ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL

MEASURING REGIONAL INNOVATION PERFORMANCE IN TURKEY

Ph.D. THESIS

Berna Sezen ÖZEN

Department of Urban and Regional Planning

Urban and Regional Planning Doctorate Programme

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(502122803)

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Thesis Advisor: Prof. Dr. Tüzin BAYCAN

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DOKTORA TEZİ

Berna Sezen ÖZEN
(502122803)

Şehir ve Bölge Planlaması Anabilim Dalı

Şehir ve Bölge Planlama Doktora Programı

Tez Danışmanı: Prof. Dr. Tüzin BAYCAN

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Berna Sezen ÖZEN, a Ph.D. student of ITU Graduate School student ID 502122803, successfully defended the dissertation entitled "MEASURING REGIONAL INNOVATION PERFORMANCE IN TURKEY", which she prepared after fulfilling the requirements specified in the associated legislations, before the jury whose signatures are below.

Thesis Advisor :	**Prof. Dr. Tüzin BAYCAN** Istanbul Technical University	.....
Jury Members :	**Prof. Dr. Gülden ERKUT** Istanbul Technical University	.....
	Prof. Dr. Alpay FİLİZTEKİN Sabancı University	.....
	Prof. Dr. Dilek BEYAZLI Karadeniz Technical University	.....
	Assoc. Prof. Dr. Kerem Yavuz ARSLANLI Istanbul Technical University	…….....

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In loving memory of the late Prof. Dr. Şinasi AYDEMİR,

FOREWORD

The process of knowledge, innovation and technology production and diffusion has been changing remarkably day by day and creating a competitive environment. In today's knowledge society, we, as individuals, have to improve ourselves and learn, produce and transfer new knowledge every day.

This knowledge society also encouraged me to work on innovation systems as a main subject of my Ph.D thesis entitled “Measuring Regional Innovation Performance in Turkey”. This process was a long, labor-intensive period full of discoveries that allowed me to learn new information and numerical methods. There are many respectable people I need to thank in this labor-intensive process.

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Since innovation is a very comprehensive concept by its nature, it also requires you to research, question and apply new techniques. For this very reason, I had to apply a large number of numerical methods that I was familiar with or just encountered in my thesis, with the guidance of my jury members. If we take the order of methods in the thesis as a basis; I would like to express my thanks to Prof. Dr. Türkan ERBAY DALKILIÇ and Prof. Dr. Gülay KIROĞLU whom I could consult on statistical issues. Also, I would like to thank Prof. Dr. Alpay FİLİZTEKİN for introducing me to Markov Chains, which I have never experienced before, but applied with two different methods in the thesis. In addition, I would like to thank Prof. Dr. Murat Can GENÇ for his help on Panel Data Analysis, which is a method I have just learned and applied five different econometric models in my thesis. Besides these methodologies, I am still trying to improve myself more and more in this field with a great excitement.

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For my academic experiences, I would like to thank all the academic staff at the Urban and Regional Planning Departments of Karadeniz Technical University and Istanbul Technical University.

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Wishing everyone to learn and teach new knowledge every day…

December 2022

Berna Sezen ÖZEN
(Urban and Regional Planner)

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ABBREVIATIONS

AAGR : Average Annual Growth Rate
AGR : Annual Growth Rates
AHİKA : Ahiler Development Agency
ANKARAKA: Ankara Development Agency
ASELSAN : Military Electronic Industries
ASO : Ankara Chamber of Industry
BAKA : West Mediterranean Development Agency
BAKKA : Western Black Sea Development Agency
BEBKA : Bursa, Eskişehir, Bilecik Development Agency
BERD : Business Enterprise Expenditure on Research and Development
BRICS : Brazil, Russia, India, China and South Africa
BRSA : Banking Regulation and Supervision Agency
BTK : The Information and Communication Technologies Authority
CD : Cross-section Dependency
CIS : Community Innovation Survey
CoHE : Council of Higher Education
DAs : Development Agencies
DAKA : Eastern Anatolia Development Agency
DEA : Data Envelopment Analysis
DİKA : Tigris Development Agency
DOĞAKA : Eastern Mediterranean Development Agency
DOKA : Eastern Black Sea Development Agency
EC : European Community
EEG : Evolutionary Economic Geography
EIS : European Innovation Scoreboard
EPC : European Patent Convention
EPO : European Patent Office
EU : European Union
EUIPO : European Union Intellectual Property Office
Eurostat : The Statistical Office of the European Union
FDH : Free Disposal Hull
FDI : Foreign Direct Investment
FKA : Fırat Development Agency
GDP : Gross Domestic Product
GEKA : Southern Aegean Development Agency
GERD : Gross Expenditure on Research and Development
GMKA : South Marmara Development Agency
GMM : Generalized Method of Moments
GOVERD : R&D Expenditures in the Government Sector
GREMI : The Groupe de Recherche Européen sur les Milieux Innovateurs
HERD : Higher Education Expenditure on Research and Development
HPC : The High Planning Council
ICT : Information and Communication Technology
IK : Indigenous Knowledge

IPC : The International Patent Classification
IPL : Industrial Property Law
IPR : Intellectual Property Rights
IRE : Innovating Regions of Europe
IS/SI : Innovation Systems/Systems of Innovation
ISCED : International Standard Classification of Education
IT : Innovation and Technology
KARACADAĞ: Karacadağ Development Agency
KOP : Konya Plain Project
KOSGEB : Small and Medium Enterprises Development Organization of Turkey
KUDAKA : Northeast Anatolia Development Agency
KUZKA : North Anatolian Development Agency
LFS : Labour Force Survey
MAR : Marshall-Arrow-Romer
MARKA : East Marmara Development Agency
MEVKA : Mevlana Development Agency
MNEs : Multinational Enterprises
MÜSİAD : Independent Industrialists' and Businessmen's Association
NEG : Neweconomic Geography
NEGG : Neweconomic Geography Growth Models
NGOs : Non-governmental organizations
NIS/NSI : National Innovation Systems/National Systems of Innovation
NUTS : Nomenclature of Territorial Units for Statistics
OECD : The Organisation for Economic Co-operation and Development
OIZs : Organized Industrial Zones
OKA : Middle Black Sea Development Agency
OLS : Ordinary Least Squares
ORAN : Middle Anatolia Development Agency
PCT : The Patent Cooperation Treaty
PEST : Political, Economic, Social and Technological
Ph.D : Doctor of Philosophy
PPP : Purchasing Power Parity
PPS : Purchasing Power Standards
PRDs : Priority Regions in Development
R&D : Research and Development
RDAs : Regional Development Agencies
RIS/RSI : Regional Innovation Systems/Regional Systems of Innovation
S&E : Science and Engineering
S&T : Science and Technology
SCST : The Supreme Council of Science and Technology
SEGE : Socio-Economic Development Ranking Studies
SERKA : Serhat Development Agency
SFA : Stochastic Frontier Analysis
SII : Summary Innovation Index
SIS/SSI : Sectoral Innovation Systems/Sectoral Systems of Innovation
SITC : Standard International Trade Classification
SMEs : Small and Medium-sized Enterprises
SPO : State Planning Organization
SPSS : Statistical Package for the Social Sciences
SSH : Social Sciences and Humanities

SWOT : Strengths, Weaknesses, Opportunities, and Threats
TARAL : Turkish Research Area
TDZs : Technology Development Zones
TEKMER : Technology Development Center
TFA : Thick Frontier Analysis
TIS/TSI : Technological Innovation Systems/Technological Systems of Innovation
TNCs : Transnational Corporations
TR : Turkey
TRAKYAKA: Trakya Development Agency
TSE : Turkish Standards Institution
TTGV : Technology Development Foundation of Turkey
TTOs : Technology Transfer Offices
TURKSTAT : Turkish Statistical Institute
TÜBA : Turkish Academy of Sciences
TÜBİTAK : The Scientific and Technological Research Council of Turkey
TÜBİTAK BİLGEM : Informatics and Information Security Research Center
TÜBİTAK BİLGEM UEKAE: National Research Institute of Electronics and Cryptology
TÜBİTAK BUTAL: Bursa Test and Analysis Laboratory
TÜBİTAK MAM: Marmara Research Center
TÜBİTAK SAGE: Defense Industries Research And Development Institute
TÜBİTAK TBAE: Research Institute for Fundamental Sciences
TÜBİTAK TEYDEB: Technology and Innovation Support Programs Directorate
TÜBİTAK TUG: National Observatory
TÜBİTAK TÜSSİDE: Turkish Management Sciences Institute
TÜBİTAK ULAKBİM: Turkish Academic Network and Information Center
TÜBİTAK UME: National Metrology Institute
TÜBİTAK UZAY: Space Technologies Research Institute
TÜRKAK : Turkish Accreditation Agency
TÜRKPATENT: Turkish Patent and Trademark Office (previously known as Turkish Patent Insitute-TPI)
UN : United Nations
US : United States
USPTO : United States Patent and Trademark Office
WIPO : World Intellectual Property Office
ZAFER : Zafer Development Agency
ÇİTTAGE : Çukurova Advanced Agricultural Technologies Research and Development Institute
ÇKA : Çukurova Development Agency
İKA : Silkroad Development Agency
İSTKA : İstanbul Development Agency
İZKA : İzmir Development Agency

SYMBOLS

₺	: Turkish Lira
€	: Euro
$\boldsymbol{\beta_0}$	: Constant
$\boldsymbol{\beta_1,\ldots,\beta_{11}}$	: Coefficients of the x variables
lg	: Logarithmic values
$\boldsymbol{ln}$	: Natural logarithmic values
x	: Independent variables
y	: Dependent variables
%	: Percent
u	: Error term

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MEASURING REGIONAL INNOVATION PERFORMANCE IN TURKEY

SUMMARY

Innovation is increasingly regarded as one of the key engines and an important driver of value creation, economic growth and social welfare, while innovation performance is an important criterion for improving international competitive power. As demand changes rapidly with globalization, changes in products and markets also increase. The process of knowledge, innovation and technology production and diffusion has been changing remarkably day by day. In recent years, this change has accelerated very fast due to the global effects and reflections. Increasing market pressures (stemming from globalisation, deregulation, changing patterns of demand and new societal needs) makes a closer integration and relation of innovation and globalisation. In this context, it should be well known how globalization processes influence the possibilities of establishing innovation systems in developing countries, which makes local systems significant. The production of goods and services is becoming more and more knowledge/science/technology and skills-intensive. Hence technology diffusion requires organisational and managerial innovations beyond equipment procurement. As a reflection of knowledge/science/technology/skills-intensive global competitive structure, challenges on innovation make the innovation systems and policies varied both in national and regional levels. In this context, there are different responses and reactions of different countries and regions to this competitive environment. From the literature review, it can be seen that the innovation systems of nations differ depending on their country size (based on both land size as small-large countries and also population size) and the level of socioeconomic development (high;medium;low-income); their market status; “the market and non-market institutions in a country”; their patterns of economic specialization such as industrial, sectoral, scientific and technological specialisation in production, trade, knowledge and service; “industrial specialisation, specific institutional settings, policy priorities, and so on”; their governance mechanisms and their administrative and institutional structures and characteristics such as the distribution of duty, authority and responsibility within this structure, patterns of collaboration and cooperation of different units and actors within the organizational structure; “institutions such as laws, rules, norms”; and interactions among these institutions; and “the governance and coordination of research and innovation policies” and strategies for promoting innovation.

Technological developments brought about by globalization give rise to a rapidly changing, developing and transforming competitive environment. In today's conditions, also known as the knowledge society, every structure from micro to macro scale (firm, region, nation etc.) strives in this competitive environment in such a way that some try to create changes by pioneering, while others try to recognize, follow and adapt these changes. Therefore, countries and regions create policies, strategies and plans in order to establish and manage an effective innovation system. Globalization increases the need for innovation policy, and also affects the design and implementation of innovation policies. In this knowledge-driven competitive

environment, measurements of the capacity, efficiency and performance of innovation systems at different spatial levels gain importance. The European Union (EU) measures the national innovation performance of Turkey based on the European Innovation Scoreboard but does not evaluate the regions of Turkey in this regard. According to these innovation indices, Turkey was placed in the 'modest innovators' group until 2016 and then moved from modest to moderate innovators by improving its innovation performances. Unfortunately, the country could not recently sustain its position and fell back to the group of emerging countries. Even though Turkey's innovation index is far below the EU average, its innovation growth rate is much above it. According to its growth rate in innovation performance, Turkey is one of the countries that resisted the 2008 global economic crisis and had a rising trend mainly in indicators such as 'population completed tertiary education', 'youth with upper secondary level education' and 'R&D expenditure in the business sector'. In recent years, Turkey has made strong efforts to strengthen the innovation systems. According to 'European Innovation Scoreboard 2018', the strongest innovation dimensions of Turkey are 'Firm investments' and 'Innovators'. 'Firm investments' dimension is one of the best trends of Turkey. On the contrary, 'Intellectual assets' and 'Employment impacts' are the weakest innovation dimensions of Turkey. Although Turkey showed little increases in some years for these dimensions, these increases could not prevent Turkey from being one of the lowest ranking countries. Therefore, Turkey must deeply focus on and spend much more efforts on these dimensions. The reasons for Turkey being an emerging country with a higher growth rate and having some challenges on innovation increase the need and importance of innovation-related research.

There are some studies to measure the performance of regional innovation in Turkey, and which are made generally on the basis of a single time and mainly on the upper scales as (i) NUTS-1, (ii) NUTS-2, (iii) NUTS-3 levels, or (iv) on a certain region. Although there are afore-mentioned studies on regional innovation measurement for Turkey, there has not been any study found focusing on the transitions through different time periods in terms of the regional innovation performance at NUTS-3 level of Turkey. Hence, fulfilling the gap in this respect, this study analyzes the changes in the regional innovation performances in Turkey. It aims at demonstrating in which issues the similarities and/or differences of innovation performances occur within the regions and at interregional levels, and making a dynamic analysis of the diversities and changes of the innovation performances of the regions over time from 2000 to 2017 based on the performance grouping of the EU-defined performance levels as innovation leaders, strong innovators, moderate innovators and modest innovators. The purpose of the thesis is (i) to evaluate the general status of the innovation performance of Turkey in international and national scales, (ii) to focus mainly on measuring and mapping regional innovation performances in Turkey by providing a temporal dynamic analysis of transitions of the regions (at NUTS-3 level) in Turkey from one state of innovative performance to another over time from 2000 to 2017 based on the performance levels as innovation leaders, strong innovators, moderate innovators and modest innovators, (iii) to demonstrate in which issues the similarities and/or differences of the innovation performances occur within the regions and at interregional levels, (iv) to determine the factors related to these innovation performances and (v) to create related policies and strategies for establishing and managing an effective innovation system. This thesis also considers to clarify the actors, factors, dimensions influencing both national and regional innovation systems and to examine the methods of measuring the performance of a

region’s innovation system, to determine the current situation, to highlight the critical issues and the key challenges for increasing the innovation performance of Turkey in national and regional levels.

In order to assess the innovation performances of the regions, this study focused on the intellectual assets with different forms of intellectual property rights (patent, utility model, trademark, design applications and registrations) which are accepted as the directly effective issues in the measurements of regional innovation performances and analyzed the transitions of the regions (at NUTS-3 level) in Turkey from one state to the other in terms of their innovation performances which were previously defined as four different performance levels as innovation leaders, strong innovators, moderate innovators and modest innovators as a result of the four quartiles according to the 2000–2005 (t-1), 2006–2010 (t) and 2011–2017 (t+1) time periods. Regarding the intellectual assets, consisting of the patent, utility model, trademark and design applications, Markov Chains have revealed that there are regional disparities (between i. regions located in the east and west of the country, ii. metropolitan and non-metropolitan regions, iii. high-developed and relatively less-developed regions). Results show that metropolitan regions have higher performances. Five different panel data models were performed to identify the determinants of the innovation performances of the innovation leaders. These econometric models included a wide data set of dependent (patent, utility model, trademark, design applications) and independent (population size, youth dependency ratio, gross domestic product, exports, number of enterprises, total cash loans, population aged 25-34 with tertiary edıucation, number of teaching staff within own unit for higher education institutions, life-long learning, fixed broadband penetration, high-skilled immigration) variables. Due to the heteroscedasticity, autocorrelation and cross-dependency problems, different estimators were applied such as fixed effects with Arellano, Froot ve Rogers Estimators for the utility model and patent applications; fixed effects with clustered estimation for the trademark applications; random effects with Driscoll-Kraay Estimator for the design applications (file), and random effects with Arellano, Froot ve Rogers Estimators for the design applications (design). These models reveal that different innovation indicators may differently affect the different types of intellectual property rights. While one independent variable positively affects one dependent variable, it may affect another dependent variable negatively. For example, ‘total cash loans’ and ‘number of teaching staff within own unit for higher education institutions’ variables have negative effects on the trademark applications, but have strikingly positive effect on the design applications (design). Likewise, ‘life-long learning’ variable positively affects utility models and design applications (design), it negatively affects patent applications.

This thesis will make a significant contribution to the future and the literature in terms of (i) focusing on the regions of Turkey, which is a large, diverse and emerging country, as an example to other similar countries, (ii) covering the NUTS-3 level highlighting local knowledge and dynamics, and (iii) examining the transitions of regions of Turkey with the Markov Chains and Shorrocks indices including three different time periods, (iv) defining the determinants of the performances with Panel Data Analysis as well as (v) evaluating the regional performances of intellectual assets, which is one of Turkey's challenges on innovation and (vi) creating related policies and strategies for establishing and managing an effective innovation system. Depending on the ‘knowledge society', this thesis gains prominence in evaluating the innovation performance of Turkey both in international, national and regional levels.

TÜRKİYE'NİN BÖLGESEL İNOVASYON PERFORMANSININ ÖLÇÜLMESİ

ÖZET

İnovasyon, değer yaratmanın, ekonomik büyümenin ve sosyal refahın kilit motorlarından biri ve önemli itici gücü olarak giderek daha fazla kabul edilirken, inovasyon performansı uluslararası rekabet gücünü geliştirmek için önemli bir kriterdir.

Küreselleşme ile birlikte talep hızla değiştikçe, ürün ve pazarlardaki değişimler de artmaktadır. Bilgi, inovasyon ve teknoloji üretim ve yayılım süreci her geçen gün önemli ölçüde değişmektedir. Son yıllarda küresel etkiler ve yansımalar nedeniyle bu değişim çok hızlı hızlanmıştır. Artan piyasa baskıları (küreselleşme, serbestleştirme, değişen talep kalıpları ve yeni toplumsal ihtiyaçlardan kaynaklanan), inovasyon ve küreselleşmenin daha yakın bir entegrasyonu ve ilişkisini sağlar. Bu bağlamda, küreselleşme süreçlerinin, yerel sistemleri önemli kılan, gelişmekte olan ülkelerde inovasyon sistemlerinin kurulma olanaklarını nasıl etkilediği iyi bilinmelidir.

Mal ve hizmetlerin üretimi giderek daha fazla bilgi/bilim/teknoloji ve beceri-yoğun hale gelmektedir. Bu nedenle teknoloji yayılımı, ekipman tedarikinin ötesinde organizasyonel ve yönetimsel inovasyonlar gerektirir. Bilgi/bilim/teknoloji/beceri-yoğun küresel rekabet yapısının bir yansıması olarak, inovasyon konusundaki zorluklar, inovasyon sistemlerini ve politikalarını hem ulusal hem de bölgesel düzeyde çeşitlendirmektedir. Bu bağlamda, bu rekabet ortamına farklı ülke ve bölgelerin farklı müdahaleleri ve tepkileri bulunmaktadır.

Literatür taramasından, ulusların inovasyon sistemlerinin ülke büyüklüklerine (hem küçük-büyük ülkeler olarak arazi büyüklüğüne hem de nüfus büyüklüğüne göre) ve sosyoekonomik gelişmişlik düzeyine (yüksek;orta;düşük- gelir); piyasa durumu; "bir ülkedeki piyasa ve piyasa dışı kurumlar"; üretim, ticaret, bilgi ve hizmette endüstriyel, sektörel, bilimsel ve teknolojik uzmanlaşma gibi ekonomik uzmanlaşma kalıpları; "endüstriyel uzmanlaşma, belirli kurumsal ortamlar, politika öncelikleri ve benzeri"; yönetişim mekanizmaları ve bu yapı içerisinde görev, yetki ve sorumluluk dağılımı, farklı birim ve aktörlerin organizasyon yapısı içindeki işbirliği ve uyum kalıpları gibi idari ve kurumsal yapıları ve özellikleri; "yasalar, kurallar, normlar gibi kurumlar"; ve bu kurumlar arasındaki etkileşimler; ve "araştırma ve inovasyon politikalarının yönetimi ve koordinasyonu" ve yeniliği teşvik etmeye yönelik stratejilerine bağlı olarak farklılaştıkları özetlenebilir.

Küreselleşmenin getirdiği teknolojik gelişmelerle birlikte hızla değişen, gelişen ve dönüşen rekabetçi bir çevre ortaya çıkmaktadır. 'Bilgi toplumu' olarak adlandırılan günümüzde, mikrodan makro ölçeğe (firma, bölge, ulus vb.) her yapı bu rekabet ortamında çaba göstermektedir; bazıları öncülük ederek değişiklikleri yaratmaya çalışırken, bazıları da bu değişikliklerin farkına varmaya, takip etmeye ve uyarlamaya çalışmaktadır. Dolayısıyla ülkeler ve bölgeler etkili bir inovasyon sisteminin kurulması ve yönetilmesi için politikalar, stratejiler ve planlar

oluşturmaktadır. Küreselleşme, inovasyon politikası ihtiyacını arttırmakta ve bununla birlikte inovasyon politikalarının tasarım ve uygulanmasını etkilemektedir.

Bilgi odaklı bu rekabet ortamında, farklı mekansal düzeylerde inovasyon sistemlerinin kapasite, verimlilik ve performans ölçümleri önem kazanmaktadır. Avrupa Birliği, Türkiye'nin ulusal inovasyon performansını Avrupa İnovasyon Skorboard Endeksine göre ölçmekte ancak Türkiye'nin bölgelerini bu açıdan değerlendirmemektedir. Bu inovasyon endekslerine göre 2016 yılına kadar "mütevazı yenilikçiler" grubunda yer alan Türkiye, daha sonra inovasyon performanslarını geliştirerek mütevazı yenilikçilerden "ılımlı yenilikçilere" geçti. Ne yazık ki ülke son dönemde konumunu sürdürememiş ve gelişmekte olan ülkeler grubuna geri dönmüştür. Türkiye'nin inovasyon endeksi AB ortalamasının çok altında olmasına rağmen inovasyon büyüme hızı AB'nin çok üzerindedir. İnovasyon performansındaki büyüme hızına göre Türkiye, 2008 küresel ekonomik krizine direnen ve başta 'yükseköğretimi tamamlamış nüfus', 'orta öğretimli gençler' ve 'özel sektördeki AR-GE harcamaları' gibi göstergelerde yükselen bir trend gösteren ülkelerden biridir. Türkiye son yıllarda inovasyon sistemlerini güçlendirmek için güçlü çabalar sarf etmiştir. Avrupa İnovasyon Skorboard Endeksi 2018'e göre Türkiye'nin en güçlü inovasyon boyutları "Firma yatırımları" ve "Yenilikçiler". 'Firma yatırımları' boyutu, Türkiye'nin en iyi trendlerinden biridir. Aksine, 'Fikri varlıklar' ve 'İstihdam etkileri' Türkiye'nin en zayıf inovasyon boyutlarıdır. Türkiye bu boyutlarda bazı yıllarda çok az artışlar gösterse de bu artışlar Türkiye'nin en alt sıradaki ülkelerden biri olmasını engelleyememiştir. Dolayısıyla Türkiye'nin bu boyutlara daha fazla odaklanması ve daha fazla çaba sarf etmesi gerekmektedir. Türkiye'nin daha yüksek büyüme hızına sahip gelişmekte olan bir ülke olması ve inovasyon konusunda bazı zorluklarının olması, inovasyonla ilgili araştırmaların gerekliliğini ve önemini artırmaktadır.

Türkiye'de bölgesel inovasyon performansını ölçmeye yönelik, genel olarak tek bir zaman bazında ve ağırlıklı olarak üst ölçeklerde (i) İBBS-1, (ii) İBBS-2, (iii) İBBS-3 seviyeleri veya (iv) belirli bir bölge üzerine yapılan çalışmalar bulunmaktadır. Türkiye için bölgesel inovasyon performansı ölçümü konusunda yukarıda bahsedilen çalışmalar olmasına rağmen, Türkiye'nin İBBS-3 düzeyinde bölgesel yenilik performansı açısından farklı zaman dilimlerindeki geçişlere odaklanan herhangi bir çalışmaya rastlanmamıştır. Dolayısıyla, bu konudaki boşluğu dolduran bu çalışma, Türkiye'deki bölgesel inovasyon performanslarındaki değişiklikleri analiz etmektedir. Bu çalışma, bölgeler içinde ve bölgeler arası düzeyde inovasyon performanslarının benzerlik ve/veya farklılıklarının hangi konularda ortaya çıktığını ortaya koymayı ve AB'nin inovasyon liderleri, güçlü yenilikçiler, ılımlı yenilikçiler ve mütevazı yenilikçiler şeklindeki performans düzeylerini tanımladığı performans gruplamasına dayalı olarak 2000'den 2017'ye kadar bölgelerin inovasyon performanslarının zaman içindeki farklılıklarının ve değişikliklerinin dinamik bir analizini yapmayı amaçlamaktadır.

Tezin amacı, Türkiye'nin inovasyon performansının genel durumunu ulusal ölçekte değerlendirmek; ardışık Markov Zincirleri ve Shorrocks Trace Endekslerini kullanarak, Türkiye'deki bölgelerin bir inovasyon performans durumundan diğerine geçişlerinin zamansal dinamik bir analizini sağlayarak esas olarak Türkiye'deki bölgesel inovasyon performansını ölçmeye ve haritalamaya odaklanmak; Panel Veri Analizi ile bu performanslarla ilgili faktörleri belirlemek ve etkin bir inovasyon sisteminin kurulması ve yönetilmesi için ilgili politika ve stratejileri oluşturmaktır. Bu tez aynı zamanda hem ulusal hem de bölgesel inovasyon sistemlerini etkileyen

aktörleri, faktörleri ve boyutları netleştirmeyi, bir bölgenin inovasyon sisteminin performansını ölçme yöntemlerini incelemeyi, mevcut durumu belirlemeyi, Türkiye'nin ulusal ve bölgesel düzeyde inovasyon performansını artırmaya yönelik kritik konuları ve temel zorlukları vurgulamayı da ele almaktadır.

Bölgelerin inovasyon performanslarını değerlendirmek için bu çalışma, farklı formlardaki fikri mülkiyet haklarına (patent, faydalı model, marka, tasarım başvuruları ve tescilleri) sahip olan ve bölgesel inovasyon performanslarının ölçülmesinde doğrudan etkili faktörler olarak kabul edilen fikri varlıklara odaklanmış, 2000–2005 (t-1), 2006–2010 (t) ve 2011–2017 (t+1) zaman dilimlerine göre dört çeyrek sonucunda oluşan daha önce inovasyon liderleri, güçlü yenilikçiler, ılımlı yenilikçiler ve mütevazı yenilikçiler olarak dört farklı performans düzeyi olarak tanımlanan inovasyon performansları açısından Türkiye'deki bölgelerin (NUTS-3 düzeyinde) bir durumdan diğerine geçişlerini analiz etmiştir. Fikri varlıklara ilişkin olarak patent, faydalı model, marka ve tasarım başvuruları ve tescillerinden oluşan Markov Zincirleri, bölgesel farklılıklar olduğunu ortaya koymuştur (i. ülkenin doğusunda ve batısında yer alan bölgeler arasında, ii. metropol ve metropol olmayan bölgeler arasında, iii. yüksek gelişmiş ve nispeten daha az gelişmiş bölgeler arasında). Sonuçlar, metropol bölgelerin daha yüksek performansa sahip olduğunu göstermektedir.

İnovasyon liderlerinin inovasyon performanslarının belirleyicilerini belirlemek için beş farklı panel veri modeli gerçekleştirilmiştir. Bu ekonometrik modeller, bağımlı (patent, faydalı model, marka, tasarım başvuruları) ve bağımsız (nüfus büyüklüğü, genç bağımlılık oranı, gayri safi yurtiçi hasıla, ihracat, girişim sayısı, toplam nakdi krediler, yükseköğretimli 25-34 yaş arası nüfus, yükseköğretim kurumları için kendi birimindeki öğretim elemanı sayısı, yaşam boyu öğrenme, sabit genişbant penetrasyonu, yüksek vasıflı göçmenlik gibi) geniş bir veri setini içermektedir. Değişen varyans, otokorelasyon ve yatay bağımlılık problemlerinden dolayı faydalı model ve patent başvuruları için Arellano, Froot ve Rogers Tahmincileri ile sabit etkiler; marka başvuruları için kümelenmiş tahmin ile sabit etkiler; tasarım başvuruları (dosya) için Driscoll-Kraay Tahmincisi ile tesadüfi etkiler ve tasarım başvuruları (tasarım) için Arellano, Froot ve Rogers Tahmincileri ile tesadüfi etkiler gibi farklı tahminciler uygulanmıştır. Bu modeller, farklı inovasyon göstergelerinin farklı fikri mülkiyet hakları türlerini farklı şekilde etkileyebileceğini ortaya koymaktadır. Bir bağımsız değişken, bir bağımlı değişkeni olumlu yönde etkilerken, diğer bağımlı değişkeni olumsuz yönde etkileyebilir. Örneğin beş farklı panel veri modelinin sonuçları incelendiğinde, 'toplam nakdi krediler' ve 'yükseköğretim kurumlarının kendi birimindeki öğretim elemanı sayısı' değişkenleri marka başvuruları üzerinde olumsuz etkiye sebep olurken, tasarım başvuruları (tasarım) üzerinde çarpıcı bir olumlu etki sağlamaktadır. Aynı şekilde ‘yaşam boyu öğrenme’ değişkeni faydalı model ve tasarım başvurularını (tasarım) olumlu etkilerken, patent başvurularını olumsuz etkilemektedir.

Bu tez, (i) büyük, çeşitli ve gelişmekte olan bir ülke olan Türkiye'nin bölgelerine odaklanarak benzer diğer ülkelere örnek olması, (ii) yerel bilgi ve dinamikleri vurgulayan NUTS-3 düzeyini kapsaması, (iii) üç farklı zaman dilimini içeren Markov Zincirleri ve Shorrocks endeksleri ile Türkiye’nin bölgelerinin geçişlerini incelemesi, (iv) performansların belirleyicilerini Panel Veri Analizi ile saptanması gibi (v) Türkiye'nin inovasyon konusundaki zorluklarından biri olan fikri varlıkların bölgesel performanslarının değerlendirilmesi, ve (vi) etkin bir inovasyon sisteminin kurulması ve yönetilmesi için ilgili politika ve stratejilerin oluşturulması açısından da

geleceğe ve literatüre önemli katkılar sağlayacaktır. “Bilgi toplumu”na bağlı olarak bu tez, Türkiye'nin inovasyon performansını uluslararası, ulusal ve bölgesel düzeylerde değerlendirme konusunda önem kazanmaktadır.

1. INTRODUCTION

Innovation is increasingly regarded as one of the key engines and an important driver of value creation, economic growth and social welfare, while innovation performance is an important criterion for improving international competitive power (Özen and Baycan, 2014).

As demand changes rapidly with globalization, changes in products and markets also increase. The process of knowledge, innovation and technology production and diffusion has been changing remarkably day by day. In recent years, this change has accelerated very fast due to the global effects and reflections. Increasing market pressures (stemming from globalisation, deregulation, changing patterns of demand and new societal needs) makes a closer integration (OECD, 1999: p. 3, 15) and relation of innovation and globalisation (OECD, 1999: p. 15; Aiginger et al., 2009: p. 103).

In this context, how globalization processes influence the possibilities of establishing innovation systems (IS/SI)[1] in developing countries, which makes local systems significant should be well known (Lundvall et.al., 2002: p. 18).

"With the advent of globalization, implying rapidly increasing production, trade, finance and technology linkages" between countries, growing concerns about the significance of National Innovation Systems (NIS/NSI)[2] may be declining. Contrary to these growing concerns, local, regional or national innovation systems have their part "in shaping the global pattern" of institutional technological activities (UN, 2007: p. 1, 2).

New processes and products are created as a result of the combination of different pieces of knowledge through economic interactions which are not only related with Research and Development (R&D), but also with the "normal and everyday

[1] IS and SI refer to the same concept as 'Innovation Systems'/ 'Systems of Innovation'. In this thesis IS is used as an abbreviation.
[2] NIS and NSI refer to the same concept as 'National Innovation Systems'/ 'National Systems of Innovation'. In this thesis NIS is used as an abbreviation.

economic activities such as procurement, production and marketing (Edquist and Johnson, 2000: p. 42)".

According to the OECD (1999: p. 15), the production of goods and services is becoming more and more knowledge/science/technology and skills-intensive. Hence technology diffusion requires organisational and managerial innovations beyond equipment procurement.

As a reflection of knowledge/science/technology/skills-intensive global competitive structure, challenges on innovation make the innovation systems and policies varied both in national and regional levels. In this context, there are different responses and reactions of different countries and regions to this competitive environment.

From the literature review, it can be summarized that the innovation systems of nations differ depending on their country size (OECD, 1999) (based on both land size as small-large countries and also population size) and the level of socioeconomic development (OECD, 1999) (high;medium;low-income); their market status; "the market and non-market institutions in a country (OECD, 1999)"; their patterns of economic specialization (Kaiser and Prange, 2004) such as industrial (Patel and Pavitt, 1994; OECD, 1999), sectoral, scientific and technological specialisation (OECD, 1999) in production, trade, knowledge (Archibugi and Pianta 1992; Johnson, et. al., 2003) and service; "industrial specialisation, specific institutional settings, policy priorities, and so on (Patel and Pavitt, 1994)"; their governance mechanisms and their administrative and institutional structures and characteristics such as the distribution of duty, authority and responsibility within this structure, patterns of collaboration and cooperation of different units and actors within the organizational structure; "institutions such as laws, rules, norms (Edquist and Johnson, 1997; Edquist and Hommen, 1999; Edquist, 2005)"; and interactions among these institutions (Lundvall, 1992a); and "the governance and coordination of research and innovation policies (Edquist, 2014)" and strategies for promoting innovation.

These factors are the reasons why innovation systems have become more and more important for firms, regions, and nations etc.

The differences on innovation systems of countries are likely to be the indication of the impact of globalization on the design, implementation and the necessity of

innovation policies (Edquist, 2008a), as well as a proof that research and innovation is a tool to mitigate and overcome global challenges (Edquist, 2014: p. 3, 20) and "for triggering change and improvement in the country's overall framework conditions" (World Bank, 2010: p. 7).

Technological developments brought about by globalization give rise to a rapidly changing, developing and transforming competitive environment. In today's conditions, also known as the knowledge society, every structure from micro to macro scale (firm, region, nation etc.) strives in this competitive environment in such a way that some try to create changes by pioneering, while others try to recognize, follow and adapt these changes. Therefore, countries and regions create policies, strategies and plans in order to establish and manage an effective innovation system (Özen and Baycan, 2015). Globalization increases the need for innovation policy, and also affects the design and implementation of innovation policies (Edquist, 2008a).

As an opportunity for new sources of innovation-based growth (European Investment Bank, 2013), every society strives for innovation that corresponds to their needs and capabilities (World Bank, 2010: p. 7).

For this reason, innovation based studies become more and more important from day to day. In the last few decades, studies on knowledge and innovation have been increasing and evolving with different dimensions and concepts particularly in the 'national' (Freeman, 1987 and 1995; Dosi et al., 1988; Lundvall, 1992a; Nelson, 1993; Niosi et al., 1993, Patel and Pavitt, 1994; Niosi and Bellon, 1994; Edquist, 1997a; OECD, 1997 and 1999; Niosi, 2002), 'regional' (Cooke, 1992, 2001 and 2003; Cooke and Morgan, 1994; Cooke et al., 1997, 2000 and 2004; Evangelista et al., 2002, Doloreux, 2003; Doloreux and Parto, 2004 and 2005; Asheim and Gertler, 2005; Asheim and Coenen, 2006; Asheim, 2009; OECD, 2011 and 2013; Schrempf et al., 2013), 'sectoral' (Breschi and Malerba, 1997; Malerba, 2002) and 'technological' (Carlsson and Stankiewicz, 1991; Carlsson, 1995 and 1997; Carlsson and Jacobsson 1997; Carlsson et al., 2002) levels.

"In the knowledge-driven global economy, the ability to generate and exploit knowledge is an increasingly crucial factor determining economic success (Veugelers et al., 2009: p. 240)". Hence, the innovation, as the result of interactive

and cumulative learning processes (Edquist and Johnson, 2000: p. 42), has an important role in the long-term economic growth (Edquist, 2014: p. 20) to help improving productivity and social development by improving welfare (World Bank, 2010: p. 6). Since the innovation system is a tool for economic and social development, countries and regions create policies, strategies and plans for the establishment and management of effective innovation systems (Özen and Baycan, 2015).

'Innovation systems' is an interactive and integrated process composed of the network and relationships of various creators / actors (institutions in the public and private sectors such as firms, universities, government agencies, technical agencies and R&D public infrastructure etc) (Özen and Baycan, 2015). The relations between various actors are very important for the function and change of innovation systems (Edquist and Johnson, 2000: p. 60). Improving the coordination mechanism (Pellegrin et al., 2010: p. 16) and the flows of knowledge (OECD, 1997: p. 3), technology and information (OECD, 1997: p. 7) among these various actors strengthens innovation processes by promoting systematic and qualified interactions (Pellegrin et al., 2010: p. 16) and dynamic networks (Feinson, 2003: p. 19) between them.

'National innovation systems' is defined as "the network of institutions in the public and private-sectors whose activities and interactions initiate, import, modify and diffuse new technologies (Freeman, 1987: p. 1)" and "a system of innovation is constituted by elements and relationships which interact in the production, diffusion and use of new, and economically useful knowledge and that a national system encompasses elements and relationships, either located within or rooted inside the borders of a nation state (Lundvall, 1992b: p. 2)".

'Regional innovation systems (RIS/RSI)[3]' is defined as "…a collective order based on micro constitutional regulation conditioned by trust, reliability, exchange and cooperative interaction (Cooke et al., 1997: p. 490)" and "a regional innovation system consists of interacting knowledge generation and exploitation sub-systems

[3] RIS and RSI refer to the same concept as 'Regional Innovation Systems'/'Regional Systems of Innovation'. In this thesis RIS is used as an abbreviation.

linked to global, national and other regional systems for commercialising new knowledge (Cooke et al., 2000 cited in Cooke, 2003)".

Despite the free movement of capital and labor as a result of globalization, the importance of regions is increasing as a process of knowledge production, use and "accumulation of knowledge remains locally embedded and spatially concentrated (European Commission, 2014a: p. 74)". A RIS approach helps to explain the regional dimension of production and the regional disparities of innovation capacity and economic power (Schrempf et al., 2013), and highlights the diversity of regions in the countries, the differing dynamics of innovation and the interactions between organizations in a particular system (OECD, 2011). The analysis of a RIS allows the creation and dissemination of economically relevant information in a certain region, and also the identification of key actors and resources (such as existing infrastructures, sources of information and resources of expertise, financing, etc.). A system concept helps to clarify what kind of support is established and what inter-regional cooperation opportunities are at which policy level (local, regional, national, transnational) (IRE Working Group, 2008).

'Innovation Systems' is an effective tool for examining the national and regional economies and innovative performances and policy-making. For analysing the innovation systems, performance and capacity measurements gain importance. In this context, the European Union (EU) measures innovation systems both at national and regional levels. The annual European Innovation Scoreboard (EIS) provides a comparison of the research and innovation performances of the EU countries (European Commission, 2019a). As a regional extension of the EIS, the Regional Innovation Scoreboard provides a comparative assessment of innovation performances across the regions (European Commission, 2017a). There is no one single ideal method to evaluate innovation and innovation processes in a certain region since innovation is a complex and dynamic phenomenon defined with reference to various activities and characteristics. Most studies use quite a number of indicators consisting of various aspects of innovation, and parametric and nonparametric methods.

1.1 Purpose of Thesis

In this knowledge-driven competitive environment, measurements of the capacity, efficiency and performance of innovation systems at different spatial levels gain importance. It is obvious that a wide variety of methods are used in the literature regarding the measurement of regional innovation performance. The European Innovation Scoreboard Index is one of the widely accepted tools in the measurements of innovation systems. The EU measures the national innovation performance of Turkey based on the EIS but does not evaluate the regions of Turkey in this regard. According to these innovation indices, Turkey was placed in the 'modest innovators' group until 2016 and then moved from modest to moderate innovators by improving its innovation performances (European Commission, 2017b). Unfortunately the country could not recently sustain its position and fell back to the group of emerging countries (European Commission, 2021a). Even though Turkey's innovation index is far below the EU average, its innovation growth rate is much above it (European Commission, 2017b). According to its growth rate in innovation performance, Turkey is one of the countries that resisted the 2008 global economic crisis and had a rising trend mainly in indicators such as 'population completed tertiary education', 'youth with upper secondary level education' and 'R&D expenditure in the business sector' (Baycan and Özen, 2018). In recent years, Turkey has made strong efforts to strengthen the innovation systems. According to the EIS 2018 (European Commission, 2018a), the strongest innovation dimensions of Turkey are 'Firm investments' and 'Innovators'. 'Firm investments' dimension is one of the best trends of Turkey. In terms of this dimension, Turkey got ahead of the EU with its remarkable increase in 2014 (from 0.099 to 0.568) and was located behind the leading countries such as Israel, Switzerland, Sweden, Germany, Austria, Belgium and Finland in 2017. One of the reasons for Turkey's high performance in this dimension is being "a positive outlier in 2012 and 2014 (European Commission, 2018a)" in terms of 'Non-R&D innovation expenditures' indicator. On the contrary, 'Intellectual assets' and 'Employment impacts' are the weakest innovation dimensions of Turkey. Although Turkey showed little increases in some years for these dimensions, these increases could not prevent Turkey from being one of the lowest ranking countries. Therefore Turkey must deeply focus on and spend much more efforts on these dimensions. The reasons that Turkey being an emerging

country with a higher growth rate and having some challenges on innovation increase the need and importance of innovation-related research.

There are some studies to measure the performance of regional innovation in Turkey (TR), which are made generally on the basis of a single time and mainly on the upper scales as (i) NUTS-1 (Duman, 2017), (ii) NUTS-2 (Gömleksiz, 2012; Mercan and Gömleksiz, 2013; Kutgi and Işık Maden, 2020), (iii) NUTS-3 levels (Varış, 2021 and Lenger, 2008), or (iv) on a certain region (Karaçor and Duman, 2017; Duman and Karaçor, 2017; Akşık, 2019; Şahin and Altuğ, 2017).

(i) Duman (2017) compared innovation performances and capacities of 12 regions at NUTS-1 level of Turkey by creating regional innovation indices based on the normalization methods covering different years and also assessed the regions according to the average of NUTS-1 level regions.

(ii) Gömleksiz (2012) aimed at presenting the innovative capabilities within the regional innovation systems and created regional innovation indices of 26 NUTS-2 regions by using the normalization methods including a set of indicators with different years as innovation input and output variables. Besides, Mercan and Gömleksiz (2013) focused on the Konya Plain Project (KOP) Region covering Konya, Karaman, Aksaray, Niğde regions and compared the regional innovation capabilities of KOP Region and other 5 NUTS-2 regions as TR10 (İstanbul), TR31 (İzmir), TR41 (Bursa, Eskişehir, Bilecik), TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova) and TR51 (Ankara) regions by using the same methodology. In addition to these studies, Kutgi and Işık Maden (2020) measured the regional innovation performance at NUTS-2 level with normalization methods.

(iii) Varış (2021) aimed at revealing the determinants of the innovation outputs at NUTS-3 level by examining in three main axes as human agency, institutions, and spaces with the statistical and spatial analyses. Lenger (2008) focused on the regional innovation systems in Turkey through state universities and legal and institutional set-up at NUTS-3 level by using the Generalized Method of Moments (GMM) model for the time period 1998–2005.

(iv) Karaçor and Duman (2017) investigated innovation performance capacity of the TR1 (İstanbul) region by using the normalization methods and made a comparison of the region and the average of Turkey. Besides the TR1 region, they conducted

another study (Duman and Karaçor, 2017) aiming at examining the regional innovation capacity of the TR4 (Eastern Marmara) region with the same methodological approach. Akşık (2019) measured the regional innovation of İzmir and its surroundings by using the Decision Making Trial and Evaluation Laboratory model. Şahin and Altuğ (2017) focused mainly on the regional specializations of innovative sectors in Turkey. They first determined the innovative regions based on the patent applications per ten thousand people at NUTS-3 level for the years 2007 and 2016, then compared three largest metropolitan regions as İstanbul, Ankara and İzmir, which specialized in the manufacturing industries, in terms of innovative specialization by analyzing the data of manufacturing industry subsectors patent applications.

Although there are afore-mentioned studies on regional innovation measurement for Turkey, there has not been any study determined focusing on the transitions through different time periods in terms of the regional innovation performance at NUTS-3 level of Turkey. Hence, fulfilling the gap in this respect, this study analyzes the changes in the regional innovation performances in Turkey. It aims at demonstrating in which issues the similarities and/or differences of innovation performances occur within the regions and at interregional levels, and making a dynamic analysis of the diversities and changes of the innovation performances of the regions over time from 2000 to 2017 based on the performance grouping of the EU-defined performance levels as innovation leaders, strong innovators, moderate innovators and modest innovators.

The purpose of the thesis is (i) to evaluate the general status of the innovation performance of Turkey in international and national scales, (ii) to focus mainly on measuring and mapping regional innovation performances in Turkey by providing a temporal dynamic analysis of transitions of the regions (at NUTS-3 level) in Turkey from one state of innovative performance to another over time from 2000 to 2017 based on the performance levels as innovation leaders, strong innovators, moderate innovators and modest innovators, (iii) to demonstrate in which issues the similarities and/or differences of the innovation performances occur within the regions and at interregional levels, (iv) to determine the factors related to these innovation performances and (v) to create related policies and strategies for establishing and managing an effective innovation system.

This thesis also considers to clarify the actors, factors, dimensions influencing both national and regional innovation systems and to examine the methods of measuring the performance of a region's innovation system, to determine the current situation, to highlight the critical issues and the key challenges for increasing the innovation performance of Turkey in national and regional levels.

This thesis will make a significant contribution to the future and the literature in terms of (i) focusing on the regions of Turkey, which is a large, diverse and emerging country, as an example to other similar countries, (ii) covering the NUTS-3 level highlighting local knowledge and dynamics, and (iii) examining the transitions of regions of Turkey with the Markov Chains and Shorrocks indices including three different time periods, (iv) defining the determinants of the performances with Panel Data Analysis as well as (v) evaluating the regional performances of intellectual assets, which is one of Turkey's challenges on innovation and (vi) creating related policies and strategies for establishing and managing an effective innovation system.

Depending on the 'knowledge society', this thesis gains importance in evaluating the innovation performance of Turkey both in international, national and regional levels.

1.2 Research Questions

For illustrating the regional disparities in terms of the innovation performances in Turkey, this thesis is based on a main research question and some related explanatory questions.

Main Question:

- Are there any regional disparities (at NUTS-3 level) in innovation performance in Turkey?

Explanatory Questions:

- What are the similarities and differences in innovation performance among regions?
- How do Turkish regions differentiate in innovation performances?
- In what ways and how do regions of Turkey differ from one another?
- What are the reasons for the difference in innovation performance?

- Which are the most and the least innovative regions?
- Are metropolitan regions more innovative? Is the performance of metropolitan regions a result of the agglomeration?
- Is there a spatial convergence in terms of innovation performance? Does innovation performance show a sprawl or splash effect? Does the disparity exist across the country or within the region?

In addition to all these research questions, there are other questions that shape the structure of the thesis. These supportive questions are given in Figure 1.1 together with the structure of the thesis.

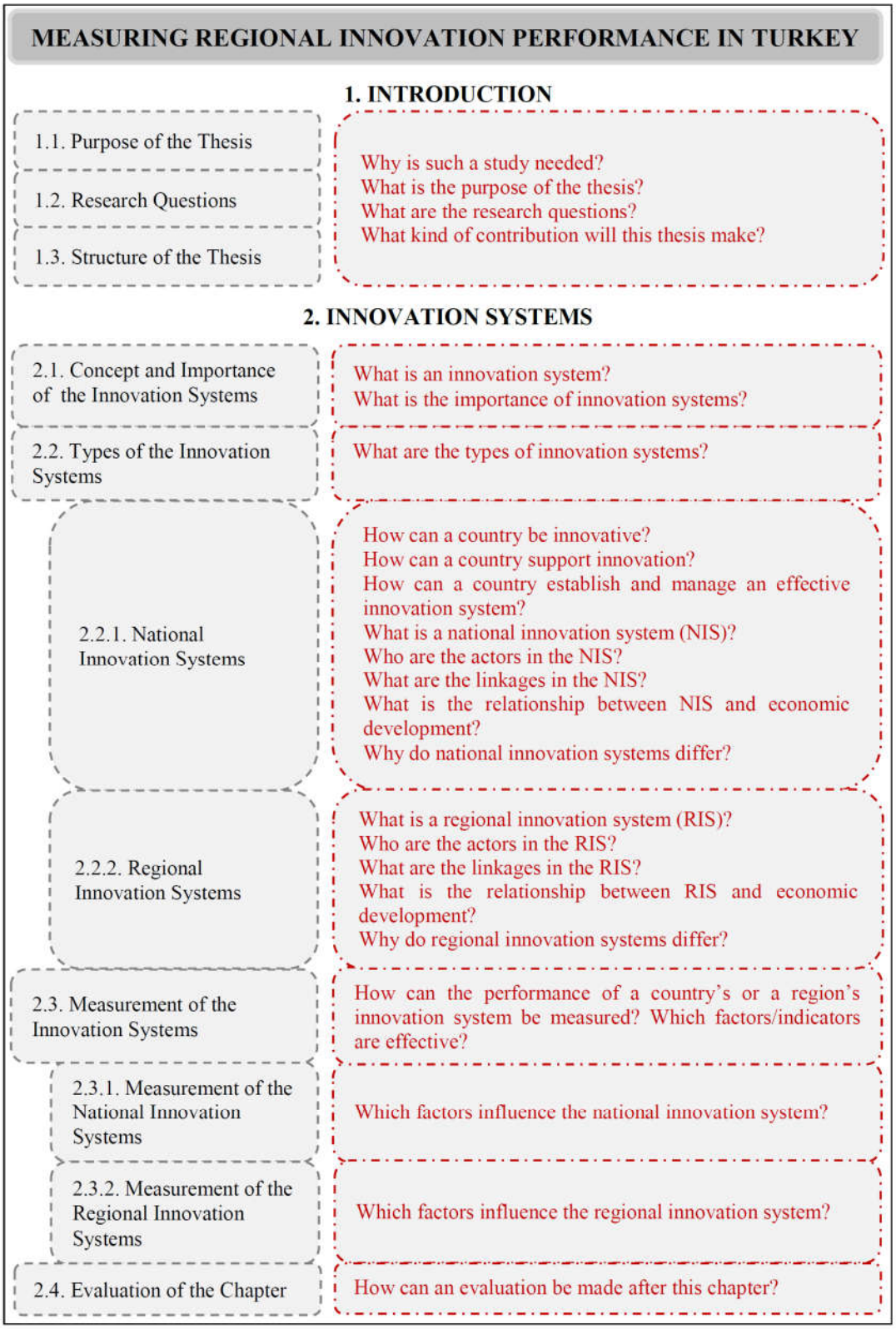


Figure 1.1 : Supportive questions contributing to the structure of the thesis (Author's own illustration).

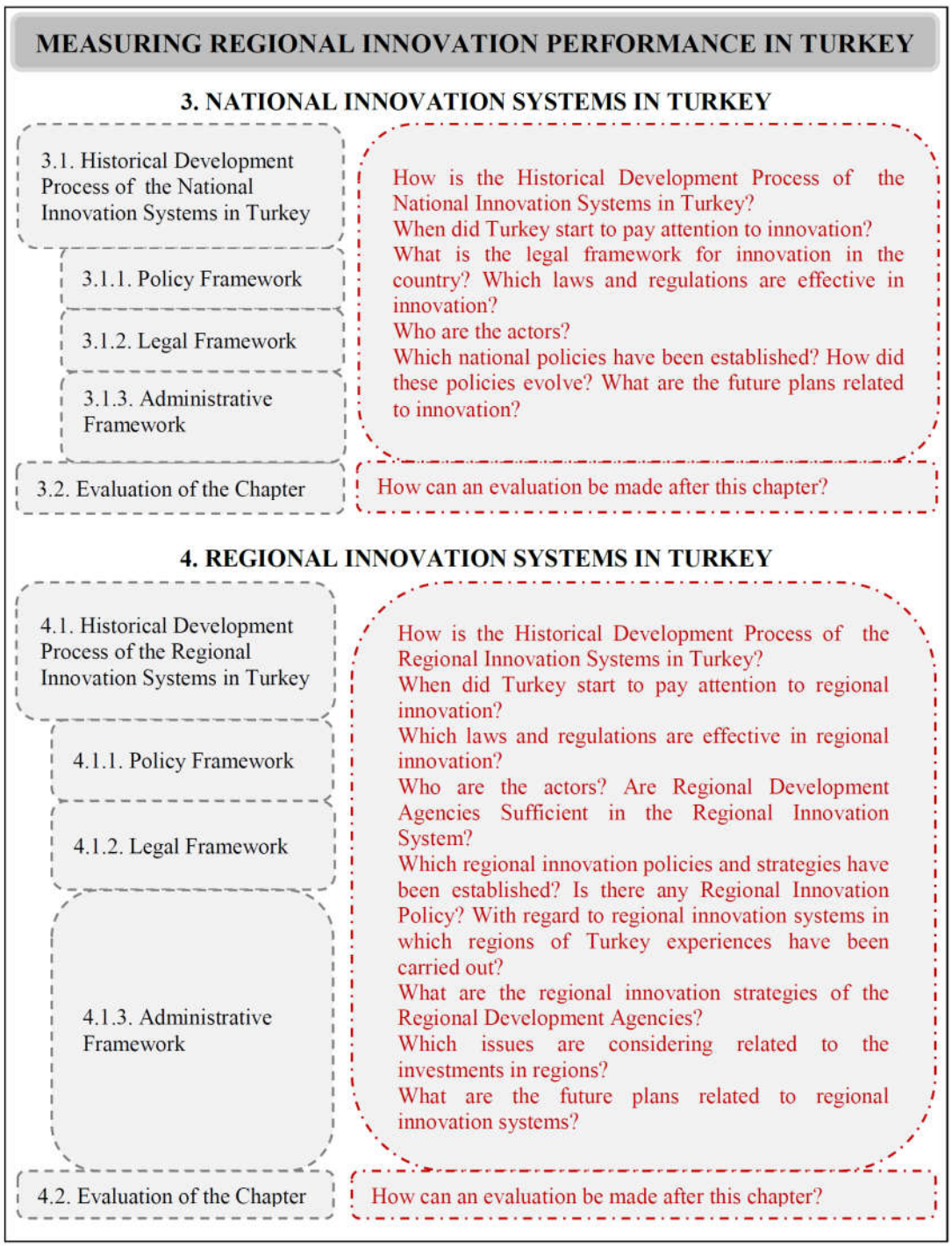


Figure 1.1 (continued): Supportive questions contributing to the structure of the thesis (Author's own illustration).

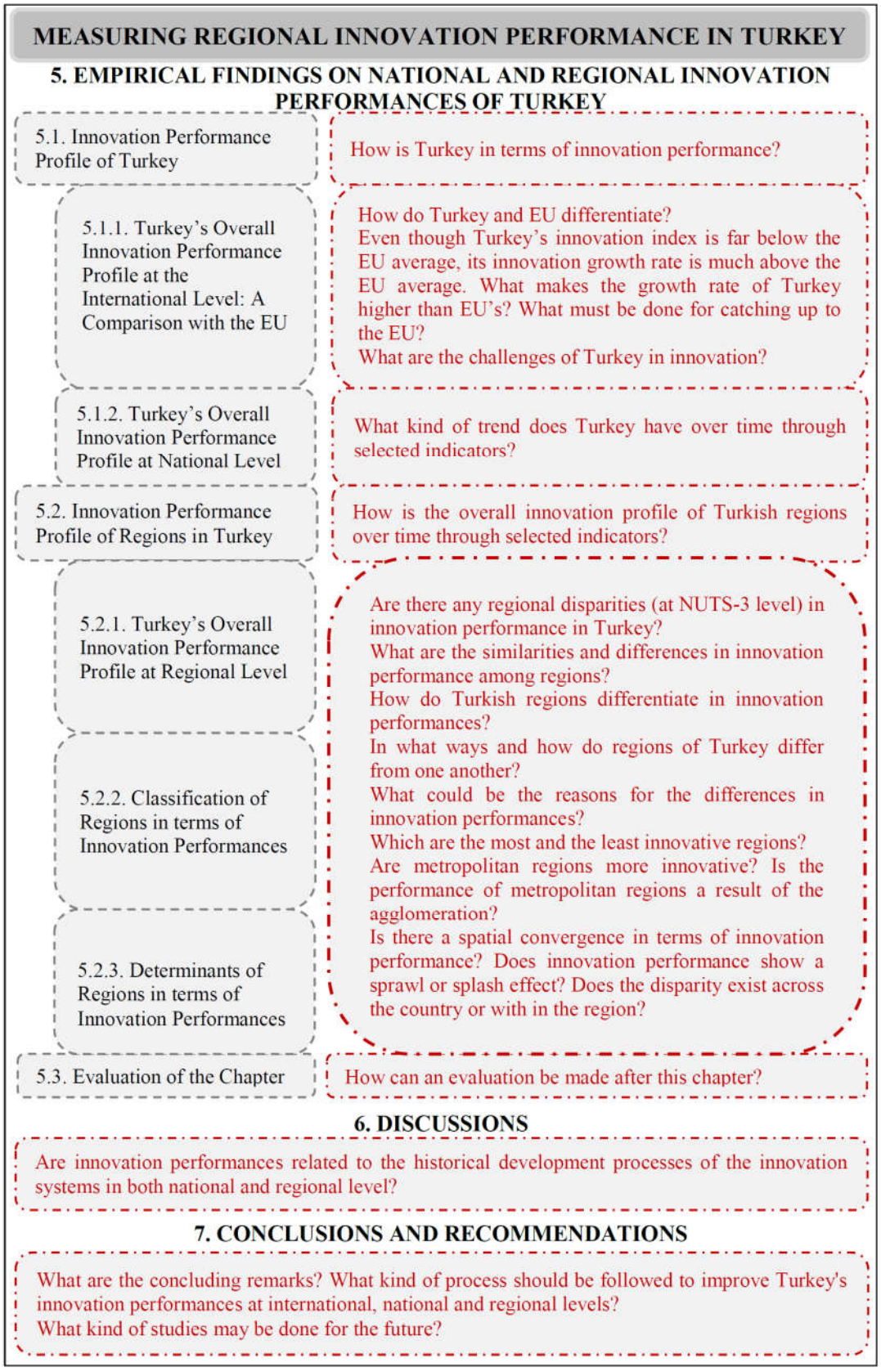


Figure 1.1 (continued): Supportive questions contributing to the structure of the thesis (Author's own illustration).

1.3 Structure of Thesis

The thesis is structured with the guidance of many important questions and it includes seven chapters as following: (Figure 1.1).

- Chapter 1: Introduction
- Chapter 2: Innovation Systems
- Chapter 3: National Innovation Systems in Turkey
- Chapter 4: Regional Innovation Systems in Turkey
- Chapter 5: Empirical Findings on National and Regional Innovation Performances of Turkey
- Chapter 6: Discussions
- Chapter 7: Conclusions.

As shown in Figure 1.1, the second chapter of the thesis includes a broad conceptual framework on innovation and innovation systems focusing mainly on the National Innovation Systems (NIS) and Regional Innovation Systems (RIS). In this section, the concept of innovation and the necessity and importance of innovation are briefly mentioned. Then, innovation is dealt with as a system. In this section, it is aimed to explain how innovation systems have gained importance since 1980 and have evolved to the present day. For this reason, innovation systems approach is defined and its importance is stated. Then, briefly, the types of innovation systems are explained. Considering the purpose of the thesis, the concepts of national and regional innovation systems are focused on. For this reason, the national innovation system is defined and the components of the NIS are specified based on these definitions. Then the relationship between NIS and economic development is given. Differences in various countries' innovation structures and institutional forms are highlighted by answering the question "Why do national innovation systems differ?". In this chapter, also the concept of regional innovation systems is identified with different definitions. By means of these definitions, actors, interactions and components of the regional innovation system are explained. Just like in the NIS, the relationship between RIS and economic development is given. The differentiation of the innovation systems of the regions is explained and the reason for this is shown as the local knowledge, dynamics, production and institutional structure. Before the

evaluation of the second chapter, measurement of innovation systems is examined in detail through various methods and indicators, and then the factors and indicators affecting the innovation system are expressed.

The third chapter is fully focused on Turkey's national innovation system. The aim of this chapter is to evaluate the innovation performance of Turkey and recent progresses and ongoing challenges facing Turkey's NIS and to highlight the critical issues and the key challenges for increasing the innovation performance of Turkey by examining the performance, recent progresses and ongoing challenges. In order to display the recent progresses, the historical development process of the NIS in Turkey is explained with the policy, legal and administrative frameworks.

Fourth chapter is aimed at explaining the historical development process of the Regional Innovation Systems in Turkey in terms of the policy, legal and administrative frameworks. For this reason, firstly the policies, projects and studies towards regional innovation systems in Turkey have been examined. Then, the legal instruments that support regional innovation systems are listed. Finally, focusing on the main actors of the RIS, the institutional structuring in the regional innovation systems has been discussed in a broad framework, and the differences in the institutional structuring among the regions have been highlighted with regional maps.

Empirical findings on the national and regional innovation performance of Turkey constitute the fifth chapter of the thesis (Figure 1.2). Before measuring the regional innovation performance of the regions, first the overall innovation profile of the country is analysed. For this analysis, to illustrate the innovation profile at the international level, a comparison with the EU by the EIS measurement framework for revealing the trends of the EU countries and Turkey over time is given comprehensively; a review is carried out not only on the basis of the EU average, but also through the EU countries as individually in terms of the innovation scoreboard indices, innovation dimensions and the EIS indicators. Following this comparison, ongoing challenges of Turkey are detected. Next, to illustrate the innovation profile at national level, an evaluation is made based on the intellectual assets such as patent (local patents), utility model, trademark, and design gathered from the Turkish Patent

and Trademark Office (TÜRKPATENT[4]). In addition to the patent, trademark and design indicators, 'the utility model' indicator is also included in this study because the TÜRKPATENT attaches importance to utility model within the scope of intellectual property rights. Since the RIS is a very comprehensive concept, studies in the literature focus on different variables. Within this context, this study focuses on the intellectual assets with different forms of Intellectual Property Rights (IPR) for the following reasons: (i) being accepted as the directly effective issues in the measurements of regional innovation performances over the world (ii) one of the indispensable innovation dimensions of the EIS and (iii) one of the most important challenges of Turkey.

This chapter also includes the measurement of the regional innovation performances and understanding how the regions vary from each other.

The main purpose of this study is to determine in which aspects the regions of Turkey differ from each other and intra-regional level over time with reference to their innovation performances. For revealing the overall innovation profile of the regions, the data were first organized and analyzed for descriptive statistics (range, normality tests, outlier analysis, histograms and boxplot graphs) and afterwards Markov Chains, with two different methods based on the mean values and the distances to the median, were used to classify the regions' innovation performances over three time periods between 2000 and 2017.

Through the changes in the intellectual assets, this study provides a temporal dynamic analysis of the transitions of 81 regions (at NUTS-3 level) in Turkey from one state of innovative performance to another over time covering the years between 2000 and 2017 by using the successive Markov Chains and Shorrocks Trace Indices method with the EU-defined four different innovation performance groups. While addressing 81 regions/provinces at NUTS-3 level, this chapter aims to reveal the patterns of regional innovation performance and to evaluate which regions/provinces are more or less innovative. Then, the results of Markov Chains enabling detailed analyses of changes in the innovation performances of the regions in Turkey are given.

[4] Turkish Patent and Trademark Office (TÜRKPATENT) is previously known as Turkish Patent Insitute (TPI).

Another empirical part of this chapter is based on panel data analyses. Panel data analysis is found appropriate for questioning the determinants of the differences, varieties and diversities of the innovation performances of the regions. For this reason, by creating five different econometric models on five different variables, the determinants of the innovation leader regions were figured out (Figure 1.2).

'Discussions' is the sixth chapter that aims at discussing the historical processes of innovation systems together with the innovation performances both in national and regional levels.

The seventh and final chapter is the 'Conclusions' considering about the policies and strategies for improving the NIS and RIS of Turkey, an executive summary of the evaluations of all chapters and also the recommendations to further studies.

Depending on the structure of the thesis, the chapters are interrelated to each other according to their conceptual relations (input-output) (Figure 1.3). Defining the dimensions, components and factors which influence the innovation systems in national (Section 2.2.1) and regional (Section 2.2.2) levels and determining the indicators for measuring the innovation performances in national (Section 2.3.1) and regional (Section 2.3.2) levels are shown as the outputs of the "Innovation Systems" chapter.

The prominent keywords identified in the descriptions as the dimensions, components and factors influencing the national (Section 2.2.1) and regional (Section 2.2.2) innovation systems are as an input for the historical development processes of the National Innovation Systems (Section 3.1) and Regional Innovation Systems (Section 4.1) as policy, legal and administrative frameworks. While Section 2.2.1 contributes to the Section 3.1, Section 2.2.2 contributes the the Section 4.1 with in the same purpose.

Defining various methodologies and indicators through academic studies measuring the innovation performances in national (Section 2.3.1) and regional (Section 2.3.2) levels in the literature also led to the study as being the inputs for deciding the appropriate methods and determining the data which used as tools in the measurement of the national (Section 5.1) and regional (Section 5.2) innovation performances within the scope of the thesis methodology. Therefore these outputs

provide input effects to the methodology of the thesis. In this context, Section 2.3.1 is a base for Section 5.1 while Section 2.3.2 contributes the Section 5.2.

The relations of the evaluations of “National Innovation Systems in Turkey” and “Regional Innovation Systems in Turkey” chapters, which are the results of analyzing the historical development processes of national and regional innovation systems in Turkey with the legal, administrative and policy frameworks, and the innovation performances at the international, national and regional levels, that obtained in the “Empirical Findings on National and Regional Innovation Performances of Turkey” Chapter provides indispensable inputs for the “Discussions” chapter (Figure 1.3). For this purpose the relations of the Section 3.2 and the Section 5.1, and also the relations of the Section 4.2 and Section 5.2 contibute the “Discussions” (Chapter 6). These contributions are means for the assessment of the recent progresses and challenges on innovation systems over the relations of the historical development processes of the innovation systems and the innovation performances.

Finally, the evaluations of all chapters (Section 2.4, Section 3.2, Section 4.2 and Section 5.3) are the inputs to make an executive summary for the conclusions and recommendations for further studies (Chapter 7).

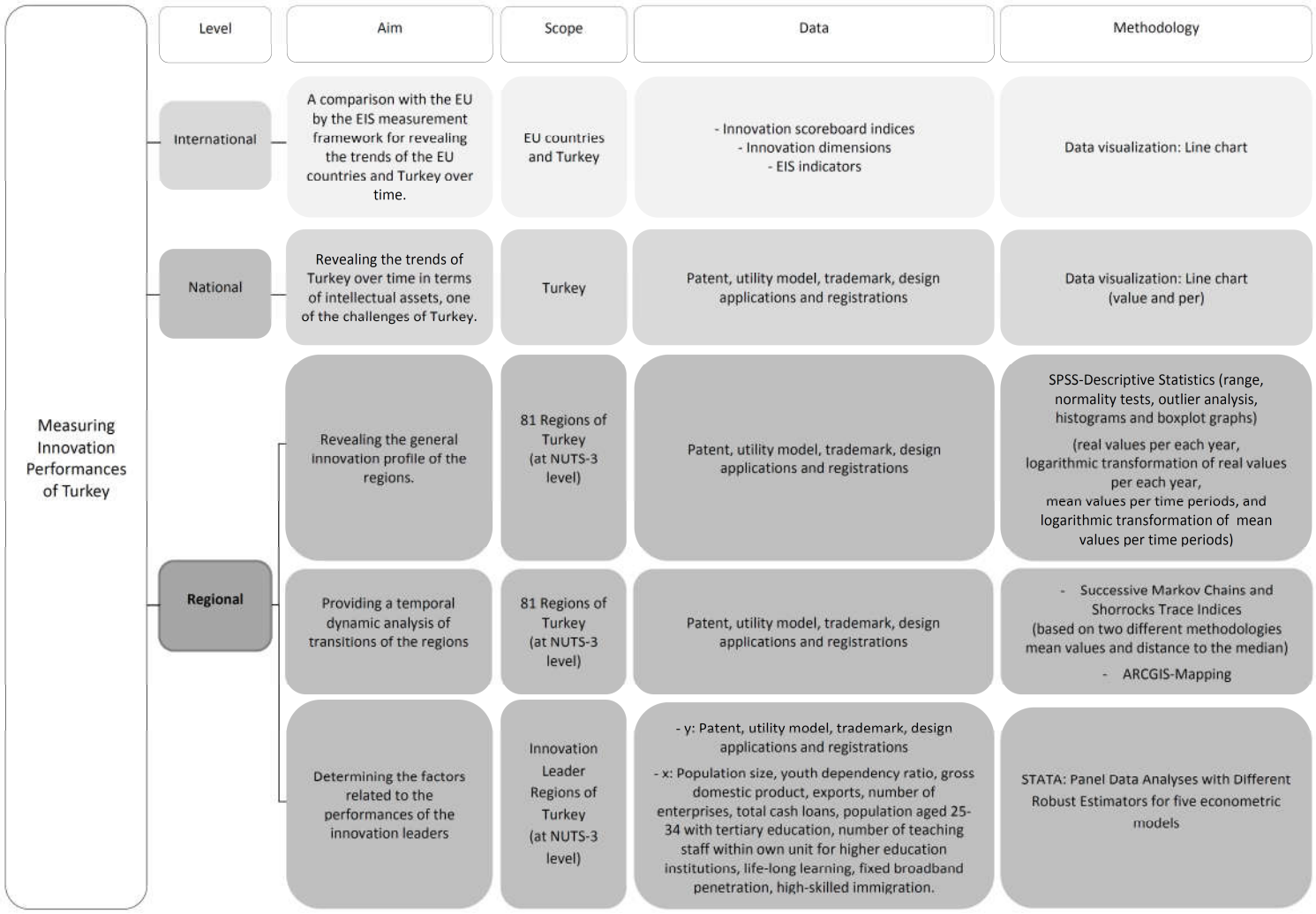


Figure 1.2 : Aim, scope, data and methodology of the empirical findings (Author's own illustration).

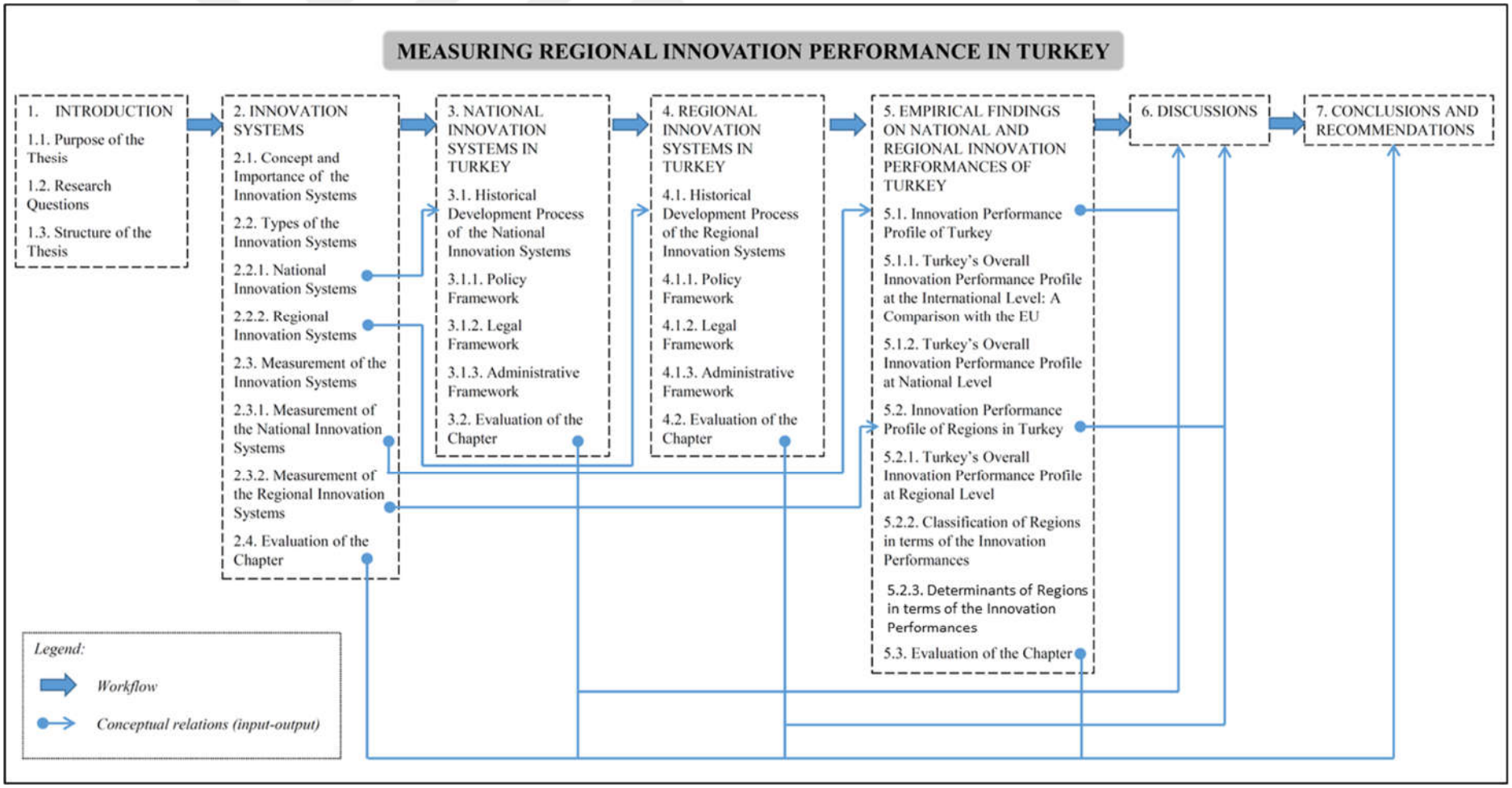


Figure 1.3 : Structure of the thesis in terms of the workflow and conceptual relations (Author's own illustration).

2. INNOVATION SYSTEMS

In this section the concept of innovation systems and the necessity and importance of IS are given briefly. Then the types of IS are identified. In this study, mainly the concept of NIS and RIS are focused areas. Therefore, firstly the descriptions and progresses of these concepts are clarified. Then, how these systems are measured and which variables are effective for measurement are explained with various examples from the literature. The chapter is structured with important supportive questions as follows:

- What is an innovation system (IS)?
- What is the importance of IS?
- What are the types of IS?
- How can a country be innovative?
- How can a country support innovation?
- How can a country establish and manage an effective innovation system?
- What is a national innovation system (NIS)?
- Who are the actors in the NIS?
- What are the linkages in the NIS?
- What is the relationship between NIS and economic development?
- Why do national innovation systems differ?
- What is a regional innovation system (RIS)?
- Who are the actors in the RIS?
- What are the linkages in the RIS?
- What is the relationship between RIS and economic development?
- Why do regional innovation systems differ?

- How can the performance of a country's or a region's innovation system be measured? Which factors/indicators are effective?
- Which factors influence the national and regional innovation system?

Before defining the innovation systems, it is necessary to mention what innovation means and why it is necessary and required. According to Schumpeter's literature (Schumpeter, 1934: p. 66 and 1939; pp. 84-5 cited in Hagedoorn, 1994: pp. 5, 6), in short, the concept of innovation is not only a new good, but also a new method of production, a new market, a new source and a new organisation (Table 2.1).

Table 2.1 : Definitions of innovation (Author's own illustration).

Year	Author	Definitions
1934 and 1939	(Schumpeter, 1934: p. 66 and 1939, pp. 84-5) cited in (Hagedoorn, 1994: pp. 5,6).	"1) The introduction of a new good--that is one with which consumers are not yet familiar--or a new quality of a good. 2) The introduction of a new method of production, that is one not yet tested by experience in the branch of manufacture concerned, which need by no means be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially. 3) The opening of a new market, that is a market into which the particular branch of manufacture of the country in question has not previously entered, whether or not this market has existed before. 4) The conquest of a new source of supply of raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created. 5) The carrying out of the new organisation of any industry, like the creation of a monopoly position (for example through trustification) or the breaking up of a monopoly position" (Hagedoorn, 1994: pp. 5,6).
1995	European Commission (1995: p. 4),	"(i): the renewal and enlargement of the range of products and services and the associated markets; (ii): the establishment of new methods of production, supply and distribution; and (iii) the introduction of changes in management, work organisation, and the working conditions and skills of the workforce".
2007	United Nations (UN) (2007: p. 92),	"In an economic context, any new way of creating economic value added, for instance, through a new production or distribution process, a new business model, a new way of organizing work, or by creating new markets or finding new sources of supply/inputs". (UN, 2007: p. 92)
2009	Breznitz, et al., (2009)	"Innovation can mean; (i): new products/services (*product innovation*), (ii): new ways of producing/offering an established product/service (process innovation, business model innovation, administrative innovation, organizational innovation), or (iii): new recombinations of established products/services and ways to produce/offer them (*second-generation innovation*, *business model innovation*) (Breznitz, et al., 2009: p. 73).

The European Commission (1995: p. 4), the United Nations (UN) (2007: p. 92) and Breznitz, et al. (2009: p. 73) have developed Schumpeter's definitions in similar expressions (Table 2.1). Common and differentiated expressions can be explained as followings:

- The European Commission (1995: p. 4) and Breznitz, et al. (2009: p. 73) also have additionally included the expressions as new products and services in the definitions.

- The European Commission (1995: p. 4) and the UN (2007: p. 92) have commonly focused on supply as Schumpeter did, but they have also raised the expression of distribution. They also have referred the work organisation.
- The UN (2007: p. 92) and Breznitz, et al. (2009: p. 73) have expressed the process dimension of innovation.
- When defining the concept of innovation, unlike the others, the UN (2007: p. 92) has considered 'new way of creating economic value added' in an economic context.

Due to the definitions of innovation, it is possible to comment that innovation is solving existing problems and converting them to profit (World Bank, 2010: p. 4) by combining ideas to new (Van de Ven, 1986: p. 591) products and services (European Commission, 1995: p. 4; Breznitz et al., 2009: p. 73). Innovation is not only beneficial to individuals, but also a wide society both regionally, nationally and internationally (URL-1).

Innovation provides improvements in living conditions on various subjects as health, transportation, communications, and environment (European Commission, 1995: p. 15). Therefore it is obvious and inevitable that innovation is necessary for a given society by providing social prosperity besides economic and technological development. Innovation is an economic, technical and social process (European Commission, 1995: p. 11) coming out over time and effected by the interactions between various actors or organizations (Edquist, 1997b: p. 1). Therefore innovation is a complex (Edquist, 1997b: p. 1), interactive and cumulative learning process (Edquist and Johnson, 2000: p. 42) and participatory phenomenon with multi-actor and multi-disciplinary.

2.1 Concept and Importance of Innovation Systems

As it is understood from the common and repeated statements in the definitions in Table 2.2; the concept of an IS can be defined as 'a combination of factors and interactions influencing the production, development, diffusion, application and use of innovations'. In addition to the production, development, diffusion, application and use of innovations, another prominent and indispensable issue in the definitions of IS is the interactions among the actors.

Table 2.2 : Definitions of innovation systems (Author's own illustration).

Year	Author	Definitions
1997	Edquist, (1997b: p. 14)	"One way of specifying 'system' is to include in it all important economic, social, political, organizational, institutional, and other factors that influence the development, diffusion, and use of innovations."
1998	Beije, (1998: p. 256)	An innovation system "can be defined as a group of private firms, public research institutes, and several of the facilitators of innovation, who in interaction promote the creation of one or a number of technological innovations [within a framework of] institutions which promote or facilitate the diffusion or application of these technological innovations."
1999	Cantwell, (1999: p. 238) cited in Christ, (2007: p. 43)	"...the network of institutions in the public and private sectors of each country that support the initiation, modification and diffusion of new technologies." (Cantwell, 1999: p. 238)
2008	Kayal, (2008: p. 75)	"The function of an innovation system is to generate, diffuse and utilisetechnology. Thus, the main features of the system are the capabilities of the actors to generate, diffuse, and utilise technologies (physical artifacts as well as technical know-how) that have economic value".
2009	Edquist, et al., (2009: pp. 13, 14)	"At a general level, the main or 'overall' purpose of systems of innovation is, of course, to pursue innovation processes: that is, to develop and diffuse innovations." "A system of innovation includes 'all important economic, social, political, organizational, institutional and other factors that influence the development and diffusion of innovations' (Edquist, 1997b: p. 14; Edquist, 2005: p. 183; Edquist, 2009; Edquist and Hommen, 2008: p. 6).

While Edquist (1997b) defines the factors that influence the development, diffusion, and use of innovations as economic, social, political, organizational, institutional factors, Beije (1998) mainly focuses on the institutions. A prominent issue in Cantwell (1999) is the expression of 'the network of institutions'. Unlike other definitions, 'economic value' and 'physical artifacts' draw attention in Kayal (2008)'s identification. Edquist, et al. (2009) added the 'process' statement to all these definitions (Table 2.2).

Innovation is "an interactive process" (IRE Working Group, 2008) which includes "specific patterns of interaction between users and producers of innovations (Freeman, 1991; Nelson, 1993; Edquist, 1997a cited in OECD, 1999)" and "results from complex interactions between research, design, production and marketing that take place in a web of interactive learning (Lundvall, 1992a)". As a process, innovation "requires intensive cooperation (IRE Working Group, 2008)" and collaboration "within and among firms and other knowledge organisations (Lundvall, 1992a)" such as "universities and other public research facilities, technology centres, educational establishments, financing institutions, industry associations and government agencies and bodies (IRE Working Group, 2008)". According to Lundvall (2000: p. 2 cited in Feinson, 2003), IS is both social and dynamic. The social side is being based on "an institutional context…constituted by laws, social

rules, cultural norms, routines, habits, technical standards, etc. (Lundvall, 2000: p. 24 cited in Feinson, 2003)" and "legislative artifacts such as regulatory laws, traditions, and social norms" (Kayal, 2008). The dynamic side is composed of "financial flows between government and private organizations…human flows between universities, firms, and government laboratories, regulation flows emanating from government agencies towards innovation organizations, and knowledge flows (spillovers) among these institutions (Niosi, 2002: p. 292 cited in Feinson, 2003)". Also "the dynamics of innovation depend not only on the performance of individual companies but also on the institutional context in which they are embedded (Whitley, 2007 cited in Pinto and Pereira, 2018)".

Considering all afore-mentioned definitions, innovation system is an interactive and integrated process which is composed of the flows, linkages, interactions, networks and relationships of various creators / actors (institutions in the public and private sectors such as firms, universities, government agencies, technical agencies and R&D public infrastructure etc). Since the innovation system is a tool for economic development, countries and regions form policies, strategies and plans for the establishment and management of an effective innovation system (Özen and Baycan, 2015).

2.2 Types of Innovation Systems

As an opportunity for new sources of innovation-based growth (European Investment Bank, 2013), every society strives innovation that correspond to their needs and capabilities (World Bank, 2010: p. 7). For this reason, innovation based studies become more and more important from day to day. In the last few decades, studies on knowledge and innovation have been increasing and evolving with different dimensions and concepts particularly in the 'national' (Freeman, 1987 and 1995; Dosi et al., 1988; Lundvall, 1992a; Nelson, 1993; Niosi et al., 1993, Patel and Pavitt, 1994; Niosi and Bellon, 1994; Edquist, 1997a; OECD, 1997 and 1999; Niosi, 2002), 'regional' (Cooke, 1992, 2001 and 2003; Cooke and Morgan 1994; Cooke et al. 1997, 2000 and 2004; Evangelista et al., 2002, Doloreux, 2003; Doloreux and Parto, 2004 and 2005; Asheim and Gertler, 2005; Asheim and Coenen, 2006; Asheim, 2009; OECD, 2011 and 2013; Schrempf et al, 2013), 'sectoral' (Breschi and

Malerba, 1997; Malerba, 2002) and 'technological' (Carlsson and Stankiewicz, 1991; Carlsson, 1995 and 1997; Carlsson and Jacobsson 1997; Carlsson et al, 2002) levels.

Chang and Chen (2004) compare three systems of innovation approaches, namely, the national system of innovation approach (NSI/NIS), the technological/sectoral system of innovation approach (TSI/TIS[5]-SSI/SIS[6]), and the regional system of innovation approach (RSI/RIS) in terms of knowledge links, knowledge transfer and systematic boundaries (Figure 2.1). According to the assessment in their study, NIS stresses the triple-helix interactions. While TIS-SIS is based on the inter-technological links, RIS is built on tacit knowledge sharing and social networks. Due to the knowledge transfer faciliatating factors, NIS has a common language, social, cultural codes of communication. When they explain the knowledge transfer, they use 'technological complementarities and synergies' and 'science and tecnology relation' statements for SIS and 'geographical proximity', 'co-location learning' and 'tacit knowledge spillover' for RIS. In terms of comparison of systematic boundaries, as seen from the names of the approaches, NIS is based on nation-bounded and RIS is based on region-bounded. The SIS and TIS approaches are sector or technology-bounded, not necessarily nation-bounded.

Approach	Major knowledge links	Knowledge transfer faciliatating factors	Systemic boundaries
NIS	Triple-helix interactions	Common language, social, cultural codes of communication	Nation-bounded
RIS	Tacit knowledge sharing Social networks	Geographical proximity Co-location learning Tacit knowledge spillover	Region-bounded
TIS-SIS	Inter-technological links	Technological complementarities and synergies Science and technology relation	Sector or technology-bounded, not necessarily nation-bounded

Figure 2.1 : Comparing systems of innovation aproaches: the knowledge perspective (Chang and Chen, 2004: p. 28).

[5] TIS and TSI refer to the same concept as 'Technological Innovation Systems'/'Technological Systems of Innovation'. In this thesis TIS is used as an abbreviation.
[6] SIS and SSI refer to the same concept as 'Sectoral Innovation Systems'/'Sectoral Systems of Innovation'. In this thesis SIS is used as an abbreviation.

Besides Chang and Chen (2004), Koschatzky et al (2009: pp. 8, 9) also compared these systems in terms of agents and organizations, human capital, institutions, policies, technologies and demand, and competition and selection (Table 2.3).

Table 2.3 : A sectoral-territorial approach to the analysis of innovation systems (Koschatzky et al, 2009: pp. 8, 9 based on Edquist, 2005 and Malerba, 2002).

Innovation System			
Elements	**Territorial dimension**		**Sectoral dimension**
	National	**Regional**	**Sector / technology field**
Agents and organizations	national governance bodies, national education institutions, national IPR administration	regional governance bodies, regional education institutions	Multinational enterprises (MNEs), international norming and standardisation bodies, international IPR administration, (international) branch associations
Institutions	national laws and regulations, national governance	regional laws, regional governance	international treaties, international norms and standards
Policies	innovation policy, education policy	regional innovation policies, education policies	transnational Information and Communication Technology (ICT) sector oriented policies and policies aiming at IT skills
Technologies and demand	national laws on technology, acceptance of technology in society, position to lead markets	regional laws on technology, regional acceptance of technology, regional buying power, regional demand caused by industry structure	factual trends in leading edge technology development
Knowledge base	codified knowledge (general, basic research related, cross-sectoral)	localized tacit knowledge (specific, application related, cross-sectoral)	codified knowledge, tacit knowledge in intra-MNE networks, tacit knowledge communities of practice
Human Capital	national labour pool, mobility of labour force	regional labour pool	specialised labour market, cross-sectoral mobility of labour force
Interactions	national cross-sectoral networks	local cross-sectoral networks	international intra-MNE interactions, communities of practice
Competition and selection	national economic characteristics: anti-trust legislation, bankruptcy legislation	regional economic characteristics: presence of competitors in the field, spirit of competition, entrepreneurial spirit, foundation aptitude	sectoral specificities, firm size, position in product/service life cycle, mobility of product/service, degree of specialisation

Although studies have focused on certain types of innovation systems in general, Christ (2007: pp. 45, 46) has addressed the theoretical approaches to innovation from a broad perspective, summarized these approaches (Table 2.4) within the framework of the following headings as (i): “Classical Agglomeration Theory, Geographical Economics”, (ii): “Industrial District, Technological District, Innovative Milieu”, (iii): “Flexible Specialization School”, (iv): “National Innovation Systems (NIS)”, (v): “Regional Innovation Systems (RIS), Learning Regions”, (vi): “Sectoral Innovation Systems (SIS)”, (vii): “Technological Innovation Systems (TIS)”, (viii):

"Cluster Approach", (ix): "Dynamic Externalities, (Localized) Knowledge Spillovers", (x): "Neweconomic Geography (NEG)", (xi): "Neweconomic Geography Growth Models (NEGG)" and (xii): "Evolutionary Economic Geography (EEG)" and illustrated the flows in the conceptualizations of IS (Figure 2.2).

Christ (2007) explains the innovation systems with the spatial, technological or sectoral perspectives. According to Christ (2007), different concepts, which differ in terms of tacit and codified knowledge, form the emergence of different systems. Innovation performance is mostly affected by the governance structures, agglomerative tendencies, and some externalities. Christ interpreted geographical proximity as a decisive factor in the knowledge diffusion and spatially concentrated economic activities. Besides these, Christ also emphasized that the territorial innovation models and spatially concentrated economic activities such as districts, clusters and innovative milieus and their access to network, flows and sources of knowledge draw the interest of several sub-groups within the literature (Figure 2.2).

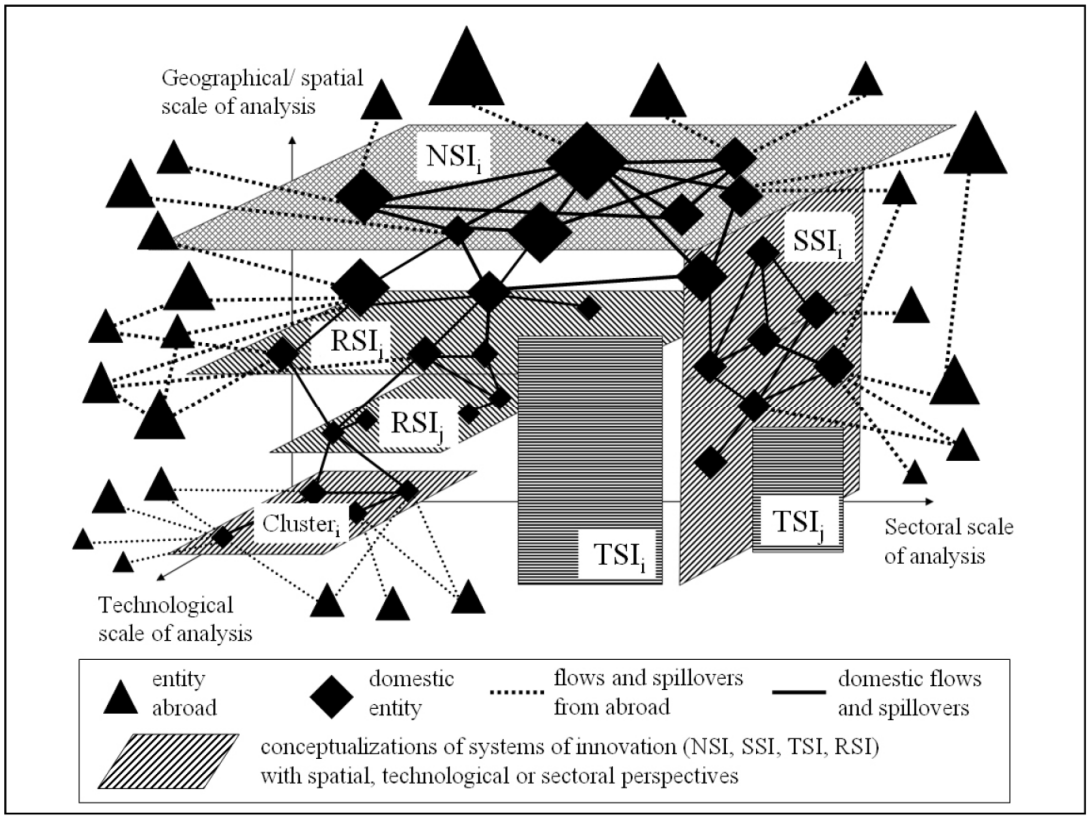


Figure 2.2 : Conceptualizations of innovation systems (Christ, 2007: p. 44).

Table 2.4 : Summary of theoretical approaches and studies to agglomeration and the geography of innovative activity (Christ, 2007: pp. 45, 46).

THEORETICAL APPROACH	CERTAIN KEY POINTS
Classical Agglomeration Theory, Geographical Economics	- External economies of scale - Urbanization vs. localization economies - Labor market pooling, input sharing,technology spillovers, diversity - Agglomeration and industry location - Inter-industry linkages and interdependencies - Industrial complex analysis, growth poles
Industrial District, Technological District, Innovative Milieu	- Agglomeration and industry location - Italian Industrial Districts (SMEs), Third Italy - Innovative Milieu, France, the Groupe de Recherche Européen sur les Milieux Innovateurs (GREMI)
Flexible Specialization School	- From economies of scale to flexible forms of industrial organization - Post-Fordist production - Localized interdependencies, proximity - Embedding the economic within the social,cultural and institutional structures - Industrial organization and business culture
National Innovation Systems (NIS)	- Nation-state level analysis and theorizing - Learning, interaction of organizations - Institutional and organizational set-ups - Trajectories and path-dependencies - Knowledge (input), learning (process)
Regional Innovation Systems (RIS), Learning Regions	- Local and regional issues of the geography of innovation - Knowledge economy; localized knowledge - Knowledge and collective learning - Tacit vs. codified knowledge - Localized patterns of knowledge creation, diffusion, learning and innovation - Localized knowledge spillovers - Regional capabilities, absorptive capacity
Sectoral Innovation Systems (SIS)	- Sectoral partial analysis, theorizing - Knowledge (input), learning (process) - Sectoral perspective; industry set-up - Sectoral knowledge base - Geographical-concentrated sectoral systems
Technological Innovation Systems (TIS)	- Knowledge (input), learning (process) - Technological perspective - Technological knowledge base
Cluster Approach	- Competitiveness, specialization and competition - Clusters and regional competitive advantage - Cooperation and rivalry - Regional resources and infrastructure
Dynamic Externalities, (Localized) Knowledge Spillovers	- Knowledge spillovers and endogenous growth - Ideas, education, research, and institutions - Marshall-Arrow-Romer (MAR) externalities vs. Jacobian externalities - Monopoly vs. competition - Diversification vs. specialization - Geographical proximity - Technologically and geographically mediatedknowledge spillovers - Empirical research vs. theorizing
Neweconomic Geography (NEG)	- Pecuniary externalities - Agglomeration economies and diseconomies - Agglomeration and regional distribution of income and wealth; core-periphery structure - Increasing returns and imperfect competition
Neweconomic Geography Growth Models (NEGG)	- Transaction costs of ideas; technol. externalities - Core-periphery structure and endogenous growth - Global and localized knowledge spillovers - Agglomeration and regional distribution of innovative activity (patents) - Increasing returns and imperfect competition
Evolutionary Economic Geography (EEG)	- Agglomeration and spatial distribution of economic activity, growth differences - Tacit and codified knowledge - Learning, routines, regional capabilities - Appreciative theorizing and formal modeling

Before Christ (2007), OECD (1999) explained the importance of this interesting subject by expressing that the actors and interactions play an important role in innovation processes. These actors are identified as “firms, public and private research organisations, and government and other public institutions” which are

"influenced by a variety of factors that exhibit some degree of country specificity: the financial system and corporate governance, legal and regulatory frameworks, the level of education and skills, the degree of personnel mobility, labour relations, prevailing management practices, etc (OECD, 1999: p. 22)" (Figure 2.3).

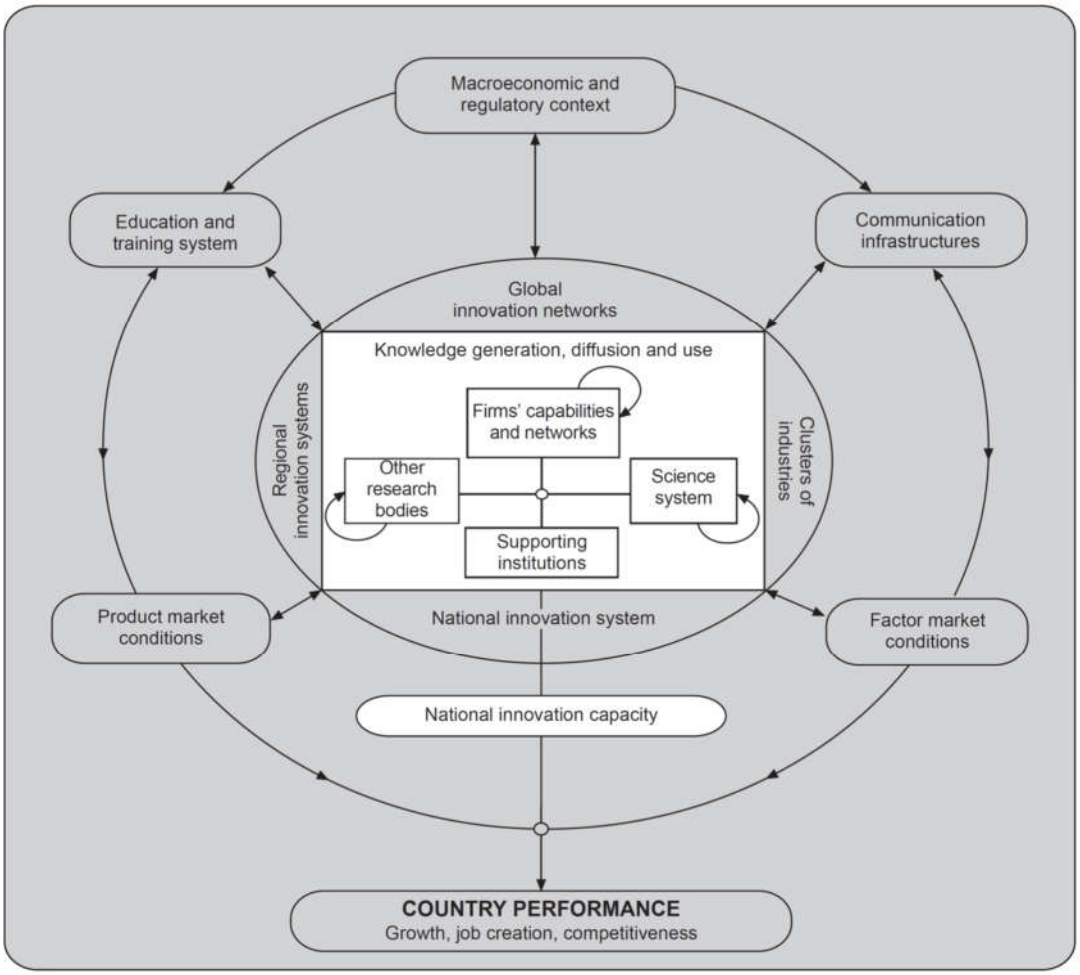


Figure 2.3 : Actors and linkages in the innovation system (OECD, 1999: p. 23).

Frenz and Oughton (2005: p. 33) illustrate the relationships between the IS and their boundaries (Figure 2.4). Global innovation systems include the activities of multinational firms/enterprises which generate and diffuse innovation across the countries. Those activities are regulated by international laws, trade agreements, intellectual property rights, and international financial regulations. Various elements as infrastructure, institutions (including laws, regulations, and habits), the educational and training system, the financial system, the R&D system, the governance system and the inter-linkages between those elements form a national innovation system. All in this structure, sectoral and technological boundaries overlap with both national and regional borders (Figure 2.4). As a conclusion,

sectoral, technological, regional and national innovation systems interact with each other in a global innovation system.

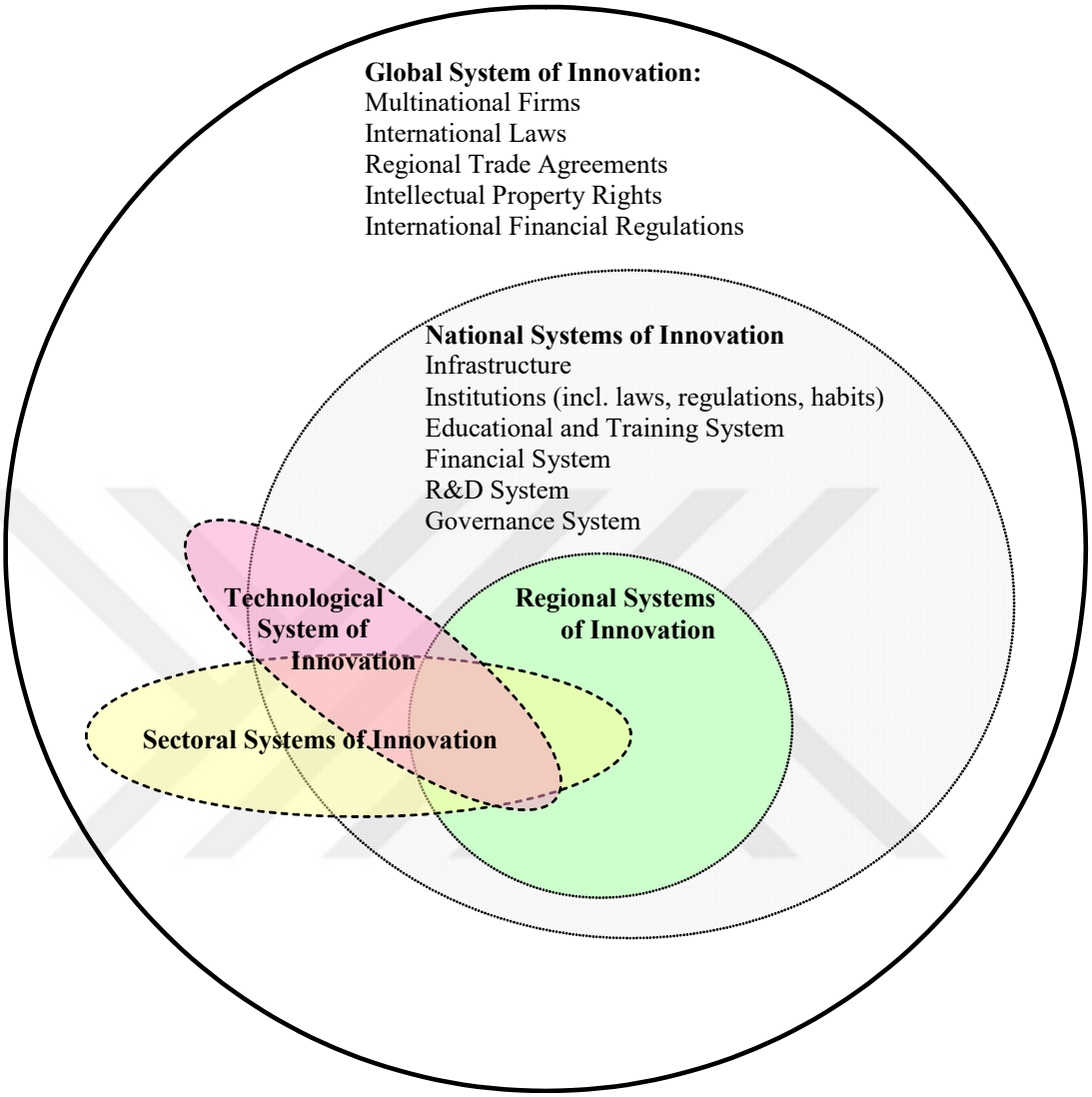


Figure 2.4 : The relationship between global, national, regional, sectoral and technological systems of innovation (Frenz and Oughton, 2005: p. 33).

The approach of IS, which started with the NIS, has come up with different dimensions in time. As a conclusion of this literature summary, innovation systems can be interpreted as a very comprehensive, multi-dimensional and multi-actor phenomenon with complex interactions, networks, flows and linkages. Although these systems have some dimensional differences within themselves, they all need to be supported by similar requirements such as institutional and political structures. However, these specific institutional and political structures must be interactive and integrated.

2.2.1 National innovation systems

Before mentioning about the RIS, it is essential to consider the NIS due to the hierarchical structure.

National Innovation System can be defined as an integrated and interactive process supported by a constitutional and administrative system made up of networks and relations of various factors and creators/actors, innovative firms and firm networks, clusters, mobility of human resources, focus groups of organisational mapping and catching-up economies, development, production, importation, modification, dissemination of innovation and new technologies to influence and control the rate and direction and nature of scientific and technological learning and to produce, store and transfer economically useful knowledge, skills and artifacts (Freeman, 1987 and 1995; Lundvall, 1992a; Johnson, 1992; Nelson and Rosenberg, 1993; Edquist and Lundvall, 1993; Niosi et al., 1993; Patel and Pavitt, 1994; Metcalfe, 1995; Mowery and Oxley, 1995; Edquist, 1997a and 2005; OECD, 1997 and 1999; Cantwell, 1999; Evangelista et al., 2002; Niosi, 2002; Malerba, 2005; Carlsson, 2006; Özen and Baycan, 2014).

According to the literature, the NIS is defined by the following factors; (Freeman, 1987; Lundvall, 1992a; Johnson, 1992; Nelson and Rosenberg, 1993; Edquist and Lundvall, 1993; Niosi et al., 1993; Patel and Pavitt, 1994; Metcalfe, 1995; Mowery and Oxley, 1995; Edquist, 1997a and 2005; OECD, 1999; Cantwell, 1999; Evangelista et al., 2002; Niosi, 2002; Malerba, 2005; Carlsson, 2006).

- an interactive and integrated process
- composed of the network / relationships of various factors
- composed of the network / relationships of various creators / actors
- innovative firms, innovative firm networks, clusters, mobility of human resources, organisational mapping and catching – up economies are the focus groups
- initiate, product, import, modify, generate, select, diffuse and use of innovation, new technologies and
- create, store and transfer the economically useful knowledge, skills and artifacts
- affect the rate and direction of scientific & technological learning

- supported by a regulatory system

Definitions of the NIS are generally focuses on the actors, institutions and the network, links, relationships and interactions among these actors (Table 2.5).

Table 2.5 : Definitions and progresses of national innovation systems (Author's own illustration).

Year	Author	Definitions
1987	Freeman (1987: p. 1)	"the network of institutions in the public and private-sectors whose activities and interactions initiate, import, modify and diffuse new technologies".
1992	Lundvall (1992b: p. 2)	"a system of innovation is constituted by elements and relationships which interact in the production, diffusion and use of new, and economically useful knowledge and that a national system encompasses elements and relationships, either located within or rooted inside the borders of a nation state."
	Johnson (1992: p. 39) cited in Christ (2007: p. 43)	"...all interrelated, institutional and structural factors in a nation, which generate, select, and diffuse innovation."
	Nelson (1993) cited in OECD (1997)	"... a set of institutions whose interactions determine the innovative performance ... of national firms."
	Edquist and Lundvall (1993: p. 267)	"the national system of innovation is constituted by the institutions and economic structures affecting the rate and direction of technological change in the society".
1993	Niosi et al. (1993) cited in Niosi and Bellon (1994).	"A national system of innovation is the system of interacting private and public firms (either large or small), universities and government agencies, aiming at the production of science and technology within national borders. Interaction among those units may be technical, commercial, legal, social and financial, inasmuch as the goal of the interaction is the development, protection, financing or regulation of new science and technology."
	Nelson and Rosenberg, (1993) cited in Niosi (2002)	"... The set of institutions whose interactions determine the innovative performance of national firms"
1994	Patel and Pavitt (1994) cited in OECD (1997)	"... The national institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning (or the volume and composition of change generating activities) in a country"
	Metcalfe (1995) cited in OECD (1997)	"... That set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artifacts which define new technologies"
1995	Mowery and Oxley (1995: p. 80)	"Although a precise definition of a national innovation system is difficult, previous work on the Japanese and United States (US) national innovation systems (Freeman, 1987; Nelson, 1990, 1992, 1993) have defined them as the network of public and private institutions within an economy that fund and perform R&D, translate the results of R&D into commercial innovations, and affect the diffusion of new technologies.2 More concretely, a national innovation system includes the public agencies that support and/or perform R&D; a nation's universities, which may perform research and play an important role in the training of scientists and engineers; the firms within an economy that invest in R&D and in the application of new technologies; any public programmes intended to support technology adoption; and the array of laws and regulations that define intellectual property rights."

Table 2.5 (continued): Definitions and progresses of national innovation systems (Author's own illustration).

Year	Author	Definitions
1997	Galli and Teubal (1997: p. 3)	"the set of organizations, institutions, and linkages for the generation, diffusion, and application of scientific and technological knowledge operating in a specific country".
2002	Rip (2002: p. 124)	"a mosaic of sectoral systems and networks, with a national boundary imposed upon them".
	Evangelista et al. (2002: p. 173)	"In particular, the literature on national systems of innovation (NSIs) has stressed that the technological performances of national economies can not be explained only by looking at the strategies and performances of firms; beyond firms, other factors and actors play a role in favouring the diffusion and economic exploitation of knowledge, such as the presence of networks among firms, appropriate financial institutions, technical agencies and R&D public infrastructures, the capacity of the education and training system to up-grade and re-shape skills and competences, and the presence of appropriate and effective innovation policies (Lundvall, 1992a; Nelson, 1993; Edquist, 1997a; OECD, 1997)."
	Niosi (2002: p. 291)	"NSIs is thus a set of interrelated institutions; its core is made up of those institutions that produce, diffuse and adapt new technical knowledge, be they industrial firms, universities, or government agencies. The links between these institutions consist of flows: knowledge, financial, human (people being the bearers of tacit knowledge and know-how), regulatory, and commercial."
2006	Carlsson (2006: p. 58)	"A national system of innovation may be defined as that set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artifacts, which define new technologies."

The concept of NIS underlines both "interactions and interfaces between various actors and the workings of the system as a whole (Lundvall, 1992a cited in OECD, 1999)" and also "the interdependencies between the historically developed designs of institutional frameworks on the one hand and patterns in innovative activities on the economy level (Balzat and Pyka, 2005)".

Establishing and managing an effective NIS have never been more important than today. NIS focuses on how a system of innovation shapes competitive advantage and the literature on NIS shows that countries differ enormously with respect to their economic structures, R&D bases, institutional set-ups and innovation performances (Özen and Baycan, 2014). 'National innovation system' approach is "a tool for analysing economic development and economic growth (Lundvall, 2007)" and a tool for countries to give direction/plan the economic development in terms of competitiveness (Özen and Baycan, 2014). Shergill (2015) states that "there is a positive link between NIS and economic growth".

Ensuring economic development is only possible in case of an effective innovation structure of countries'. Establishing and managing an effective innovation structure is related to the institutional profile, the network of the actors, the flows in the system

and the vision and policies produced. Because the system includes networks, the system's effectiveness and success can be provided with governance and accordingly with the cooperation and coordination (Özen and Baycan, 2014).

First, the country's innovation performance should be measured, then by considering the existing innovation infrastructure, "in which fields there are deficiencies and with which policies these deficiences can be overcome" should be asked. After this question, policies and action plans must be created to reach the vision related to innovation (Özen and Baycan, 2014).

“As a reflection of knowledge/science/technology/skills-intensive global structure (OECD, 1999: p. 15), in this global competitive structure, the challenges on innovation make innovation systems and policies vary both in national and regional scales. In this context, there are different responses and reactions of different countries and regions in this competitive environment (Özen and Baycan, 2022a: p. 237)”. For instance, while “high-income countries become more specialized in resources and services including sophisticated inputs as qualified labor, research and knowledge (Aiginger et al., 2009: p. 118)”, low-income countries face to many challenges in innovation such as; poor business and governance conditions, low educational levels, and mediocre infrastructure (Aubert, 2005), in addition to market constraints, firms having a lack of scientific skills and access to credits (Fu et al., 2014: p. v) and having scarce knowledge of policy instruments (Fu et al., 2014: p. vi), limited collaboration of universities and firms on innovation creation and knowledge transfer (Fu et al., 2014: p. 47), inability to protect intellectual property rights (Fu et al., 2014: p. 49) etc. Although low-income countries face some difficulties (Fu, et al., 2014), it is essential for these countries to have their own “ability to develop its own innovation system” in catching up with the developed countries (Fagerberg and Verspagen, 2007: pp. 2, 13) by having “invested massively in the formation of skills and R&D infrastructure (Fagerberg and Godinho, 2004: pp. 12, 13)”. In addition, these low-income countries should have both the ability to make “(or attract) sufficient investments”, and also “its capacity to absorb existing and generate new technologies (e.g. innovate) (Fagerberg and Verspagen, 2007: p. 2)”. For catching up developed countries; “every country has to find its own way based on an understanding of (a) the contemporary global technological, institutional and economic dynamics, (b) the behavior of the relevant agents and (c) the specific

context in which the catch-up takes place and the broader factors that influence it (Freeman and Louçã, 2001 cited in Fagerberg and Godinho, 2004: pp. 13, 14). Hu et al (2018) describe the countries in different income stages with respect to innovative development as follows: "a country or region in the low-income stage is basically driven by primary elements such as land, resources, energy, and a labor force, whereas a country or region in the lower middle-income stage is largely driven by capital elements such as the domestic savings rate, investment rate and scale. In contrast, a country or region in the upper middle-income stage is driven by technological elements, usually associated with the introduction of large-scale technology, and one in the high-income stage must be driven by a reliance on innovation (Hu et al., 2018: p. 15)".

"An indigenous knowledge included IS can facilitate participatory development processes, foster socioeconomic resilience of local communities and enhance the comparative advantage of a developing country (Jauhiainen and Hooli, 2017: p. 89)". While analyses on innovation systems generally done focusing on the developing countries (Gu, 1999; Segura-Bonilla and Johnson, 2001; Arocena and Sutz, 2002; Metcalfe and Ramlogan, 2008; Kayal, 2008; Altenburg, 2009; Lundvall et al., 2011; Watkins et al., 2015; Egbetokun et al., 2017; Fu and Shi, 2022), relatively less attention has given to the countries with poor-IS. "Furthermore, substantial differences exist among developing countries in terms of socioeconomic contexts and capacities to reach advanced knowledge-based societies and economies (Intanakumnerd et al., 2002; Arocena and Sutz, 2003; Bartels and Koria, 2014; Yun et al., 2015 cited in Jauhiainen and Hooli, 2017: p. 90)". While low productivity and low-income countries could adopt the pioneering changes to catch up the innovation leaders by the international diffusion of knowledge and technology, high-income countries may benefit more from technological progress (Taşkın and Zaim, 1997).

The response of countries' to innovation is not only related to income level differences (high and low income), but also to the size of the country. While small countries, in particular, are affected and become more dependent on the global knowledge flows (Aiginger et al., 2009: p. 103), large countries gain more from comparative advantage than from the division of labour and export a smaller share of final goods and a larger share of intermediate goods when compared to small countries (Soo, 2018). Nelson (ed., 1993) explains the differentiation of innovation

system of countries' through making a wide comparison of various countries such as six large high-income countries (France, Italy, Japan, the United States, Britain, and West Germany), four smaller high-income countries (Australia, Canada, Denmark, and Sweden) and five lower income countries (Argentina, Brazil, Israel, Korea, and Taiwan). These differences are about the firms, university systems, development paths, or-ganization of industry and structure of research and development (R&D) depending on the histories, cultures and entry times into the industrialization processes of the countries. Freeman (1995: p. 14) states that there are differences in national innovation systems of countries such as between Japan, the United States and the European Community (EC) and between European countries themselves (Nelson (ed.), 1993); Ireland and other small countries (Mjøset, 1992); Denmark and Sweden (Edquist and Lundvall, 1993). According to the statement of Freeman (1995: p. 14), Denmark and Sweden, neighbouring countries which superficially appear very similar in many ways, have big differences. Kaiser and Prange (2004) state that countries differ in terms of such features as "the internal organization of firms, the interfirm relationships, the role of the public sector, the institutional set-up of the financial sector, as well as the intensity and the organization of R&D (Kaiser and Prange, 2004: p. 397)" as a reflection of the differentiation of national economies "regarding the structure of the production system and regarding the general institutional set-up" (Lundvall, 1992b, p. 13 cited in Kaiser and Prange, 2004: p. 397)."

As a summary, the innovation systems of nations differ depending;

- their "country size and level of development (OECD, 1999)".
- their market status,
- "the market and non-market institutions in a country (OECD, 1999)",
- their "national patterns of economic specialization (Kaiser and Prange, 2004)", such as industrial (Patel and Pavitt, 1994; OECD, 1999), sectoral, scientific and technological specialisation (OECD, 1999) in production, trade, knowledge (Archibugi and Pianta 1992; Johnson, et. al., 2003) and service.
- "depending on industrial specialisation, specific institutional settings, policy priorities, and so on (Patel and Pavitt, 1994)".

- their governance mechanism and their administrative and institutional structures and characteristics such as the distribution of duty, authority and responsibility within this structure, patterns of collaboration and cooperation of different units and actors within the organizational structure.
- "with regard to the extent, nature and motives of inter-firm collaboration, as well as the degree of internationalisation of inter-firm linkages (OECD, 1999)".
- "institutions such as laws, rules, and norms (Edquist and Johnson, 1997; Edquist and Hommen, 1999; Edquist, 2005)".
- not only the institutional profile, also the interactions among these institutions (Lundvall, 1992a).
- "the governance and coordination of research and innovation policies (Edquist, 2014)" and strategies for promoting innovation.
- "in terms of institutional structures, and measured in their specialization patterns in the areas of scientific basis, technological strength, and international trade. In addition, policy institutions, as well as policy portfolios and policy means (Gu, 1999)".
- in terms of features such as "the internal organization of firms, the interfirm relationships, the role of the public sector, the institutional set-up of the financial sector, as well as the intensity and the organization of research and development (Kaiser and Prange, 2004)".
- "to the direction of public science and technology policies, the distribution and the success of public R&D-financing, the technological orientation of industrial research, the level of the enterprises' technological development, and the acquisition strategies of firms (Pauly, 1999 cited in Kaiser and Prange, 2004)".
- "the capacities and traditions of their science and technology policy institutions; the division of responsibilities between central and sub-central levels of government; the role and power of different ministries; the nature of government/industry relationships; and the scope for public/private partnerships (OECD, 1999)".

- "structurally differ in the way they conduct technical change, both at the level of their socio-economic institutions, such as industrial firms, and at the level of public policy for promoting innovation, which pertains to industrial and technological policy, universities, and public laboratories (Niosi and Bellon, 1994)".
- "the respective roles of the main actors in innovation processes (firms, public and private research organisations, and government and other public institutions), and the forms, quality, and intensity of their interactions (OECD, 1999)".
- "the orientation of publicly funded R&D (OECD, 1999)".

The above-mentioned features differentiate the innovation systems of the regions as well as the nations.

2.2.2 Regional innovation systems

"Regional Innovation Systems (RIS) approach has multiple theoretical antecedents drawing on the literatures on Marshallian industrial districts, economic geography, innovative milieux, clusters and national systems of innovation (Asheim et al. 2011: p. 877)". In support of this view, Martin (2004) also describes the importance of regions by visualizing the "useful concepts and elements that help to define and understand regional competitiveness, including its driving factors" as a historical process (Figure 2.5). In this process Martin (2004) explains the literature of macro-economic literature (Classical theory, Neoclassical theory, Keynesian economic theory, Development economics, New economic growth theory - endogenous growth theory, and New trade theory) and some complementary perspectives that can be derived from micro-economy as well as sociology (Urban growth theory, 'New' Institutional economics, Business strategy economics and Schumpeterian/evolutionary economics). Martin (2004) presents three basic conceptions of regional competitiveness:

- Regions as sites of export specialisation;
- Regions as source of increasing returns
- Regions as hubs of knowledge.

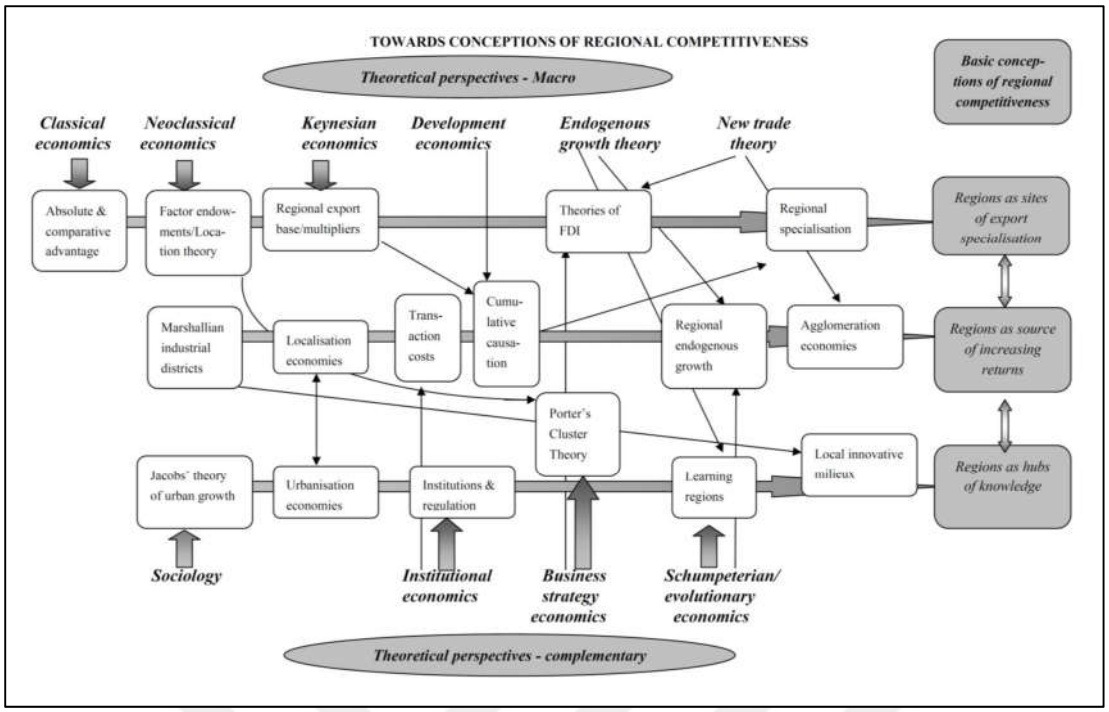


Figure 2.5 : Conceptions of regional competitiveness (Martin, 2004: Chapter 2 – p. 14).

The regions that are important in this historical process are gaining importance in this globalizing world that requires knowledge and innovation.

Regional Innovation Systems (RIS) is an interactive and complex network related not only to national but also international agencies and innovation systems. Within these systems regions may not only have different levels of innovative performance but also evolve in different ways depending on various factors, such as changes in national policies or their position in the system.

Technological developments brought about by globalization give rise to a rapidly changing, developing and transforming competitive environment. In today's conditions, also known as the knowledge society, every structure from micro to macro scale (firm, region, nation etc.) strives in this competitive environment in such a way that some try to create changes by pioneering, while others try to recognize, follow and adapt these changes. Therefore, countries and regions create policies, strategies and plans in order to establish and manage an effective innovation system (Özen and Baycan, 2015). Globalization increases the need for innovation policy, and also affects the design and implementation of innovation policies (Edquist, 2008a). Despite the free movement of capital and labor as a result of globalization, the importance of regions is increasing as a process of knowledge production, use

and accumulation (European Commission, 2014a). A RIS approach helps to explain the regional dimension of production and the regional disparities of innovation capacity and economic power (Schrempf et al., 2013), and highlights the diversity of regions in the countries, the differing dynamics of innovation and the interactions between organizations in a particular system (OECD, 2011). The analysis of a RIS allows the creation and dissemination of economically relevant information in a certain region, and also the identification of key actors and resources (such as existing infrastructures, sources of information and resources of expertise, financing, etc.). A system concept helps to clarify what kind of support is established and what inter-regional cooperation opportunities are at which policy level (local / regional / national / transnational) (IRE Working Group, 2008).

Similarly to NIS, the RIS concept is defined as actors (big or small, local or multi-national firms, universities, public research facilities, technology centers and cluster associations etc.) and the linkages, connections and relationships between these actors (Edquist, 2005; OECD, 2011; Asheim et al., 2013; European Commisssion, 2014a; Özen et al., 2018). The RIS has been of great importance recently. According to OECD (2011), regions have increasing roles in regional innovation policies by (i) forming and shaping virtuous innovation trajectories and mobilizing untapped potential for national growth (URL-2) (ii) setting up the necessary administrative mechanisms to support clusters and innovative enterprises, (iii) defining the flow of real economic activities and (iv) making use of the synergy and connections among economic actors (Cooke et al., 2000; Cook and Memedovic, 2003). The emergence of clusters as a local innovation system and the emphasis on competition superiority are related to the presence of regional and local innovation systems. Hence, it shows that regional innovation systems form the basis for national competitive advantage (McCall, 2010).

In this regard, various definitions of RIS with reference to their different dimensions and characteristics are given in Table 2.6. As can be seen from these definitions, main feature of RIS is to be a dynamic and interactive structure where regional knowledge is highlighted for the production, use, dissemination and commercialization of knowledge that includes the relationships and networks of organizational and institutional infrastructure and regulations.

Table 2.6 : Definitions and progresses of regional innovation systems (Author's own illustration).

Year	Author	Definitions
1997	Cooke et al. (1997: p. 490)	" ... a collective order based on microconstitutional regulation conditioned by trust, reliability, exchange and cooperative interaction"
2000	Cooke et al. (2000) cited in Cooke, (2003)	"A regional innovation system consists of interacting knowledge generation and exploitation sub-systems linked to global, national and other regional systems for commercialising new knowledge"
2002	Howells, (1999) cited in Evangelista et al., (2002: p. 174)	"…a regional system of innovation may be defined as the localized network of actors and institutions in the public and private sector whose activities and interactions generate, import, modify and diffuse new technologies within and outside the region."
2003	Doloreux, (2003) cited in Doloreux and Parto, (2004: p. 9)	"The concept of regional innovation systems has no generally accepted definitions, although it is typically understood to be a set of interacting private and public interests, formal institutions, and other organizations that function according to organizational and institutional arrangements and relationships conducive to the generation, use, and dissemination of knowledge"
2004	Cooke et al. (2004) cited in European Commission, (2014a)	[It contains] "... subsystems of generation and exploitation of knowledge that interact with other regional, national and global systems for the commercialization of new knowledge"
2005	Doloreux and Parto (2005: pp. 135, 148)	"In other words, a regional innovation system is characterized by cooperative innovation activities between firms and knowledge- creating and diffusing organizations, such as universities, training organizations, R&D institutes, technology transfer agencies, and so forth, and the innovation-supportive culture that enables both firms and systems to evolve over time". "A regional innovation system is a normative and descriptive approach that aims to capture how technological development takes place within a territory. The approach has been widely adopted to underline the importance of regions as modes of economic and technological organization, and to highlight policies and measures that increase the innovative capacity of diverse kinds of regions".
	Morgan, (1997) cited in De Bruijn and Lagendijk, (2005: p. 1155)	"The RIS concept, in line with that of the learning region, is the outcome of an intellectual debate at the intersection of two bodies of work, that on the organisation and systemness of innovation on the one hand, and that on spatial agglomeration on the other"
	Asheim and Gertler (2005: p. 301)	" ... the institutional infrastructure supporting innovation within the production structure of a region"
2006	Asheim and Coenen, (2006) cited in the European Commission, (2014a)	"[It compRSIes] two subsystems of actors: … 1) the regional production structure or knowledge exploitation subsystem (mainly firms, often displaying clustering tendencies) 2) the regional supportive infrastructure or knowledge generation subsystem. …These two subsystems are systematically engaged in interactive learning in an informal institutional context (i.e. norms, trust and routines). This dynamic and complex interaction constitutes what is commonly labeled systems of innovation [where] systems are understood as interaction networks."
2009	Asheim, (2009) cited in the European Commission, (2014a)	RSI can be defined as the ".. wider setting of organisations and institutions affecting and supporting learning and innovation in a region"
2011	OECD (2011: p. 4)	"The regional innovation system concept is a way of describing the factors influencing innovation. It is composed of different types of actors: firms (small or large, domestic or multi-national), universities, public research facilities, technology centres, and cluster associations, among others. It is also characterised by specific institutions, rules, regulations and routines that shape innovation paths. The RIS lens highlights the variety of regions within countries, the different dynamics of innovation, and the interactions across organisations in a given system".
2013	Schrempf et al. (2013: pp. 10, 11)	"The RIS approach highlights the regional dimension of the production and the exploitation of new knowledge, thereby helping to explain regional differences in innovation capacity and economic strength". "RSIs usually consist of a set of interacting private, semi-private and public organisations, interacting within an institutional framework. This framework supports the generation, exploitation and dissemination of knowledge and thus supports innovative activities on a regional level (Asheim et al., 2003; Cooke, 2004; Doloreux, 2003)."
2014	Braczyk et al. (1998) and Cooke (1992) cited in European Commission, (2014a)	"Braczyk et al. (1998) and Cooke (1992) proposed the RSI concept to examine how governance, institutionalized learning, and culture may impact innovation at the regional level".
2015	Mikhaylova, (2015: pp. 30, 32)	"RIS is a localized cluster-network system that combines different kinds of actors being systematically involved in the innovation process and embedded in the institutional environment of the region". "RIS is a complex territorial social system, the development dynamics of which is influenced by a large number of internal and external factors of different nature (economic, social, institutional, foreign policy, organizational, cultural, historical, etc.).

“Many elements characterizing a national system could be, in principle, transferred to a smaller territorial scale and used also to define the RIS (Evangelista et al 2002: p. 174). The list includes:

- The internal organization of firms, the latter being the principal agents of technological innovation,
- The interfirm relationships (and, more generally, the type and intensity of interactions between the business sector and other organizations,
- The role of the public sector and public policy (assuming that, at the local level, formal policies interact to a much greater extent with informal customs and conventions),
- The institutional set-up of the financial sector (i.e. whether based either on a developed capital market, or on a regulated and strictly controlled credit, or on relatively ‘free’ access to funds, etc),
- The R&D intensity and organization,
- The institutional framework (regional governance structure, i.e. administrative organization, political, legal, fiscal, financial and educational arrangements, etc.),
- The characters of the production system (including the level of competition and collaboration faced by firms, the market structure, the division of labour, etc.) and the pattern of sectoral specialization,
- The degree of openness and the capacity to attract/absorb external resources,
- The core/periphery hierarchical forces (history, geography, etc.), taking into account the peculiarities of the different geographical scale (Evangelista et al 2002: p. 174)”.

Besides, “the local-specific elements which are relevant for a RIS are the following:

- localized communication patterns relating to the innovation process, both at individual level and firm or group level
- localized search and scanning procedures relating to innovation and technology
- localized invention and learning patterns,
- localized knowledge sharing
- localized innovation performance and, even more important, territorial spillovers (Evangelista et al 2002: pp. 174-175)”.

Mikhaylova (2015) proposes a composition model of RIS with subsystems with seperate elements. She identified the subsytems as economic, scientific and technological, social, political and legal, and finally ecological and geographical subsystems (Table 2.7). She also identified 'systemic', 'innovative' and 'spatio-positional' properties of RIS (Figure 2.6). The first part is the systemic properties with a reflection of systemic nature of RIS and this group consists of sustainability, complexity, emergence, integrity, purposefulness, and hierarchy. The second part is innovative properties that affected by the innovation components which consist of openness, nonlinearity, adaptability, embeddedness, self-development, and competitiveness. The third and last component is 'spatio-positional properties' which arise out of the territorial socio-economic system. These properties are localization, functionality, multicomponent, heterogeneity, uniqueness and dynamism.

Table 2.7 : Composition model of regional innovation system (Mikhaylova, 2015: p. 29).

System	Subsystem	Elements
Regional Innovation System	Economic	Transnational Corporations (TNCs); large, small and medium enterprises in the manufacturing industry, agriculture, fisheries and fish farming, mining, construction, manufacturing and distribution of electricity, gas and water (i.e. utilities sector), wholesale and retail trade, transport and communication, hotel and restaurant business; small innovative companies; organizations engaged in financial activities (e.g. insurance companies, financial and credit institutions, leasing and investment firms, financial funds, sponsorship funds, etc.); companies that provide a variety of services (e.g. consulting, auditing, accounting, certification, licensing, patenting, examination, design, etc.) and others.
	Scientific and Technological	Organizations involved in basic and applied research and development (e.g. R&D organizations, higher education research organizations, experimental design, engineering design, design and technology organizations), industrial parks, business incubators, innovation centers, scientific and technological centers, etc.
	Social	Organizations in the field of education (e.g. university, college, NGOs, training centers, etc.), health and social services, households, social institutions, a pool of highly qualified specialists, etc.
	Political and Legal	Regional authorities and administration, political organizations and other political institutions, legal and regulatory framework, etc.
	Ecological and Geographical	Natural resources

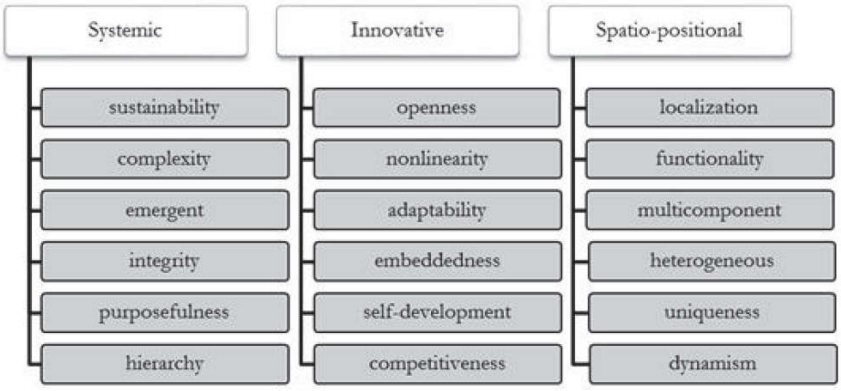


Figure 2.6 : Properties of RIS (Mikhaylova, 2015: p. 31).

The model of Mikhaylova (2015) considers the diversity of the actors in the innovation process. Due to the model, "the core of the RIS is formed by clusters of interdependent and complementary industries" (Figure 2.7). The boundaries of the clusters are designative and define the inter-sectoral linkages of the regional network. "Between the core and peripheral zones the resource flows are formed, by which there is a movement of various resources within the RIS (Mikhaylova, 2015: p. 32)". As a result, this model can be interpreted as a combination of the core of RIS and the peripheral area with the networks and resource flows.

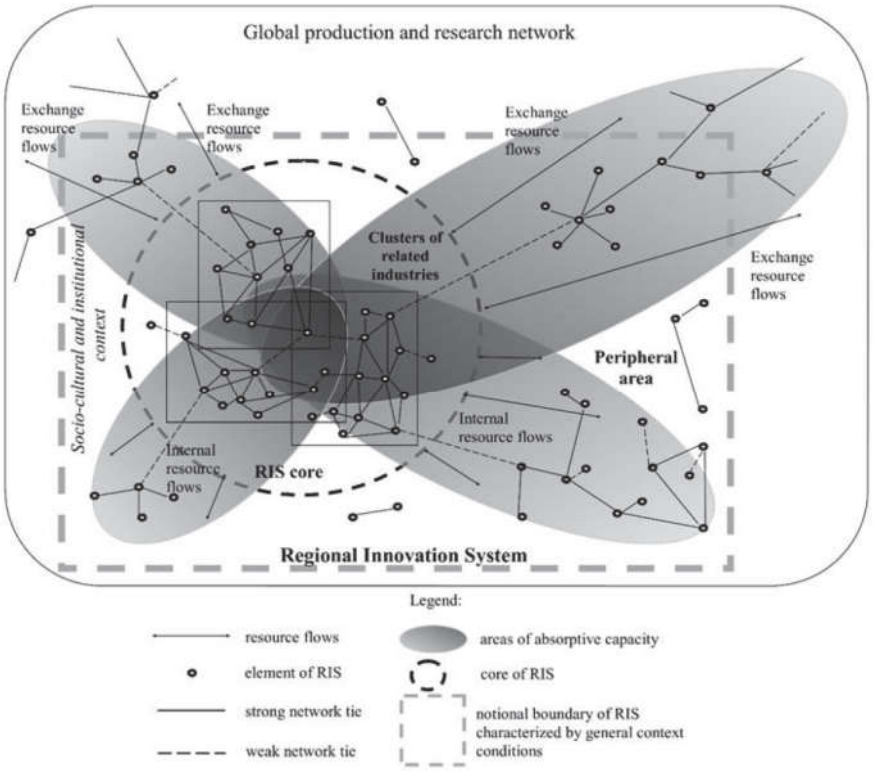


Figure 2.7 : Schematic model of RIS (Mikhaylova, 2015: p. 32).

As a result of the literature based on the RIS, since the regional innovation systems require "a strong governance based on a diversity of institutional arrangements (Uyarra, 2007; Pinto and Pereira, 2018)", performances of the regions differ not only due to the regional governance structures, but also due to variations in local features identified above.

2.3 Measurement of Innovation Systems

According to Lundvall et al. (2002), just because IS require active learning, performance of IS not only depends of economic, political and social infrastructures

and institutions, but also depends on past experiences. In order for innovation to be more effective, existing capacity in the systems should be considered (Asheim, et al., 2011 cited in Pinto and Pereira, 2018) “by means of comparing existing innovation systems with each other – over time and space (Edquist, 2008a: p. 1)”.

As mentioned before, technological developments brought about by globalization give rise to a rapidly changing, developing and transforming into a competitive environment. In today's conditions, called the knowledge society, every structure from micro to macro scale (firm, region, nation etc.) strives in this competitive environment in such a way that some try to create changes by pioneering, while others try to recognize, follow and adapt these changes. Therefore, countries and regions create policies, strategies and plans in order to establish and manage an effective innovation system (Özen and Baycan, 2015). Globalization increases the need for innovation policy, and affects the design and implementation of innovation policies (Edquist, 2008a).

For this reason the following questions gain importance:

- How can the performance of a country’s or a region’s innovation system be measured? Which factors/indicators are effective?
- Which factors influence the national innovation system?
- Which factors influence the regional innovation system?

2.3.1 Measurement of national innovation systems

According to the OECD (1997), “the measurement and assessment of national innovation systems has centred on four types of knowledge or information flows:

1) interactions among enterprises, primarily joint research activities and other technical collaborations;

2) interactions among enterprises, universities and public research institutes, including joint research, co-patenting, co-publications and more informal linkages;

3) diffusion of knowledge and technology to enterprises, including industry adoption rates for new technologies and diffusion through machinery and equipment; and

4) personnel mobility, focusing on the movement of technical personnel within and between the public and private sectors.”

Not only these flows, Niosi (2002) considers the indicators that measure NIS performance as effective indicators, efficiency indicators, quality of output, flows/synergy, and ratios and indexes (Table 2.8).

Table 2.8 : Examples of indicators of NIS performance (Niosi, 2002: p. 299).

	Level	Indicators (benchmarks)
Effectiveness indicators	University	University graduates as percentage of new enrollment
	University	University publication per university researcher
	Industry	Industry patents per industrial researcher
	Government policy	Number of firms conducting R&D
	Government policy	Number of research universities
Efficiency indicators	University	Cost of university graduates
	University	Cost of university publications (publications/HERD)
	Industry	Cost of industry patents (total industrial patents/BERD)
	Government laboratories	Cost of government laboratories' patents
Quality of output	All institutions	Citations to patents
	All institutions	Citations to publications
	Industry	Number of innovations
	Industry	Exports of technologically-intensive goods and services
Flows/synergy		Personnel flows among organizations
		Knowledge flows
		Technology transfer
		Technological alliances
		Machinery diffusion
		Financial flows
		Venture capital for new high-technology firms
		Government subsidies for R&D
		Regulatory flows
		Intellectual property legislation
		Legislation on standards
		Anti-trust and cooperative rules and laws
		Human flows
		University graduates supply and demand by discipline and institution
Ratios and indexes	At NIS level	GERD/GDP
		Revealed technological advantages
		Input/output macroeconomic ratios
		Trade balances on high-technology goods and services

- European Innovation Scoreboard Index:

The EU makes a comparative assessment of the research and innovation performance of the EU Member States by using the annual European Innovation Scoreboard (EIS)[7] since 2001 (European Commission, 2019a).

The EU has been making some changes in the dimensions and indicators over time since they started this measurement (Figure 2.8). As a result of the measurement, the EU classifies the countries into four performance groups based on their average innovation performance. 'Modest innovators', 'moderate innovators', 'strong innovators', and 'innovation leaders' are the performance groups.

[7] The annual European Innovation Scoreboard (EIS) has been published since 2001. The report was not published only in 2012. The EIS reports have been published under the name "European Innovation Scoreboard" until 2009, as "Innovation Union Scoreboard" between 2010 and 2015, and again as "European Innovation Scoreboard" from 2016 onwards.

Historical Process of the EIS Indicators Used in the Measurement of the Innovation Performance: Although the indicators used in the measurement change over time, there are some similar main factors such as educational conditions (doctorate graduates, population with tertiary education), expenditures, small and medium-sized enterprises (SMEs), venture capital investments, exports, employment, and intellectual assets with different forms of Intellectual Property Rights (IPR) (as patents, trademarks and designs) etc. A detailed comparison of the historical process of the indicators between the years 2007 and 2019 is given in Figure 2.8.

The years of 2008, 2010 and 2017 are the milestones of the EIS since the EU revised the methodology in these years. The EU (European Commission, 2009a) mentions that "The methodology for the EIS 2008 is revised compared to that of 2007 with a stronger focus on services, nontechnological aspects, and outputs of innovation".

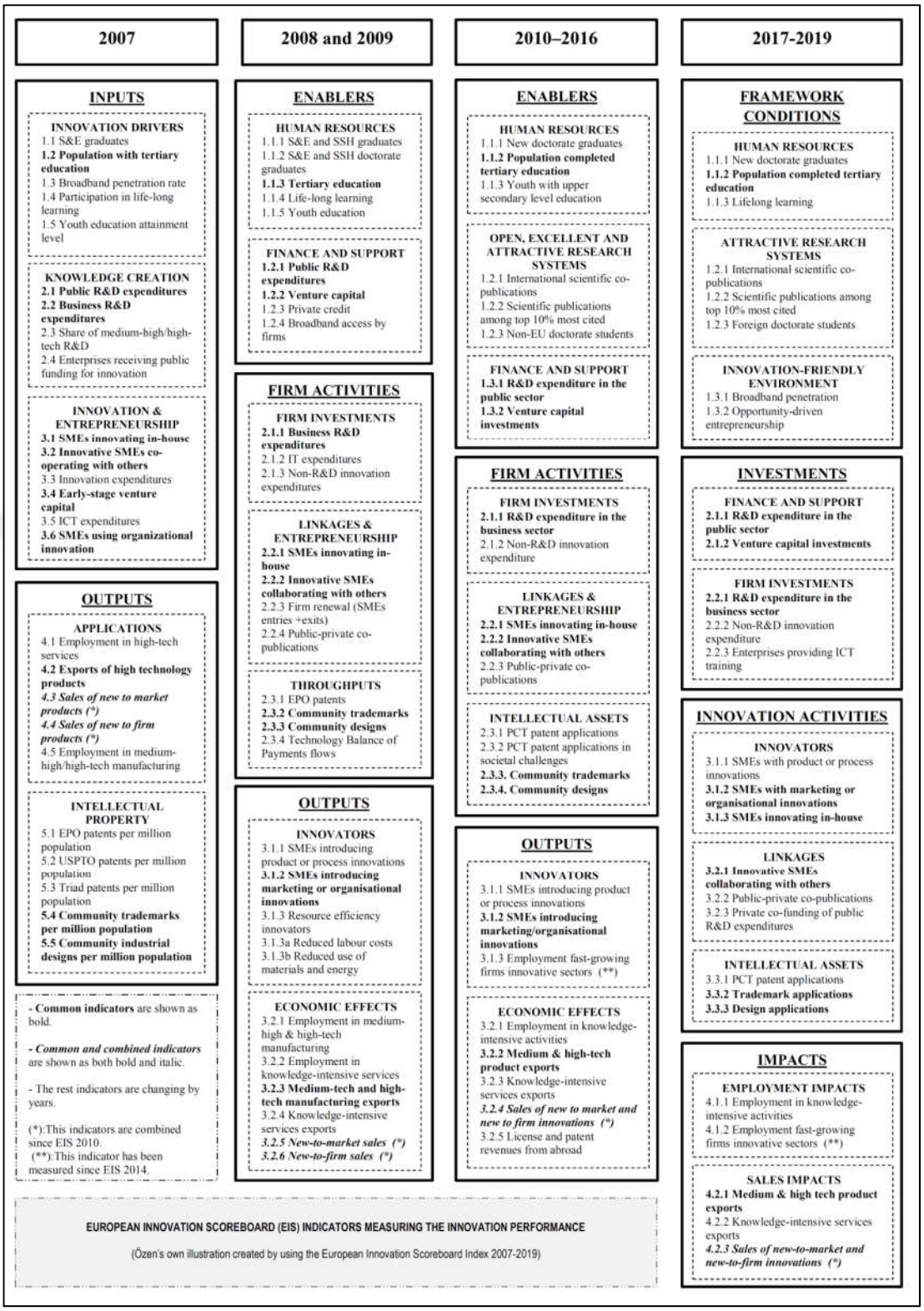


Figure 2.8 : Indicators measuring the innovation performance (Author's own illustration created by using the European Innovation Scoreboard Index 2007-2019) (European Commission, 2008a, 2009a, 2010a, 2011a, 2012a, 2014b, 2014c, 2016a, 2017c, 2017b, 2018a, 2019a).

The indicator 'Science and Engineering (S&E) graduates' in the EIS 2007 is replaced by 'S&E and Social Sciences and Humanities (SSH) graduates in the EIS 2008, and has no longer been used since 2010. Another indicator in human resources, named 'S&E and SSH doctorate graduates (2nd stage per 1000 population aged 25-34)', in the EIS 2008 and 2009 is replaced in 2010 by a new indicator called 'New doctorate graduates (ISCED[8] 6) per 1000 population aged 25-34' with a broader definition than that used in the EIS 2009. This indicator has still been in use since the EIS 2010.

Employment is another important factor in measuring innovation performance. In the EIS 2007, 'Employment in high-tech services' and 'Employment in medium-high/high-tech manufacturing' were the indicators. In the EIS 2008 and 2009, the indicators were 'Employment in medium-high & high-tech manufacturing' and 'Employment in knowledge-intensive services'. These two indicators were removed in the EIS 2010 due to the revised methodology of the EIS and a new indicator which is named 'Employment in knowledge-intensive activities (manufacturing and services) as % of workforce' came up and is still used. Besides this indicator, an additional employment indicator, which is called 'Employment fast-growing firms innovative sectors', has been used since the EIS 2014.

Just like employment, exports and sales have changed over time. In 2007, 'Exports of high technology products as a share of total exports' indicator was used. Since 2008, Medium-tech exports have been added to this indicator and named as 'Medium-tech and high-tech manufacturing exports'.

As a form of Intellectual Property Rights (IPR), patent is an important indicator. Although there have been different types of patent definitions in different years over time, it is obvious that patent is an indispensable variable in the measurement. In the EIS 2007, there were three types of patent definitions as 'European Patent Office (EPO) patents per million population', 'United States Patent and Trademark Office (USPTO) patents per million population' and 'Triad patents per million population'. The indicator in the EIS 2008 and 2009 was 'EPO patents'. These indicators are no longer used. Since the EIS 2010, 'The Patent Cooperation Treaty (PCT) patent applications' is used at the measurement. Another indicator which could not reach today was 'PCT patent applications in societal challenges' and it was used between

[8] ISCED refers to the 'International Standard Classification of Education'.

2010 and 2016. This indicator is no longer used since the revised methodology of the EIS 2017.

Although some variables are not common for all years, they have reached to the present day after certain years. For example, the variables “SMEs with product or process innovations” and “Knowledge-intensive services exports”, which have survived since 2008, have emerged as new variables and still used in the measurement. In addition, the variable “Employment in knowledge-intensive activities” has reached to the present since 2010. The variable named “Employment fast-growing firms innovative sectors” has been used in the measurement since the EIS 2014.

Some of the previously important indicators are no longer used (youth education etc.), some variables gain importance over time (scientific publications etc.), and some of the previously used variables come to the fore (broadband penetration and life-long learning etc.).

Although ‘Youth education attainment level (% of population aged 20-24 having completed at least upper secondary education)’ was an important indicator in the years between 2007 and 2016, this indicator has been removed since the EIS 2017. “‘Youth with at least upper secondary education’ has been removed for several reasons: first, education attainment is already captured by the indicator measuring the share of population with tertiary attainment; second, removing the indicator allowed for the inclusion of an indicator measuring the upgrading of skills during working life, i.e. the new indicator on lifelong learning (European Commission, 2017b).”

New indicators appeared with the EIS 2010, which are still in use, are mainly in the ‘Attractive research systems’ dimension. These indicators are ‘International scientific co-publications’, ‘Scientific publications among top 10% most cited’, and ‘Foreign doctorate students’. Another new indicator was in the intellectual assets, which called ‘PCT patent applications’. This indicator is also still in use. Although these indicators were not used at the measurement, they gained importance and became effective at the present.

For instance, some indicators such as broadband penetration and life-long learning were included in earlier versions of the EIS, but removed from the 2010 to 2017. However, they have come to the fore afterwards.

In 2007, “Broadband penetration rate (number of broadband lines per 100 population)” was an indicator using to measure the innovation performance. In 2008 and 2009 the indicator became more specific and called “Broadband access by firms (% of firms) which has a numerator as “Number of enterprises (excluding the financial sector with 10 or more employees with broadband access)” and denominator as “Total number of enterprises (excluding the financial sector with 10 or more employees)”. Between 2010 and 2016 this indicator was not used as a tool for measuring the innovation performances. Since the EIS 2017, this indicator again has come up again and started to be used in the measurement with a different form of numerator and denominator. The definition of numerator turned into “Number of enterprises with a maximum contracted download speed of the fastest fixed internet connection of at least 100 Mb/s” and the denominator is “Total number of enterprises”. “This indicator captures the relative use of this e-potential by the share of enterprises that have access to fast broadband (European Commission, 2017b)”.

Just like broadband penetration, ‘Life-long learning’ indicator has been used as an indicator in some years. Between 2007 and 2009 the indicator was ‘Participation in lifelong learning per 100 population aged 25-64’. The numerator was “Number of persons involved in life-long learning. Life-long learning is defined as participation in any type of education or training course during the four weeks prior to the survey” and the denominator was “The reference population is all age classes between 25 and 64 years inclusive”. Between 2010 and 2016 this indicator was not used as a tool for measuring the innovation performances. Since the EIS 2017, this indicator again has come up again and started to be used in the measurement. The definition of the numerator is identified as “The target population for lifelong learning statistics refers to all persons in private households aged between 25 and 64 years. The information collected relates to all education or training, whether or not relevant to the respondent’s current or possible future job. Data are collected through the EU labour force survey (LFS). The reference period for the participation in education and training is the four weeks preceding the interview as is usual in the LFS” (European Commission, 2017b) and the denominator as “Total population of the same age group, excluding those who did not answer the question concerning participation in (formal and non-formal) education and training” (European Commission, 2017b).

Some of the indicators, which are not included in the measurement in 2007, gained importance and started to be used in the measurement since 2008 to the present such as 'Non-R&D innovation expenditures' and 'Public-private co-publications'.

As a result of the comparison of the historical process (Figure 2.8), common indicators between 2007 and 2019 are as following;

- Population completed tertiary education: Although 'Population completed tertiary education' is a common indicator between years 2007 and 2019, the age range identified in the definition denominator differentiates according to different years. In 2007-2010, the indicator was 'Population with tertiary education per 100 population aged 25-64'. The time period between 2010 and 2016 (including both years), the age group of the indicator more narrowly defined than in the EIS 2009 and became 'Percentage population aged 30-34 having completed tertiary education'. Since the EIS 2017, the age range revised from 30-34 to 25-34 and became 'Percentage population aged 25-34 having completed tertiary education'. According to the EU, "The indicator focuses on a younger age cohort of the population, aged 25 to 34, and will therefore easily and quickly reflect changes in educational policies leading to more tertiary graduates (European Commission, 2019a)."
- R&D expenditure in the public sector: Another common indicator is 'R&D expenditure in the public sector'. The numerator is defined as "All R&D expenditures in the government sector (GOVERD) and the higher education sector (HERD)" and the denominator as "Gross Domestic Product (GDP)". This indicator is valid for all years.
- Venture capital investments: Although this indicator was called as 'Early-stage venture capital' in 2007, it has been called as "Venture capital investments (percentage of GDP)" since 2008 to the present. It has still the same meaning and the numerator is "defined as private equity being raised for investment in companies. Management buyouts, management buy-ins, and venture purchase of quoted shares are excluded. Venture capital includes early stage (seed + start-up) and expansion and replacement capital" and denominator as "Gross Domestic Product" (European Commission, 2019a).

In the EIS 2018 and EIS 2019, three-year averages have been used for this indicator (European Commission, 2018a and 2019a).

- R&D expenditure in the business sector: Just like R&D expenditure in the public sector, another common indicator for all years is 'R&D expenditure in the business sector' and the numerator is defined as "All R&D expenditures in the business sector (BERD) and the denominator as "Gross Domestic Product". "The indicator captures the formal creation of new knowledge within firms. It is particularly important in the science-based sectors (pharmaceuticals, chemicals and some areas of electronics) where most new knowledge is created in or near R&D laboratories (European Commission, 2019a)."
- SMEs innovating in-house: This common indicator is valid for all years. According to the EU (European Commission, 2019a), the numerator is defined as "Number of Small and medium-sized enterprises (SMEs) with in-house innovation activities. In-house innovating enterprises are defined as enterprises which have introduced product or process innovations either themselves or in co-operation with other enterprises or organisations" and the denominator is the "Total number of Small and medium-sized enterprises (SMEs)". "The indicator is limited to SMEs, because almost all large firms innovate and because countries with an industrial structure weighted towards larger firms tend to do better (European Commission, 2019a)".
- Innovative SMEs collaborating with others: Another common indicator for all years is 'Innovative SMEs collaborating with others (percentage of SMEs)'. The numerator is defined as "Number of Small and medium sized enterprises with innovation co-operation activities, i.e. those firms that had any co-operation agreements on innovation activities with other enterprises or institutions in the three years of the survey period" and the denominator is defined as "Total number of Small and medium-sized enterprises". "This indicator measures the flow of knowledge between public research institutions and firms, and between firms and other firms. The indicator is limited to SMEs, because almost all large firms are involved in innovation cooperation (European Commission, 2019a)".

- Trademark applications: 'Trademark applications' indicator has different definitions of numerator and denominator in different years. Between 2007 and 2009, the name of the indicator was 'Community trademarks per million population', with a numerator as "Number of new community trademarks. A trademark is a distinctive sign, identifying certain goods or services as those produced or provided by a specific person or enterprise (European Commission, 2019a)" and a denominator as "Total population". It fulfils the three essential functions of a trademark at European level: it identifies the origin of goods and services, guarantees consistent quality through evidence of the company's commitment vis-à-vis the consumer, and is a form of communication, a basis for publicity and advertising.

  Between 2010 and 2013, the indicator was called 'Community trademarks per billion GDP (in PPP€)'. The numerator was "Number of new community trademarks applications" and the denominator was "Gross Domestic Product in Purchasing Power Parity Euros (PPP€)". In the EIS 2013, two-year averages were used.Between 2014 and 2016, the indicator was called 'Community trademarks per billion GDP (in PPS€)' and the numerator was defined as "Number of new community trademarks applications" and the denominator as "Gross Domestic Product in Purchasing Power Standards (PPS)". Just like the EIS 2013, two-year averages were used between 2014 and 2016.

  Since the EIS 2017, the indicator called 'Trademarks applications per billion GDP (in PPS)' has a numerator as "Number of trademark applications applied for at European Union Intellectual Property Office (EUIPO) plus number of trademark applications applied for at World Intellectual Property Office (WIPO) ("yearly Madrid applications by origin") and denominator as "Gross Domestic Product in Purchasing Power Standard". As the EIS 2013-2016, two-year averages have been used.

- Design applications: Similar to the 'Trademark applications', 'Design applications' indicator has also undergone changes in its definition in the same years such as having different denominator in the EIS 2010.

The indicator between 2007 and 2009 was 'Community designs per million population'. The numerator of the indicator is defined as "Number of new community designs. A registered Community design is an exclusive right for the outward appearance of a product or part of it, resulting from the features of, in particular, the lines, contours, colours, shape, texture and/or materials of the product itself and/or its ornamentation" and the denominator as "Total population" in the EIS 2007-2009 (European Commission 2008a, 2009a and 2010a).

Since the EIS 2010, with a different denominator, the indicator turned into 'Community designs per billion GDP (in PPP€)'. The numerator was identified as"Number of new community designs applications" and the denominator as "Gross Domestic Product in Purchasing Power Parities (in the EIS 2010-2013)." Just like the 'Trademark Applications' indicator, two-year averages have been used in the EIS 2013 for the 'Design Applications' (European Commission 2014b).

Between 2014 and 2016, similar to the 'Community trademarks per billion GDP (in PPS€)' indicator, the name of the indicator turned into 'Community designs per billion GDP (in PPS€)". The numerator was defined as "Number of new community designs applications" and the denominator as "Gross Domestic Product in Purchasing Power Standards". Just like the EIS 2013, two-year averages were used between 2014 and 2016.

Since the EIS 2017, the indicator called 'Designs applications per billion GDP (in PPS)' has a numerator as "Number of individual designs applied for at the European Union Intellectual Property Office (EUIPO)" and denominator as "Gross Domestic Product in Purchasing Power Standard". As the EIS 2013-2016, two-year averages have been used.

Although 'Trademark applications' and 'Design Applications' have different definitions of numerator and denominator over time, they are still important indicators for measuring innovation performance.

- Medium & high-tech product exports: As mentioned previously, just like employment, exports and sales have changed over time. In 2007, 'Exports of high technology products as a share of total exports' indicator was used.

Since 2008, Medium-tech exports have been added to this indicator and named as 'Medium-tech and high-tech manufacturing exports'.

The 'Exports of medium and high technology products as a share of total product exports' indicator has the numerator identified as "Value of medium and high-tech exports, in national currency and current prices, including exports of the following Standard International Trade Classification (SITC) Rev.3 product" and the denominator as "Value of total product exports" (European Commission, 2019a). The classification of the products was based on SITC Rev.3 product and was identical for all years.

The variable was valid only in 2013 and 2014 with a different formula approach and data source. With this formula, unlike other years, the numerator was based on the contribution to the trade balance, not export values.

The 'Exports of medium and high technology products as a share of total product exports' indicator "measures the technological competitiveness of the EU i.e. the ability to commercialise the results of research and development (R&D) and innovation in the international markets. It also reflects product specialisation by country (European Commission, 2019a)".

- SMEs introducing marketing or organisational innovations: The indicator in the EIS 2007 was called 'SMEs using organizational innovation (% of SMEs)' based on a survey on firms. The numerator is the response to the question because they asked to the firms if "they introduced 'new or significantly improved knowledge management systems', 'a major change to the organisation of work within their enterprise' or 'new or significant changes in their relations with other firms or public institutions'. A 'yes' response to at least one of these categories would identify a SME having introduced an organisational innovation (European Commission, 2008a)". The denominator was the "Total number of SMEs".

  Since 2008 to the present the name of the indicator turned into "SMEs introducing marketing or organisational innovations (percentage of SMEs)". The numerator of the indicator is defined as "Number of Small and medium-sized enterprises (SMEs) who introduced at least one new organisational

innovation or marketing innovation. An organisational innovation is a new organisational method in an enterprise's business practices (including knowledge management), workplace organisation or external relations that has not been previously used by the enterprise. A marketing innovation is the implementation of a new marketing concept or strategy that differs significantly from an enterprise's existing marketing methods and which has not been used before" and the denominator as the "Total number of Small and medium-sized enterprises" in the EIS 2019 (European Commission, 2019a).

- Sales of new-to-market and new-to-firm innovations: Although the variable has been included in the measurement under this name since 2010, it was again included in the measurement as two separate variables between 2007 and 2009. By the EIS 2010, the two previous variables were combined and reached to the present day.

  In the EIS 2007, 'Sales of new-to-market products (% of turnover)' indicator had a numerator as "Sum of total turnover of new or significantly improved products for all enterprises." and a denominator as "Total turnover for all enterprises, in national currency and current prices (European Commission, 2008a)."

  The indicator 'Sales of new-to-firm products (% of turnover)' has a numerator as Sum of total turnover of new or significantly improved products to the firm but not to the market for all enterprises." and a denominator as "Total turnover for all enterprises, in national currency and current prices (European Commission, 2008a)".

  Although these two indicators were named differently in the EIS 2008 and 2009 (as 'New-to-market sales (% of turnover)' and 'New-to-firm sales (% of turnover)'), they are identical to the EIS 2007 because they have the same definitions of the numerator and denominator.

  With the EIS 2010, these two indicators are combined and under a indicator called 'Sales of new-to-market and new-to-firm innovations as % of turnover'. This indicator has a numerator as "Sum of total turnover of new or significantly improved products, either new to the firm or new to the market, for all enterprises" and a denominator as "Total turnover for all enterprises"

(European Commission, 2011a).This indicator is still in use with the same definitions of numerator and denominator.

Current EIS Indicators: According to the last and current measurement framework of the EIS 2019, which follows the methodology of the previous EIS 2018 report, "innovation performance is measured using a composite indicator – the Summary Innovation Index – which summarises the performance of a range of different indicators (European Commission, 2019a: p. 8)". The main types of indicators are 'Framework Conditions', 'Investments', 'Innovation Activities' and 'Impacts' (Figure 2.8).

'Framework conditions' has three innovation dimensions as 'Human Resources' (1.1.1 New doctorate graduates; 1.1.2 Population completed tertiary education; and 1.1.3 Lifelong learning), 'Attractive Research Systems' (1.2.1 International scientific co-publications; 1.2.2 Scientific publications among top 10% most cited; and 1.2.3 Foreign doctorate students), and 'Innovation-friendly Environment' (1.3.1 Broadband penetration; and 1.3.2 Opportunity-driven entrepreneurship).

'Investments' includes two innovation dimensions as 'Finance and Support' (2.1.1 R&D expenditure in the public sector; and 2.1.2 Venture capital investments) and 'Firm Investments' (2.2.1 R&D expenditure in the business sector; 2.2.2 Non-R&D innovation expenditure; and 2.2.3 Enterprises providing Information and Communication Technology (ICT) training).

'Innovation Activities' is consist of three innovation dimensions as 'Innovators' (3.1.1 SMEs with product or process innovations; 3.1.2 SMEs with marketing or organisational innovations; and 3.1.3 SMEs innovating in-house), 'Linkages' (3.2.1 Innovative SMEs collaborating with others; 3.2.2 Public-private co-publications; and 3.2.3 Private co-funding of public R&D expenditures) and 'Intellectual assets' (3.3.1 PCT patent applications; 3.3.2 Trademark applications; and 3.3.3 Design applications).

The last indicator is 'impacts'. It is composed of 'Employment impacts' (4.1.1 Employment in knowledge-intensive activities and 4.1.2 Employment fast-growing firms innovative sectors) and 'Sales impacts' (4.2.1 Medium & high tech product exports, 4.2.2 Knowledge-intensive services exports and 4.2.3 Sales of new-to-market and new-to-firm innovations).

Three of these 27 indicators have been used for the first time in the measurement of innovation performance in the scope of the EIS since the EIS 2017. These indicators are ‘Opportunity-driven entrepreneurship’, ‘Enterprises providing ICT training’ and ‘Private co-funding of public R&D expenditures’.

2.3.2 Measurement of regional innovation systems

Regional innovation systems are complex and interactive networks not only in national but also in global ties and connections via international agencies and innovation systems. Within these systems, regions not only have innovation performances at different levels, but also make progress in different ways depending on factors like their positions in the system and changes in national policies.

Some of these factors are related to the variables such as the percentage of population with higher education, the percentage population aged 25-64 having completed tertiary education, the number of students enrolled in postgraduate programs, the number of defended Ph.D thesis, the number of science and technology graduates by gender, the resarch quality indicators of universities, the percentage of active population, gross domestic expenditure on R&D (GERD), regional Gross Domestic Product (Per capita GDP), scientific and technological capital stock in R&D, venture capital investments, investment funds on science and technology (S&T) activities, investment in education funds, scientific and technological expenditures, R&D expenditure in the public and business sectors, Non-R&D innovation expenditures, SMEs innovating in-house, innovative SMEs collaborating with others, SMEs introducing product or process innovations, SMEs introducing marketing or organisational innovations, labor force, total labour force productivity, employment in medium-high/high-tech manufacturing and knowledge-intensive services, the number of stuff involved in scientific and technological activities both in private and public sector, the number of researchers, full-time equivalent of R&D researchers, scientists and engineers of S&T personnel, the number of technological and scientific papers, regional distribution of technology centers and their annual income, foreign direct investments, applications or registrations of patents, utility models, trademarks and designs at both European Patent Office (EPO) or national levels, regional exports, high-tech exports, the share of high technology in gross domestic production, new product sales revenues, the

number of regular internet users, the number or enterprises having access to the Internet, average annual growth rate of population, etc. (Kutvonen, 2007; Fu, 2008; Zabala Iturriagagoitia, 2008; Li, 2009; Cincera et al., 2009; Bosco and Brugnoli, 2010; Roman, 2010; Zilang et al., 2012; Foddi and Usai, 2013; Dzemydaitė and Galinienė, 2013; European Commission, 2017a).

Regional Innovation Systems is an effective tool for examining the regional economy and innovative performance and policy-making. However, there is no one single ideal method to evaluate innovation and innovation processes in a certain region since innovation is a complex and dynamic phenomenon defined with reference to various activities and characteristics. Most studies use quite a number of indicators consisting of various aspects of innovation, and parametric and nonparametric methods. A RIS can be evaluated through such non parametric methods as Data Envelopment Analysis-DEA (Kutvonen, 2007; Fu, 2008; Bosco and Brugnoli, 2010; Roman, 2010; Foddi and Usai, 2013; Dzemydaitė et al., 2016), Free Disposal Hull-FDH (Dzemydaitė and Galinienė, 2013-also they used DEA in their studies) and through parametric methods like Stochastic Frontier Analysis-SFA) (Li, 2009; Cincera et al., 2009- also they used DEA in their studies) and Thick Frontier Analysis-TFA. Besides, some other statistical methods, mainly factor (Zabala Iturriagagoitia, 2008; Zilang et al., 2012), discriminant (URL-3), cluster (Hájková and Hájek, 2011) and regression analysis (Fu, 2008; Yang et al., 2017), and also normalization methods (Duman, 2017; Gömleksiz, 2012; Mercan and Gömleksiz, 2013; Kutgi and Işık Maden, 2020; Karaçor and Duman, 2017; Duman and Karaçor, 2017), Markov Chains (Purchase et al., 2014; Todo et al., 2016; Uğur et al., 2016) and Panel Data Analysis (Bai, 2013; Jiao et al., 2016; Yi and Xiao-li, 2018; Zhao, 2016; Zhang and Dong, 2016; Yun, 2011) are used to evaluate regional innovation performances and to classify regions with similar characteristics. Besides the varieties of the methods used in the evaluation of regional innovation system, factors and variables that affect regional innovation systems also differ based upon the scope of studies conducted. It is possible to reproduce these variables according to the scope of a given study. In addition to the statistical techniques mentioned above, this thesis uses Markov Chains and Panel data analysis as an alternative methodology.

Dzemydaitė and Galinienė (2013) applied an output-oriented version of a model containing the order-α frontier method together with “the DEA and FDH to

determine their applicability for evaluating the Lithuanian regional efficiency" (Figure 2.9).

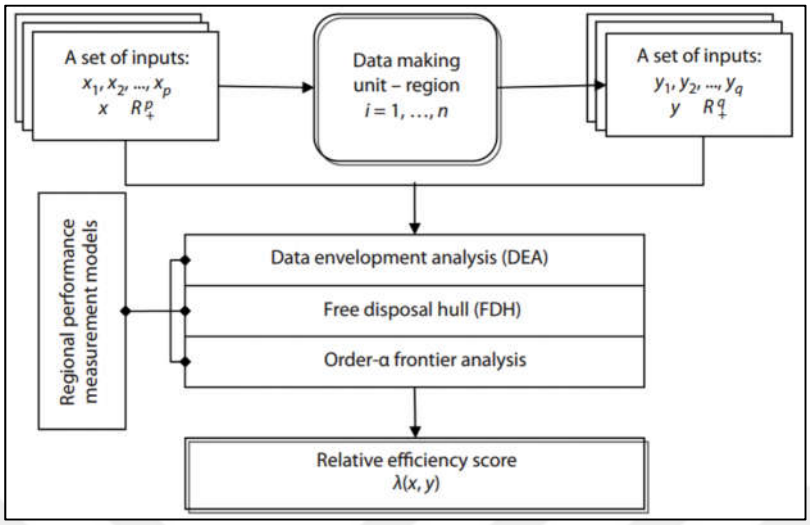


Figure 2.9 : Conceptual framework for the regional performance measurement (Dzemydaitė and Galinienė, 2013: p. 26).

Another study related to measuring regional innovation is "The Firms behind the Regions: Analysis of Regional Innovation Performance in Portugal by External Logistic Biplots" (de Noronha, et. al., 2013). This study aims "to evaluate the firms' contribution to national and regional growth, their obstacles and impacts, and to explain the present performance of Portuguese firms located throughout the country, and to explore those innovation determinants that have a region-specific connotation". "The ten variables under consideration are: Promoting knowledge; Studying processes; Managing; Promoting R&D; Knowledge transfer; Support to entrepreneurship; New product development; Promoting partnership and cooperation; Application of external technologies; and Orientation." The methodology is principal coordinates analysis, as a technique for ordering the units, in Euclidean space. Lisbon and Algarve regions take the lead in the performance of regional innovation.

- EU's Regional Innovation Scoreboard Index:

The European Union (EU) measures and evaluates innovation performance on a regional scale as well as national scale with the European Innovation Scoreboard (EIS). As a regional extension of the European Innovation Scoreboard, the Regional Innovation Scoreboard provides a comparativeassessment of innovation performances across (European Commission 2017a: p. 4) "238 regions in 23 EU

MemberStates, Norway, Serbia and Switzerland at different NUTS levels (European Commission, 2019b)". Regional Innovation Scoreboard Index provides statistical facts on regions' innovation performances and classifies these regions according to their innovation performances thus it allows making a comparative assessment of innovation performances. The EU does not measure the regional innovation performance of the regions of Turkey.

Previous Regional Innovation Scoreboard reports were published on 2002, 2003, 2006, 2009, 2012, 2014, 2016, 2017 and 17 June 2019. Differentiating from the EIS, the Regional Innovation Scoreboard 2019 has a more limited data with 17 of the 27 indicators used in the EIS (Table 2.9). "For the Regional Innovation Scoreboard 2019, most recent data refer to 2017 for six indicators, 2016 for 10 indicators, and 2015 for one indicator (European Commission, 2019b)". The EU defines this limitation as following (European Commission, 2019b):

"For several indicators, slightly different definitions have been applied, as regional data would not be available if the definitions were the same as in the EIS:

- For 'Population with completed tertiary education', the Regional Innovation Scoreboard uses data for the age group 30-34. The indicator in the EIS covers the broader age group 25-34. Tabulated regional data for this age group are not available from the statistical office of the European Union (Eurostat), so the same age group is used as in the Regional Innovation Scoreboard 2017;
- For two indicators using data from the Community Innovation Survey (CIS) – Non-R&D innovation expenditures and Sales of new-to-market and new-to-firm innovations – the data refer only to SMEs and not to all companies;
- For PCT patent applications, regional data have been extracted from the OECD's REGPAT database;
- For Trademark applications, only EU trademark applications have been used, for which the data have been calculated by Science Metrix. The EIS uses the aggregate of both EUIPO and WIPO (Madrid Protocol) applications, but regional data for the latter are not available;
- For Design applications, the EIS uses data on individual design applications, for which regional data are not available. The RIS uses data on design applications, where a design application can include more than one individual

design application. Data for regional design applications have been calculated by Science Metrix;

- For Employment in knowledge-intensive activities, regional data are also not available, and instead Employment in medium-high and high-tech manufacturing and knowledge-intensive services is used (European Commission, 2019b)".

Table 2.9 : A comparison of the indicators included in the European Scoreboard Index and Regional Innovation Scoreboard (European Commission, 2019b: p .8).

	European Innovation Scoreboard 2019	Regional Innovation Scoreboard 2019
FRAMEWORK CONDITIONS		
Human resources	Doctorate graduates per 1000 population aged 25-34	No regional data
	Percentage of population aged 25-34 having completed tertiary education	Smaller age group 30-34
	Life-long learning, the share of population aged 25-64 enrolled in education or training aimed at improving knowledge, skills and competences	Identical
Attractive research systems	International scientific co-publications per million population	Identical
	Scientific publications among the top-10% most cited publications worldwide as percentage of total scientific publications of the country	Identical
	Foreign doctorate students as percentage of all doctorate students	No regional data
Innovationfriendly environment	Broadband penetration (Share of enterprises with a maximum contracted download speed of the fastest fixed internet connection of at least 100 Mb/s)	No regional data
	Opportunity-driven entrepreneurship	No regional data
INVESTMENTS		
Finance and support	R&D expenditure in the public sector as percentage of GDP	Identical
	Venture capital expenditure as percentage of GDP	No regional data
Firm investments	R&D expenditure in the business sector as percentage of GDP	Identical
	Non-R&D innovation expenditures as percentage of total turnover	For SMEs only
INNOVATION ACTIVITIES		
Innovators	SMEs introducing product or process innovations as percentage of SMEs	Identical
	SMEs introducing marketing or organisational innovations as percentage of SMEs	Identical
	SMEs innovating in-house as percentage of SMEs	Identical
Linkages	Innovative SMEs collaborating with others as percentage of SMEs	Identical
	Public-private co-publications per million population	Identical
	Share of private co-funding of public R&D expenditures	No regional data
Intellectual assets	PCT patent applications per billion GDP*	Identical
	Trademark applications per billion GDP*	European trademark applications
	Individual design applications per billion GDP*	European design applications
IMPACTS		
Employment impacts	Employment in knowledge-intensive activities (manufacturing and services) as percentage of total employment	Employment in medium-high and high-tech manufacturing and knowledge-intensive services
	Employment in fast-growing firms of innovative sectors	No regional data
Sales impacts	Medium and high-tech product exports as percentage of total product exports	No regional data
	Knowledge-intensive services exports as percentage of total service exports	No regional data
	Sales of new-to-market and new-to-firm innovations as percentage of total turnover	For SMEs only

* GDP in Purchasing Power standards

The Regional Innovation Scoreboard uses the EIS methodology to measure the region's innovation performances and similar to the EIS classifies regions into four innovation performance groups as regional Innovation Leaders, regional Strong Innovators, regional Moderate Innovators and regional Modest Innovators with a more detailed breakdown (Figure 2.10) (European Commission, 2019b).

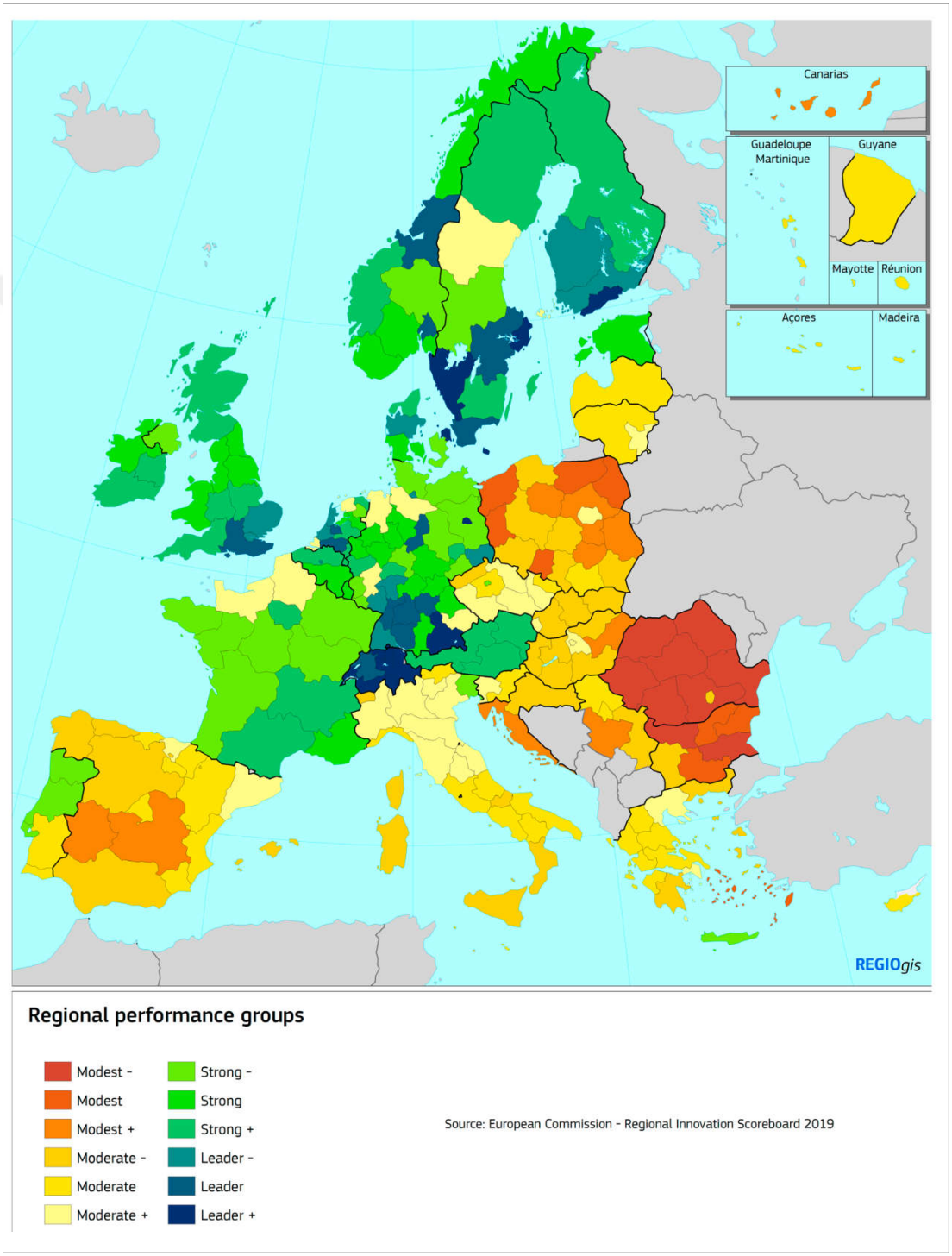


Figure 2.10 : Innovation performance groups of the regions (European Commission, 2019b: p. 5).

2.4 Evaluation of the Chapter

According to OECD (1999: 15) the production of goods and services is becoming more and more knowledge/science/technology and skills-intensive, also technology diffusion requires organisational and managerial innovations. As a reflection of knowledge/science/technology/skills-intensive global structure (OECD, 1999:15), in this global competitive structure, the challenges on innovation make innovation systems and policies vary both in national and regional scales. In this context, there are different responses and reactions of different countries and regions in this competitive environment.

Technological developments promoted by globalization give rise to a rapidly changing, developing and transforming into a competitive environment. In today's conditions, called the knowledge society, every structure from micro to macro scale (firm, region, nation etc.) strives at in this competitive environment in such a way that some try to create changes by pioneering, while others try to recognize, follow and adapt these changes. Therefore, countries and regions create policies, strategies and plans in order to establish and manage an effective innovation system (Özen and Baycan, 2015). Globalization increases the need for innovation policy, and also affects the design and implementation of innovation policies (Edquist, 2008a).

For this reason, innovation based studies become more and more important from day to day. In the last few decades, studies on knowledge and innovation have been increased and evolved with different dimensions and concepts particularly in the 'national' (Freeman, 1987 and 1995; Dosi et al., 1988; Lundvall, 1992a; Nelson, 1993; Niosi et al., 1993, Patel and Pavitt, 1994; Niosi and Bellon, 1994; Edquist 1997a; OECD 1997 and 1999; Niosi, 2002), 'regional' (Cooke, 1992, 2001 and 2003; Cooke and Morgan 1994; Cooke et al. 1997, 2000 and 2004; Evangelista et al., 2002, Doloreux, 2003; Doloreux and Parto, 2004 and 2005; Asheim and Gertler, 2005; Asheim and Coenen, 2006; Asheim, 2009; OECD, 2011 and 2013; Schrempf et al, 2013), 'sectoral' (Breschi and Malerba, 1997; Malerba, 2002) and 'technological' (Carlsson and Stankiewicz, 1991; Carlsson, 1995 and 1997; Carlsson and Jacobsson 1997; Carlsson et al, 2002) levels.

Due to the production, development, diffusion, application and use of technology and knowledge, innovation systems have become the focus of interest not only for

academics but also for decision makers at the national and regional level in terms of economic development and social welfare.

Innovation system is an interactive and integrated process composed of the flows, linkages, interactions, networks and relationships of various creators / actors (institutions in the public and private sectors such as firms, universities, government agencies, technical agencies and R&D public infrastructure etc). Since the innovation system is a tool for economic development, countries and regions create policies, strategies and plans for the establishment and management of an effective innovation system (Özen and Baycan, 2015).

Innovation Systems are an effective tool for examining the national and regional economy and innovative performance and policy-making. However, there is no one single ideal method to evaluate innovation and innovation processes in a certain region since innovation is a complex and dynamic phenomenon defined with reference to various activities and characteristics. Most studies use quite a number of indicators consisting of various aspects of innovation, and parametric and nonparametric methods. Besides the varieties of the methods used in the evaluation of regional innovation system, factors and variables that affect regional innovation systems also differ based upon the scope of studies conducted. It is possible to reproduce these variables according to the scope of a given study.

As aforementioned, this study focuses on NIS and mainly on RIS as a sub-system. In this section, methods and variables used to measure innovation performances are broadly mentioned in various articles. Although there are various methods, this thesis uses Markov Chains and Panel Data Analysis as the methodology for measuring the innovation performances of the regions. The reasons for choosing Markov Chains and Panel Data Analysis, the operation and the literature research of these methods and the econometric models will be explained in detail at the beginning of the empirical work in Section 5.

3. NATIONAL INNOVATION SYSTEMS IN TURKEY

As discussed in the previous chapter, all countries in the globalizing world, including Turkey, need to keep their innovation structures strong in line with the scientific and technological developments. Turkey's national innovation system is explained under the headings of legislative, administrative and policy framework which are important components of innovation. In order to understand the national innovation performance of a country, historical development process of the country from past to present should be examined. In this context, it is necessary to examine the formation and results of the policies, the bindingness of the laws and the authority and duties of the relevant institutions. The purpose of this section is to assess Turkey's policy, administrative and legal framework as a chronological process from past to present and to reveal how the current national innovation system has taken its present form. Within the scope of the thesis, the legal, administrative and policy frameworks have been examined within a period from the 1960s called planned economy to the present.

This section is structured by the supportive questions as follows:

- How is the Historical Development Process of the National Innovation Systems in Turkey?
- When did Turkey start to pay attention to innovation?
- What is the legal framework for innovation in the country? Which laws and regulations are effective in innovation?
- Who are the actors?
- Which national policies have been established? How did these policies evolve? What are the future plans related to innovation?

3.1 Historical Development Process of National Innovation Systems

3.1.1 Policy framework

For results of these supportive questions, first of all the innovation structure of Turkey must be examined. Since, as stated in 'Chapter 2: Innovation Systems', innovation systems are affected not only by the dynamics of the country but also by external events, the policy framework is also considered with the internal and external events (Table 3.1). The effects of these external and internal breaking points is detailed in terms of the relevant time periods.

Table 3.1 : External and internal breaking points/milestones shaping the historical development process of the NIS in Turkey in terms of the policy, administrative and legal frameworks (Author's own illustration).

1960-1980 Time Period	1980-2000 Time Period	From 2000 to the present
- The effects / reflections of the Second World War - Planned development economy: growth based on import substitution industrialisation - May 27, 1960 Military Intervention - 1961 Constitution - 1973 Oil Crisis (October 1973-March 1974) - 1974 Cyprus Peace Operation - 1979 Oil Crisis	- Return from import substitution industrialization policy to export-based industrialization policy with the decisions of 24 January 1980 - Outward-oriented economic growth strategies - Neo-liberalism and privatization policies - September 12, 1980 Military Intervention - 1982 Constitution - Gulf War (1990-1991)	- The Turkish 2000-2001 Banking/Financial Crisis - The 2001 Recession - Strengthening of Neo-liberalism with Government Change - US-Iraq War (2003-2011) - 2008 Global Economic Crisis - Syrian Civil War (2011-...)

The 1960-1980 time period is a that shaped by numerous external and internal breaking points/milestones, as the effects / reflections of the Second World War; Planned development economy: growth based on import substitution industrialisation; May 27, 1960 Military Intervention; 1961 Constitution; 1973 Oil Crisis (October 1973-March 1974); 1974 Cyprus Peace Operation and 1979 Oil Crisis, and where policies are considered within the framework of these breaking points/milestones (Table 3.1).

Return from import substitution industrialization policy to export-based industrialization policy with the decisions of 24 January 1980, outward-oriented economic growth strategies, neo-liberalism and privatization policies, September 12, 1980 Military Intervention, 1982 Constitution and Gulf War (1990-1991) can be listed as the external and internal breaking points/milestones of the 1980-2000 time period (Table 3.1).

The time period from 2000 to the present is shaped by numerous external and internal breaking points/milestones, as The Turkish 2000-2001 Banking/Financial Crisis, The 2001 Recession, Strengthening of Neo-liberalism with Government

Change, US-Iraq War (2003-2011), 2008 Global Economic Crisis and Syrian Civil War (2011-...) (Table 3.1).

The first significant developments in terms of science and technology policies coincide with the planned period started by The Scientific and Technological Research Council of Turkey (TÜBİTAK) and industry ministries, which were implemented with new constitutional regulations after 1960. In the first years of the planned period, science policies for training the necessary manpower and carrying out basic research activities came to the fore, in the following plans a more systemic approach was adopted to channel research activities to the technology development needs of the industry and more selective targets could be set. However, it is seen that this shift, which occurred at the design level until the 1990s, did not become operational in the implementation phase. Although there were some efforts with the planned period of the 1960s, technology policies and innovation-oriented policy designs have come to the fore since the 1990s, especially with the Turkish Science and Technology Policy: 1993-2003 document in 1993.

"In the 1990s, positive developments were experienced in the financing of R&D investments, and R&D donations and supports were given by TÜBİTAK and Technology Development Foundation of Turkey (TTGV). Since 1994, Turkey has been included in the Framework Programs under the coordination of TÜBİTAK in order to be included in the research networks in the EU and to benefit from various funds and supports. Technology Development Centers (TEKMER) have been put into operation since 1991 under the coordination of the Small and Medium Industry Development Organization (KOSGEB) in order to make technology transfer operative, to develop university-industry collaborations and to support SMEs' R&D activities (Acar, 2008). More concrete results have been achieved in terms of innovation, especially thanks to financial supports such as TÜBİTAK, TTGV and KOSGEB.

3.1.2 Legal framework

There are many various laws and regulations playing an effective role in the historical development process of the Innovation Systems in Turkey. Some of these laws are for the establishment of key/main institutions for the development of innovation, while others are for the development of the factors/components/dimensions affecting the innovation systems.

Some of the laws regarding the establishment and duties of the institutions are shown in Table 3.2 and some of the laws for the development of the factors/components/dimensions affecting the innovation systems in Table 3.3.

Table 3.2 : Laws regarding the establishment and duties of the institutions (Author's own illustration).

Name of the Law
❖ Law on the establishment of the State Planning Organization (SPO), Law Number: 91, Acceptance Date: September 30/1960 (REPEALED)
❖ Law on the establishment of the Turkish Standards Institution (TSE), Law Number: 132, Acceptance Date: November 18 /1960 known as Law on the Some Arrangements related to Turkish Statistical Institute with Article 96 of Decree Law 703 dated July 2/2018
❖ Law on the establishment of The Scientific and Technological Research Council of Turkey (TÜBİTAK) Law Number: 278, Acceptance Date: July 17/1963
❖ Regulation on the Meeting and Working Principles of Science Committee of The Scientific and Technological Research Council of Turkey
❖ Decree Law on the The Decree Law on the Establishment of the Supreme Council of Science and Technology (SCST), Decree Law Number: 77, Acceptance Date: August 16/1983
❖ Regulation on the Duties, Working Procedures and Principles of the Supreme Council of Science and Technology (SCST)
❖ Establishment and Business Regulation on The Scientific and Technological Research Council of Turkey Marmara Research Center, Official Gazette Date: February 11/2001 Official Gazette Number: 24315 (TÜBİTAK MAM)
❖ Framework Regulation on the Establishment and Business of the Institutes of connected directly to Head of The Scientific and Technological Research Council of Turkey, Official Gazette Date: October 17/2001, Official Gazette Number: 24556
❖ Regulation on (The Scientific and Technological Research Council of Turkey) Space Technologies Research Institute (TÜBİTAK UZAY)
❖ Regulation on (The Scientific and Technological Research Council of Turkey) Çukurova Advanced Agricultural Technologies Research and Development Institute (ÇİTTAGE)
❖ Regulation on (The Scientific and Technological Research Council of Turkey) Defense Industries Research And Development Institute (TÜBİTAK SAGE)
❖ Regulation on (The Scientific and Technological Research Council of Turkey) Research Institute For Fundamental Sciences (TÜBİTAK TBAE)
❖ Regulation on (The Scientific and Technological Research Council of Turkey) Turkish Academic Network and Information Center (TÜBİTAK ULAKBİM)
❖ Regulation on (The Scientific and Technological Research Council of Turkey) National Observatory (TÜBİTAK TUG)
❖ Regulation on (The Scientific and Technological Research Council of Turkey) National Metrology Institute (TÜBİTAK UME)
❖ Regulation on (The Scientific and Technological Research Council of Turkey) National Research Institute of Electronics and Cryptology (TÜBİTAK BİLGEM UEKAE)
❖ Regulation on (The Scientific and Technological Research Council of Turkey) Turkish Management Sciences Institute (TÜBİTAK TÜSSİDE)
❖ Regulation on Establishment, Duty, Authority and Working Principles of TÜBİTAK Support Program Presidences
❖ Decree on the Establishment of Turkish Academy of Sciences (TÜBA), Number of Decree: 497, Official Gazette Date: September 2/1993, Official Gazette Number: 21686
❖ Presidental Decree Law on Turkish Space Agency, Presidental Decree Law No: 23, Publishment Date and Number on Official Gazette: December 13/2018-30624.
❖ "Law on the Establishment of Small and Medium Scaled Industry Development and Support Directorate", Law Number: 3624, Acceptance Date: April 12/1990
❖ Law on the establishment and duties of Turkish Accrediation Agency, Law Number: 4457, Acceptance Date: October 27/ 1999

Table 3.3 : Laws for the development of the factors/components/dimensions affecting the innovation systems (Author's own illustration).

Name of the Law
❖ Regulation on (The Scientific and Technological Research Council of Turkey) Project Incentive and Support Principles
❖ Communiqué on Research & Development Aid (Communiqué No: 98/10), Official Gazette Date: November 4/1998, Official Gazette Number: 23513
❖ Regulation on (The Scientific and Technological Research Council of Turkey) Public Institutions Research Development Projects Support Program and Projects Conducted by TÜBİTAK Units
❖ Regulation on (The Scientific and Technological Research Council of Turkey) Technology and Innovation Support Programs, Official Gazette Date: January 16/2007, Official Gazette Number: 26405
❖ Regulation on (The Scientific and Technological Research Council of Turkey) Publication
❖ Regulation on Science and Society Projects and Activities Supported or Conducted by The Scientific and Technological Research Council of Turkey
❖ Establishment ad Business Regulation on (The Scientific and Technological Research Council of Turkey) Marmara Research Center Technology Free Zone
❖ Regulation on Programs Conducted by (The Scientific and Technological Research Council of Turkey) Head of Research Support Program
❖ Regulation on (The Scientific and Technological Research Council of Turkey) R&D Based Public Needs-Oriented Support Programs, Official Gazette Date: February 2/2016, Official Gazette Number: 29612
❖ Law on Some Arrangements Related to Patent and Trademark Attorney, Law Number: 5000, Acceptance Date: November 6/2003, Official Gazette Date: November 19/2003, Official Gazette Number: 25294
❖ Law on Supporting Research and Development Activities, Law Number: 5746, Acceptance Date: February 28/2008, Official Gazette Date: March 12/2008, Official Gazette Number: 26814 known as Law on Supporting Research, Development and Design Activities with the Article 25 of the Law 6676, dated February 16/2016
❖ Regulation on Implementation and Audit of Supporting Research, Development and Design Activities, Official Gazette Date: August 10/ 2016, Official Gazette Number: 29797
❖ General Communiqué on the Law 5746 on the Support of the Research, Development and Design Activities, Official Gazette Date: September 30/2016, Official Gazette Date: September 30/2016, Official Gazette Number: 29843
❖ Communiqué on Market Research and Market-Entry Support, Communiqué No: 2011/1
❖ Law on Technology Development Zones, Law Number: 4691, Acceptance Date: June 26/2001
❖ Foreign Direct Investment Law, Law Number: 4875, Acceptance Date: June 5/2003. Official Gazette Date: June 17/2003, Official Gazette Number: 25141
❖ Communiqué on the Implementation of the Decision on Governmental Assistance In Investments (Communiqué No: 2012/1), Official Gazette Date: June 20/2012, Official Gazette Number: 28329.
❖ Communiqué on the Implementation of the Decision on Giving Project-Based Government Assistance in Investments (Communiqué No: 2019/1), Official Gazette Date: December 28/2019, Official Gazette Number: 30992.
❖ Industrial Zones Regulation, Official Gazette Date: August 6/2019, Official Gazette Number: 30854.
❖ Intellectual and Artistic Works Law, Law Number: 5846, Acceptance Date: December 5/1951, Official Gazette Date: December 13/1951, Official Gazette Number: 7981
❖ Turkish Commercial Code, Law Number: 6102, Acceptance Date: January 13/2011, Official Gazette Date: February 14/2011, Official Gazette Number: 27846.
❖ "Regulation on the Definition, Qualifications and Classification of Small and Medium-sized Enterprises", published in the Official Gazette dated 04.11.2012 and numbered 790
❖ Communiqué on the Design Support (Communiqué No: 2008/2), Official Gazette Date: April 18/2008, Official Gazette Number: 26851

In this heading, the legal framework in terms of intellectual assets is also given as patents, trademarks, designs and geographical signs addressed by the TÜRKPATENT. The TÜRKPATENT states the legal framework related to the patents as in Table 3.4 (URL-4) and trademarks in Table 3.5 (URL-5).

Table 3.4 : Legal framework related to patents by the TÜRKPATENT (URL-4).

Legal Framework related to Patents	Abbreviation	Statement
National	Industrial Property Law (IPL)	❖ Industrial Property Law, Law Number: 6769, Acceptance Date: December 22/2016, Official Gazette Date: January 10/2017, Official Gazette Number: 29944
	Regulation on Implementation of IPL	❖ Regulation on the Implementation of Industrial Property Law, Official Gazette Date: April 24/2017, Official Gazette Number: 30047
	Repealed Patent Decree-Law	❖ Decree-Law on the Protection of Patent Rights, Decree-Law Number: 551 dated June 24/1995, Official Gazette Date: June 27/1995, Official Gazette Number: 22326 *: This Decree-Law was repealed by Article 191 of Law Number: 6769 dated December/22/2016. However, in accordance with the temporary articles of the Law Number 6769, since the implementation of certain provisions of the repealed Decree-Law will continue, the Decree Number: 551 has been preserved in the system for the convenience of the practitioner.
	Regulation on Employee Inventions	❖ Regulation on Employee Inventions Published in the Official Gazette dated September 29/2017, Inventions Performed in Higher Education Institutions and Inventions in Public Supported Projects, Official Gazette Date: September 29/2017, Official Gazette Number: 30195
International	PCT	Patent Cooperation Treaty
	PCT Regulations	Regulations under the PCT (as in force from July 1, 2019)
	EPC Regulation	❖ Regulation showing the Mode of Administration of European Patent Convention in Turkey related to the Issuance of European Patents
	IPC	❖ Strasbourg Agreement 1971 for The International Patent Classification (IPC)

Table 3.5 : The legal framework of trademarks stated in the TÜRKPATENT (URL-5).

Legal Framework related to Trademarks	Abbreviation	Statement
National	Industrial Property Law (IPL)	❖ Industrial Property Law, Law Number: 6769, Acceptance Date: December 22/2016, Official Gazette Date: January 10/2017, Official Gazette Number: 29944
	Regulation on Implementation of IPL	❖ Regulation on the Implementation of Industrial Property Law, Official Gazette Date: April 24/2017, Official Gazette Number: 30047
	Repealed Trademark Decree-Law	❖ Decree-Law on the Protection of Trademarks, Decree-Law Number: 556 dated June 24/1995, Official Gazette Date: June 27/1995, Official Gazette Number: 22326. *: This Decree-Law was repealed by Article 191 of Law Number: 6769 dated December/22/2016. However, in accordance with the temporary articles of the Law Number 6769, since the implementation of certain provisions of the repealed Decree-Law will continue, the Decree Number: 556 has been preserved in the system for the convenience of the practitioner.
	Classification Communiqué	Communiqué on the Classification of Goods and Services for Trademark Registration Applications
	Notoriety Principles	Principles and Implementation of Trademarks' Notoriety Levels
International	Madrid Regulation	Trademarks Act (Adopted in Geneva on October 27, 1994.) ❖ Regulation on the Madrid Agreement for the International Registration of Trademarks and the Application of the Protocol of This Agreement (Based on Law Number: 4458 on November 4/1999. Official Gazette Date: March 12/1999, Official Gazette Number: 23637.)
	Basic Information of Madrid	Basic Information on the Implementation of the Procedure for the International Registration of Trademarks within the Framework of the Madrid Protocol

The TÜRKPATENT states the legal framework of designs as in Table 3.6 (URL-6) and geographical signs and traditional products in Table 3.7 (URL-7).

Table 3.6 : The legal framework of designs stated in the TÜRKPATENT (URL-6).

Legal Framework related to Designs	Abbreviation	Statement
National	Industrial Property Law (IPL)	❖ Industrial Property Law, Law Number: 6769, Acceptance Date: December 22/2016, Official Gazette Date: January 10/2017, Official Gazette Number: 29944
	Regulation on Implementation of IPL	❖ Regulation on the Implementation of Industrial Property Law, Official Gazette Date: April 24/2017, Official Gazette Number: 30047
		❖ Decree-Law on the Protection of Industrial Designs, Decree-Law Number: 554 dated June 24/1995, Official Gazette Date: June 27/1995, Official Gazette Number: 22326.
	Repealed Industrial Design Decree-Law	*: This Decree-Law was repealed by Article 191 of Law Number: 6769 dated December/22/2016. However, in accordance with the temporary articles of the Law Number 6769, since the implementation of certain provisions of the repealed Decree-Law will continue, the Decree Number: 554 has been preserved in the system for the convenience of the practitioner.
International	Lahey Agreement	International Registration of Designs

Table 3.7 : The legal framework on geographical signs and traditional products stated in the TÜRKPATENT (URL-7).

Legal Framework related to Geographical Signs and Traditional Product	Abbreviation	Statement
National	Industrial Property Law (IPL)	❖ Industrial Property Law, Law Number: 6769, Acceptance Date: December 22/2016, Official Gazette Date: January 10/2017, Official Gazette Number: 29944
	Regulation on Implementation of IPL	❖ Regulation on the Implementation of Industrial Property Law, Official Gazette Date: April 24/2017, Official Gazette Number: 30047
	Emblem Regulation	❖ Geographical Sign and Traditional Product Name Emblem Regulation, Official Gazette Date: December 29/2017, Official Gazette Number: 30285
		❖ Decree-Law on the Protection of Geographical Signs, Decree-Law Number: 555 dated June 24/1995, Official Gazette Date: June 27/1995, Official Gazette Number: 22326.
	Repealed Geographical Signs Decree-Law	*: This Decree-Law was repealed by Article 191 of Law Number: 6769 dated December/22/2016. However, in accordance with the temporary articles of the Law Number 6769, since the implementation of certain provisions of the repealed Decree-Law will continue, the Decree Number: 555 has been preserved in the system for the convenience of the practitioner.

3.1.3 Administrative framework

Since the innovation system is an interactive and integrated process which is composed of the flows, linkages, interactions, networks and relationships of various creators/actors (institutions in the public and private sectors such as firms, universities, government agencies, technical agencies and R&D public infrastructure etc.) (Özen and Baycan, 2015), it will not be possible to talk about the effectiveness of innovation where there is no coordination, collaboration and cooperation among these institutions.

Also previously stated in the 'Innovation Systems' section, the innovation systems of nations' differ depending on their governance mechanism and their administrative and institutional structures and characteristics such as the distribution of authority

and responsibility within this structure, patterns of collaboration and cooperation of different units and actors within the institutional structure.

"Countries also differ markedly in the capacities and traditions of their science and technology policy institutions; the division of responsibilities between central and sub-central levels of government; the role and power of different ministries; the nature of government/industry relationships; and the scope for public/private partnerships (OECD, 1999)". The national innovation systems differ according to institutional profile (OECD, 1999) and not only by the institutional profile, but also the interactions among these institutions (Lundvall, 1992a). Similar to Lundvall (1992a), OECD (1999) states that the national innovation system differs depending on "the respective roles of the main actors in innovation processes (firms, public and private research organisations, and government and other public institutions), and the forms, quality, and intensity of their interactions".

In this context, important actors/institutions affecting the national innovation system of Turkey, such as ministries, universities, SMEs, technology development zones, strategic centers etc., are briefly explained with their founding purpose, duties and responsibilities in this heading.

The 1960-1980 time period is especially important for the establishment of basic institutions that affect science and technology policies. Institutions such as State Planning Organization (SPO), The Scientific and Technological Research Council of Turkey (TÜBİTAK), The Supreme Council of Science and Technology (SCST), High Planning Council (HPC), Technology Development Foundation of Turkey (TTGV), Small and Medium Enterprises Development Organization of Turkey (KOSGEB), Turkish Academy of Sciences (TÜBA), Council of Higher Education (CoHE), Turkish Accreditation Agency (TÜRKAK), the Turkish Patent and Trademark Office (TÜRKPATENT) (previously known as Turkish Patent Insitute-TPI) have played important roles in terms of examining the historical process of institutional structuring of the innovation systems in Turkey.

TÜBİTAK (2011: p. 6) classifies the basic institutions of the National Innovation Systems of Turkey according to the functional dynamics as 'promoting entrepreneurship', 'production of knowledge', 'diffusion of knowledge', 'directing R&D and innovation', 'market formation', and 'development and mobilization of

resources', also to the respective roles as 'fund providers', 'contributors to market formation', 'opportunity providers', 'executive branches carrying out R&D activities', and 'policymakers'. At the same time, Independent Industrialists' and Businessmen's Association (MÜSİAD) classified the actors of the national innovation system in a similar but more detailed way (MÜSİAD, 2012: pp. 80,81). Similar to TÜBİTAK (2011), also MÜSİAD identified the respective roles as 'policymakers', 'fund and support providers', and 'opportunity providers and facilitators'. Besides these roles, just like TÜBİTAK, also MÜSİAD has a statement about the market, too. But MÜSİAD adresses the roles seperately as 'market regulators' and 'market mobilizers'. Besides these, there are roles as 'vision and strategy determiners', 'implementing actors', 'human resourse providers', 'knowledge and technology transferors', 'commercializers, producers' and 'beneficiaries' (MÜSİAD, 2012: pp. 80,81).

Within the scope of this thesis, how the institutional structure has changed in terms of innovation systems and the current new institutional framework will be explained with the duties of the relevant institutions.

Changes in institutional structure in Turkey is also reflected in the innovation system. SPO, one of the most important actors of the innovation system, was abolished in 2011 and the Ministry of Development was established instead with the (Repealed) Decree-Law Number 541[9]. Turkey has entered into a new institutional structuring process after the transition to a presidential system by July 2018[10]. Instead of SPO, which was leading innovation with the development plans since its establishment year 1960, the Presidency of Strategy and Budget now prepares the development plans after the Presidential System. The High Planning Council (HPC), where economic, social and cultural targets and the issues that will constitute the basis for the determination of the policies were discussed, is another institution removed by the Presidential system with the Decree-Law Number: 703. The current Presidential Organization of the Republic of Turkey with the Presidential Decree on the

[9] Declaration on Some Committees Relating to Development (1) Date of Decree-Law: 3 June 2011, No:641 Date of Authorization Law: 6 April 2011, No:6223 Date of Publication in Official Gazette: 8 June 2011, No:27958 R..

[10] Declaration on Change in Some Law and Legal Decisions to Adapt to the Amendments Made to the Constitution: Date of Decree-Law: 2 July 2018 No: 703 Date of Authorization Law: 18 October 1982 No: 2709 10 May 2018 No: 7142 Date of Publication in the Official Gazette: 9 July 2018 No: 30473 (3rd Repetition) Code of Publication: Order: 5 Volumes :60

Presidential Organization (Number of Presidential Decree:1)[11] is illustrated in Figure 3.1.

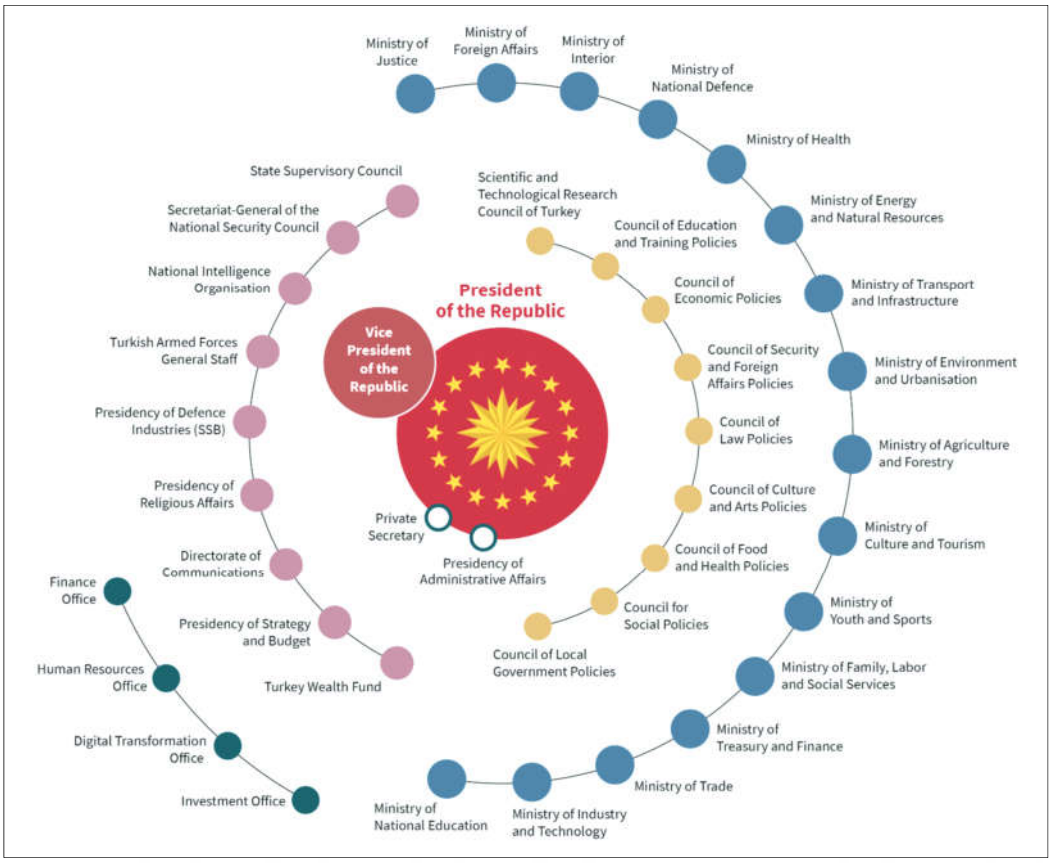


Figure 3.1 : Organization Chart of the Presidential System of Turkish Republic (URL-8).

According to Presidential Decree Number:1, the policy boards within the Presidency are as follows:

1- Science, Technology and Innovation Policies Board
2- Education and Training Policies Board
3- Economic Policies Board
4- Security and Foreign Policies Board
5- Legal Policies Board
6- Culture and Art Policies Board
7- Health and Food Policies Board
8- Social Policies Board
9- Local Government Policies Board

[11] Presidential Decree on the Presidential Organization, Presidential Decree Number: 1, Date of Published in the Official Gazette – Number: 10 July 2018 – 30474.

When the general duties and authorities of these boards are examined, it can be interpreted that the four boards as Science, Technology and Innovation Policies Board, Education and Training Policies Board, Economic Policies Board and Security and Foreign Policies Board are related to the innovation system.

According to the Article 23 of the related Presidential Decree, the general duties and authorities of the Science, Technology and Innovation Policies Board highlight about the concepts as competition, policy design, research and research infrastructure, promoting R&D, human resources, entrepreneurship, reducing import dependency, free zones, and finally effective, widespread easy access to the internet. According to the Article 24 of the related Presidential Decree, the general duties and authorities of the Education and Training Policies Board highlight about the concepts as high-skilled education, human resources, human capital, qualified labor force, tertiary education, life-long learning. The duties of Economic Policies Board highlight about the concepts as strong economy and development, monitoring the global and national trends, public-private investments, exports, financial support, risk mitigation. The duties of Security and Foreign Policies Board highlight about the concepts as international relations, global developments, migration policies, cyber security. The duties of the Health and Food Policies Board highlight about the conservation and research on the diversification of the local gene resources, policies on localization of medical technologies and pharmaceutical industry, and following international developments in health services and technologies.

The following institutions and organizations, stated in Article 37 of the related Presidential-Decree, are affiliated to the Presidency and are subject to the provisions in their laws and/or Presidential decrees:

a) Presidency of State Archives

b) State Supervisory Board

c) Directorate of Religious Affairs

d) Presidency of Communications

e) General Secretariat of National Security Council

f) Presidency of National Intelligence

g) Directorate of National Palaces

h) Presidency of Defence Industries

i) Presidency of Strategy and Budget

j) Turkey Wealth Fund

The duties of the Presidency of State Archives are defined in the Article 5 of the Presidential Decree: 11[12] and the statements highlight that The Presidency of State Archives is important in the innovation systems in terms of detection, registration, certification and protection of the documents, creation of the data center, research on information and documents, publishing and application of innovative techniques, document management and archiving, cooperation with local, foreign organizations and universities.

The Presidential Decree: 14[13] states the duties of the Presidency of Communications highlight about knowledge flows to enlighten the public, external promotional activities, information activities, financial support, publication, creation of Media Database.

With The Presidential Decree: 7[14] Presidency of Defence Industries focuses on the keywords as encouraging new enterprises, determination of financing models, manifacturing in private and public organizations, supporting public, private and mixed new investments, research and production, financial and economic incentives, exports and offset trade.

As seen from The Presidential Decree: 13[15], regarding the duties of the Presidency of Strategy and Budget, prominent topics can be interpreted as national, sectoral and strategic plans, macroeconomic estimations, research on national and international macroeconomic strategies, expenditure and budget policies, performance programs, financing models, public-private cooperation projects.

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[12] Presidential Decree on the Presidency of State Archives, Number of the Presidential Decree: 11, Official Gazette Date: July 16/2018, Official Gazette Number: 30480.
[13] Presidential Decree on the Presidency of Communications, Number of the Presidential Decree: 14, Official Gazette Date: July 24/2018, Official Gazette Number: 30488.
[14] Presidential Decree on the Presidency of Defence Industries, Number of the Presidential Decree: 7, Official Gazette Date: July 15/2018, Official Gazette Number: 30479.
[15] Presidential Decree on the Presidency of Strategy and Budget, Number of the Presidential Decree: 13, Official Gazette Date: July 24/2018, Official Gazette Number: 30488.

According to the Decree of the Council of Ministers (2016/9429)[16], Turkey Wealth Fund deals with the concepts of project-based fundraising, external project loans, domestic and foreign partnerships, 'participating in national investments and investments by other states and/or foreign companies in international areas'.

In addition to these presidencies, the Ministries under the Sixth Part of the Presidential Decree:1 are defined as follows:

- Ministry of Justice
- Ministry of Family, Labor and Social Services
- Ministry of Environment and Urbanization
- Ministry of Foreign Affairs
- Ministry of Energy and Natural Resources
- Ministry of Youth and Sport
- Ministry of Treasury and Finance
- Ministry of Interior
- Ministry of Culture and Tourism
- Ministry of National Education
- Ministry of National Defence
- Ministry of Health
- Ministry of Industry and Technology
- Ministry of Agriculture and Forestry
- Ministry of Trade
- Ministry of Transport and Infrastructure

Ministry of Family, Labor and Social Services focuses on 'measures to protect employees and support work', 'amenities, high quality of life and social welfare',

[16] Council of Ministers Decision Number: 2016/9429 Decision Date: 17 October 2016, Decision on The Implementation of The Decision on The Procedure and Principles Regarding The Structure and Function of Turkey Wealth Fund, Official Gazette Date: 9 November 2016, Official Gazette Number: 298.

‘engaging in activities related to the international workforce’, life-long learning, social insurance.

Ministry of Environment and Urbanization deals with such highlights as ‘research on environmental issues, environmental pollution maps and climate change’ and works regarding the establishment, use and development of the National Geographical Information System.

Ministry of Foreign Affairs works on determining the foreign policy, following the developments and changing conditions in the foreign world, developing cooperation with international organizations, directing, monitoring and coordinating the studies to be done for Turkey's preparation for the EU membership and coordinating the post-membership studies.

Ministry of Energy and Natural Resources is concerned with the evaluation of renewable energy sources and the determination of policies and strategies for increasing energy efficiency.

Ministry of Treasury and Finance considers on ‘public financing, public-funded organizations and enterprises and state affiliates, bilateral and multilateral foreign economic relations’.

Ministry of National Education works on tertiary education and life-long learning, openness to innovation, ease of access and equality in education.

Ministry of Health gains important due to the high-tech products. The ministry deals with carrying out studies for the safe and quality delivery of drugs, special products, substances subject to national and international control, active and auxiliary substances used in drug production, cosmetics and medical devices to the market, delivering them to the public and determining their prices.

Ministry of Industry and Technology is one of the key actor in the innovation systems. The ministry mainly focuses on increasing the productivity of industrial enterprises; determining suitable areas for the site selection of the Organized Industrial Zones (OIZs), Technology Development Zones (TDZs), free zones and industrial sites and building the infrastructures of these areas; developing policies for clustering initiatives in order to increase the competitiveness of enterprises; carrying out the market surveillance and control, making risk analyzes, creating a product

safety information system, and carrying out the necessary studies to increase the competitiveness of the Innovation and Technology (IT) sector.

Ministry of Agriculture and Forestry considers carrying out research on the development of plant and animal production and aquaculture production, the development of the agricultural sector and the formation of agricultural policies; and ensuring the efficient use of food production, safety and reliability, rural development, protection of soil, water resources and biodiversity.

Ministry of Trade deals with the determining the main targets and policies regarding domestic and foreign trade services; preparation of customs policy; exports; and carrying out the cooperation activities in the field of technology and entrepreneurship-oriented projects, scientific studies and education with public institutions and organizations, universities, private sector and non-governmental organizations for the structuring of foreign trade.

In addition to the ministries, as stated in Article 525 of the Presidential Decree No. 1, there are also offices. In this article, it is stated that “Digital Transformation Office, Finance Office, Human Resources Office and Investment Office have been established under the Presidency, with a special budget, public legal personality, administrative and financial autonomy”. As can be seen, these officies are related to the digitalisation, finance, human capital and investments.

3.2 Evaluation of the Chapter

For the evaluation of the national innovation systems of Turkey, the historical development process is considered within the three time periods as 1960-1980 Time Period, 1980-2000 Time Period, From 2000 to the present.

Especially, the establishment of SPO in 1960 and the establishment of TÜBİTAK in 1963 are milestones in terms of forming the basis of an important institutional structuring in science, technology and innovation (Figure 3.2).

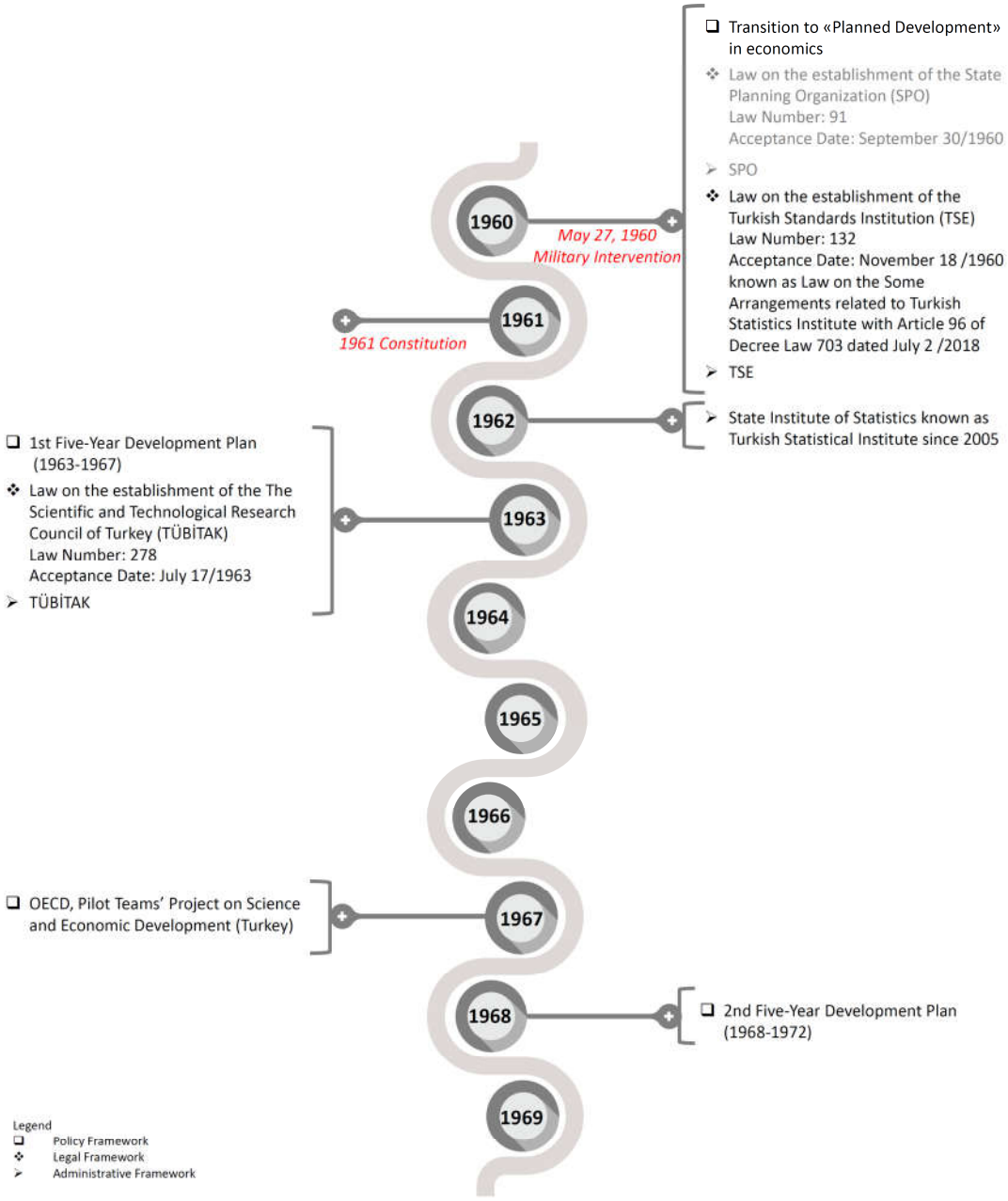


Figure 3.2 : Historical development process of the national innovation systems: 1960-1980 time period (Author's own illustration).

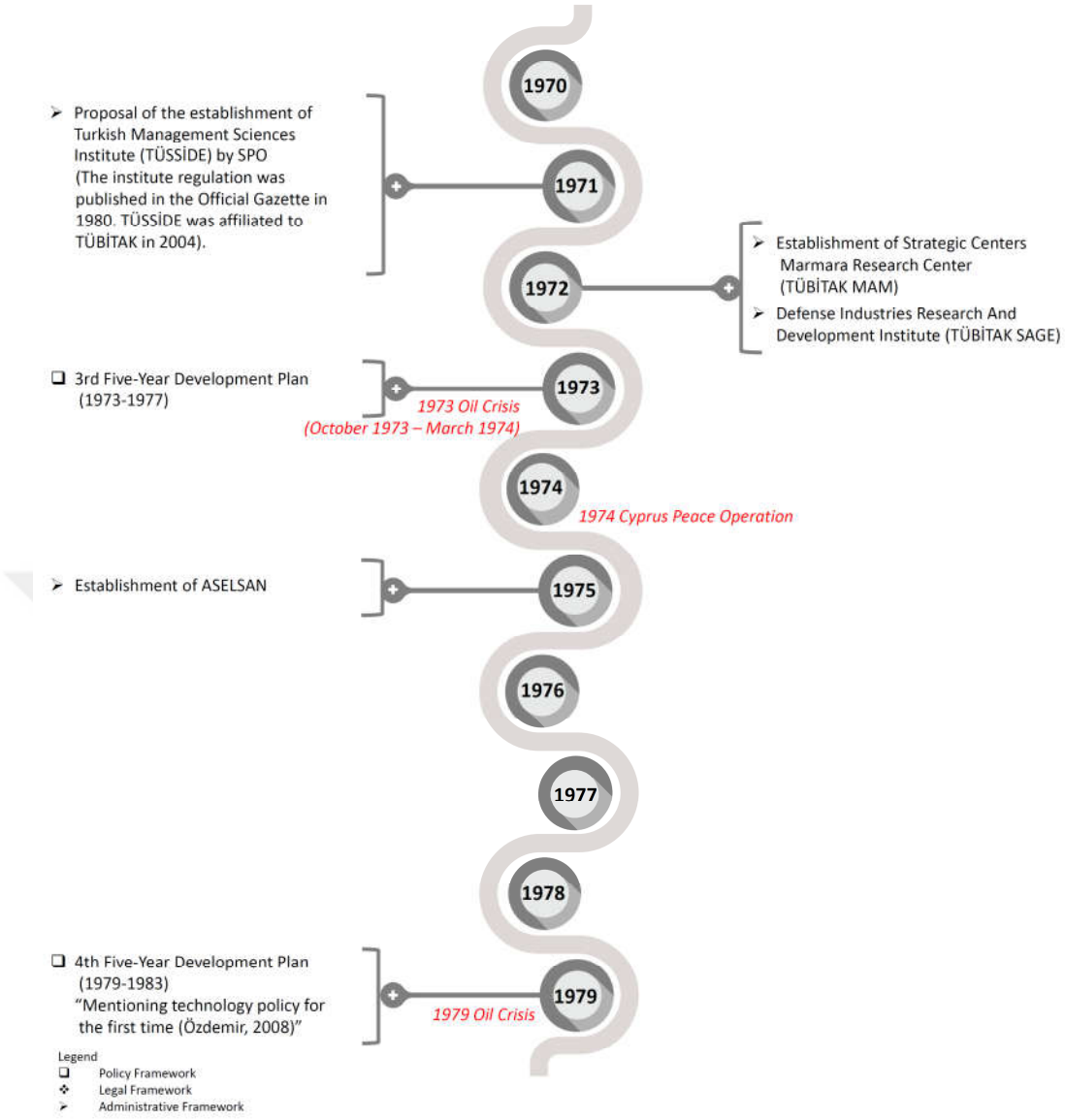


Figure 3.2 (continued): Historical development process of the national innovation systems: 1960-1980 time period (Author's own illustration).

Especially, with the establishment of institutes affiliated to TÜBİTAK in the 1980s, the formation of SMEs and technology centers in the 1990s, and the EU Cohesion Policy after 1999, both national and regional reflections come to the fore in historical development (Figure 3.3 and Figure 3.4).

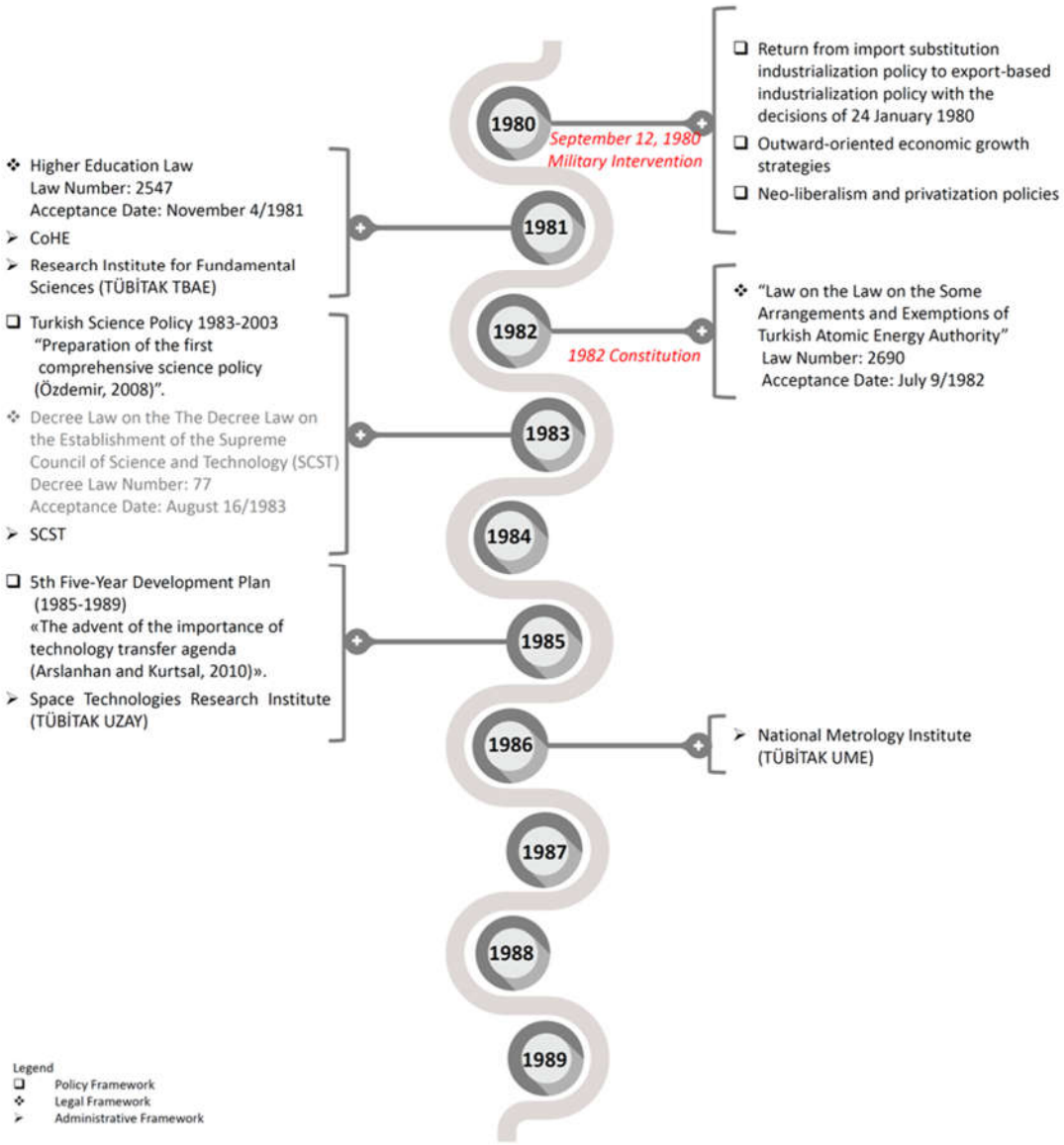


Figure 3.3 : Historical development process of the national innovation systems: 1980-2000 time period (Author's own illustration).

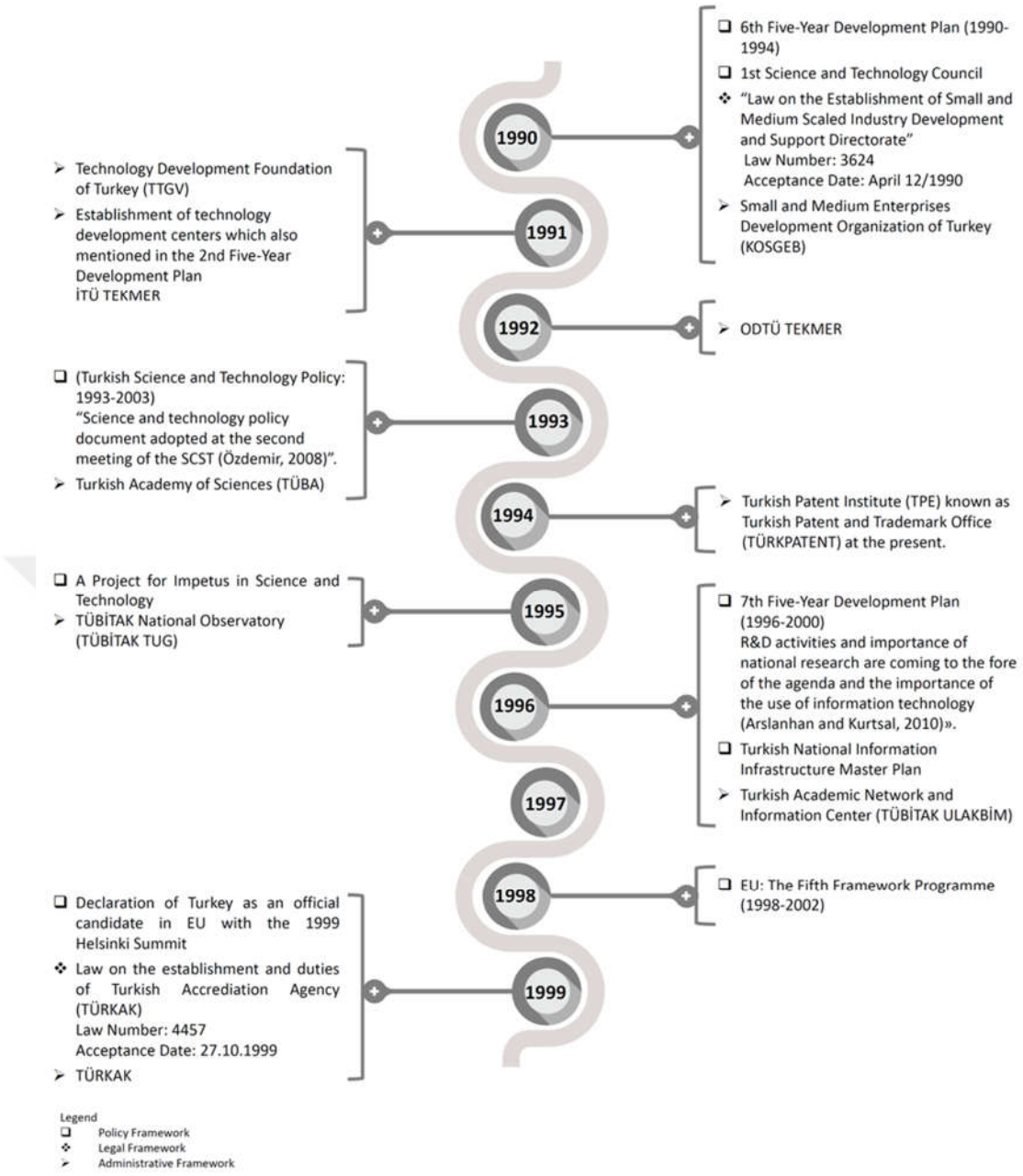


Figure 3.3 (continued): Historical development process of the national innovation systems: 1980-2000 time period (Author's own illustration).

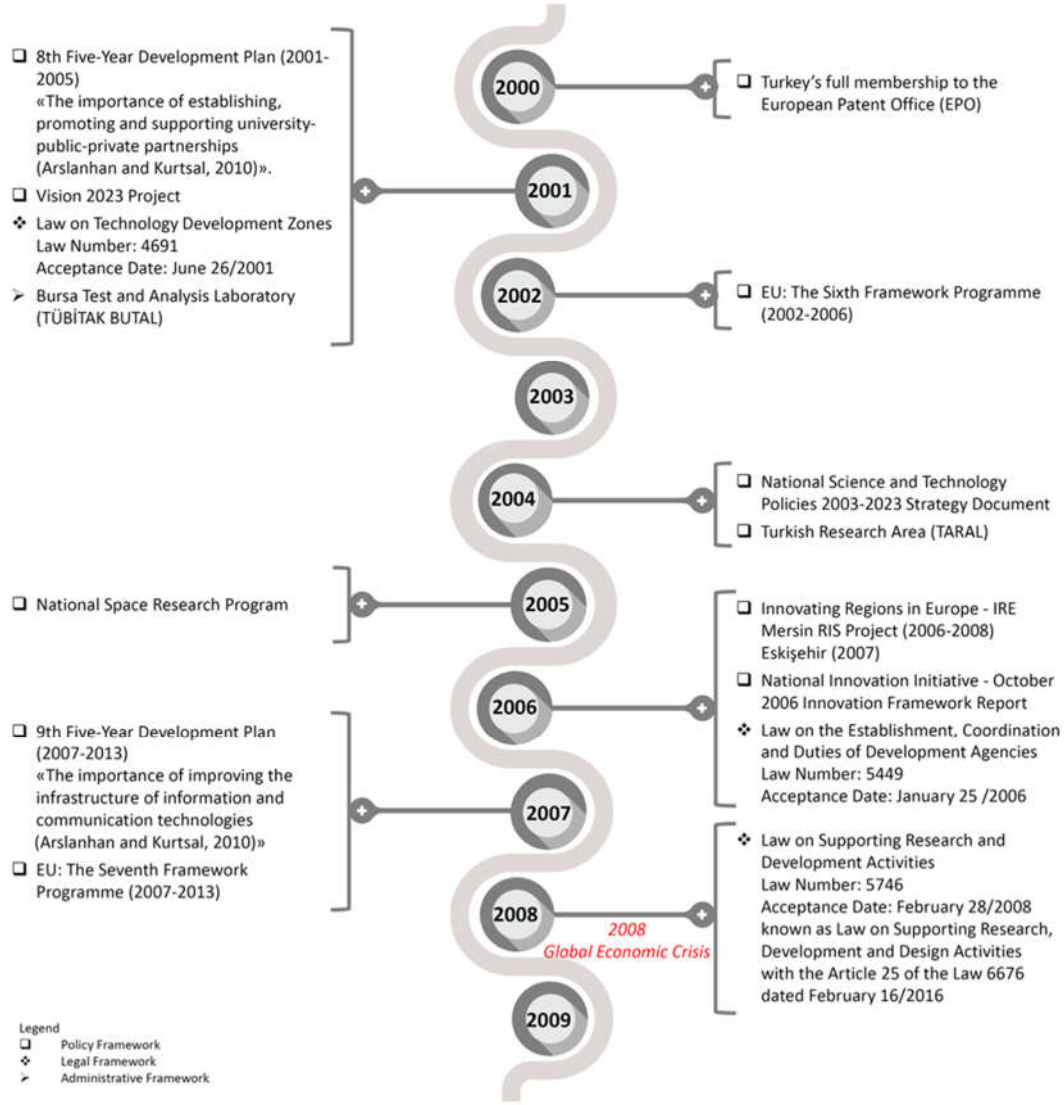


Figure 3.4 : Historical development process of the national innovation systems: from 2000 to the present (Author's own illustration).

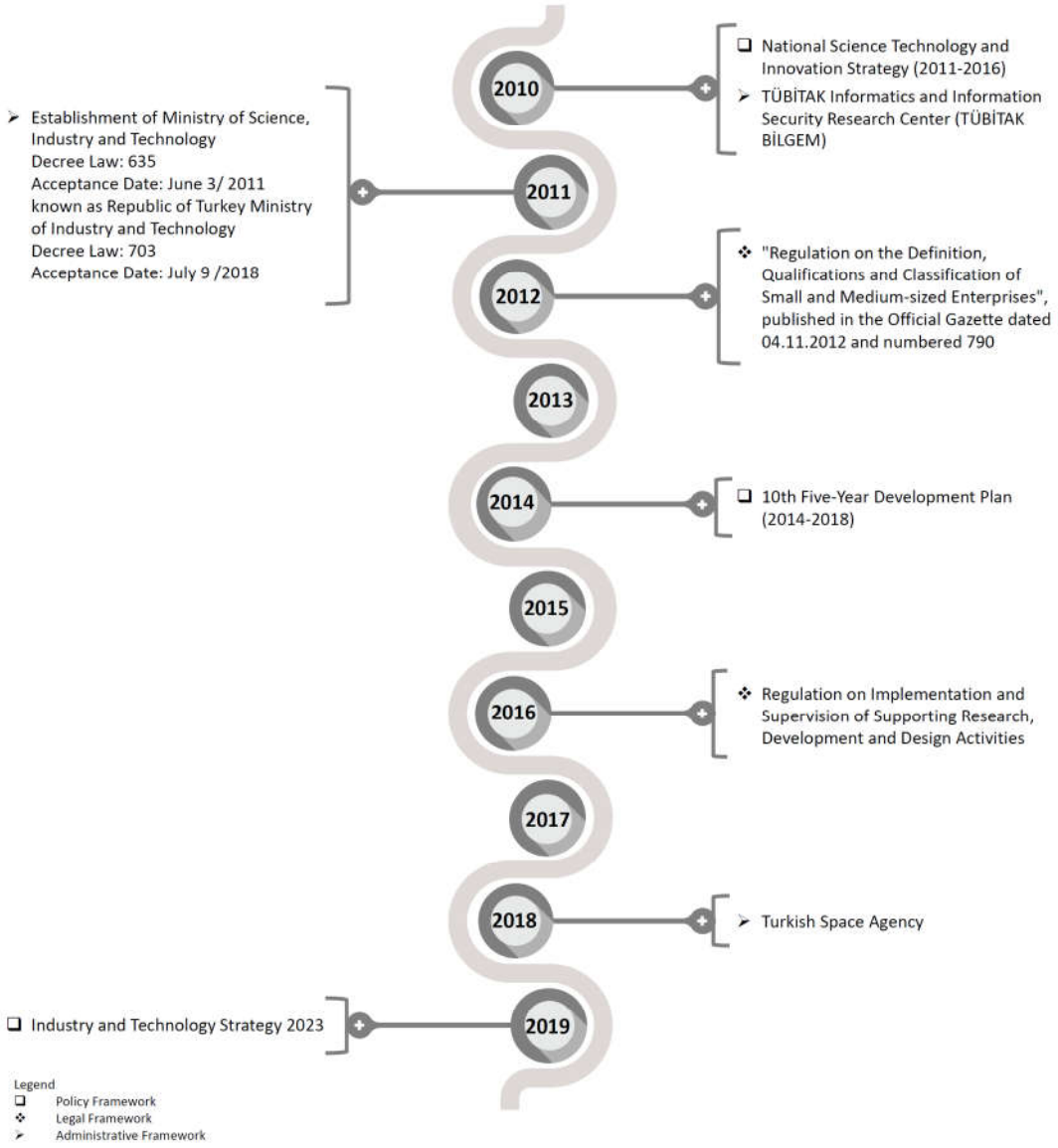


Figure 3.4 (continued): Historical development process of the national innovation systems: from 2000 to the present (Author's own illustration).

4. REGIONAL INNOVATION SYSTEMS IN TURKEY

As mentioned in the Chapter 2 ‘Innovation Systems’, the regions are gaining importance in this globalizing world that requires knowledge and innovation.

This section, as in the previous one, is based on with a focus to the regional innovation systems in Turkey within the scope of policy, legal and administrative frameworks.

For to determine the historical development process of the regional innovation systems in Turkey, this section is structured by the supportive questions as follows:

- How is the Historical Development Process of the Regional Innovation Systems in Turkey?
- When did Turkey start to pay attention to regional innovation?
- Which laws and regulations are effective in regional innovation?
- Who are the actors? Are Regional Development Agencies sufficient in the Regional Innovation System?
- Which regional innovation policies and strategies have been established? Is there any Regional Innovation Policy in which regions of Turkey experiences have been carried out regarding the regional innovation systems?
- What are the regional innovation strategies of the Regional Development Agencies?
- Which issues are considered to be related to the investments in regions?
- What are the future plans related to regional innovation systems?

4.1 Historical Development Process of the Regional Innovation Systems

The increasing importance of local activities by the 1990s made regional development policies be at the top of agenda with a totally new perspective. During this period, states having a national perspective on development were replaced by ‘regional development agencies’ within the framework of newly emerging understanding of ‘governance’. Regional development policies in Turkey were

transformed from centralization to decentralization in terms of implementation, method and content with the process of membership to the EU (Tiftikçigil, 2015).

Regional development policies in Turkey have been restructured and transformed with the declaration of Turkey as an official candidate in the EU at the 1999 Helsinki Summit, and have become a hot topic with a totally new perspective to provide a cohesion to the EU policies (Özen and Baycan, 2022a).

4.1.1 Policy framework

In line with the EU Cohesion Policies, in the 8th Five Year Development Plan (2001-2005), it is mentioned that EU will be one of the most important reference point in Turkey's globalization movement. In line with the decisions of the Helsinki Summit, where Turkey's candidacy for full membership of the European Union approved, necessary steps will be taken to achieve the membership goal (p: 26). One of the objective of this plan is to speed up the required studies for the adaptation of regional development policies of Turkey to the EU regional development policies and to intensify the studies on the cooperation initiated on regional policies (p: 73).

In line with this cohesion process, as a beginning step, Turkey accepted the NUTS classification and defined its new regions as compatible to NUTS in 2002 (Decree of the Council of Ministers 2002/4720) and decided to establish development agencies (DAs) with a result of the Law (no. 5449) on the Establishment, Coordination and Duties of Development Agencies (2006). As a result, today Turkey has 26 RDAs, respectively 2 RDAs (İzmir and Çukurova) in 2007 (Decree of the Council of Ministers 2006/10550), 8 RDAs (İstanbul, Konya, Samsun, Erzurum, Van, Gaziantep, Diyarbakır and Mardin) in 2008 (Decree of the Council of Ministers 2008/14306) and finally 16 remaining RDAs in 2009 (Decree of the Council of Ministers 2009/15236). Therefore, the development of RDAs with a result of the Law (no. 5449) on the Establishment, Coordination and Duties of Development Agencies (2006) can be mentioned as one of the milestones in the historical background of the regional structure of Turkey (Özen and Baycan, 2022a).

Besides having a regional structure at NUTS-2 level, within the scope of the Innovating Regions of Europe (IRE) Network, in 2005, just like Bulgaria, Czech Republic, Estonia, Hungary, Israel, Lithuania, Malta, Norway, Poland, Romania,

Slovakia, Switzerland, Turkey has also been involved 33 New-RIS projects in certain regions such as Mersin and Eskişehir (Metin, 2010) (Özen and Baycan, 2022a).

Also, in the 2011 Progress Report (European Commission, 2011b: p. 83), preparation of regional plans in 24 of the 26 NUTS-2 regions under the coordination of DAs are shown as a progress within the institutional framework. Regional plans determine the relationships among plans, policies and strategies produced at the national level and the activities to be carried out at the local level. Besides producing the regional plans, with the production of regional innovation strategy documents in two RDAs (İzmir Development Agency and Middle Black Sea Development Agency denoted as İZKA and OKA, respectively) in 2012, the agencies have shown that they are playing a concrete role in innovation with their effective work. In addition to these two agencies, some other RDAs have also created regional innovation strategy documents in the following years. Therefore, the pioneering of these regional innovation strategy documents in 2012 is a milestone in regional innovation systems (Özen and Baycan, 2022a).

Another important factor is that the DAs, which were previously affiliated to the Ministry of Development, are now affiliated to the Ministry of Industry and Technology according to Presidential Decree No. 1 in 2016.

4.1.2 Legal framework

Some of the laws and regulations mentioned in the Chapter 3 are also associated with the regional innovation. Some of these laws and regulations are as follows:

- Law on the Establishment of Small and Medium Scaled Industry Development and Support Directorate", Law Number: 3624, Acceptance Date: April 12/1990.
- Law on Supporting Research and Development Activities, Law Number: 5746, Acceptance Date: February 28/2008, Official Gazette Date: March 12/2008, Official Gazette Number: 26814 known as Law on Supporting Research, Development and Design Activities with the Article 25 of the Law 6676, dated February 16/2016.
- Regulation on Implementation and Audit of Supporting Research, Development and Design Activities, Official Gazette Date: August 10/ 2016, Official Gazette Number: 29797.

- General Communiqué on the Law 5746 on the Support of the Research, Development and Design Activities, Official Gazette Date: September 30/2016, Official Gazette Date: September 30/2016, Official Gazette Number: 29843.
- Law on Technology Development Zones, Law Number: 4691, Acceptance Date: June 26/2001.
- Industrial Zones Regulation, Official Gazette Date: August 6/2019, Official Gazette Number: 30854.
- Communiqué on the Design Support (Communiqué No: 2008/2), Official Gazette Date: April 18/2008, Official Gazette Number: 26851.

Besides these, there is also an important law for the establishment of the development agencies which take an important role in the regional innovation.

- Law on the Establishment, Coordination and Duties of Development Agencies, Law Number: 5449, Acceptance Date: January 25 /2006.

4.1.3 Administrative framework

Although actors such as universities and institutes of technology, TDZs, R&D centers, design centers, science centers, TTOs, RDAs, etc. are administratively dependent on centralized administration, they are explained within the framework of the administrative framework under this heading as effective regional actors thanks to the regional dynamics and interactions.

- **Universities and Institutes of Technology:**

As mentioned in the literature, universities are one of the important institutions due to the knowledge.

According to the historical process of the universities in Turkey, the oldest universities were established in İstanbul (İstanbul University in 1453 and İstanbul Technical University in 1773). In addition to these universities, Ankara University, Ege University, Karadeniz Technical University, Atatürk University, Middle East Technical University, Hacettepe and Çukurova Universities were founded until 1970. Although many state universities established until the 1980s, Turkey's first foundation university has emerged with the establishment of İhsan Doğramacı Bilkent University in 1984.

More than 40 universities, including 18 foundation universities which were allowed by the enforcement of the order of the Constitutional Court (on 30 May 1990 and numbered E.1990/2, K.1990/19), were founded in 1990s. While one of these foundation universities was set up in Mersin and 4 in Ankara, the remaining 13 were established in İstanbul. It is seen in this period that the majority of the state universities established in the provinces where there was not any university before.

There were 75 universities and institutes of technology before 2006. With the law no 5467 in 1st March 2006, some amendments were made to The Law on Organization of Higher Education Institutions, Higher Education Law, Public Financial Management and Control Law, Wireless Law 78 and 190 numbered Decree Laws (2006).

With this law, "a university in each province" policy adopted by the government came into effect and immediately after that many state and mostly foundation universities have been rapidly established since 2006.

41 provinces, which did not have a university before 2006, have gained universities in the following years with this policy. 15 of these 41 provinces gained their first universities in 2006 (Adıyaman, Amasya, Burdur, Çorum, Erzincan, Giresun, Kastamonu, Kırşehir, Ordu, Rize, Tekirdağ, Uşak, Yozgat, Aksaray and Düzce); 17 in 2007 (Ağrı, Artvin, Bilecik, Bingöl, Bitlis, Çankırı, Kırklareli, Mardin, Muş, Nevşehir, Siirt, Sinop, Karaman, Batman, Karabük, Kilis, and Osmaniye) and finally 9 in 2008 (Gümüşhane, Hakkari, Tunceli, Bayburt, Şırnak, Bartın, Ardahan, Iğdır and Yalova).

As of June 2019 the units as Universities and Institutes of Technology in Turkey increased to 207 in total. When the distribution of the units as Universities and Institutes of Technology by regions at NUTS 3 level is examined, İstanbul takes the lead with 61 universities. Ankara and İzmir follows İstanbul respectively with 21 and 10 universities (Figure 4.1).

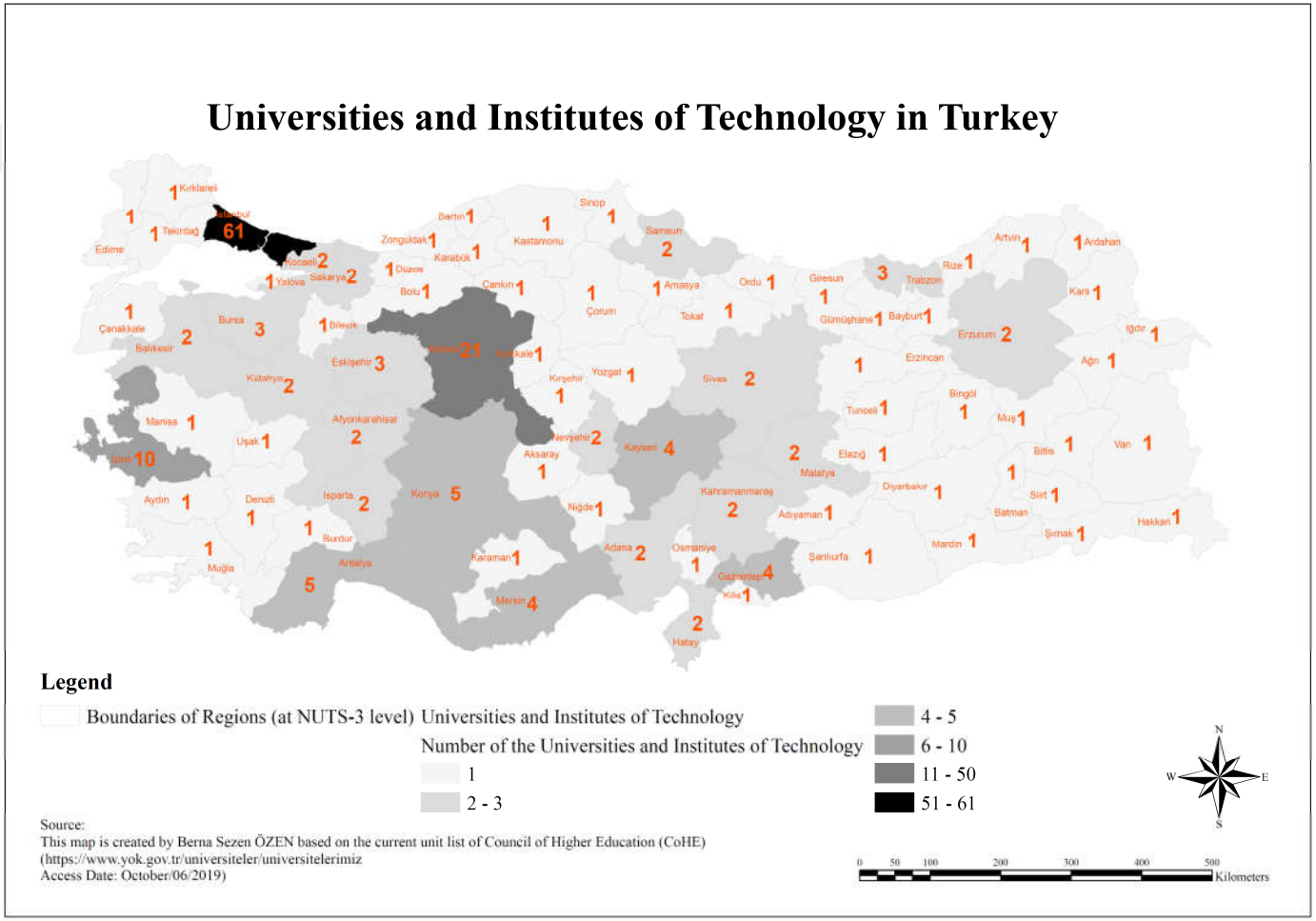


Figure 4.1 : Spatial distribution of universities and institutes of technology in Turkey (Author's own illustration based on the current unit list of the Council of Higher Education (CoHE), URL-9).

- **Technology Development Zones:**

Technology Development Zones were established in 2001 by the Law on Technology Development Zones (2001), Law Number: 4691.

The purpose of the law is defined in the Article 1 of the related law as "with the cooperation between universities, research institutions and organizations and production sectors, to produce technological knowledge in order to bring the industry of the country to an internationally competitive and export oriented structure, to develop innovation in product and production methods, to increase product quality or standard, to increase productivity, to reduce production costs, to commercialize technological knowledge, to support technology-intensive production and entrepreneurship, to ensure the adaptation of small and medium-sized enterprises to new and advanced technologies, to create investment opportunities in technology-intensive areas by taking into consideration the decisions of the High Council of Science and Technology, to create job opportunities for researchers and skilled people, to assist in technology transfer and to provide the technological infrastructure to accelerate the entry of foreign capital into the country that will provide high/advanced technology" (Law on Technology Development Zones, 2001).

According to the definitions in the Article 3 of the same law, 'Technology Development Zone' refers to the site where the academic, economic and social structure integrate or the technopark with these features within or near the same university, high-tech institute or R&D center or institute area where companies, using high/high technology or oriented towards new technologies, produce/develop technology or software by making use of the opportunities of a specific university or high technology institute or R&D center or institute, and show an activity to transform a technological invention into a commercial product, method or service, and thus contribute to the development of the region. (Law on Technology Development Zones, 2001).

The TDZs were first started operating in Ankara (METU Technopolis Technology Development Zone) and Kocaeli (TÜBİTAK Marmara Research Center Technopark) provinces in 2001.

As of November 2019, there are a total of 85 TDZs in Turkey (URL-10). The spatial distribution of these zones are 11 in İstanbul, 10 in Ankara, 5 in Kocaeli, 4 in İzmir,

2 in Konya, Gaziantep, Antalya, Mersin and Hatay, 1 each in Kayseri, Trabzon, Adana, Erzurum, Isparta, Eskişehir, Bursa, Denizli, Edirne, Elazığ, Sivas, Diyarbakır, Tokat, Sakarya, Bolu, Kütahya, Samsun, Malatya, Urfa, Düzce, Çanakkale, Kahramanmaraş, Tekirdağ, Van, Çorum, Manisa, Niğde, Burdur, Yozgat, Kırıkkale, Balıkesir, Karaman, Muğla, Afyonkarahisar, Aydın, Batman, Osmaniye, Zonguldak, Karabük, Nevşehir, Çankırı, Kastamonu, Kırklareli, Giresun and Rize (Figure 4.2). 66 of these 85 TDZs continue their activities and 19 of them have not started to operate due to the ongoing infrastructure works and still in progress (URL-10).

Unfortunately, it is observed that some of the technology development zones whose infrastructure is still in progress have a long history, but are still not operational. These are the Ankara Chamber of Industry (ASO) Technopark Technology Development Zone in Ankara, which was established in 2008, the Finance Technopark Technology Development Zone in Istanbul, which was established in 2014, the Karaman Technology Development Zone in Karaman and Muğla Technology Development Zone in Muğla which were established in 2015.

According to the November 2019 statistics (URL-10), there are a total of 5472 firms in Turkey. 308 of these firms are foreign/foreign partners, and 1154 are academician partner firms. 56599 staff work in the TDZs (Table 4.1).

If it is evaluated in terms of intellectual assets, the copyrighted software (received) is 280 in total (Table 4.2).

In terms of sectoral distribution, the majority of the firms in the TDZs in Turkey (41%) are on the computer programming activities (Table 4.3).

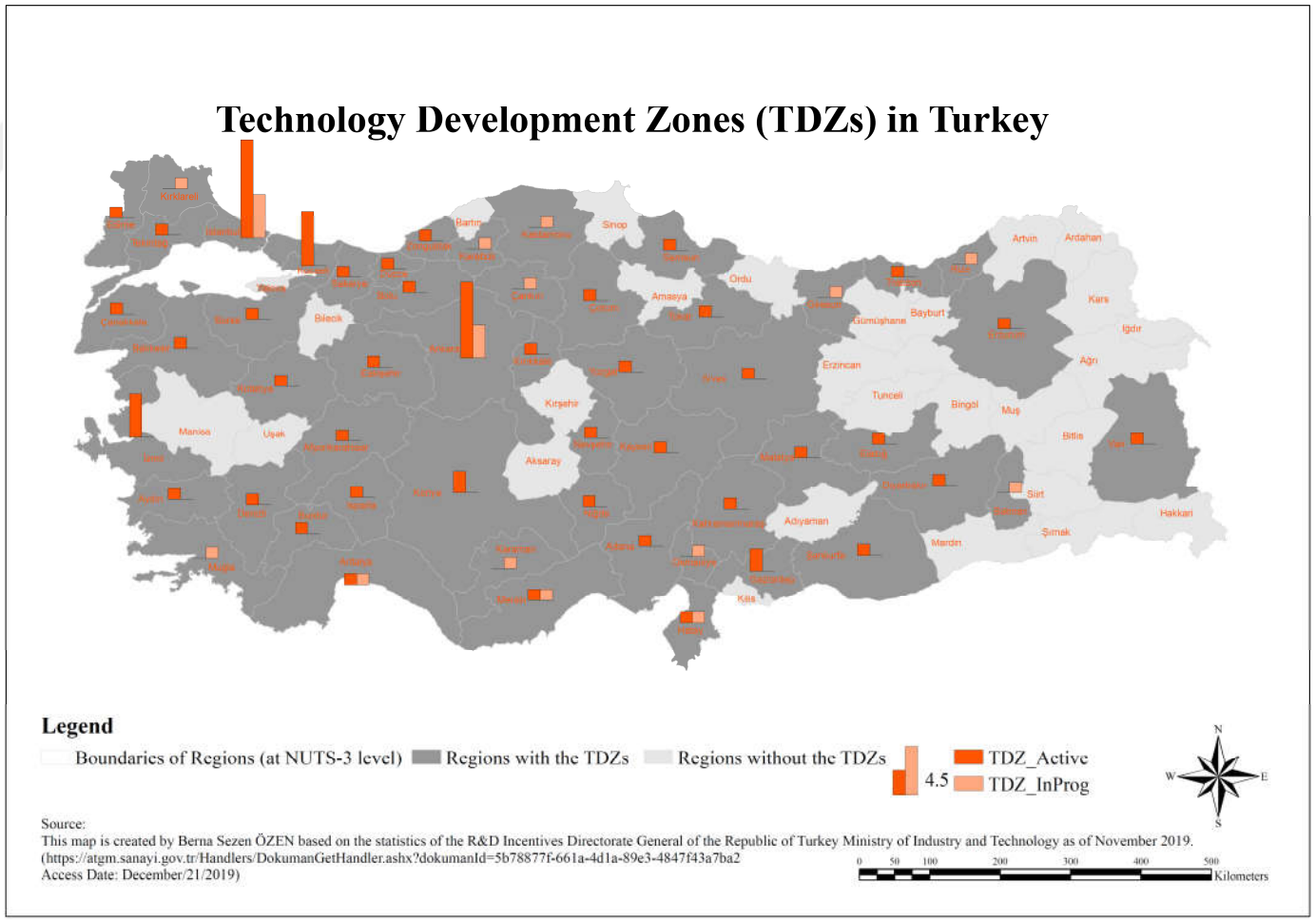


Figure 4.2 : The TDZs in Turkey (Author's own illustration based on the statistics of the R&D Incentives Directorate General of the Republic of Turkey Ministry of Industry and Technology as of November 2019, URL-10).

Table 4.1 : Statistics about the TDZs in Turkey (Statistics of the R&D Incentives Directorate General of the Republic of Turkey Ministry of Industry and Technology as of November 2019, URL-10).

Statistics about the technological development zones in Turkey	
Total Number of Firms	5.472
Number of Foreign/Foreign Partner Firms	308
Number of Academics' Partner Firms	1.154
Total number of staff	56.599
R&D	46.045
Design	754
Support	3.584
Out of scope	6.216
Number of projects (Ongoing)	9.577
Number of projects (Completed)	33.921
Total Sales (TL)	84,1 Billion
Total Exports (USD)	4,4 Billion

Table 4.2 : Intellectual assets (Statistics of the R&D Incentives Directorate General of the Republic of Turkey Ministry of Industry and Technology as of November 2019, URL-10).

Intellectual and Industrial Property	Number
Number of Patent Grants (National / International)	1.117
Number of Patent Applications (Ongoing)	2.468
Number of Utility Model Grants	408
Number of Utility Model Applications (Ongoing)	200
Number of Industrial Design Registrations	122
Number of Industrial Design Applications (Ongoing)	91
Software Copyright (Received)	280

Table 4.3 : Sectoral distribution of the firms in the TDZs (Statistics of the R&D Incentives Directorate General of the Republic of Turkey Ministry of Industry and Technology as of November 2019, URL-10).

NA-CE Code	Percent
Computer programming activities	41%
Other research and experimental development on natural sciences and engineering	7%
Computer consultancy activities	4%
Research and experimental development activities on biotechnology	3%
Manufacture of basic pharmaceutical products and pharmaceutical preparations	3%
Engineering and consultancy activities for industry and manufacturing projects	2%
Growing legumes	2%
Engineering and consultancy activities for energy projects	2%
Engineering consultancy services (except those made in connection with a project)	2%
Wholesale trade of computers, computer peripheral equipment and software	1%
Other information technology and computer service activities	1%
Manufacture of other special-purpose machinery n.e.c.	1%
Manufacture of electronic components; diodes, transistors, diacs, triacs, thyristors, resistors, leds, crystals, relays, micro switches, fixed or adjustable resistors and capacitors and electronic integrated circuits	1%
Business and other administrative consultancy acitivities	1%
Intermediaries who wholesale the computer, software, electronic and telecommunications equipment and other office equipment on a fee or contract basis	1%
Installation services of industrial process control equipment	1%
Manufacture of loaded electronic boards	1%
Engineering and consultancy activities for other projects	1%
Retail sale of computers, peripheral units and software in specialised stores	1%
Manufacture of instruments and appliances used for medical, surgical, dental and veterinary purposes	1%
Publishing of other software programs	1%
Other	25%

- **R&D Centers:**

In the Article 4 of the Regulation on Implementation and Audit of Supporting Research, Development and Design Activities (2016), where the definitions are made, R&D centers refer to the units which are engaged in research and development

activities domestically and employ at least fifty full-time equivalent R&D staff, have sufficient R&D accumulation and ability, and are organized as a separate unit within the organizational structure of the legal or business center of the capital companies in Turkey including the limited taxpayer corporations in Turkey, which are established to perform R&D and innovation projects or order-based R&D and innovation activities within the framework of the contract.

With the General Communiqué on the Law 5746 on the Support of the Research, Development and Design Activities (2016), it is aimed to increase international competitiveness of Turkey, develop its innovation capacity and create an industrial infrastructure suitable for the developments in the world by creating an efficient and competitive economic environment focused on innovation, qualified employment-developed, producing products with high added value and also to enable foreign capital companies to develop new technologies in the country by structuring their R&D units in the country. Private Sector R&D Centers are established and operate within the scope of Law No. 5746, prepared with the understanding that investments in R&D, technology and human resources return as technological development, high competitiveness and high welfare level (URL-10).

There are 1213 R&D Centers in Turkey with a total number of 59541 staff working in these centers (Table 4.4).

Table 4.4 : Statistics on the R&D centers (Statistics of the R&D Incentives Directorate General of the Republic of Turkey Ministry of Industry and Technology as of November 2019, URL-10).

R&D Centers	Number
Number of operating R&D Centers	1213
Total number of staff	59541
Bachelor	32216
Master	9894
PhD and Post-Doc	972
Number of projects (Ongoing and completed)	44575
Number of Patents	20236
Registrations	5721
Applications	14515
Number of foreign/foreign partner firms with R&D centers	183

As of November 2019, there are 1213 R&D centers in Turkey. When the spatial distribution of the R&D centers by regions is examined, the regions of İstanbul (414), Bursa (129), Kocaeli (127), Ankara (115) and İzmir (88) are located in the upper ranks, respectively. There are 32 regions (at NUTS-3 level) without R&D centers. These regions are Afyonkarahisar, Ağrı, Artvin, Bingöl, Bitlis, Diyarbakır, Edirne, Erzurum, Giresun, Gümüşhane, Hakkari, Kars, Kastamonu, Kırşehir, Mardin,

Muş, Nevşehir, Rize, Siirt, Sinop, Tokat, Tunceli, Van, Yozgat, Bayburt, Kırıkkale, Batman, Şırnak, Bartın, Ardahan, Iğdır and Kilis (Figure 4.3).

According to the sectoral distributions (Figure 4.4), 'machinery and equipment manufacturing (176)', 'automotive sub-industry' (129), 'software' (110), 'computer and communication technologies' (80), 'electric-electronic' (77), 'textile' (77) and 'chemical' (71) sectors come to the fore.

The least number of sectors are ‘glass and glass products’ (1), ‘leather technologies’ (1), ‘livestock’ (1), ‘liquefied liquid petroleum gas’ (1), ‘medical’ (2), ‘media and communication’ (2), ‘manufacture of weapons and ammunition’ (2), ‘manufacturing industry’ (3), ‘cement and cement products’ (4), ‘mining’ (4), ‘retail’ (4), ‘automotive design and engineering’ (5), ‘marine’ (6), ‘paper and paper products’ (6), ‘engineering / architectural activities’ (6), ‘petroleum and petroleum products’ (6), ‘construction’ (8) and ‘cosmetics and cleaning products’ (8).

Due to the document dates of the R&D Centers, the oldest sectors are predominantly seen as ‘durable consumer goods’, ‘automotive supply industry’ and ‘defense industry’ sectors.

Only 219 of the 1213 R&D centers have a document date before 2016. Incredible increase in R&D Centers after 2016 can be associated with the General Communiqué on the Law 5746 on the Support of the Research, Development and Design Activities (2016).

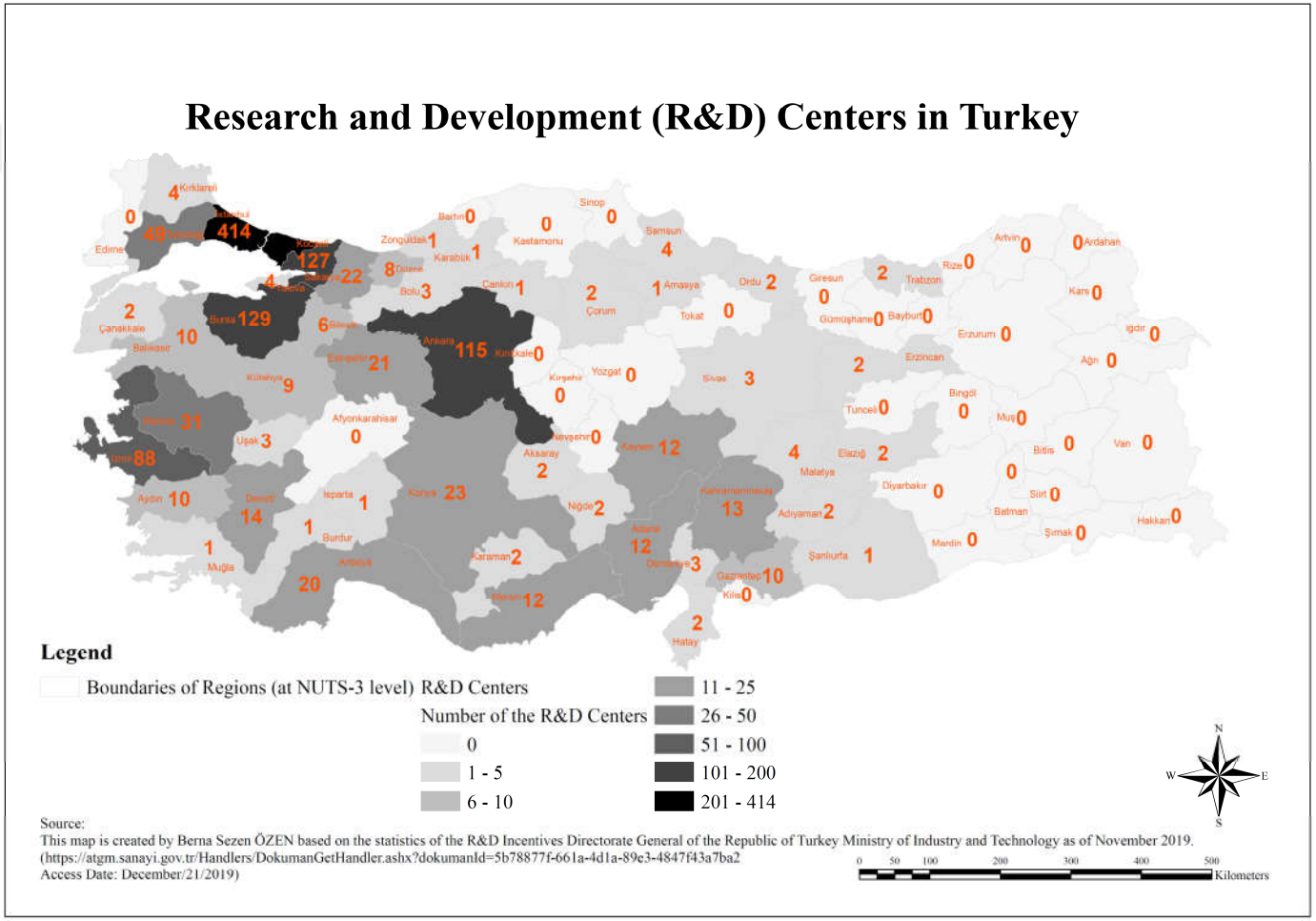


Figure 4.3 : Spatial distribution of the R&D centers in Turkey (Author's own illustration based on the (Statistics of the R&D Incentives Directorate General of the Republic of Turkey Ministry of Industry and Technology as of November 2019, URL-10).

SECTORS \ REGIONS	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
Packaging																											1							3	2						3
Banking and Finance																																		12							2
Computer and Communication Technologies						8										3																	1	63	3						2
Glass and Glass Products																																									1
Cement and Cement Products																				1													1	1							
Durable Consumer Goods					1	2								1												3								9							1
Ferrous and Non-Ferrous Metals	3															4				1														5	5						3
Marine																1																		2							1
Leather Technologies																																		1							
Foundry						2				1						2				1						1								1	1						2
Electric-Electronic						5			1							2				1						1								41	5						7
Energy	1	1				7	1			4						1				1														3	1			1			3
Food	2					1	1									5	1							1		1	2						3	15	6			1	1		6
Aviation						2																				2								8							
Livestock										1																															
Air Conditioning						1	1		1		1					1										1								3	4						3
Medicine						4				1																								14					2		3
Manufacturing Industry						2																													1						
Construction						3																											1	2							
Paper and Paper Products							1													1														1	2						
Chemical	2															2				1				1			1							17	10						22
Cosmetics and Cleaning Products																																		4							2
Mining																							1											1							
Machinery and Equipment Manufacturing						20	3		4	2	1				1	27			1				1			5	1						3	38	19			2			16
Medical																																		1							
Media and Communication																																		2							
Furniture						2	1		1							3																		1					3		1
Engineering/Architectural Activities						1	1									1																		2							1
Automotive	1					4										5										1							1	4	3						2
Automotive Design and Engineering									1																									2							1
Automotive Supply Industry						3										49		1								3					1			13	9						30
Retail																																		4							
Petroleum and Petroleum Products						1																											1		1						3
Plastic-Rubber														2		2										1								6	2						3
Health						4																					2							10	2						1
Defense Industry						31																												2	1			1			
Ceramic and Refractory						1			1		3						1		1							2												1			
Liquefied Liquid Petroleum Gas																																									1
Weapons and Ammunition Manufacturing																																		1							
Agriculture	1						10		1	1						1															1		1								2
Textile	2	1								1						17				7							3							7	7			2	1		1
Telecommunication																																		15	1						
Transport and Logistics																																		10				1			3
Software						11	1									3															1			90	3						1
∑	12	2	0	0	1	115	20	0	10	10	6	0	0	3	1	129	2	1	2	14	0	0	2	2	0	21	10	0	0	0	2	1	12	414	88	0	0	12	4	0	127

Figure 4.4 : Matrix of the R&D centers in the regions (at NUTS-3 level) in terms of spatial and sectoral distributions (Author's own illustration based on statistics of the R&D Incentives Directorate General of the Republic of Turkey Ministry of Industry and Technology as of November 2019, URL-10).

SECTORS \ REGIONS	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	∑
Packaging	1			1																																					11
Banking and Finance	1																																								15
Computer and Communication Technologies																																									80
Glass and Glass Products																																									1
Cement and Cement Products																																								1	4
Durable Consumer Goods				2														3																							22
Ferrous and Non-Ferrous Metals					1								1					2								1										1			1		28
Marine																																			2						6
Leather Technologies																																									1
Foundry	1			1														1																							14
Electric-Electronic	3			3									1	1				5																					1		77
Energy		1		1	1													1																							28
Food	2									1	1		1					1					2						1													55
Aviation																																									12
Livestock																																								1
Air Conditioning				3									1																												20
Medicine	1																	8																						1	34
Manufacturing Industry																																									3
Construction				1			1																																		8
Paper and Paper Products					1																																				6
Chemical	1	1		3									1					7																		1				1	71
Cosmetics and Cleaning Products																		1																					1		8
Mining				2																																					4
Machinery and Equipment Manufacturing	7	1	1	7	1								8					4		1							1		1												176
Medical																	1																								2
Media and Communication																																									2
Furniture	1										1		1					1																							16
Engineering/Architectural Activities																																									6
Automotive													2														1														24
Automotive Design and Engineering	1																																								5
Automotive Supply Industry	3	2		4						1			2	2			1	3																					2	129
Retail																																									4
Petroleum and Petroleum Products																																									6
Plastic-Rubber													2					2																					1	21
Health																						1																			20
Defense Industry														1			1																						1	38
Ceramic and Refractory		4		2																																					16
Liquefied Liquid Petroleum Gas																																									1
Weapons and Ammunition Manufacturing																				1																					2
Agriculture																																									18
Textile			3	1	9								2					10					1													1				1	77
Telecommunication																																										16
Transport and Logistics	1																																									15
Software																																										110
∑	23	9	4	31	13	0	1	0	0	2	2	0	22	4	0	0	3	49	0	2	0	1	3	0	0	1	2	0	2	0	0	0	0	0	4	1	0	3	8	1213

Figure 4.4 (continued) Matrix of the R&D centers in the regions (at NUTS-3 level) in terms of spatial and sectoral distributions (Author's own illustration based on statistics of the R&D Incentives Directorate General of the Republic of Turkey Ministry of Industry and Technology as of November 2019, URL-10).

- **Design Centers:**

With the amendments made within the scope of the R&D Reform Package that was published in the Official Gazette on February 26, 2016, many regulations were introduced to improve the R&D and innovation ecosystem of Turkey, especially the Law No. 5746 on Supporting Research and Development Activities (2016). As one of these regulations, design activities are included in the scope of support such as R&D activities. Thus, high value added technological products will be produced. Within the scope of this law, the concept of Design Centers has placed into law and many important supports have been brought to Design centers. Like Private Sector R&D Centers, Private Sector Design Centers are established and operate within the scope of Law No. 5746, prepared with the understanding that investments in designs, technology and human resources return as technological development, high competitiveness and high welfare level.

The deficiency in the law numbered 5746 is eliminated with the law number 6676 dated 02.16.2016 and the phrase 'design' is included in the first sub-article of the Article 1 of the law and thus the design gains a legal dimension.

There are 356 Design Centers in Turkey with a total number of 7462 staff working in these centers (Table 4.5).

Table 4.5 : Statistics on the design centers (Statistics of the R&D Incentives Directorate General of the Republic of Turkey Ministry of Industry and Technology as of November 2019, URL-10).

Design Centers	Number
Number of operating Design Centers	356
Total number of staff	7462
Bachelor (58 %)	4338
Master (8%)	603
PhD and Post-Doc (1%)	31
Number of projects (Ongoing and completed)	5097
Number of Patents	380
Registrations	173
Applications	207
Number of foreign/foreign partner firms with Design centers	27

According to the November 2019 statistics (URL-10), the document date of the design centers by years shows that the first centers started in November 2016 and their distributions by years is 6 in 2016, 121 in 2017, 162 in 2018 and 67 in 2019.

According to the distribution of design centers by regions (at NUTS-3 level) (URL-10), only 25 regions have design centers. These regions are given according to their numerical majority: İstanbul (167), Ankara (41), İzmir (29), Bursa (26), Denizli (20), Kocaeli (18), Tekirdağ (13), Adana (8), Konya (5), Manisa (4), Gaziantep, Kütahya

and Sakarya regions (3), Aydın, Eskişehir, Kayseri and Düzce regions (2) and finally Amasya, Antalya, Giresun, Mersin, Kırklareli, Kahramanmaraş, Niğde and Yalova regions (1).

Regions such as Adıyaman, Afyonkarahisar, Ağrı, Artvin, Balıkesir, Bilecik, Bingöl, Bitlis, Bolu, Burdur, Çanakkale, Çankırı, Çorum, Diyarbakır, Edirne, Elazığ, Erzincan, Erzurum, Gümüşhane, Hakkari, Hatay, Isparta, Kars, Kastamonu, Kırşehir, Malatya, Mardin, Muğla, Muş, Nevşehir, Ordu, Rize, Samsun, Siirt, Sinop, Sivas, Tokat, Trabzon, Tunceli, Şanlıurfa, Uşak, Van, Yozgat, Zonguldak, Aksaray, Bayburt, Karaman, Kırıkkale, Batman, Şırnak, Bartın, Ardahan, Iğdır, Karabük, Kilis and Osmaniye do not have a design center (Figure 4.5).

The highest number of sectors are in ‘textile’ (65), ‘engineering/architectural activities’ (48), ‘manufacturing industry’ (43) and ‘machinery and equipment manufacturing’ (32) sectors. The lowest are ‘packaging’, ‘aviation’, ‘cosmetics and cleaning products’, ‘jewelry’, ‘telecommunication’, and ‘transportation and logistics’sectors (Figure 4.6).

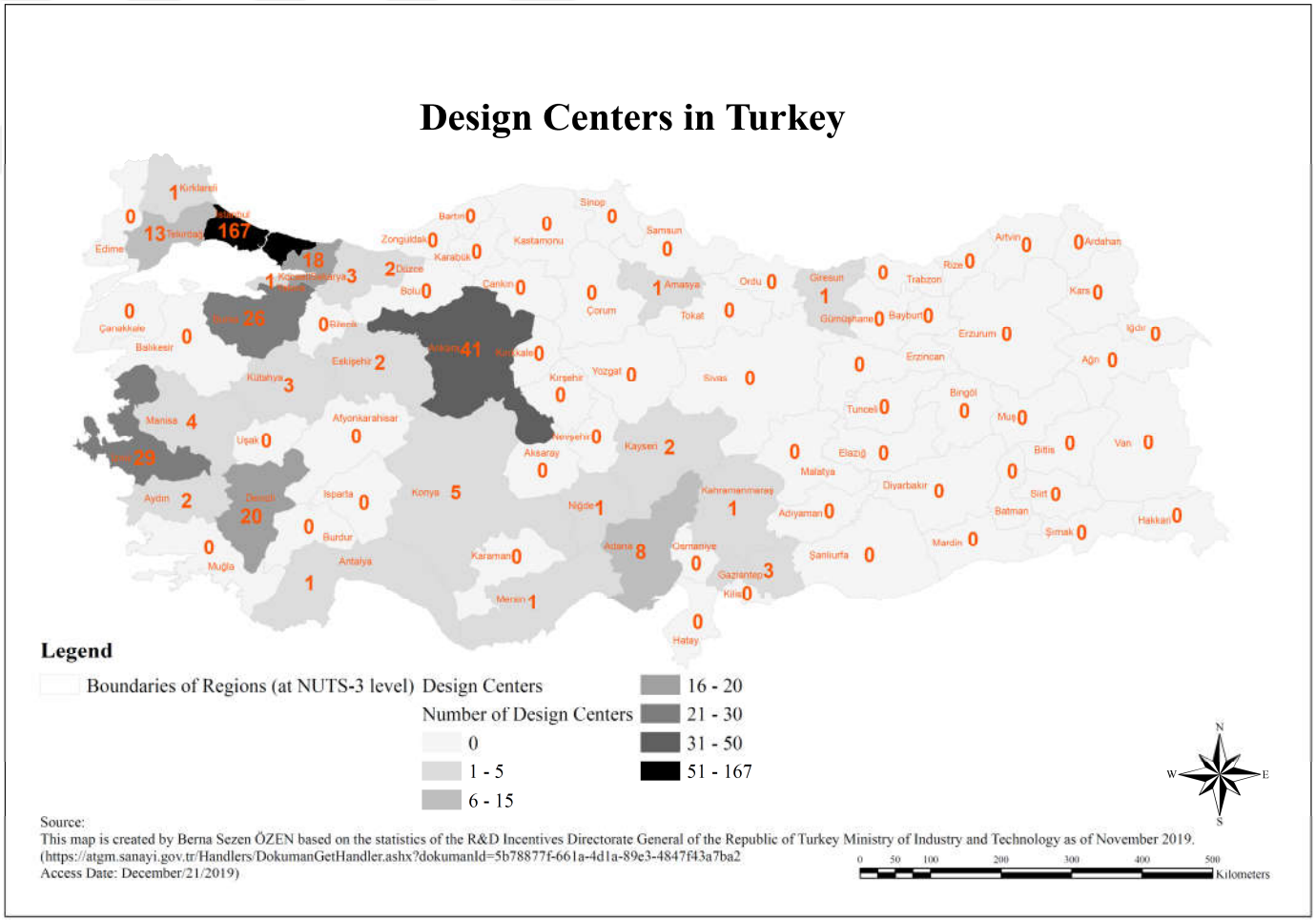


Figure 4.5 : Design centers (Author's own illustration based on the statistics of the R&D Incentives Directorate General of the Republic of Turkey Ministry of Industry and Technology as of November 2019, URL-10).

SECTORS \ REGIONS	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
Packaging																																									
Computer and Communication Technologies																																		4							
Glass and Glass Products									1																									1							1
Durable Consumer Goods																																		2							1
Ferrous and Non-Ferrous Metals																				2														1							2
Marine																																		3							
Foundry																																		2	2						
Electronic																																		10	2						
Energy						2														1														1							
Food Industry						1										1																									
Aviation																																		1							
Air Conditioning						1																												2							
Manufacturing Industry	3					6										1											1							11	7						8
Construction						4																												14							1
Paper and Paper Products																				1															1						
Apparel and Ready-to-Wear																																		4	2						
Cosmetics and Cleaning Products																																		1							
Jewelry																																		1							
Mining						2														2																					
Machinery and Equipment Manufacturing	1				1	5	1																			1								9	6						2
Media and Communication						2																												17							
Furniture						1										2																		9	3			1			
Engineering/Architectural Activities						10																												37				1			
Automotive	1															4																	1	2							
Automotive Design and Engineering																1																									1
Automotive Supply Industry						1			1							8				1														3	2						1
Defense Industry						5																						1						1							
Ceramic and Refractory																1										1								1							
Agriculture																																									
Textile	3															8				13							2							27	3				1		1
Telecommunication																																		1							
Transport and Logistics																																		1							
Software						1																												1	1						
∑	8	0	0	0	1	41	1	0	2	0	0	0	0	0	0	26	0	0	0	20	0	0	0	0	0	2	3	1	0	0	0	0	1	167	29	0	0	2	1	0	18

Figure 4.6 : Matrix of the design centers in the regions (at NUTS-3 level) in terms of spatial and sectoral distributions (Author's own illustration based on statistics of the R&D Incentives Directorate General of the Republic of Turkey Ministry of Industry and Technology as of November 2019, URL-10).

SECTORS \ REGIONS	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	∑
Packaging	1																																								1
Computer and Communication Technologies																																									4
Glass and Glass Products																																									3
Durable Consumer Goods																																									3
Ferrous and Non-Ferrous Metals					1																																				6
Marine																																				1					4
Foundry																																									4
Electronic																																									12
Energy																																									4
Food Industry																																									2
Aviation																																									1
Air Conditioning																		1																							4
Manufacturing Industry	1			1									2					1																						1	43
Construction																																									19
Paper and Paper Products																																									2
Apparel and Ready-to-Wear																																									6
Cosmetics and Cleaning Products																																									1
Jewelry																																									1
Mining																																									4
Machinery and Equipment Manufacturing	1			1									1					3																							32
Media and Communication																																									19
Furniture	1																	1																						1	19
Engineering/Architectural Activities																																									48
Automotive																																									8
Automotive Design and Engineering																																									2
Automotive Supply Industry				2																																					19
Defense Industry																																									7
Ceramic and Refractory		3																																							6
Agriculture	1									1																																2
Textile																		7																							65
Telecommunication																																									1
Transport and Logistics																																									1
Software																																									3
∑	5	3	0	4	1	0	0	0	0	1	0	0	3	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	356

Figure 4.6 (continued) Matrix of the design centers in the regions (at NUTS-3 level) in terms of spatial and sectoral distributions (Author's own illustration based on statistics of the R&D Incentives Directorate General of the Republic of Turkey Ministry of Industry and Technology as of November 2019, URL-10).

- **Enterprises:**

As previously mentioned in the literature in Chapter 2: Innovation Systems, enterprises are the main actors of the innovation systems and stand out as different variables that play important roles in the innovation performances within the EIS measurement framework as the drivers of innovation activities such as 'innovators' and 'linkages' dimensions of the innovation (Figure 2.8).

Therefore, the spatial distribution of the enterprises gains importance with their competitive powers and linkages. In 2019, there are 3954698 enterprises in Turkey according to the TURKSTAT. İstanbul takes the lead by far with 944954 enterprises (Figure 4.7).

As a result of a large numerical difference, while Ankara and İzmir follow İstanbul respectively with the 283076 and 238802 enterprises, Antalya and Bursa regions also follow these two regions with a lower number of enterprises respectively as 159407 and 153435 enterprises.

On the contrary, the regions having less than 5000 enterprises are Gümüşhane (4959), Ardahan (3511), Tunceli (3419) and Bayburt (3091) regions.

According to the spatial and numerical distribution of the enterprises (Figure 4.7), it can be interpreted that there are a huge differences among the regions and can be said that metropolitan regions stand out with their numerical superiority.

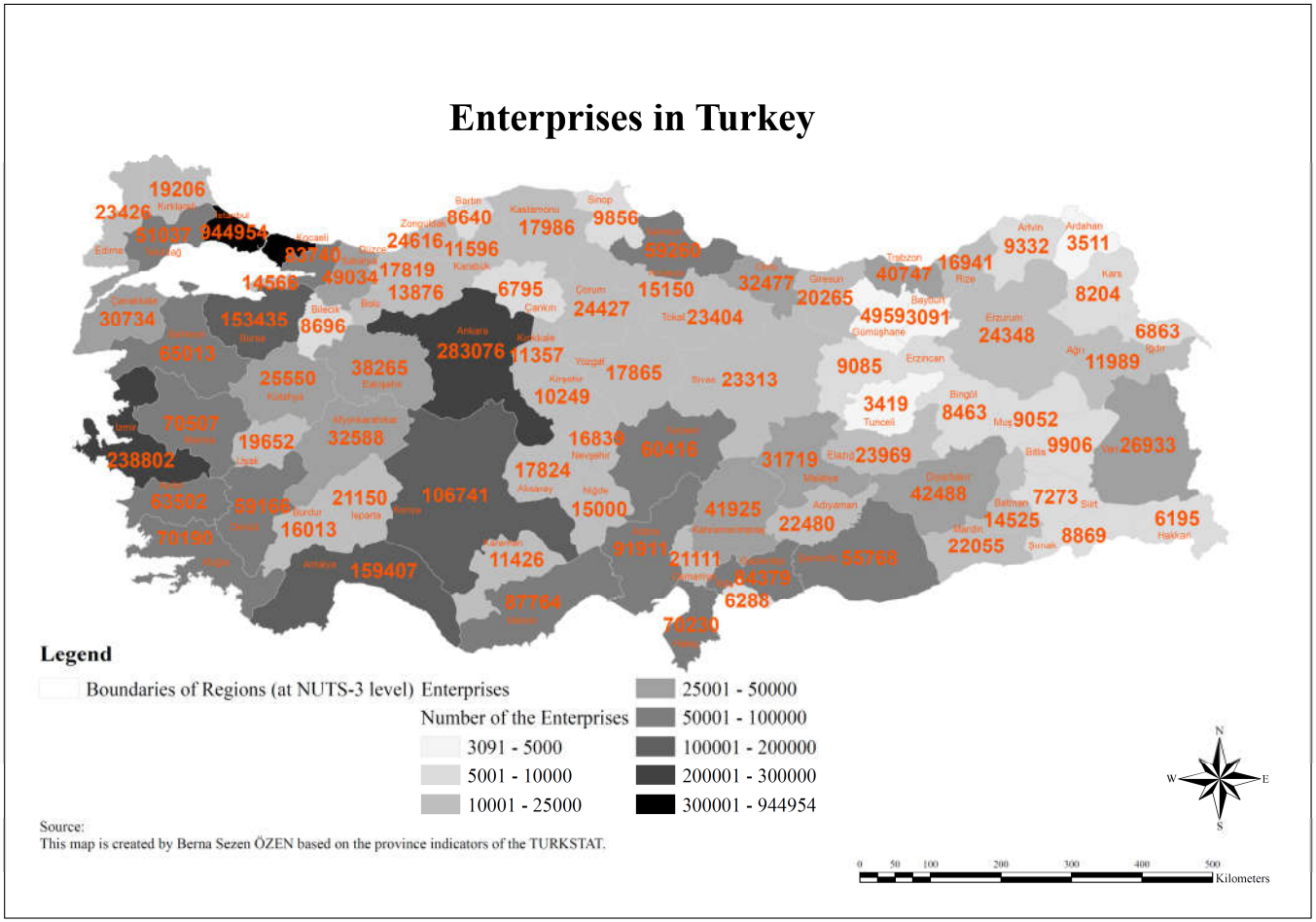


Figure 4.7 : Enterprises in the regions (at NUTS-3 level) in terms of spatial distribution (Author's own illustration based on the province indicators of the TURKSTAT).

- **Science Centers:**

Science centers aim individuals with different experiences from different age groups

- at meeting with science
- at making science and technology understandable and accessible.
- at increasing the importance of science and technology in the society.
- at creating awareness in science and technology with experimental and applied activities.
- at encouraging individuals to try and discover (URL-11).

Through the science centers, TÜBİTAK aims at spreading the culture of science and increasing the interest and curiosity of the society in science. It aims at bringing together science and society by supporting the establishment of science centers in the country and increasing their numbers over the years (URL-11).

In 2008, TÜBİTAK made the first official call to support the science centers to be established in Turkey (URL-12).

There are 6 TÜBİTAK Science Centers within the scope of the 4003 Science Center Establishment Support Program (Table 4.6). These are Üsküdar Science Center (İstanbul), Kayseri Science Center (Kayseri), Kocaeli Science Center (Kocaeli), Konya Science Center (Konya), Elazığ Science Center (Elazığ) and Bursa Science Center (Bursa) (URL-13).

TÜBİTAK lists other science centers in Turkey as follows (Table 4.6): Ali Kuşçu Science Center, Feza Gürsey Science Center, METU Society and Science Application and Research Center, Polatlı Municipality Alparslan Türkeş Science Center and Uluğ Bey Gökevi, Eskişehir Science Experiment Center, Gaziantep Planetarium and Science Center, Bayrampaşa Municipality Science Center, ITU Science Center, Pendik Municipality Science Center, Sancaktepe Science Center, Sultangazi Municipality Science Center, Bornova Municipality Mevlana Society and Science Center, Karşıyaka Municipality Science Museum, Ödemiş Municipality Trial and Science Center and TRNC-METU Northern Cyprus Campus Science and Technology Center.

Table 4.6 : Statistics on science centers (Author's own illustration based on the information on URL-13, URL-14 and information obtained from the official websites and authorized persons of all science centers.)

	Name of the Science Center	Region	Establishment Year
TÜBİTAK Science Centers	Üsküdar Science Center	İstanbul	November 4, 2018
	Kayseri Science Center	Kayseri	December 4, 2016
	Kocaeli Science Center	Kocaeli	April 18, 2015
	Konya Science Center	Konya	April 26, 2014
	Elazığ Science Center	Elazığ	May 27, 2015
	Bursa Science Center	Bursa	January 25, 2014
Other Science Centers (*)	Ali Kuşçu Science Center	Ankara	April, 2017
	Feza Gürsey Science Center	Ankara	April 23, 1993
	METU Society and Science Application and Research Center	Ankara	2006
	Polatlı Municipality Alparslan Türkeş Science Center and Uluğ Bey Gökevi	Ankara	October 29, 2014
	Eskişehir Science Experiment Center	Eskişehir	April 12, 2012
	Gaziantep Planetarium and Science Center	Gaziantep	December, 2010
	Bayrampaşa Municipality Science Center	İstanbul	2008
	ITU Science Center	İstanbul	2000
	Pendik Municipality Science Center	İstanbul	October, 2017
	Sancaktepe Science Center	İstanbul	2014
	Sultangazi Municipality Science Center	İstanbul	2017
	Bornova Municipality Mevlana Society and Science Center	İzmir	September, 2010
	Karşıyaka Municipality Science Museum	İzmir	March 11, 2009
	Ödemiş Municipality Trial and Science Center	İzmir	February 2, 2011
	TRNC-METU Northern Cyprus Campus Science and Technology Center	Kalkanlı, Güzelyurt Lefkoşa	February, 2008

Excluding TRNC-METU Northern Cyprus Campus Science and Technology Center, there are 20 science centers in total in Turkey. The spatial distribution of the science centers are 6 in İstanbul, 4 in Ankara, 3 in İzmir, and 1 in Bursa, Kayseri, Kocaeli, Konya, Elazığ, Eskişehir and Gaziantep regions (Figure 4.8).

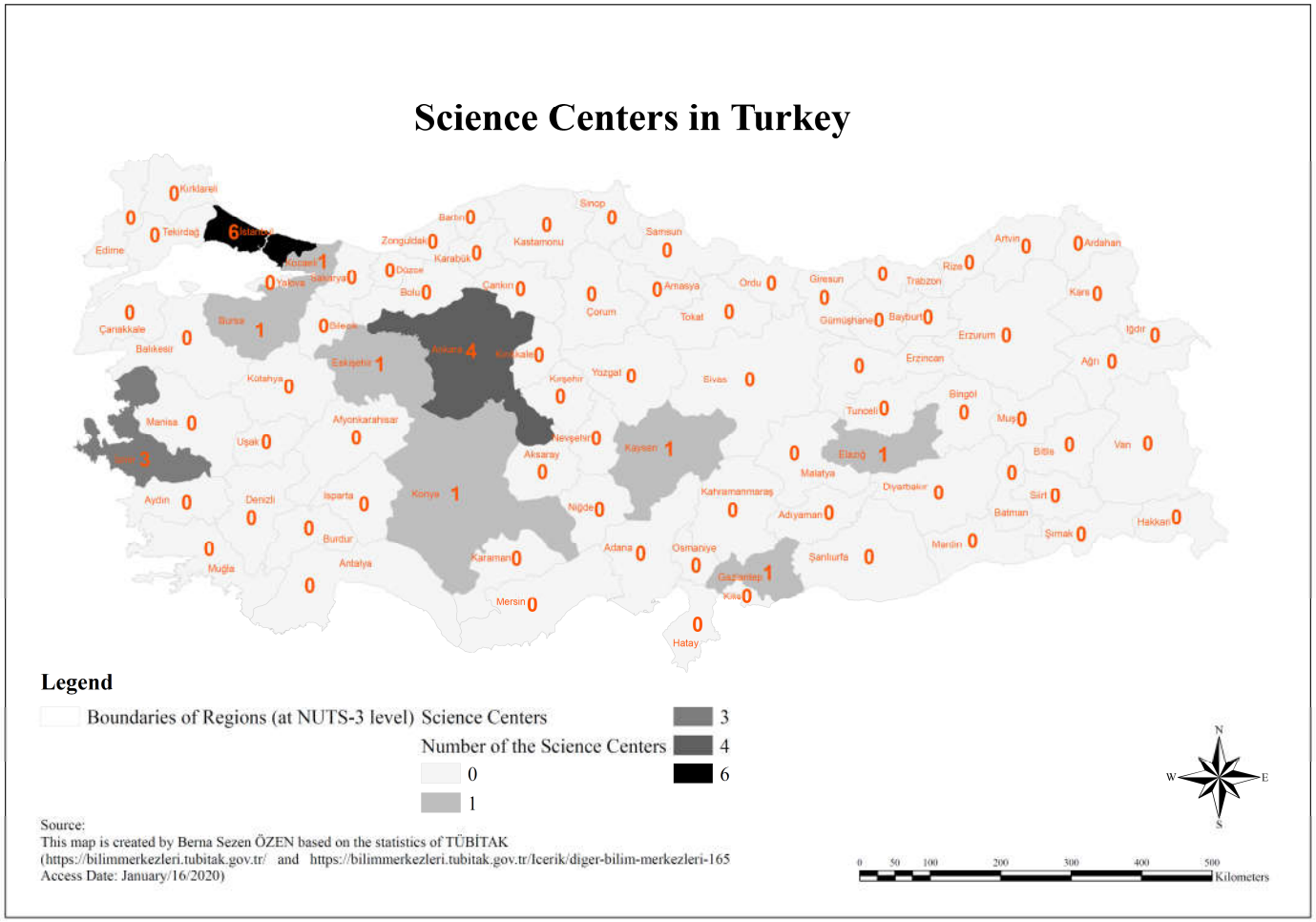


Figure 4.8 : Science centers in the regions (at NUTS-3 level) in terms of spatial distribution (Author's own illustration based on the URL-13 and URL-14).

- **Technology Transfer Offices (TTOs):**

In the Regulation on the Higher Education Institutions Technology Transfer Office (2017), the Technology Transfer Office (TTO) refers to the capital company, which can be established by the decision of the board of higher education institution with the prior permission of the Council of Higher Education, to cooperate with public and private sector in higher education institutions regarding R&D and innovation, to protect and implement the produced information and inventions made within the scope of intellectual property.

While explaining the role of university technology transfer offices, Hauksson (1998) lists the objectives of these offices that vary among universities as following:

- "To help to put technologies invented at the university to practical use.
- To protect the intellectual property generated by research at the university.
- To protect the university from research-related law suits.
- To increase direct research support from industry.
- To generate income for the university.
- To provide advice and services for faculty.
- To redistribute the royalty income to faculty and others involved."

"A schematic diagram of the communication channels between faculty and industry" Hauksson (1998) is given in Figure 4.9. Also a more detailed and comprehensive schematic diagram of technology transfer offices can be seen in Figure 4.10.

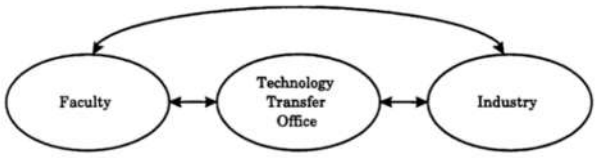


Figure 4.9 : The faculty-industry interface (Hauksson, 1998).

The main objectives of the TTOs are (URL-16):

- To create strategies reducing the risks faced by scientific researchers.
- To ensure that industrialists and investors meet researchers and transfer know-how to the industry.

- To offer a training program on entrepreneurship, innovation, R&D and intellectual property rights.
- To assist entrepreneurs in obtaining patent documents valid both at national and international.
- To establish a relationship between qualified staff and firms.
- Bringing production sectors and universities together and directing them according to the needs by working on the fields of patent procurement, intellectual property rights, licensing academic-based new firms (spin-offs), market research and establishment capital funding and project funding.

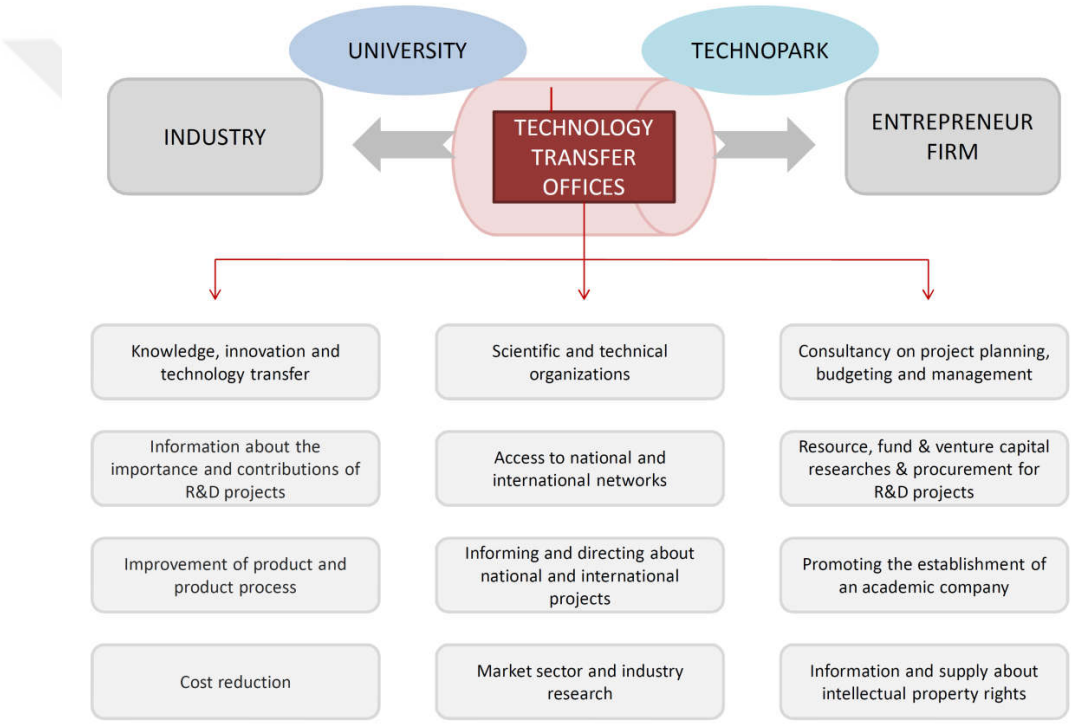


Figure 4.10 : Technology transfer offices (TTOs) in innovation systems (URL-16).

Middle East Technical University (METU) TTO, which was established in 2007 as a subordinate of METU Technopark, and Hacettepe Technopolis Technology Transfer Center, which was established in 2008 within the Hacettepe Technopolis, are among the first TTOs in Turkey (Güler and Kırbaşlar, 2020).

The TTOs became widespread in Turkey thanks to the "1513 Technology Transfer Offices Support Program" initiated by Tübitak in 2012 (Yılmaz, 2021). There are 62 TTOs in Turkey. 25 of these TTOs are supported under "TÜBİTAK 1513 Technology Transfer Offices Support Program" and 16 of them under "TÜBİTAK

1601 Capacity Building Support Program" (DAP Regional Development Administration, 2017).

The activities of technology transfer offices are defined in the "Target and Performance Oriented Support of Technology Transfer Offices, Call for 2019 (URL-17)" under the 1513 - TÜBİTAK Technology Transfer Offices Support Program by the TÜBİTAK Technology and Innovation Support Programs Directorate (TÜBİTAK TEYDEB). The TTOs supported under the program are expected to carry out the following activities as a minimum:

- Awareness, promotion, information and education services
- Services to benefit from support programs
- Project development/management services (university-industry cooperation activities)
- Intellectual Industrial Rights management and licensing services
- Incorporation and entrepreneurship services.

➢ **Regional Development Agencies (RDAs):**

The purpose of the Law numbered 5449 on the Establishment, Coordination and Duties of Development Agencies (2006) is to organize the principles and procedures for coordination related to the establishment, duties and authorities of the development agencies which are created to reduce interregional and intra-regional disparities and to accelerate and ensure the sustainability regional development which is compatible with the principles and policies envisaged in the national development plan and programs by means of improving cooperation between the public sector, the private sector and non-governmental organizations, ensuring correct and effective use of resources and setting local potential into motion (referred to in Article 1).

Today, the Ministry of Industry and Technology is responsible for the national coordination of the RDAs. The duties of the agencies currently stated in the Article 188 of the Presidential Decree Number: 4 (Presidential Decree on the Organization of Ministry Related Institutions and Organizations, and Other Institutions and Organizations, (2018) are listed as follows:

a) To provide technical support to the planning works of local administrations.

b) To support activities and projects that ensure the implementation of regional plans and programs; in this context, to monitor and evaluate the implementation process of supported activities and projects and to report their results to the Ministry of Industry and Technology.

c) To contribute to the development of the region's capacity related to the rural and local development in accordance with the regional plans and programs and to support projects in this context.

d) To monitor other projects carried out by the public sector, private sector and non-governmental organizations in the region, which are considered important in terms of regional plans and programs.

e) To develop cooperation between public sector, private sector and non-governmental organizations to achieve regional development goals.

f) To use or to make use internal and external funds allocated to the Agency for regional development in accordance with regional plans and programs.

g) To conduct making research own/someone else or to support the research of other individuals, institutions and organizations which determine the resources and opportunities, accelerate economic and social development and increase competitiveness of the region.

h) Promoting the business and investment opportunities of the region at national and international level in cooperation with the relevant institutions.

i) To follow and coordinate the permit and license transactions and other administrative affairs and transactions of investors, public institutions and organizations in the provinces of the region, within the time specified in the relevant legislation, from a single source.

j) To support small and medium-sized enterprises and new entrepreneurs by cooperating with relevant institutions on issues such as management, production, promotion, marketing, technology, financing, organization and labor training.

k) To promote the activities related to bilateral or multilateral international programs Turkey participated in the region and to contribute to the development projects under these programs.

l) To create a website where the activities, financial structure and other issues related to the agency will be published (Presidential Decree on the Organization of Ministry Related Institutions and Organizations, and Other Institutions and Organizations, 2018).

In addition to these duties, in order to increase the regional innovation performances, RDAs should be key actors in creating the regional innovation strategies. If the regional innovation strategies in Turkey is examined, The RIS - Mersin project, started in 2005 as a region in IRE Network within the 6th Framework Programme of the EU, has an importance according to the reason of being the first regional innovation systems project of Turkey covering only Mersin province independently from the DA. Examination of the regional innovation strategies of the RDAs shows that some have already started to create regional innovation strategies since 2012 (Figure 4.11). A comparison of the 'regional innovation strategies' is evaluated in terms of: (i) visions in the regional plans and regional innovation strategies (Table 4.7), (ii) main innovation strategies (Table 4.8) and (iii) studies of the RDAs after regional innovation strategy[17] as implementation, evaluation and monitoring mechanisms (Figure 4.12-Figure 4.18) (Özen and Baycan, 2022a).

RDAs generally create their innovation strategies together with advisory boards and technical commitees including representatives of relevant public and private sector actors, non-governmental organisations (NGOs), universities and national institutions. The RDAs generally used processes as the following steps: literature review, field works, current situation analysis on R&D and innovation, workshops, surveys, interviews, focus group meetings with a participation of representatives of relevant public and private sector actors, non-governmental organisations, universities and representatives from national institutions, SWOT and/or PEST analyses, stakeholder analysis, examination of different parameters, defining regional innovation ecosystem, measurement of innovation potential, supply, demand and capacity, determination of vision, priorities, innovation strategies, targets and actions (Özen and Baycan, 2022a).

[17] Although there were some exclusive studies related to innovation before the regional innovation strategy documents, the success of the regional innovation strategy is considered based on the studies of the RDAs after the production year of the regional innovation strategy documents.

Regional Development Agencies in Turkey (NUTS-2 Level)

	NUTS 2	RDA	PROVINCES IN THE REGION	ESTABLISHMENT YEAR
1	TR 62	Çukurova D. A. (ÇKA)	**Adana**, Mersin	2007
2	TR 31	İzmir D. A. (İZKA)	**İzmir**	2007
3	TR 10	İstanbul D. A. (İSTKA)	**İstanbul**	2008
4	TR 52	Mevlana D. A. (MEVKA)	Karaman, **Konya**	2008
5	TR 83	Middle Black Sea D. A. (OKA)	Amasya, Çorum, **Samsun**, Tokat	2008
6	TR A1	Northeast Anatolia D. A. (KUDAKA)	Bayburt, Erzincan, **Erzurum**	2008
7	TR B2	Eastern Anatolia D. A. (DAKA)	Bitlis, Hakkari, Muş, **Van**	2008
8	TR C1	Silkroad D. A. (İKA)	Adıyaman, **Gaziantep**, Kilis	2008
9	TR C2	Karacadağ D. A. (KARACADAĞ)	**Diyarbakır**, Şanlıurfa	2008
10	TR C3	Tigris D. A. (DİKA)	Batman, **Mardin**, Şırnak, Siirt	2008
11	TR 21	Trakya D. A. (TRAKYAKA)	Edirne, Kırklareli, **Tekirdağ**	2009
12	TR 22	South Marmara D. A. (GMKA)	**Balıkesir**, Çanakkale	2009
13	TR 32	Southern Aegean D. A. (GEKA)	Aydın, **Denizli**, Muğla	2009
14	TR 33	Zafer D. A. (ZAFER)	Afyonkarahisar, **Kütahya**, Manisa, Uşak	2009
15	TR 41	Bursa, Eskişehir, Bilecik D. A. (BEBKA)	Bilecik, **Bursa**, Eskişehir	2009
16	TR 42	East Marmara D. A. (MARKA)	Bolu, Düzce, **Kocaeli**, Sakarya, Yalova	2009
17	TR 51	Ankara D. A. (ANKARAKA)	**Ankara**	2009
18	TR 61	West Mediterranean D. A. (BAKA)	Antalya, Burdur, **Isparta**	2009
19	TR 63	Eastern Mediterranean D. A. (DOĞAKA)	**Hatay**, Kahramanmaraş, Osmaniye	2009
20	TR 71	Ahiler D. A. (AHİKA)	Aksaray, Kırıkkale, Kırşehir, Niğde, **Nevşehir**	2009
21	TR 72	Central Anatolia D. A. (ORAN)	**Kayseri**, Sivas, Yozgat	2009
22	TR 81	Western Black Sea D. A. (BAKKA)	Bartın, Karabük, **Zonguldak**	2009
23	TR 82	North Anatolian D. A. (KUZKA)	Çankırı, **Kastamonu**, Sinop	2009
24	TR 90	Eastern Black Sea D. A. (DOKA)	Artvin, Giresun, Gümüşhane, Ordu, Rize, **Trabzon**	2009
25	TR A2	Serhat D. A. (SERKA)	Ağrı, Ardahan, Iğdır, **Kars**	2009
26	TR B1	Fırat D. A. (FKA)	Bingöl, Elazığ, **Malatya**, Tunceli	2009

(*): Central provinces of the RDAs are given in bold in the text.



- ❑ 2012 : İZKA - İzmir Regional Innovation Strategy.
- ❑ 2012 : OKA - Middle Black Sea (Amasya-Çorum-Samsun-Tokat) Regional Innovation Strategy (2013-2023).
- ❑ 2014 : BAKKA - Western Black Sea (Zonguldak-Karabük-Bartın) 2015-2025 Regional Innovation Strategy and Action Plan.
- ❑ 2014 : DOKA - TR90 Eastern Black Sea Regional Innovation Strategy and Action Plan 2015-2017.
- ❑ 2014 : MARKA - East Marmara Regional Innovation Strategy for Smart Specialization 2014-2018.
- ❑ 2014 : ZAFER - Zafer Development Agency TR33 Regional Innovation Strategy.
- ❑ 2015 : ORAN - Central Anatolia Development Agency TR72 Regional Innovation Strategy
- ❑ 2015 : TRAKYAKA - TR21 Thrace Regional Innovation Report.
- ❑ 2016 : GEKA - South Aegean Regional Innovation and Entrepreneurship Strategy.
- ❑ 2017 : İKA - TRC1 2017-2020 Regional Innovation Strategy.
- ❑ 2019 : MEVKA - Konya-Karaman Regional Innovation Strategy for Smart Specialization (2014-2023).
- ❑ 2019 : ANKARAKA - Ankara Regional Innovation Strategy
- ❑ 2019 : GMKA - South Marmara Regional Innovation Strategy and Action Plan.
- ❑ 2020 : BEBKA - TR41 Region Innovation and Smart Specialization Strategy Document

Figure 4.11 : RDAs having a specific "Regional Innovation Strategies" document (Author's own illustration) (Özen and Baycan, 2022a).

When the visions in the regional plans of these 14 RDAs are examined; it is seen that most of the RDAs (İZKA, DOKA, MARKA, TRAKYAKA, GEKA, İKA, ANKARAKA and BEBKA) put emphasize on 'innovation' in their visions of the regional plans. Although remaining RDAs not directly focused on innovation in the regional vision, they have included innovation-related concepts such as learning region, competitiveness, knowledge, human and social capital. If the visions in the

regional plans and the regional innovation strategies are compared, it has been determined that some agencies have defined innovation visions to create regional innovation strategies, and some have produced strategies in line with their regional plans without creating an innovation vision (Table 4.7) (Özen and Baycan, 2022a).

Table 4.7 : Comparison of the visions (Author's own illustration based on the Regional Plans and the Regional Innovation Strategies documents and of the RDAs) (Özen and Baycan, 2022a).

RDAs	Vision in the Regional Plan	Innovation Vision in the Regional Innovation Strategies
İZKA	"İzmir as the centre of attraction of the Mediterranean, producing information, design and innovation" (İzmir Development Agency, 2014-2023 İzmir Regional Plan).	The regional innovation vision was not defined (İzmir Regional Innovation Strategy).
OKA	An environmentally sensitive, competitive, rapidly developing region, which has become Turkey's gateway to the Black Sea and which has raised its quality of life (Yeşilırmak Basin Development Project (Amasya, Çorum, Samsun, Tokat) Regional Development Master Plan, 2006).	"Thanks to innovative and entrepreneur society together with its competitive sectors, Middle Black Sea Region will be a pioneer region for development at national and international level in 2023 (Middle Black Sea (Amasya-Çorum-Samsun-Tokat) Regional Innovation Strategy (2013-2023))".
BAKKA	Becoming a region which has broken its dependent economic condition and raised its life quality (2014-2023 Western Black Sea Regional Plan).	Becoming a region with a high level of prosperity and quality of life which have succeeded the sustainable development with innovative and powerful sectors and competitive brandmarks in both national and international area in 2025 (Western Black Sea (Zonguldak-Karabük-Bartın) 2015-2025 Regional Innovation Strategy and Action Plan).
DOKA	The Eastern Black Sea with innovative and competitive economy, improved social welfare and quality of life by ensuring rural-urban integration, livable spaces, a sustainable environment and high human quality (TR90 Eastern Black Sea Regional Plan 2014-2023).	Eastern Black Sea Region converting its original values and unique resources into competitive and dynamic products and services. Competitive and dynamic Eastern Black Sea (TR90 Eastern Black Sea Regional Innovation Strategy and Action Plan 2015-2017).
MARKA	To be a human and knowledge-oriented and open to innovations trademark region in global competition and sustainable development, powered by its strategic location and collaboration networks, producing value with its versatile economic structure, steering the future with its rich human potential, making a difference with its quality of life (East Marmara 2014-2023 Regional Plan).	"Becoming a national technology commercialization center that can produce information and develop technology, follow global innovations and shapes itself, has specialized in automotive, machinery and electrical machines, and develops key enabling technologies (East Marmara Regional Innovation Strategy for Smart Specialization 2014-2018)."
ZAFER	A learning region that pursues ecological balance, creates added value with its knowledge-based economy, increases competitiveness and quality of life, develops in a balanced way (TR33 Regional Plan 2014-2023).	The starting point of this project is to increase the competitiveness, which is in the vision and one of the development axes determined in the 2010-2013 Regional Plan (TR33 Regional Innovation Strategy).
ORAN	"Competitive in national and international level, accessible to humanity and social capital, improved potentials, improved quality of life by improving urban and social infrastructures, accessible Central Anatolia (TR72 Region 2014-2023 Regional Plan)".	It has been defined that a "Regional innovation strategy" will be developed under the priority of Competitiveness Axis "Development of R&D and Innovation" in the TR72 Region 2014-2023 Regional Plan. Innovation committees were formed from the relevant institutions and individuals in the provinces and their opinions were taken and the innovation vision and innovation strategies were determined (Central Anatolia Development Agency TR72 Regional Innovation Strategy).
TRAKYAKA	"Thrace developing with its high added value production whilst preserving its natural and cultural values, where collaboration and innovation prevails, and where the standard of life and wellbeing is at its highest (TR21 Thrace Region 2014-2023 Regional Plan Summary)".	The regional innovation vision was not defined, and it was stated that the study was carried out to increase the innovation capacity of the region based on the regional vision in the Regional Plan (TR21 Thrace Regional Innovation Report).

Table 4.7 (continued): Comparison of the visions (Author's own illustration based on the Regional Plans and the Regional Innovation Strategies documents and of the RDAs) (Özen and Baycan, 2022a).

RDAs	Vision in the Regional Plan	Innovation Vision in the Regional Innovation Strategies
GEKA	South Aegean as a global tourism focus with a high quality of life, producing based on innovation, protecting its nature (TR32 Level 2 Region 2014-2023 Region Plan).	The regional innovation vision was not defined (South Aegean Regional Innovation and Entrepreneurship Strategy).
İKA	Silkroad as the center of attraction of the Middle East, with high quality of life, strong human capital, competitive and innovative capacity (TRC1 Gaziantep-Adıyaman-Kilis Regional Plan 2014-2023).	Center of Innovation from Tradition to Future: Silk Road (TRC1 Regional Innovation Strategy 2017-2020).
MEVKA	Becoming a region with high and balanced prosperity level, integrated with international economies, preferred by people to work, produce and live in under the principle of compassion and tolerance (Konya-Karaman 2014-2023 Region Plan).	The regional innovation vision was not defined, and it was stated that the study was carried out based on the regional vision in the Regional Plan because this document is a sub-strategy document of the 2014-2023 Regional Plan (Konya-Karaman Regional Innovation Strategy for Smart Specialization (2014-2023)).
ANKARAKA	"Presenting a High Quality of Life and Competing With the World, the Capital of Knowledge and Innovation Ankara (Ankara Regional Plan 2014-2023)".	Visions in the health, informatics and agriculture-food sectors, which are the 3 pilot sectors selected within the scope of creating a future vision within the scope of the Regional Innovation Strategy, adhering to the regional vision in the Ankara Regional Plan (Ankara Regional Innovation Strategy).
GMKA	"A South Marmara with more qualified labor, competitiveness and viability (TR22 South Marmara Regional Plan 2014-2023)".	The South Marmara Region will be a region that has achieved its development goal in 2023 with its trained human resources, educational institutions, innovation and entrepreneurship culture and competitive sectors. (South Marmara Regional Innovation Strategy and Action Plan)
BEBKA	Internationally competitive, sustainable production, innovation and life center carrying the heritage of the past from establishment to salvation into the future by adding value (Bursa, Eskişehir, Bilecik Regional Plan 2014-2023).	The regional innovation vision was not defined, and it was stated that the study was carried out based on the regional vision in the Regional Plan. The innovation and smart specialization strategy prepared for the TR41 Region has also been considered within the framework of the vision defined in the regional plan, and it adopts a more competitive, more innovative and more sustainable approach taking regional characteristics into account (TR41 Region Innovation and Smart Specialization Strategy Document).

According to the Regional Innovation Strategies of the RDAs, only 14 of the RDAs currently have a specific 'regional innovation strategy' including İZKA and OKA as the leading agencies to produce regional innovation strategies. Although some RDAs do not have specific regional innovation strategies, they have various studies on different innovation dimensions, but these studies are exclusive and far from a holistic approach. Unfortunately, some agencies are currently unable to prioritize innovation (Özen and Baycan, 2022a).

While 12 (İZKA, OKA, BAKKA, DOKA, MARKA, ZAFER, ORAN, TRAKYAKA, İKA, MEVKA, GMKA and BEBKA) of these 14 agencies produced strategies on innovation dimensions, only two (GEKA and ANKARAKA) created sectoral strategies. GEKA defined problems and recommendations regarding competitive sectors in each province, and ANKARAKA developed priority strategies, targets and action plans for five prominent sectors (Table 4.8) (Özen and Baycan, 2022a).

Table 4.8 : Comparison of main strategies in the Regional Innovation Strategy documents (Author's own illustration based on the Regional Innovation Strategies documents of the RDAs) (Özen and Baycan, 2022a).

RDAs	Innovation Strategies
İZKA	Strategic Priorities: 1. Strengthening the research and innovation infrastructure. 2. Developing institutional structure and capacity in science and technology fields. 3. Developing human resources in science and technology fields. 4. Patenting research results and supporting commercialisation. 5. Facilitating access to funding. 6. Improving the entrepreneurship and innovation ecosystem.
OKA	Strategic Goals: 1. Turning the region into an international brand mark (for) having high competitiveness in strategic sectors. 2. Becoming an attraction center for qualified labor thanks to companies with high innovation performance. 3. Hosting R&D and innovation centers of national and international companies thanks to suitable environment for innovation and incentives. 4. Increasing the comfort and the quality of life of the whole society through "Inclusive innovation" approach. Strategic Breakthroughs: 1. Increasing innovation performance of private sector and increasing entrepreneurship based on innovation. 2. Strengthening R&D and Innovation Infrastructure and Human Resources. 3. Encouraging and disseminating social innovation and innovation in public services.
BAKKA	Strategic Goals: 1. To become the locomotive of regional development of priority sectors of Western Black Sea Region through the R&D and innovation. 2. Converting of regional economy into an innovation and information based economy that successfully executes the information and technology transfer from universities to the firms and public sector. 3. Becoming a center of attraction for qualified investments with the creation of a dynamic innovation ecosystem. 4. Establishment of a culture using innovation as a driving force in social development and therefore providing the increase of the prosperity and the quality of life. Strategic Breakthroughs: 1. Ensuring Awareness and Consensus in Innovation Based Development. 2. Strengthening the Information and Technology Generation and Transfer Capabilities of universities. 3. Increasing the quantity and quality of R&D and innovation activities in priority sectors.
DOKA	Development Axes: 1. Creating innovation culture. 2. Strengthening of regional innovation systems. 3. Increasing innovative output.
MARKA	Strategic Priorities: 1. Focusing on Prioritized Areas. 2. Innovation Infrastructure. 3. Cooperation and Innovation Culture. 4. Financing. 5. Promotion and Dissemination.
ZAFER	Strategic Priorities: 1. Improving human resources. 2. Strengthening the research and innovation infrastructure. 3. Strengthening the institutional structure. 4. Improving the market conditions. 5. Improving social capital and supporting networks.
ORAN	Strategic Priorities: 1. Increasing the Utilization Rate of Supports, Facilitating Access to Finance and Improving Institutional Capacity. 2. Increasing Cooperation Between Institutions. 3. Increasing the Technology Level. 4. Improving Research Infrastructure. 5. Improving Intellectual Property Rights. 6. Introducing, Disseminating and Updating the Regional Innovation Strategy.
TRAKYAKA	Strategic Goals: 1. Development of entrepreneurship and innovation ecosystem. 2: Strengthening the research and innovation infrastructure. 3: Support the patenting and commercialization of research results.

Table 4.8 (continued): Comparison of main strategies in the Regional Innovation Strategy documents (Author's own illustration based on the Regional Innovation Strategies documents of the RDAs) (Özen and Baycan, 2022a).

RDAs	Innovation Strategies
GEKA	1. Problems and recommendations regarding competitive sectors in Aydın 1.1 Dried Fruit and Nuts (Figs) Sector. 1.2 Olive and Olive Oil Sector. 1.3 Milk and Dairy Industry Sector. 1.4 Food and Agricultural Machinery Industry. 2. Problems and recommendations regarding competitive sectors in Denizli 2.1 Milk and Dairy Industry Sector. 2.2 Fruit-Vegetable and Medicinal-Aromatic Plants Sector. 2.3 Cable Sector. 2.4 Textile Sector. 3. Problems and recommendations regarding competitive sectors in Muğla 3.1. Aquaculture Sector. 3.2. Marble Sector. 3.3. Yacht and Boat Manufacturing Sector. 3.4. Beekeeping and Honey Products Sector.
İKA	Priority Axes: 1. Developing innovation awareness, capacity and willingness. 2. Increasing accessibility to innovation support elements. 3. Increasing cooperation among innovation ecosystem members.
MEVKA	Strategic Goals: 1. Developing R&D and innovation culture. 2. Improving the infrastructure. 3. Strengthening human capital. 4. Strengthening collaborations on the basis of smart specialization. 5. Increasing access to financial resources.
ANKARAKA	Priority strategies for five prominent sectors: IT Sector 1. Use of new technologies in the IT sector 2. Generalizing the use of information technologies in the sectors Medicine and Medical Devices Sector 1. Development of export in the medicine and medical device sector 2. Advanced technology high value-added products 3. R&D and development of production ecosystem Construction Machinery Sector 1. Creating the brand value of "Turkish Construction Machinery" and introducing to the world 2. Development of domestic production in critical parts 3. Qualified engineer and interim staff training Defence and Aviation Sector 1. Increasing export capacity in the defence and aviation sector 2. Production capacity improvement 3. Development of human resources competences Agriculture and Food Sector 1. Realizing the digital transformation in the agriculture and food industry in Ankara / creating a high added value and efficient sector focusing on advanced technology and agricultural industry and biotechnology 2. Increasing the share of special agricultural products of Ankara in foreign trade
GMKA	Strategic Priorities: 1. Increasing the R&D and Innovation Capacity and Performance of the Private Sector. 2. Development of Entrepreneurship and Innovation Culture in the Region. 3. Strengthening the Education, Research and Innovation Infrastructure in the Region.
BEBKA	Eight intervention areas forming the TR41 Region Smart Specialization Strategy Action Plan: 1. Supporting capacity building and collaborations in R&D centers 2. Development of support and coordination opportunities within the scope of localization 3. Developing the capacity to create and manage a common platform. 4. Increasing the transitivity between industry and university 5. Supporting capacity building in firms and developing human resources 6. Ensuring the internalization of open innovation concept by firms and supporting access to open innovation platforms 7. Development of firms in the position of supplier of main industrial firms 8. Developing the role and supports of the Development Agency in the smart specialization process

If the regional innovation strategies of these 14 agencies are evaluated, they are similarly focusing on strategies as (Özen and Baycan, 2022a);

- Creating and developing the research and innovation culture,
- Strengthening the research and innovation infrastructure,
- Developing the institutional structure,
- Developing human resources,
- Increasing the accessibility to various financial resources (funding, support programmes etc.),
- Improving effective communication, cooperation and coordination,
- Developing the entrepreneurship and innovation ecosystem,
- Organizing and increasing the awareness activities,
- Establishing and developing clusters,
- Focusing on specialized / priority / prominent / strategic sectors.
- Encouraging social innovation,
- Increasing IPR and commercialization.

When the agency studies conducted after the regional innovation strategies are examined, it is seen that the agencies that produced the strategies in the past years have made substantial headway.

As the next step, the support programs, reports, publications, strategies and researches as thematic and sector analyses produced by the RDAs were examined in detail in order to understand whether the implementation of the regional innovation strategies could be realized or not. Although producing and implementing dates of the regional innovation strategies of the RDAs differ from one another, RDAs have studies focusing on the local production and prominent sectors of the regions'. The main reasons why regions vary in success of the regional innovation strategies are related to the diversities in the dynamics/features, local production, sectoral specialization and the R&D, knowledge and innovation potentials of the regions' (Özen and Baycan, 2022a).

After the regional innovation strategy, it has been determined that İZKA's works and financial support programs are focused mainly on knowledge, entrepreneurship, Information Communication Technologies, renewable energy, small and medium-sized enterprises (SMEs), small scale industrial zones, clusters and prominent sectors especially environmental technologies. The innovation success stories, the measurement of innovation indicators, the production of innovation ecosystem analysis and monitoring reports, and the creation of evaluation reports of financial support programs after the regional innovation strategies make İZKA successful at the achiving the goals (Figure 4.12) (Özen and Baycan, 2022a).

OKA's works and financial support programs mainly consider entrepreneurship, foreign trade, exports and imports, market, competitiveness, SMEs, OIZs, crossborder collaboration, public-university-industry collaboration, youth employment, vocational and technical education, social innovation, R&D centers, Regional Business Incubation Centers Network, and geographically indicated products. Also OKA produced many pre-feasibility reports in various sectors (Figure 4.12). Like İZKA, the creation of the audit and evaluation reports of the financial support programs, the production of regional innovation strategy activities and the mid-term evaluation report of the regional innovation strategy make OKA successful, too. (Özen and Baycan, 2022a).

BAKKA focuses on prominent sectors, migration, competitiveness, exports, OIZs, SMEs, technology centers, clusters, local values, geographical indications products, and labor market. There are many pre-feasibility reports in various sectors. BAKKA produced evaluation reports after the support programmes. For Bartın province, BAKKA has 'R&D and innovation potential' report and R&D, innovation and entrepreneurship ecosystem analysis (Figure 4.13) (Özen and Baycan, 2022a).

DOKA's works and financial support programs are related mainly on clusters, SMEs, alternative financing sources, local products, women and youth entrepreneurship, geographical indications, foreign trade and target market. As previous RDAs, DOKA has many pre-feasibility reports in various sectors based on agro-industries. There are evaluation and impact analysis reports after the financial support programs (Figure 4.13) (Özen and Baycan, 2022a).

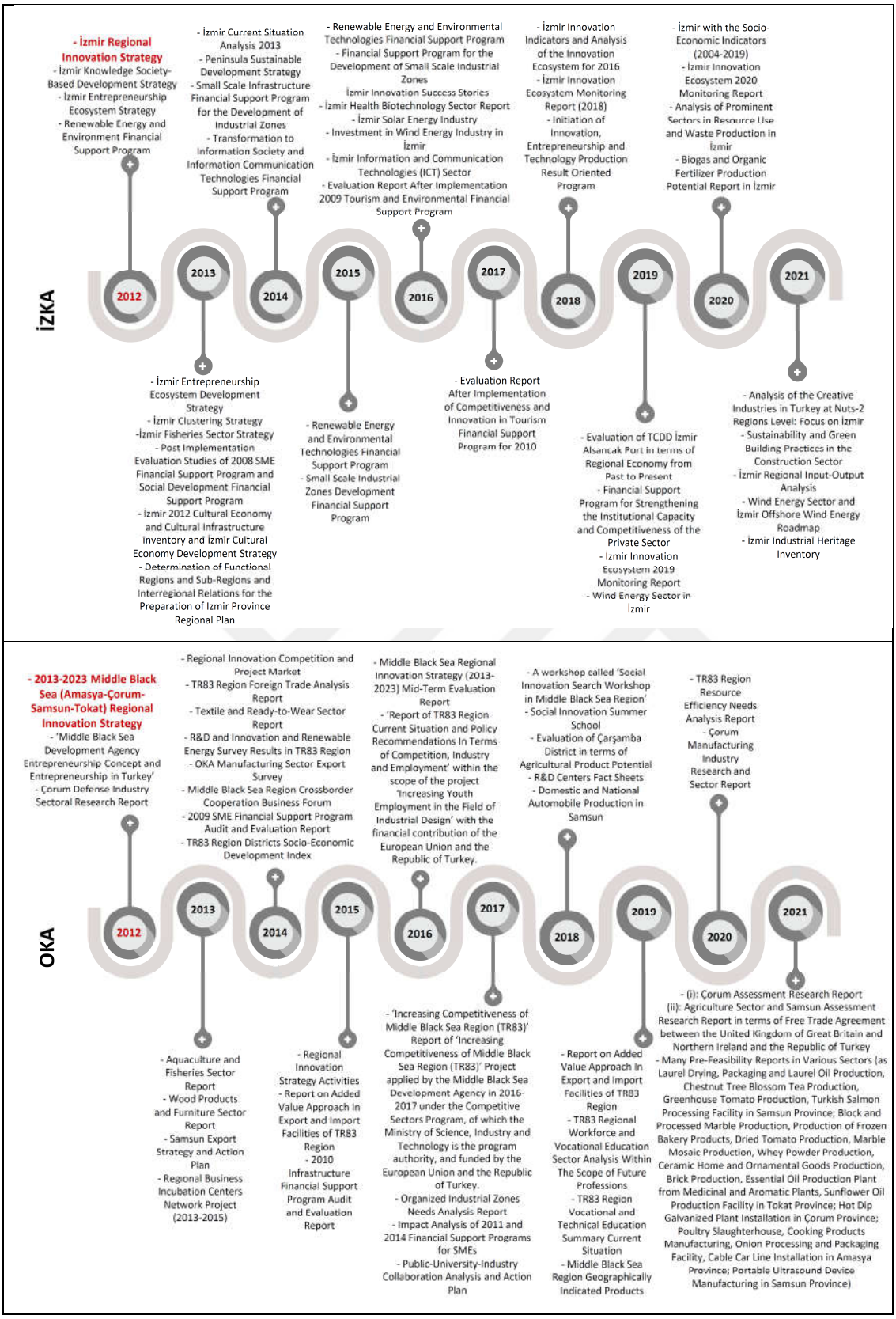


Figure 4.12 : Studies of İZKA and OKA after their regional innovation strategies (Author's own illustration based on the work programs, action plans, support programs, reports, publications of strategies and researches as thematic and sector analyses of the RDAs) (Özen and Baycan, 2022a).

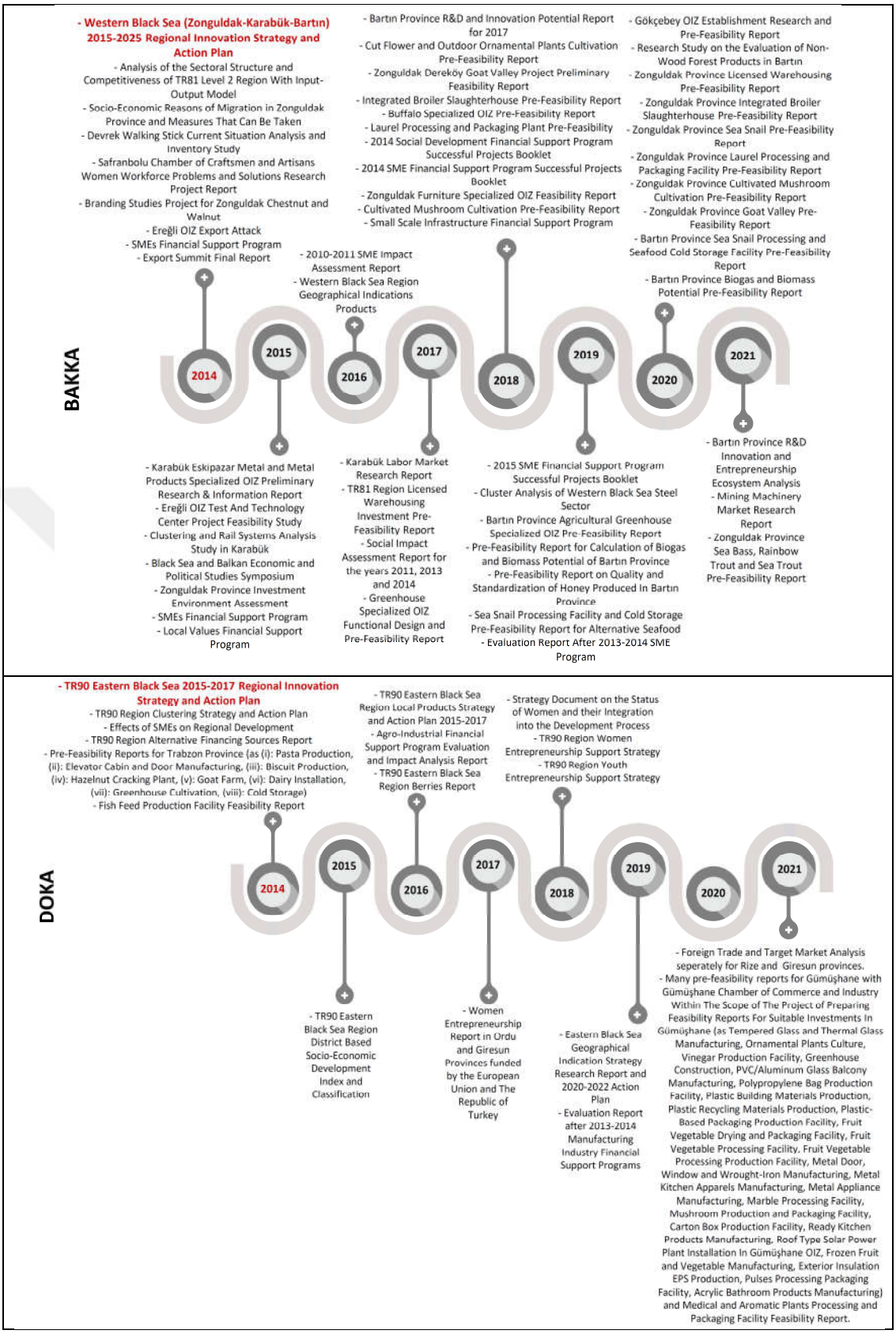


Figure 4.13 : Studies of BAKKA and DOKA after their regional innovation strategies (Author's own illustration based on the work programs, action plans, support programs, reports, publications of strategies and researches as thematic and sector analyses of the RDAs) (Özen and Baycan, 2022a).

MARKA focuses on immigration, OIZs, logistic centers, technology transfer, informatics valley, entrepreneurship, vocational education, R&D centers, SMEs, and various prominent sectors mainly informatics and manifacturing sectors. The RDA provides innovation mentorship to the SMEs (Figure 4.14) (Özen and Baycan, 2022a).

ZAFER works on exports, branding and marketing, industrial inventory, SMEs, clusters, professional competencies, entrepreneurship, vocational education, competitiveness, product diversity, local products, logistic centers, patent and trademark capacities, OIZs, and various prominent sectors mainly on traditional arts, gastronomy, machinery, mining, agriculture, environment and energy (Figure 4.14) (Özen and Baycan, 2022a).

ORAN deals with entrepreneurship, logistic centers, competitiveness, industrial symbiosis, renewable energy, vocational education, clusters, digital marketing, and sectors mainly as furniture industry, medical services, energy and agriculture. There are many pre-feasibility reports based on production and investment related to the prominent sectors. There is also a special research report on angel investments (Figure 4.15) (Özen and Baycan, 2022a).

TRAKYAKA's works focus on issues such as competitiveness, industrial symbiosis, entrepreneurship, career services, job market, vocational education, maker training, geographical indications, and the RDA has sectoral reports mainly based on agriculture and livestock. In order to support and popularize innovation oriented entrepreneurship, a program also has been carried out since 2015 by TRAKYAKA (Figure 4.15) (Özen and Baycan, 2022a).

GEKA works related to entrepreneurship, cooperatives, manufacturing industry inventory, financial literacy, OIZs, R&D, and strategic sectors such as agriculture and livestock (Figure 4.16) (Özen and Baycan, 2022a).

İKA focuses on entrepreneurship, agricultural competitiveness, target market, migration policies, empowerment and cooperatives of women, and various sectors especially agriculture (Figure 4.16). (Özen and Baycan, 2022a).

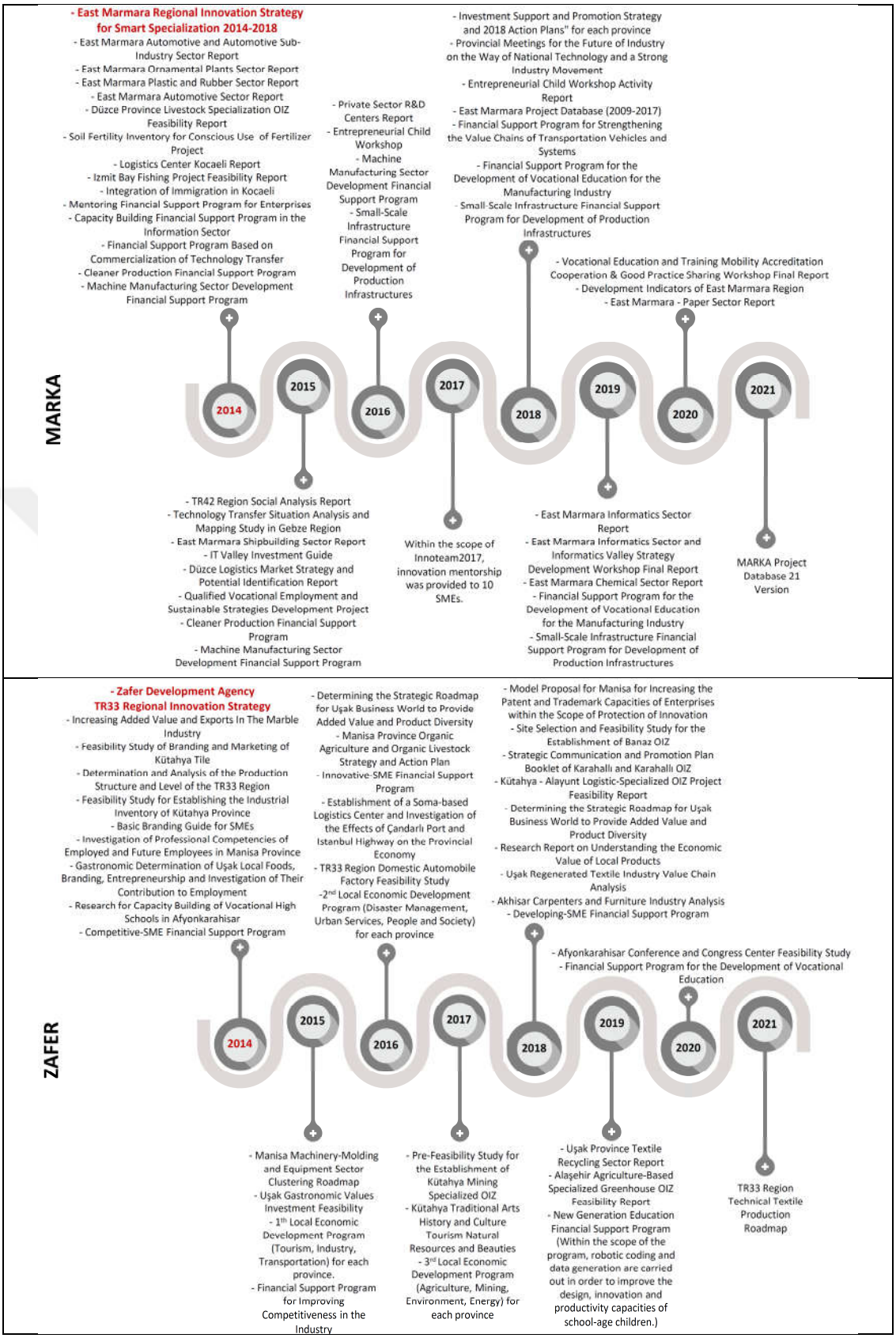


Figure 4.14 : Studies of MARKA and ZAFER after their regional innovation strategies (Author's own illustration based on the work programs, action plans, support programs, reports, publications of strategies and researches as thematic and sector analyses of the RDAs) (Özen and Baycan, 2022a).

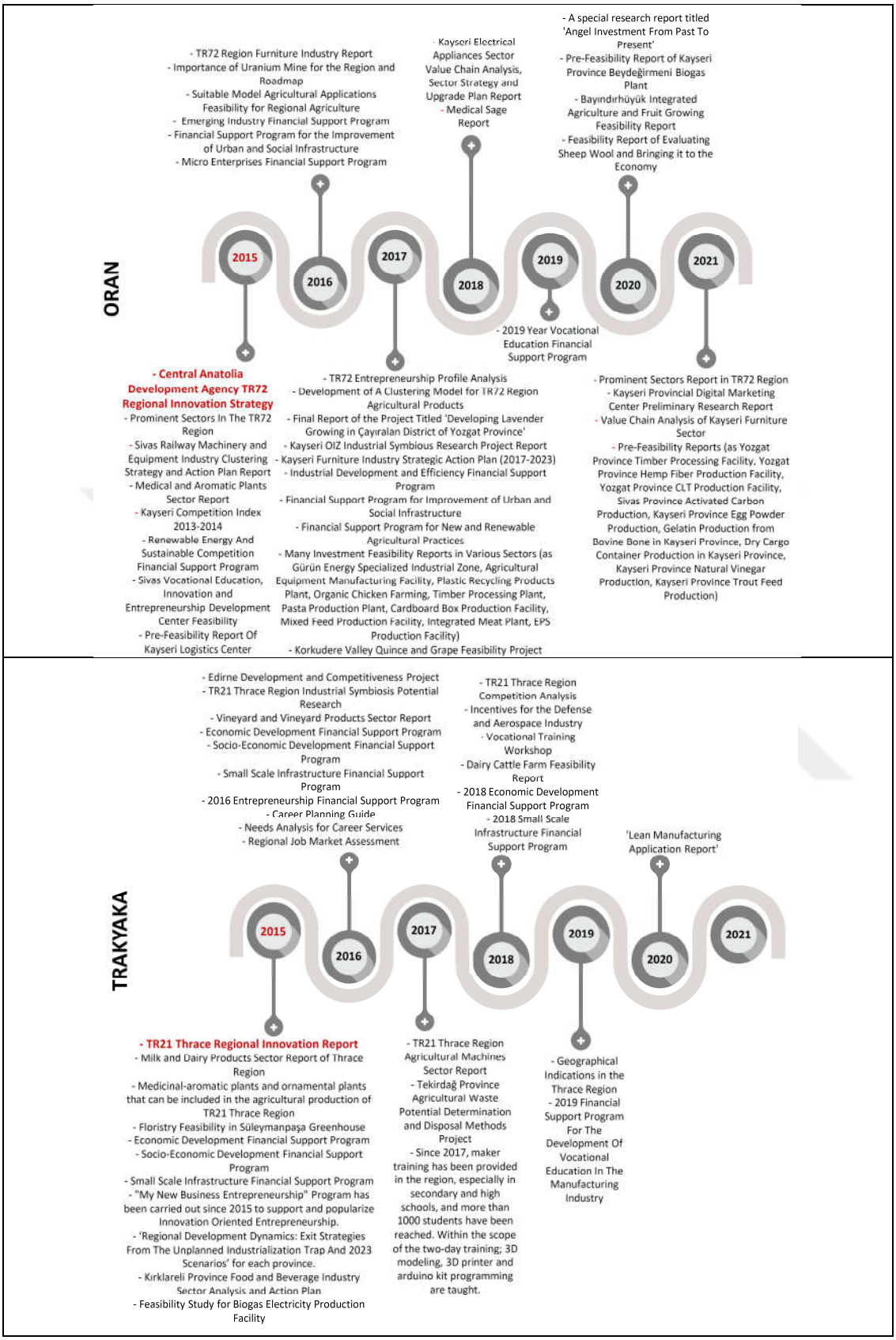


Figure 4.15 : Studies of ORAN and TRAKYAKA after their regional innovation strategies (Author's own illustration based on the work programs, action plans, support programs, reports, publications of strategies and researches as thematic and sector analyses of the RDAs) (Özen and Baycan, 2022a).

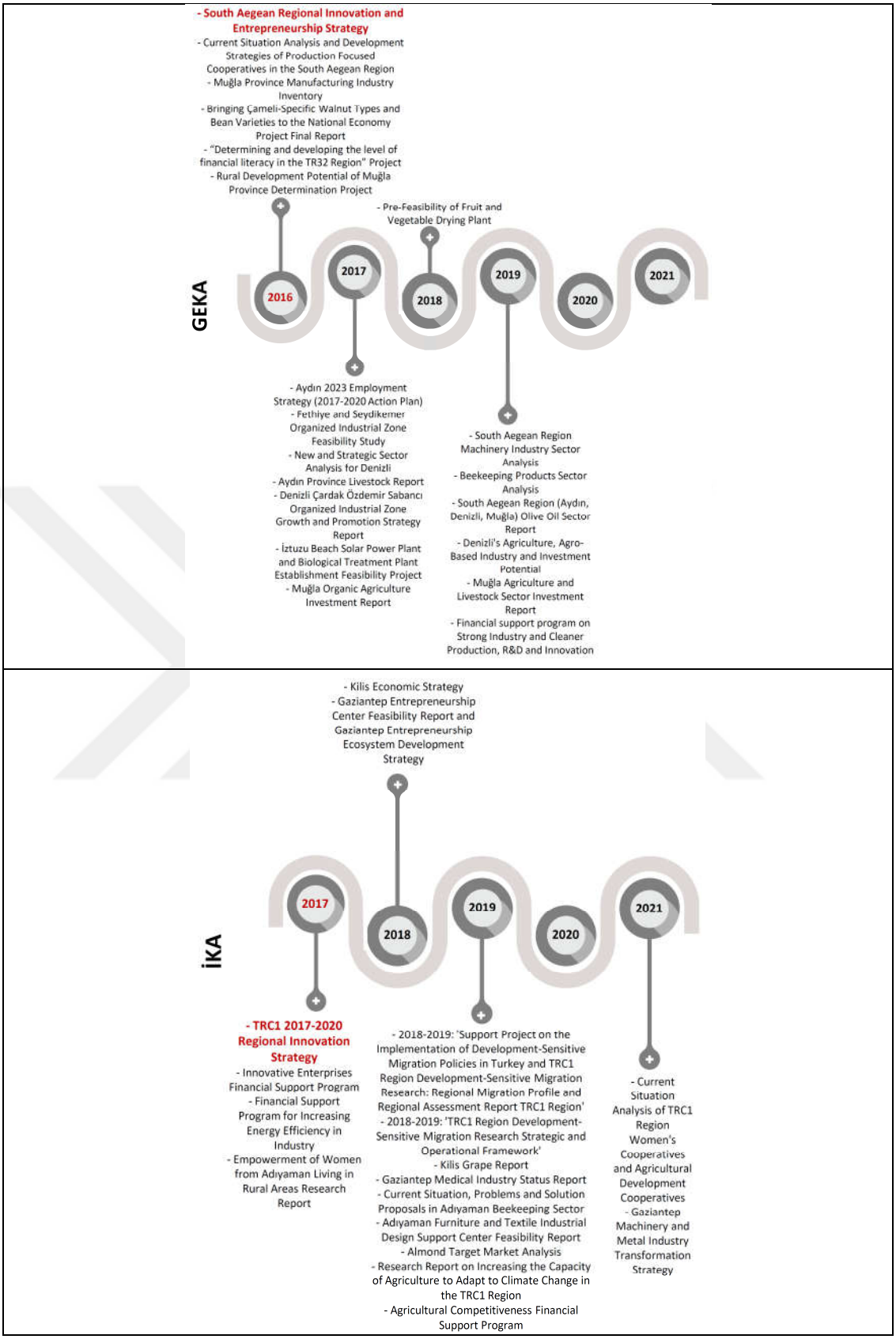


Figure 4.16 : Studies of GEKA and İKA after their regional innovation strategies (Author's own illustration based on the work programs, action plans, support programs, reports, publications of strategies and researches as thematic and sector analyses of the RDAs) (Özen and Baycan, 2022a).

MEVKA has entrepreneurship ecosystem development program. The RDA has some pre-feasibility reports related to various sectors. MEVKA also produced impact assessment reports of previous programs (Figure 4.17) (Özen and Baycan, 2022a).

ANKARAKA focuses on market, social entrepreneurship for youth program, 'product commercialization and development of vocational education in the field of advanced technology', social entrepreneurship, and sectors as IT Sector, Medicine and Medical Devices Sector, Construction Machinery Sector, Defence and Aviation Sector and Agriculture and Food Sector (Figure 4.17) (Özen and Baycan, 2022a).

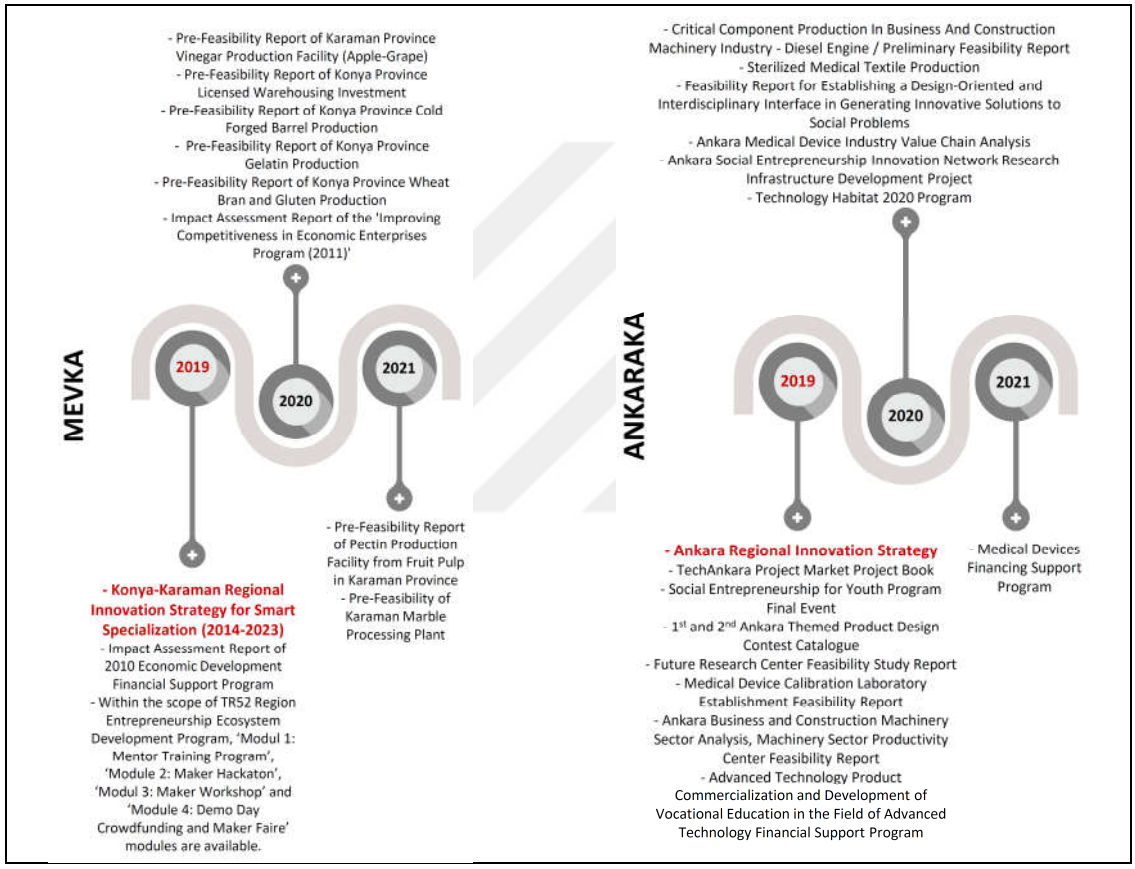


Figure 4.17 : Studies of MEVKA and ANKARAKA after their regional innovation strategies (Author's own illustration based on the work programs, action plans, support programs, reports, publications of strategies and researches as thematic and sector analyses of the RDAs) (Özen and Baycan, 2022a).

GMKA has specific strategy documents as 'Defense Industry Potential & R&D and Innovation Strategy' and 'Renewable Energy Sector Analysis & R&D and Innovation Strategy' in addition to regional innovation strategy. The RDA also is interested in vocational education analysis and strategy study. GMKA deals with enterprises and cooperatives (Figure 4.18) (Özen and Baycan, 2022a).

BEBKA has innovation ecosystem analysis, and many pre-feasibility reports for various sectors. The RDA also has reports of 'industrial symbious project' and 'R&D centers' for Eskişehir province (Figure 4.18) (Özen and Baycan, 2022a).

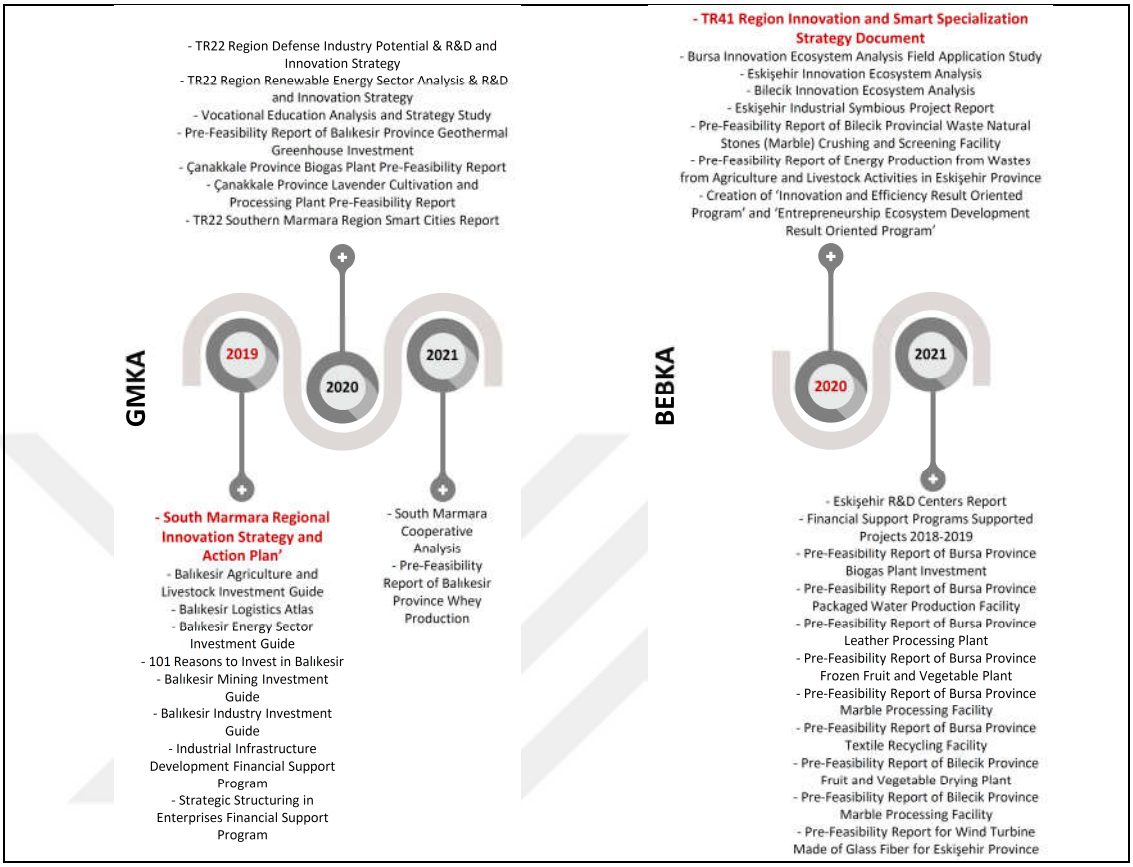


Figure 4.18 : Studies of GMKA and BEBKA after their regional innovation strategies (Author's own illustration based on the work programs, action plans, support programs, reports, publications of strategies and researches as thematic and sector analyses of the RDAs) (Özen and Baycan, 2022a).

In order to evaluate the Regional Innovation System of Turkey by comparing the regional innovation strategies of RDAs, it was seen that only 14 RDAs have regional innovation strategies. When the visions in the regional plans of these are examined; it is observed that most of these 14 RDAs focused on 'innovation' in their visions of the regional plans, however some RDAs did not put emphasize directly on innovation in the regional vision but included some innovation-related concepts. In order to produce regional innovation strategies, some of the RDAs have created innovation visions, while the others made progresses in innovation strategies in line with their regional plans without creating an innovation vision. The paper states that the visions defined in the regional plans and regional innovation strategies of the RDAs differ in terms of regional dynamics. (Özen and Baycan, 2022a).

Comparative evaluation reveals that some agencies have created a specific ‘regional innovation strategy’ whereas the others havFigure Be not yet developed specific regional innovation strategies and have various studies on different innovation dimensions, but these studies are exclusive and far from a holistic approach. The comparative evaluation also reveals that regional innovation strategies of the RDAs differ in terms of regional priorities. Nevertheless, similar strategies created by the RDAs address developing the: (i) research and innovation culture; (ii) research and innovation infrastructure; (iii) institutional structure; (iv) human resources; (v) financial resources; (vi) effective communication, cooperation and coordination; (vii) entrepreneurship and innovation ecosystem; (viii) awareness of innovation activities (ix) clusters, (x) specialized / priority / prominent / strategic sectors, (xi) social innovation and (xii) IPR and commercialization etc. (Özen and Baycan, 2022a).

Although there are some efforts to improve the regional innovation systems by the RDAs, the comparative evaluation demonstrates that RDAs have not yet reached the desired level of producing a holistic regional innovation strategy and they should be more effective as a key actor in the regional innovation systems. (Özen and Baycan, 2022a).

Most of the agencies create researches, publications, action plans, work plans and support programs to realize their innovation strategies and generally give priorities to innovation in the financial support programs. In addition, İZKA and OKA, as the leading agencies, create ‘innovation ecosystem analysis, evaluation and monitoring reports’ in certain years to reveal how much they have achieved their innovation strategies. (Özen and Baycan, 2022a).

On the one hand, the success of produced innovation strategies depends on the future work of these RDAs. On the other hand, in order to be successful, it is essential to determine how the strategies will be reflected and integrated with the spatial patterns.

Regional innovation system of Turkey will be successful if these efforts can be evaluated and implemented with (i) a broad participation of actors including the representatives of relevant public and private sector, NGOs, universities and national institutions that are effective in regional innovation system and (ii) an integrated interactive innovation process including a defined realistic regional vision, strategic goals, strategic breakthroughs and action plans. If the determination of how these

strategies will be reflected and integrated into spatial patterns is not considered as an important issue, the strategies will remain only in theory (Özen and Baycan, 2022a).

Designing and developing regional innovation strategies is not enough to establish and manage an effective regional innovation system. It is important that these strategies are carried out with the responsible stakeholders within the specified time periods. Potential factors that would limit the implementation of the strategies should be determined in advance and minimized. Furthermore, the implementation of the strategies, monitoring, evaluation and performance measurement gain importance in innovation processes (Özen and Baycan, 2022a).

4.2 Evaluation of the Chapter

An evaluation of the chapter is considered as the positive and negative impacts at the regional scale are listed as follows:

* The positive aspects can be listed as follows:

- Ensuring the existence of universities in each region, each with "a university in each province" policy and rapidly establishing of many state and mostly foundation universities after "a university in each province" policy with the law no 5467 in 1st March 2006.
- The increase in R&D centers after 2016 with the general communique within the framework of the legal regulation.
- The deficiency in the law numbered 5746 is eliminated with the law number 6676 dated February 16, 2016 and the phrase 'design' is included in the first sub-article of the Article 1 of the law and thus the design gains a legal dimension. With this legal dimension, the fact that design centers started to be established in 2016 is important for innovation.
- In 2012, İZKA and OKA, two of the RDAs, created the regional innovation strategy documents for their regions and were a model for other RDAs in this regard (Figure 4.11).
- Regional Innovation Systems approach have only been on the agenda in Turkey since the 2000s with EU Cohesion Policy.

- Accepting the NUTS classification and defined its new regions compatible to NUTS in 2002.
- Deciding to establish the DAs with a result of the Law on the Establishment, Coordination and Duties of Development Agencies (2006).
- Mersin and Eskişehir RIS Projects within the scope of the IRE Network in 2005 (Metin, 2010).
- Preparation of the regional plans in 24 of the 26 NUTS II regions under the coordination of the DAs in the 2011 Progress Report (European Commission, 2011b: p. 83)

* The negative aspects can be listed as follows:

- Turkey has given late importance to the regional innovation system approach.
- The production of regional innovation strategy documents in only two regional development agencies (İZKA and OKA) in 2012 (Figure 4.11).
- Existence of planned TDZs that could not be completed in a long time.
- Agglomeration of innovation-oriented institutions and centers, especially in the largest metropolitan regions such as (i) universities and institutes of technology: İstanbul (61), Ankara (21), İzmir (10) (Figure 4.1); (ii) TDZs: İstanbul (11), Ankara (10), Kocaeli (5), İzmir (4) (Figure 4.2); (iii) R&D Centers: İstanbul (414), Bursa (129), Kocaeli (127), Ankara (115) and İzmir (88) (Figure 4.3); (iv) Design Centers: İstanbul (167), Ankara (41), İzmir (29), Bursa (26) (Figure 4.5).
- Firms in technological development zones, R&D centers and Design centers are agglomerated only in certain sectors such as (i) the majority of the firms in TDZs are on the computer programming activities (Table 4.3); (ii) R&D centers are on the 'machinery and equipment manufacturing', 'automotive sub-industry', 'software', 'computer and communication technologies', 'electric-electronic', 'textile' and 'chemistry' sectors (Figure 4.4); (iii) design centers focus on the ‘textile’, ‘engineering/architectural activities’, ‘manufacturing industry’ and ‘machinery and equipment manufacturing’ sectors (Figure 4.6).

- There are too many regions without R&D (32 regions at NUTS-3 level) (Figure 4.3) and design centers (56 regions at NUTS-3 level) (Figure 4.5).
- Regional institutional structure for innovation is very lacking in the east of the country.
- There are very few science centers, especially those within the scope of the 4003 Science Center Establishment Support Program.
- Although İZKA and OKA created the regional innovation strategy documents for their regions and were a model for other RDAs in this regard, it is a problem that a limited number of development agencies follow these agencies and create their innovation strategies but could not spread them to the general.

In short, although Turkey started to attach importance to regional innovation systems and tried to make efforts in this regard after 2000 (Figure 4.19), it is not yet at the desired level, especially in terms of legal, administrative and institutional framework. Although some metropolitan regions come to the fore in terms of institutional structuring, it is obvious that especially the east of the country is insufficient in this regard and that regional structuring has not spread throughout the country.

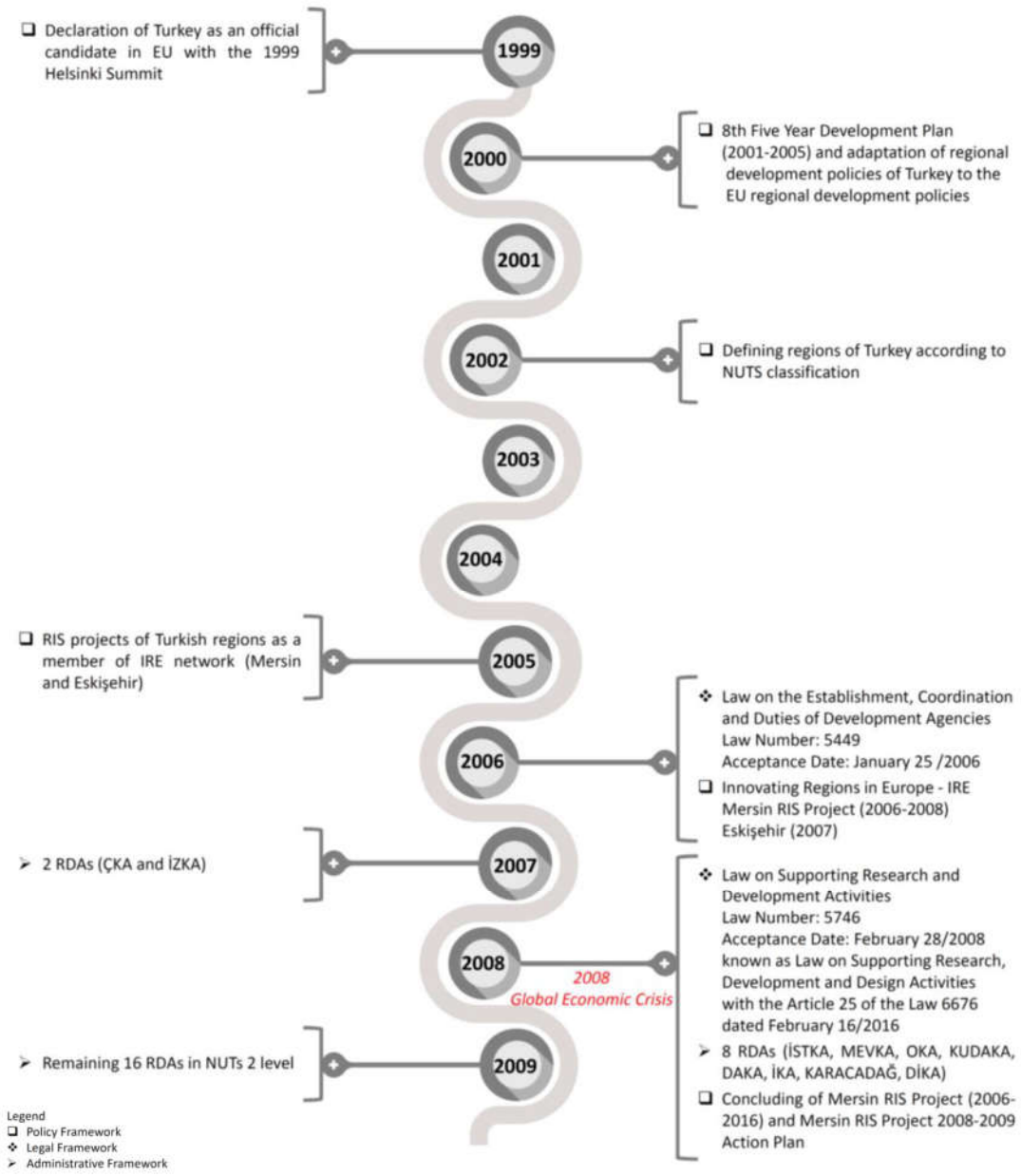


Figure 4.19 : Milestones of historical development process of regional innovation systems in Turkey (Özen and Baycan, 2022a).

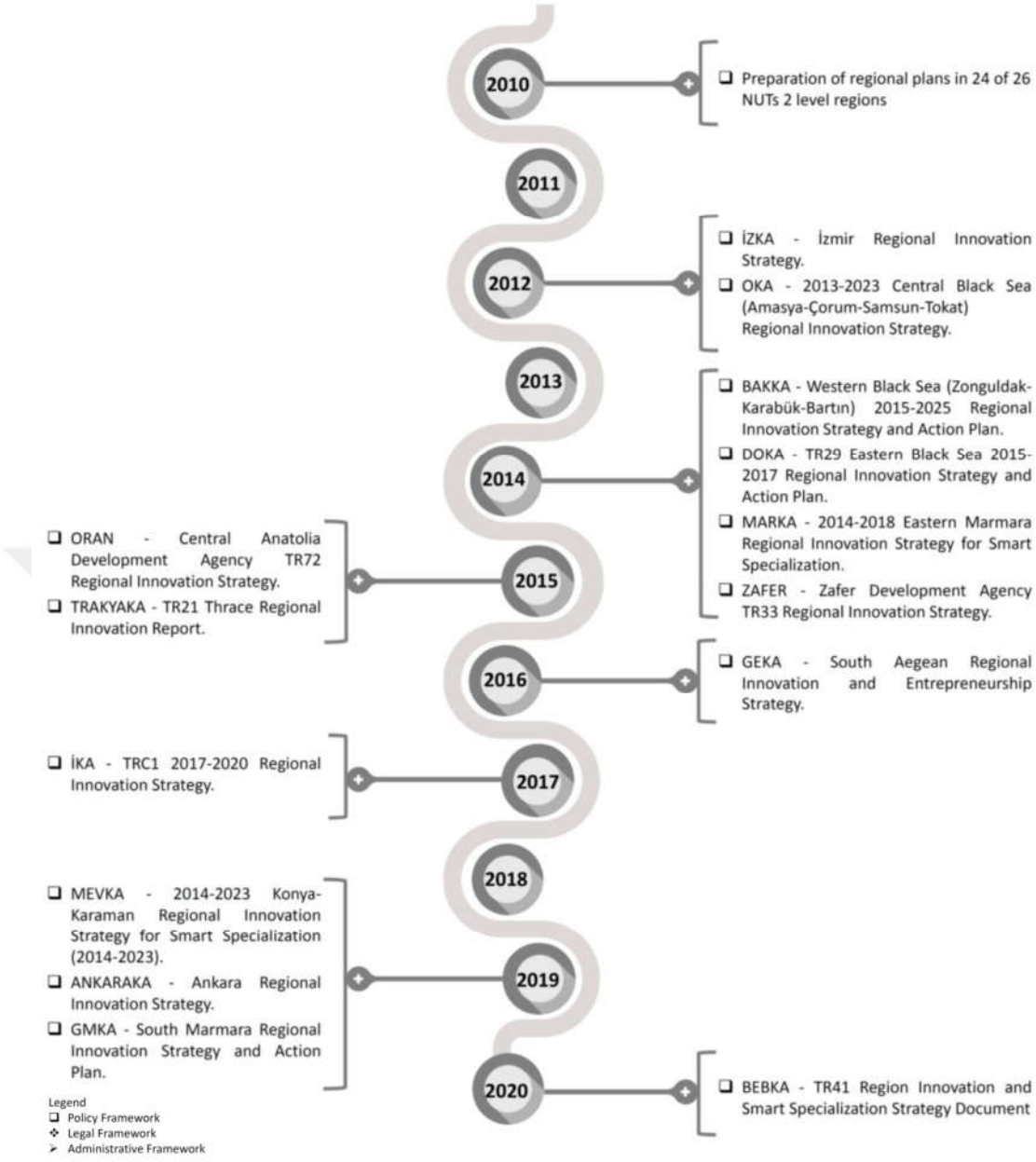


Figure 4.19 (continued): Milestones of historical development process of regional innovation systems in Turkey (Özen and Baycan, 2022a).

5. EMPIRICAL FINDINGS ON NATIONAL AND REGIONAL INNOVATION PERFORMANCES OF TURKEY

As mentioned in Section 1: 'Introduction', this thesis aims at measuring and mapping the regional innovation performance in Turkey.

Before measuring the innovation performances of the regions, first the general innovation structure of the country in national and international level should be analysed.

Therefore this section is structured by the supportive question as follows: "How is Turkey in terms of innovation performance at international, national and regional scales?"

First, for the evaluation of Turkey's overall innovation performance profile at the international level, a comparison with the EU is made over the EIS index and the indicators of this index.

Secondly, in order to analyse the innovation performance at national level, an evaluation is made based on the number of some indicators such as utility model, trademark, patent (local patents) and design gathered from the TÜRKPATENT.

Following the innovation performance of Turkey's national and international, as a next step, the regions of Turkey are examined in terms of regional innovation performance.

In order to have a general idea of the regions, descriptive statistics, normality tests, histogram and boxplot graphics are used. The purpose of using these statistical tools as the methodology is to show the shape of the distribution, the central tendency and the extent of dispersion of the variables.

After having a general idea of regions, it is necessary to measure the regional innovation performance and understand how the regions vary from each other. Markov Chains are used to classify the regions' innovation performances between 2000 and 2017. Two different methods are applied to Markov Chains. While addressing 81 regions/provinces at NUTS-3 Level, this chapter aims to reveal the

patterns of regional innovation performance and to evaluate which regions/provinces are more or less innovative by consecutive Markov Chains. This study analyzes changes in the regional innovation performances in Turkey from 2000 to 2017. It aims at demonstrating in which issues the differences occur within the regions and at interregional levels with respect to innovation performances, and making a dynamic analysis of the diversities and changes of innovation performances of the regions.

The EU measures the national innovation performance of Turkey based on the EIS but does not evaluate the regions of Turkey in this regard. Hence, fulfilling the need in this respect, the present study analyses innovation performances of the regions of Turkey based on the performance grouping of the EU and defines four different performance levels. From the first to the last, these groups are defined as innovation leaders, strong innovators, moderate innovators and modest innovators. Within the scope of this thesis, a dynamic analysis of inter-regional differences and the transitions of innovation performance of regions from one state to another is carried out by using the successive Markov Chains method.

The studies about regional innovation system and performance analysis using Markov Chains are evaluated. This section deals with preliminary explanations of empirical work, briefly describing the purpose, scope, method and data (variables) of the study, and defines four different innovation performance groups involving three different time periods and different states depending on the method.

Then, the results of Markov Chains enabling detail analyses of changes in innovation performances of the regions in Turkey are provided in the text. After that, the innovation performance of the regions in Turkey is briefly assessed and the results of the analyses are discussed.

Finally, panel data analysis is found appropriate for questioning the determinants of the differences, varieties and transitions of the innovation performances of the regions. While the panel data analysis is performed, the effect of the previous year on the next time period is examined.

The reasons for choosing Markov Chain and Panel Data Analysis will be explained in detail in the following sections (Section 5.3 and 5.4).

5.1 Innovation Performance Profile of Turkey

5.1.1 Turkey's overall innovation performance profile at the international level: A comparison with the EU

A comparison with the EU is made over the EIS innovation index and the indicators that are previously described in detail in Chapter 2 (Figure 2.8).

Before the evaluation of the current national innovation performance of Turkey, it is important to mention about the data availability for Turkey. Only 24 of the 27 indicators are available for Turkey; the missing data are 'Venture capital expenditures', 'Enterprises providing ICT training' and 'Employment fast-growing enterprises' (European Commission, 2018b).

According to the EIS index, Turkey was placed in the "modest innovators" group until 2016 and has progressed its performance from modest to moderate innovators group since 2016. Unfortunately, the country could not recently sustain its position and fell back to the group of emerging countries. Even though Turkey's innovation index is far below the EU average, its innovation growth rate is much above the EU average.

This heading seeks to answer these following supportive questions:

- How do Turkey and EU differentiate?
- Even though Turkey's innovation index is far below the EU average, its innovation growth rate is much above the EU average. What makes the growth rate of Turkey higher than EU's? 'Although the growth rate is much above than th EU average, what must be done for catching up to the EU?'
- What are the challenges of Turkey in innovation?

- **Evaluation of the Summary Innovation Index**

Turkey as a modest country: According to the EIS index, Turkey was placed in the "modest innovators" group until 2016. Even though Turkey's innovation index is far below the EU average, its innovation growth rate is much above the EU average (Figure 5.1). In recent years, Turkey has made strong efforts to strengthen key institutions of the NIS. Public expenditures on R&D and innovation support programmes have tripled over the last 10 years. However, how effectively R&D expenditures are being translated into innovation and productivity gains is still a key issue.

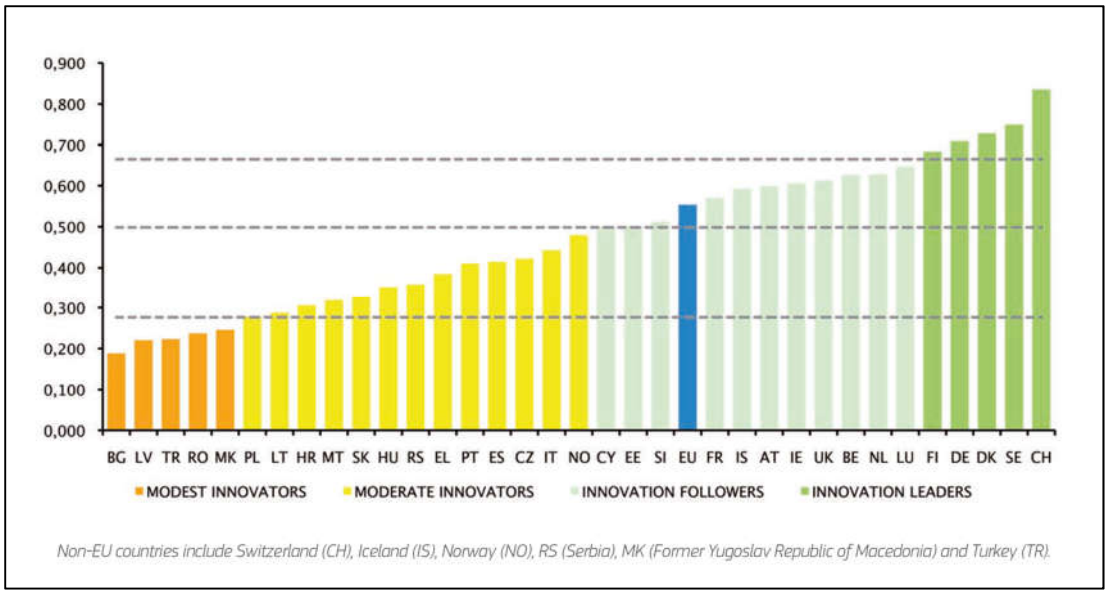


Figure 5.1 : Innovation performance in Europe (European Commission, 2014b).

According to the development of innovation index of Turkey over time and its development relative to the EU average, "Turkey's growth rate at 3.20% is also above that of the EU (1.66%) (European Commission, 2014b)" (Table 5.1 and Figure 5.2). "Turkish innovation performance has been improving at a steady rate between 2006 and 2013. Turkey is catching up to the EU: its relative performance has improved from 36% in 2006 to 40% in 2013 (European Commission, 2014b)".

Table 5.1 : Summary Innovation Index (SII) time series (European Commission, 2014b).

Country/Years	2006	2007	2008	2009	2010	2011	2012	2013	Growth Rate
EU	0.493	0.506	0.504	0.516	0.531	0.532	0.545	0.554	1.66%
TR	0.179	0.184	0.194	0.199	0.203	0.210	0.221	0.224	3.21%

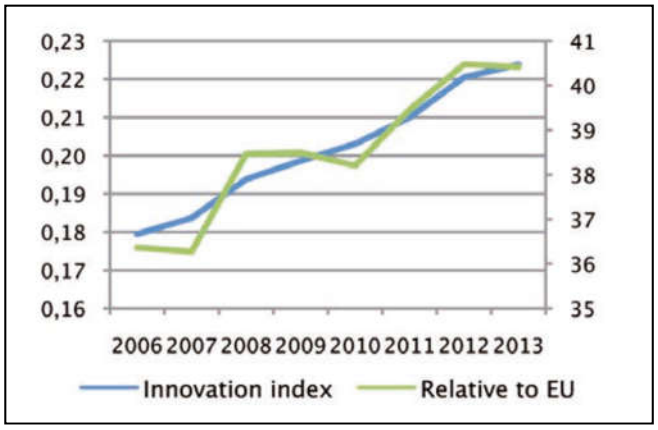


Figure 5.2 : Innovation performance of Turkey (European Commission, 2014b).

Figure 5.3 "provides a comparison by indicator with that of the EU highlighting relatively strong and weak indicators, i.e. it shows if a country is under-or

outperforming the EU average on an individual indicator. Also it shows the growth performance for each indicator highlighting which indicators have been driving a country's innovation performance change over time (European Commission, 2014b)".

Turkey performed "strongly in the Contribution of medium-high-tech product exports to the trade balance and Sales due to new innovative products (European Commission, 2014b)". In addition, it was "well below the average of the EU for almost all indicators except for SMEs with Marketing and/or Organisational innovations and Sales share of new innovations. Relative strong weaknesses are in License and patent revenues from abroad, Community designs, Community trademarks, Non-EU doctorate students and Public-private scientific co-publications (European Commission, 2014b) (Figure 5.3)". Most indicators are positively growing in Turkey. High growth is observed for Community trademarks, PCT patent applications in societal challenges and New doctorates graduates (Figure 5.3). "The few declines in growth are minor, with the largest one in community designs (European Commission, 2014b)". Turkey has efforts to catch up the EU according to growth rate of the indicators which are below the EU average.

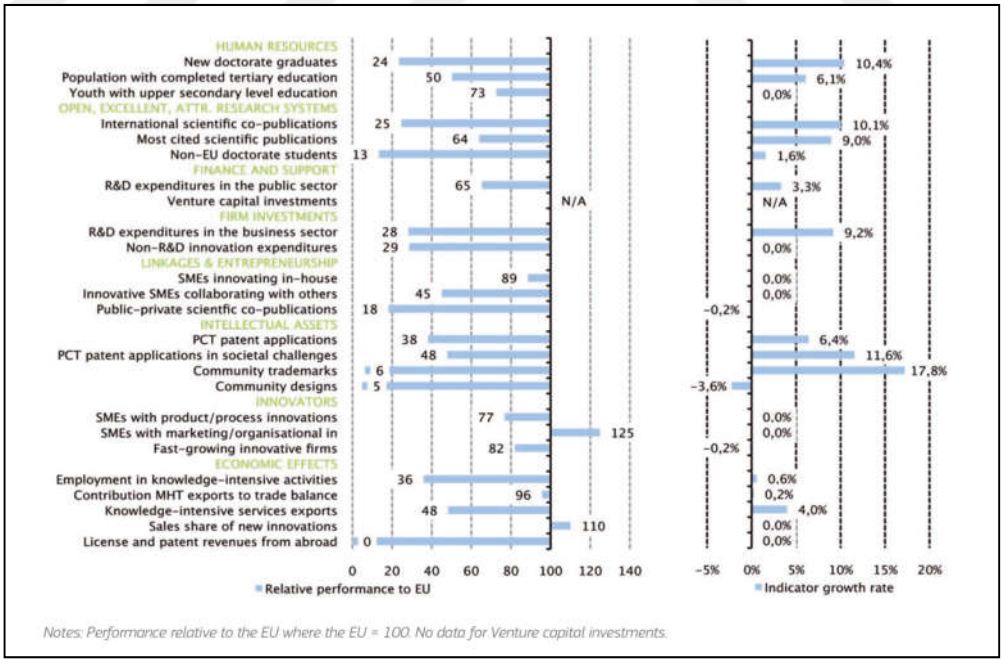
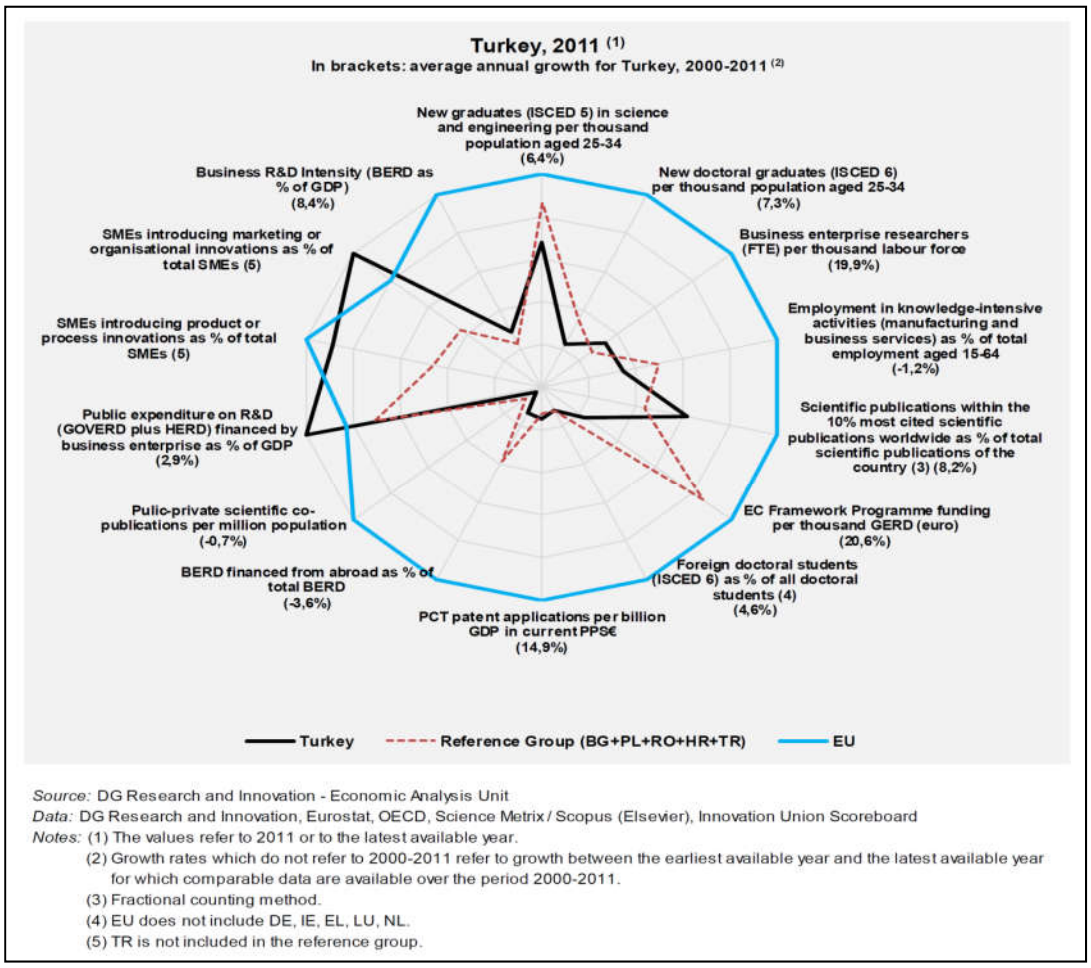


Figure 5.3 : Growth rate of Turkey according to the indicators (European Commission, 2014b).

Due to the innovation performance of Turkey, strengths are (i): Innovation in SMEs and (ii): Public expenditure on R&D financed by business enterprise as a % of GDP

(EU, 2013). Weaknesses are (i): License and patent revenues from abroad, (ii): Community designs, (iii): Community trademarks, (iv): Non-EU doctorate students and (v): Public-private scientific co-publications (European Commission, 2014b)". Although there are some weaknesses, most indicators are positively growing in Turkey. The indicators with a high growth are (i): Community trademarks, (ii): PCT patent applications in societal challenges and (iii): New doctorates graduates (European Commission, 2014b) (Figure 5.3 and Figure 5.4).



Source: DG Research and Innovation - Economic Analysis Unit
Data: DG Research and Innovation, Eurostat, OECD, Science Metrix / Scopus (Elsevier), Innovation Union Scoreboard
Notes: (1) The values refer to 2011 or to the latest available year.
(2) Growth rates which do not refer to 2000-2011 refer to growth between the earliest available year and the latest available year for which comparable data are available over the period 2000-2011.
(3) Fractional counting method.
(4) EU does not include DE, IE, EL, LU, NL.
(5) TR is not included in the reference group.

Figure 5.4 : Average Annual Growth for Turkey (European Commission, 2013).

Turkey has efforts to catch up the EU according to growth rate of the indicators which are below the EU average (Table 5.2). Performance scores of human resources, research systems, firm investments, linkages & entrepreneurship, intellectual assets and economic effects are below the EU average. These dimensions require time because the effects and results of the changes in these dimensions may appear a long time.

Table 5.2 : Performance scores per dimension (European Commission, 2014b).

Country/ Years	Human Resources	Research Systems	Finance and Support	Firm Investments	Linkages & Entrepreneurship	Intellectual Assets	Innovators	Economic Effects
EU	0.583	0.539	0.558	0.417	0.55	0.564	0.549	0.595
TR	0.098	0.185	0.371	0.093	0.27	0.126	0.444	0.264

Only two indicators in the outputs are above the EU average. These indicators are SMEs introducing marketing/organisational innovations and Sales of new to market and new to firm innovations (Table 5.3).

Table 5.3 : Current performance by indicators (European Commission, 2014b).

		EU 27	TR
ENABLERS			
HUMAN RESOURCES	New doctorate graduates	1.7	0.4
	Population completed tertiary education	35.8	18
	Youth with upper secondary level education	80.2	58.3
OPEN, EXCELLENT AND ATTRACTIVE RESEARCH SYSTEMS	International scientific co-publications	343	85
	Scientific publications among the top 10% most cited	11.0	7.0
	Non-EU doctorate students	24.2	3.2
FINANCE AND SUPPORT	R&D expenditure in the public sector	0.75	0.49
	Venture capital investment	0.277	
FIRM ACTIVITIES			
FIRM INVESTMENTS	R&D expenditure in the business sector	1.31	0.37
	Non-R&D innovation expenditure	0.56	0.16
LINKAGES & ENTREPRENEURSHIP	SMEs innovating in-house	31.8	28.2
	Innovative SMEs collaborating with others	11.7	5.3
	Public-private co-publications	7.3	1.3
INTELLECTUAL ASSETS	PCT patents applications	1.98	0.76
	PCT patent applications in societal challanges	0.92	0.44
	Community trademarks	5.91	0.38
	Community designs	4.75	0.23
OUTPUTS			
INNOVATORS	SMEs introducing product or process innovations	38.4	29.5
	SMEs introducing marketing/organisational innovations	40.3	50.3
	Fast-growing innovative firms	16.2	13.3
ECONOMIC EFFECTS	Employment in knowledge-intensive activities	13.9	5.0
	Contribution of medium and high-tech product exports to the trade balance	1.27	-3.13
	Knowledge-intensive services exports	45.3	21.9
	Sales of new to market and new to firm innovations	14.4	15.8
	License and patent revenues from abroad	0.77	0.00

Many indicators' growth performance of Turkey are much above the EU average. These indicators are new doctorate graduates, population completed tertiary education, international scientific co-publications, scientific publications among the top 10% most cited, R&D expenditure in the public sector, R&D expenditure in the business sector, non-R&D innovation expenditure, SMEs innovating in-house, PCT patents applications, PCT patent applications in societal challanges, community trademarks and knowledge-intensive services exports (Table 5.4).

"R&D intensity in Turkey has increased progressively since 2000 (European Commission, 2013)". Although it has a high growth rate, according to the trend, Turkey will still be below the projected EU average for 2020 (Figure 5.5).

Table 5.4 : Growth performance by indicators (European Commission, 2014b).

		EU 27	TR
ENABLERS			
HUMAN RESOURCES	New doctorate graduates	2.80%	10.40%
	Population completed tertiary education	3.60%	6.10%
	Youth with upper secondary level education	0.50%	0.00%
OPEN, EXCELLENT AND ATTRACTIVE RESEARCH SYSTEMS	International scientific co-publications	6.00%	10.10%
	Scientific publications among the top 10% most cited	1.40%	9.00%
	Non-EU doctorate students	6.30%	1.60%
FINANCE AND SUPPORT	R&D expenditure in the public sector	1.80%	3.30%
	Venture capital investment	-2.80%	
FIRM ACTIVITIES			
FIRM INVESTMENTS	R&D expenditure in the business sector	2.00%	9.20%
	Non-R&D innovation expenditure	-4.70%	0.00%
LINKAGES & ENTREPRENEURSHIP	SMEs innovating in-house	-0.10%	0.00%
	Innovative SMEs collaborating with others	3.80%	0.00%
	Public-private co-publications	1.20%	-0.20%
INTELLECTUAL ASSETS	PCT patents applications	0.00%	6.40%
	PCT patent applications in societal challanges	-0.10%	11.60%
	Community trademarks	6.90%	17.80%
	Community designs	1.60%	-3.60%
OUTPUTS			
INNOVATORS	SMEs introducing product or process innovations	1.30%	0.00%
	SMEs introducing marketing/organisational innovations	0.80%	0.00%
	Fast-growing innovative firms	0.00%	-0.20%
ECONOMIC EFFECTS	Employment in knowledge-intensive activities	0.70%	0.60%
	Contribution of medium and high-tech product exports to the trade balance	0.20%	0.20%
	Knowledge-intensive services exports	1.00%	4.00%
	Sales of new to market and new to firm innovations	0.50%	0.00%
	License and patent revenues from abroad	3.70%	0.00%

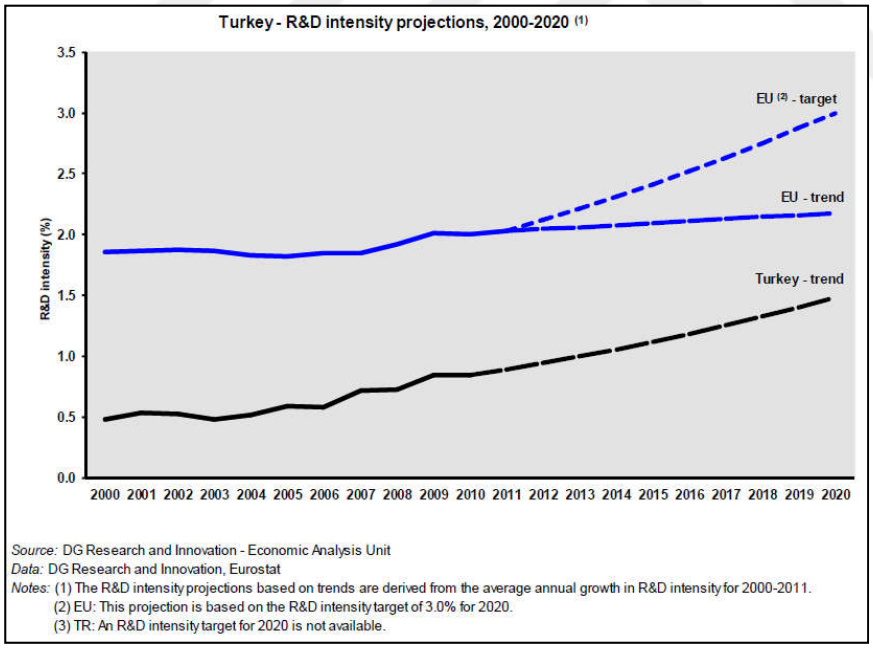


Figure 5.5 : Comparison of R&D intensity projections of Turkey and the EU (European Commission, 2013).

When examining the indicators from 2002 to 2013 (URL-18), new doctorate graduates, PCT patents applications, PCT patent applications in societal challanges and community trademarks indicators have the growth rate higher than 100% (Table 5.5).

Table 5.5 : Changes of indicators from 2002 to 2013 (URL-18).

		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
ENABLERS														Rate
HUMAN RESOURCES	New doctorate graduates			0.2	0.2	0.2	--	0.3	0.3	0.4	0.4		0.4	**100**
	Population completed tertiary education				--	11.9	12.3	13.0	14.7	15.5	16.3	18.0	18	51
	Youth with upper secondary level education				--	46.0	47.7	48.9	50.0	51.1	52.6	54.0	58.3	27
OPEN, EXCELLENT AND ATTRACTIVE RESEARCH SYSTEMS	International scientific co-publications				43.3	47.9	53.1	57.7	65.5	70.2	76.3	84.7	85	96
	Scientific publications among the top 10% most cited	3.8	3.9	4.8	5.1	5.5	6.6	6.8	7.0				7.0	84
	Non-EU doctorate students			--	2.9	2.7	2.6	2.7	2.8	2.5	3.2		3.2	10
FINANCE AND SUPPORT	R&D expenditure in the public sector				0.39	0.37	0.43	0.41	0.51	0.49	0.49	--	0.49	26
	Venture capital investment				--	--	--	--	--	--	--	--		--
FIRM ACTIVITIES														Rate
FIRM INVESTMENTS	R&D expenditure in the business sector				0.20	0.21	0.30	0.32	0.34	0.36	0.37	--	0.37	85
	Non-R&D innovation expenditure			--	--	0.16	--	--	--	--	--		0.16	--
LINKAGES & ENTREPRENEURSHIP	SMEs innovating in-house			--	--	28.2	--	--	--	--	--		28.2	--
	Innovative SMEs collaborating with others			--	--	5.3	--	--	--	--	--		5.3	--
	Public-private co-publications				--	--	1.8	1.8	1.9	2.0	1.7		1.3	-28
INTELLECTUAL ASSETS	PCT patents applications			0.24	0.39	0.45	0.48	0.46	0.58	0.57			0.76	**217**
	PCT patent applications in societal challanges		0.04	0.03	0.04	0.04	0.04	0.07	0.16	0.19			0.44	**1000**
	Community trademarks				0.12	0.16	0.18	0.18	0.18	0.21	0.30	0.38	0.38	**217**
	Community designs				0.30	0.34	0.40	0.44	0.32	0.22	0.26	0.23	0.23	-23
OUTPUTS														Rate
INNOVATORS	SMEs introducing product or process innovations			--	--	29.5	--	--	--	--	--		29.5	--
	SMEs introducing marketing/organisational innovations			--	--	50.3	--	--	--	--	--		50.3	--
	Fast-growing innovative firms			--	--	--	--	--	--	13.5	13.3		13.3	--
ECONOMIC EFFECTS	Employment in knowledge-intensive activities				--	--	--	--	4.8	4.8	4.7	5.0	5.0	4
	Contribution of medium and high-tech product exports to the trade balance				-4.8	-2.9	-2.0	-0.8	-3.9	-2.8	-2.2	-3.1	-3.13	-35
	Knowledge-intensive services exports			--	--	--	16.6	18.7	18.5	21.0	21.9		21.9	32
	Sales of new to market and new to firm innovations			--	--	15.8	--	--	--	--	--		15.8	--
	License and patent revenues from abroad				--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	0

Turkey as a moderate country: When the innovation performance change between 2010 and 2017 is examined, it is seen that Turkey's SII is far below the EU average. The EU has a more stable structure and that Turkey has a more pronounced change in its performance. Except decline in the year 2012, Turkey has generally increased its value. Although Turkey is far below the EU, it exhibits a very rapid growth unlike the stable structure of the EU. Turkey had a big increase especially in 2014 (from 0.219 to 0.275) (Figure 5.6). When compared with other countries; Ukraine and Former Yugoslav Republic of Macedonia are far below Turkey for each period between the years 2010-2017. Until 2014, the performance of Croatia was above Turkey's, this situation did not sustain. While Croatia experienced a decline in 2014 (from 0,260 to 0,234), Turkey significantly increased its performance (from 0,219 to 0,275). Croatia has lagged behind Turkey since 2014.

Compared to the annual growth rates (AGR); Turkey showed a phenomenal growth especially in 2014-2015 and partially less in 2010-2011. Average annual growth rate (AAGR) of Turkey is much higher than EU's (respectively 4,57 for Turkey and 0,80 for the EU) (Table 5.6).

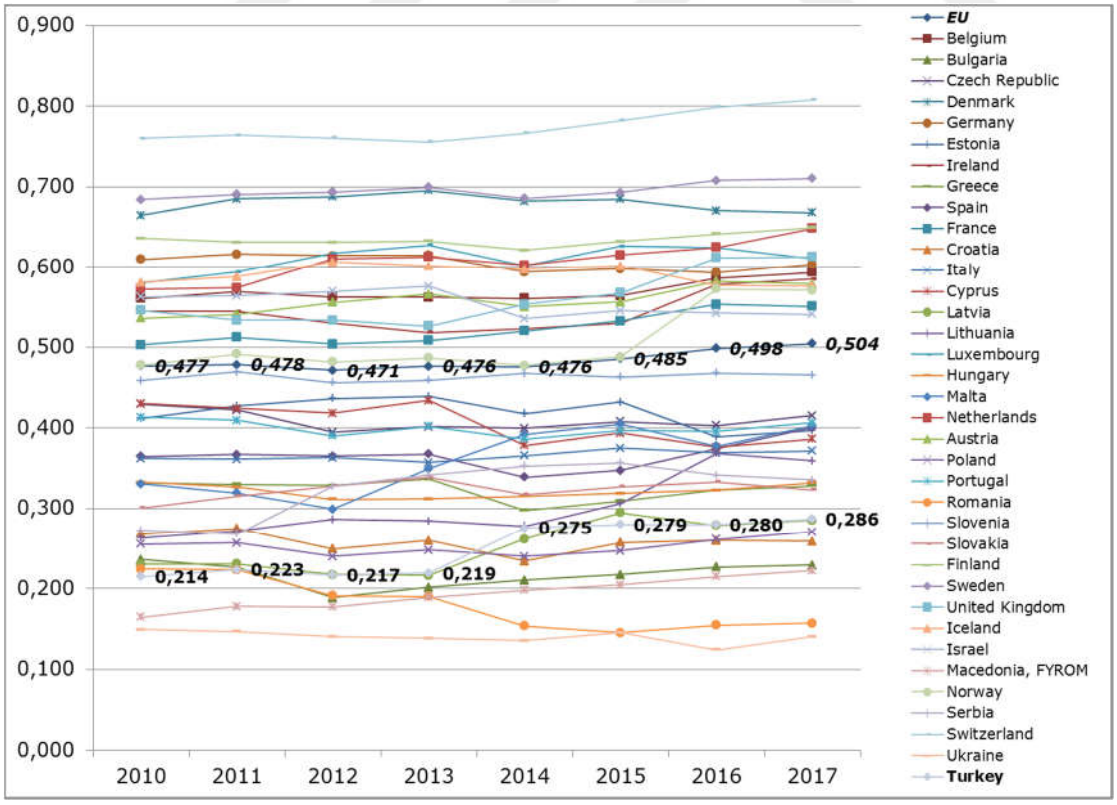


Figure 5.6 : Summary Innovation Index (Author's own illustration based on the European Commission, 2018b).

Table 5.6 : Annual growth rates of Turkey and the EU (European Commission, 2018b).

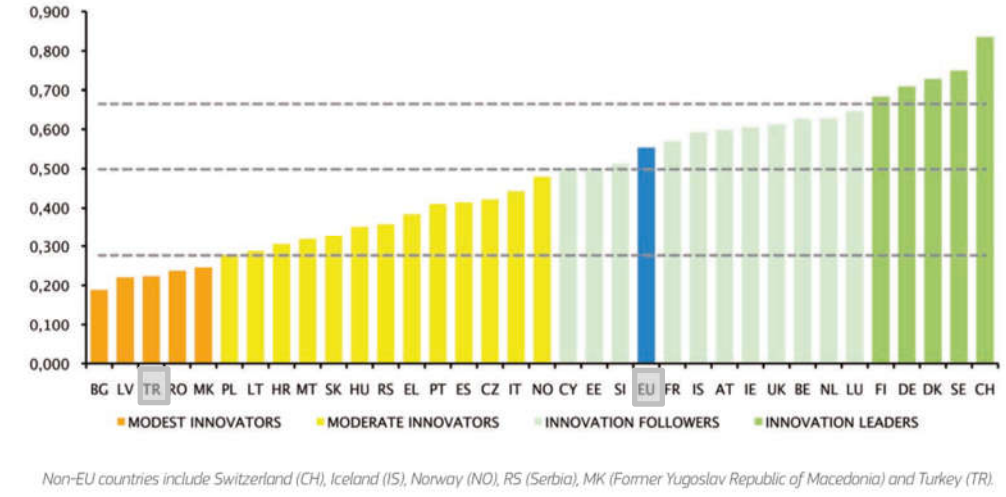
	EU		Turkey	
Year	(Value)	(AGR)	(Value)	(AGR)
2010	0,477		0,214	
2011	0,478	0,21	0,223	4,21
2012	0,471	-1,46	0,217	-2,69
2013	0,476	1,06	0,219	0,92
2014	0,476	0,00	0,275	25,57
2015	0,485	1,89	0,279	1,45
2016	0,498	2,68	0,28	0,36
2017	0,504	1,20	0,286	2,14
AAGR	0,80		4,57	

As a comparison of the SII in 2014 and 2018, the most striking issue regarding Turkey is the rise of the innovation performance group from modest to moderate innovator. While Turkey was only ahead of the EU countries such as Bulgaria and Latvia in 2014, it was still ahead of these two countries and other EU countries such as Romania, Croatia and Poland in 2018, as well as non-EU countries such as Ukraine and Former Yugoslav Republic of Macedonia (Figure 5.7). The obvious difference between the 2010 and 2016 values of Turkey is an indication of this rising trend (Figure 5.7b).

According to the EIS 2016 (European Commission, 2017c), since Turkey's growth rate at 5.1% is significantly above that of the EU (Figure 5.8), Turkey has progressed from the modest to the moderate innovators with a strong performance growth.

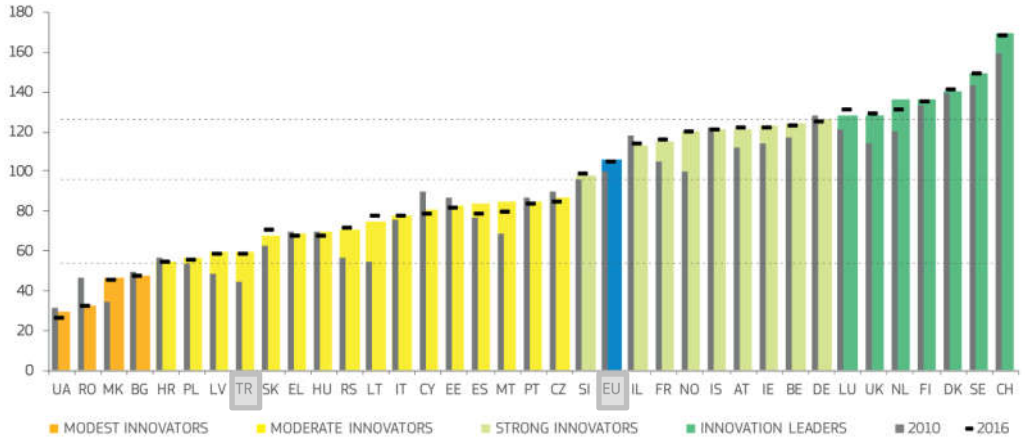
"Innovation performance has been improving at a slow but steady rate between 2008 and 2014, and for 2015 a sharp increase can be observed. Turkey is catching up to the EU; its relative performance was almost steady from 38% in 2008 to 39% in 2014 and then jumped to 51% in 2015 turning the country from a modest into a moderate innovator (European Commission, 2017c)".

"The strong increase from 2014 to 2015 is the result of an almost twelvefold increase in Non-R&D innovation expenditures and a more than fourfold increase in Sales share of new product innovations using CIS 2012 data as compared to CIS 2010 data (European Commission, 2017c)".



Non-EU countries include Switzerland (CH), Iceland (IS), Norway (NO), RS (Serbia), MK (Former Yugoslav Republic of Macedonia) and Turkey (TR).

(a)



Coloured columns show countries' performance in 2017, using the most recent data for 27 indicators, relative to that of the EU in 2010. The horizontal hyphens show performance in 2016, using the next most recent data for 27 indicators, relative to that of the EU in 2010. Grey columns show countries' performance in 2010 relative to that of the EU in 2010. For all years, the same measurement methodology has been used. The dashed lines show the threshold values between the performance groups in 2017, comparing countries' performance in 2017 relative to that of the EU in 2017.

European and neighbouring countries include: Iceland (IS), Israel (IL), the Former Yugoslav Republic of Macedonia (MK), Norway (NO), Serbia (RS), Switzerland (CH), Turkey (TR) and Ukraine (UA).

(b)

Figure 5.7 : Summary Innovation Indices and performance groups: a) Innovation performances in 2014 (European Commission, 2014c), b) Innovation performances in 2018 ((European Commission, 2018a).

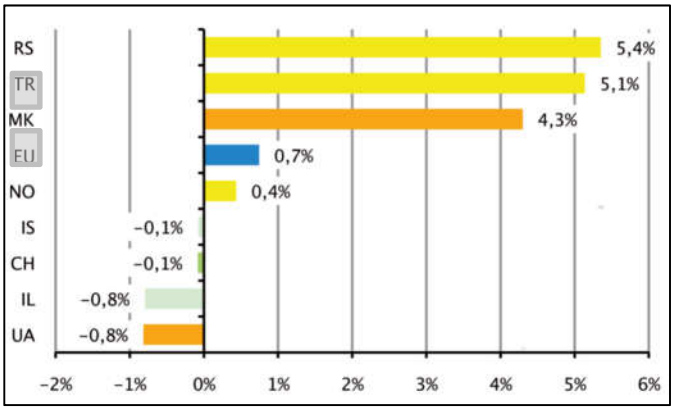


Figure 5.8 : Performance growth of Turkey (European Commission, 2017c).

"Turkey is performing well below the average of the EU for all dimensions except Firms investments – due to high relative performance in Non-R&D innovation expenditures – and on almost all indicators. Another strong relative performance is observed for Sales share of new innovations. The most significant relative weaknesses are in License and patent revenues from abroad, Public-private scientific copublications, Community designs, and Community trademarks. In nearly all dimensions – especially Firm investments – and most indicators, performance has improved. Particularly high growth is observed for Non-R&D innovation expenditures (43%), Sales share of new product innovations (24%), PCT patent applications in societal challenges (22%), and Community trademarks (19%). The few declines in performance are minor, with the relatively largest ones in Community designs (-7.0%) and Public-private scientific co-publications (-3.6%). (European Commission, 2017c) (Figure 5.9)".

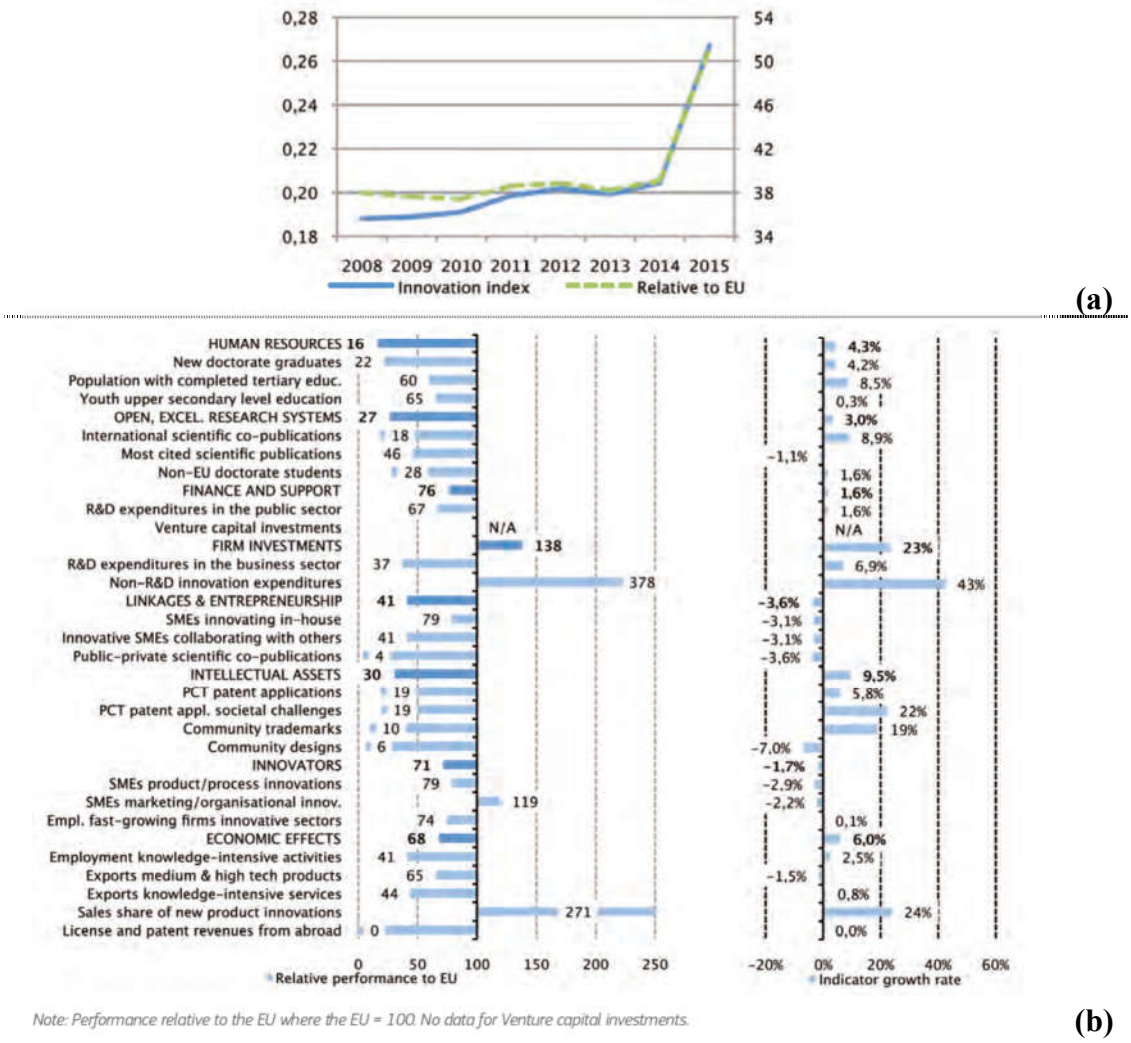


Figure 5.9 : Relative performances of Turkey to the EU: a) Innovation Index (European Commission, 2017c), b) Indicators (European Commission, 2017c).

Evaluation of Innovation Dimensions

As mentioned in the Chapter 2 (Figure 2.8), there are ten innovation dimensions in the measurement of the EIS. These innovation dimensions are Human Resources, Research Systems, Innovation-friendly Environment, Finance and Support, Firm Investments, Innovators, Linkages, Intellectual Assets, Employment Impacts and Sales Impacts.

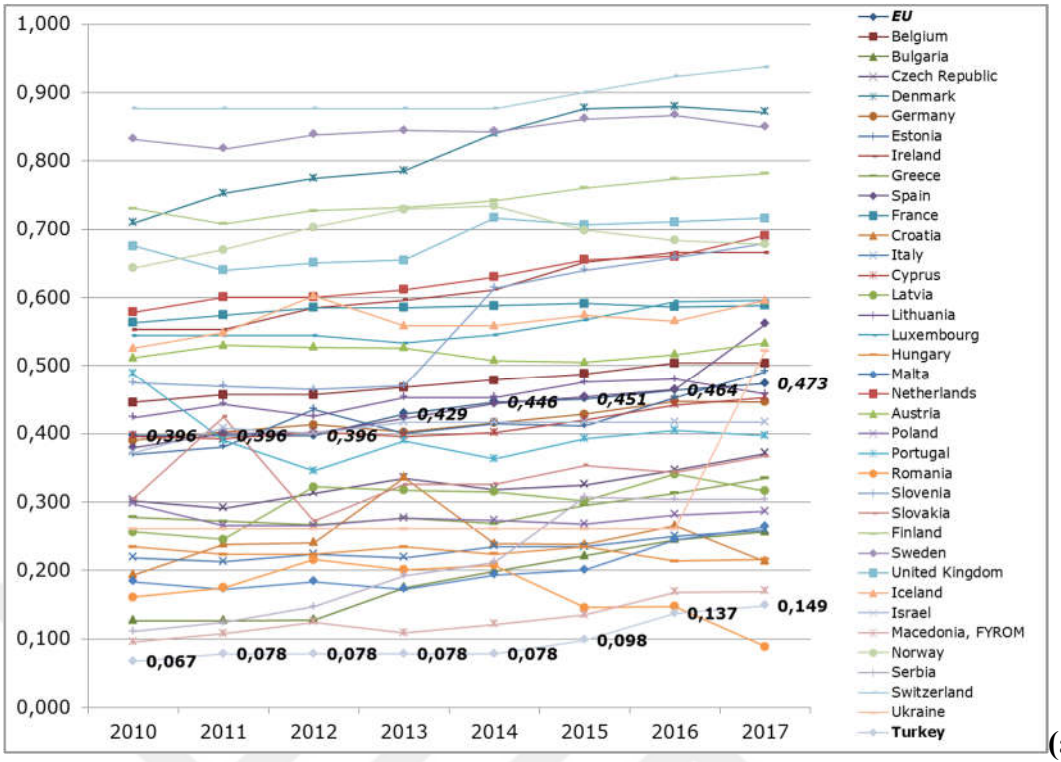
To assess the innovation dimensions, the trend is visualized with a line chart of the time series based on the EIS 2018 Database[18] (European Commission, 2018b).

Human Resources: Turkey's performance in terms of 'Human Resources' is still far below the EU, although it has a steadily rising especially after 2014 especially with a little increase in 2016 (from 0.098 to 0.137) (Figure 5.10a). Turkey was located at the bottom of the ranking except 2017. Countries closest to Turkey's performance are Macedonia FYROM and Romania. Only in 2017 Turkey survived from being in the bottom position and was able to get ahead of Romania. The reason of this is the rise of Turkey (from 0.137 to 0.149), as well as the remarkably decline of Romania (from 0.148 to 0.089).

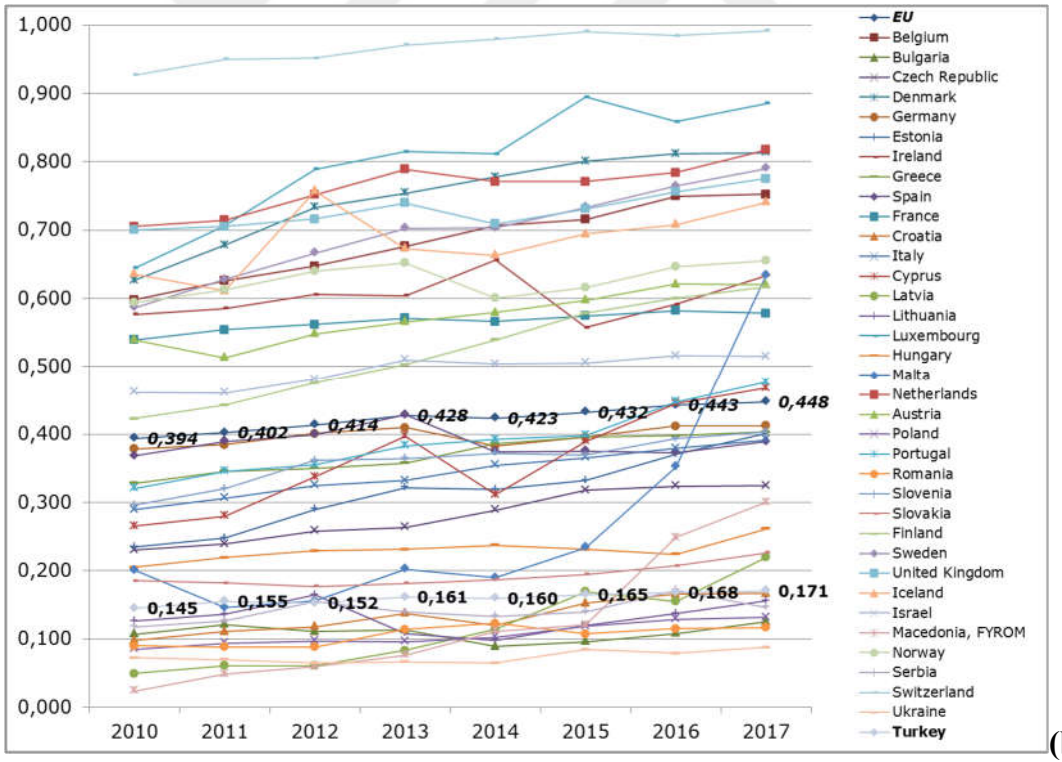
Research Systems: Turkey's performance in terms of 'Research Systems' is another dimension which is also far below the EU. Unlike the 'Human Resources', Turkey has a performance which generally leaves some countries behind although this changed in some years in terms of 'Research Systems' dimension. These countries are Lithuania, Serbia, Bulgaria, Croatia, Romania, Poland, Ukraine, Latvia and Macedonia FYROM.

If this dimension for Turkey's own performance is analyzed, it can be interpreted that there is not a specific/noticable increase. This little increase in value (from 0,145 in 2010 to 0,171 in 2017) is not enough to save the county from stability and reach the EU (Figure 5.10b).

[18] According to the measurement framework of the EIS, years of the indicators covered in the EIS in the EIS may change due to the presence of the data.
The EU states that "Results between different EIS reports should not be compared. For comparisons over time, it is recommended to only use the time series results in each EIS report" (European Commission, 2018c: p. 21). Therefore, time series in the EIS 2018 (European Commission, 2018a) is used in this thesis to evaluate the innovation dimensions and the indicators of the countries.



(a)



(b)

Figure 5.10 : Innovation Dimensions: a) Human Resources (Author's own illustration based on the European Commission, 2018b), b) Research Systems (Author's own illustration based on the European Commission, 2018b).

Innovation-friendly Environment: Although Turkey has a performance below the EU, it can be said that it has a tendency with values close to EU considering other dimensions (Figure 5.11a). However, this situation changed in 2017 due to Turkey's failure to show an increase as the EU did, and the difference is gradually opened. Despite this difference, Turkey's performance by increasing the value compared to the previous years is still promising.

Turkey has left Romania, Czech Republic, Slovakia, Bulgaria, Cyprus, Greece, Croatia, Macedonia FYROM, Serbia and Ukraine behind as performance for each year.

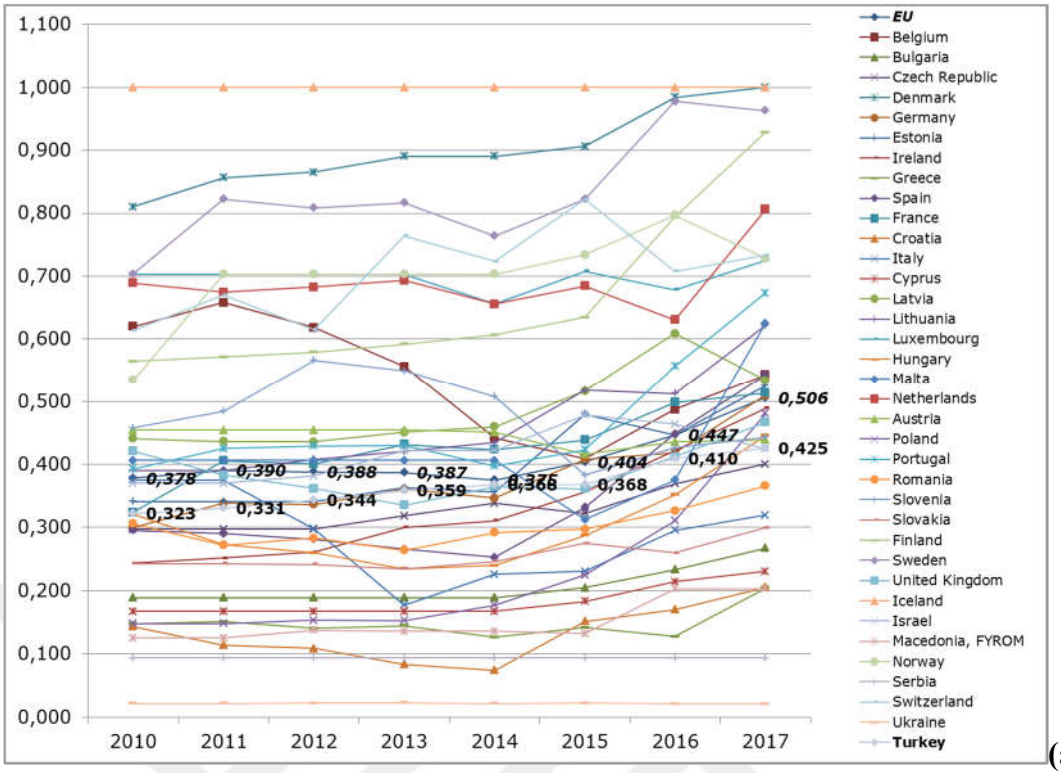
Beside these countries, except recent years, Hungary, Spain, Ireland and Poland have remained well below Turkey. For instance, Ireland (0,422) and Spain (0,448) passed Turkey (0.410) in 2106 and Hungary (0,445), Poland (0,481), Ireland (0,489) ve Spain (0,542) passed Turkey (0,425) in 2017. Although German was located below Turkey in the years 2010, 2012 and 2014, it has surpassed the performance of Turkey in the other years.

Italy was far below Turkey except the years 2010 and 2011. Although the United Kingdom has generally exhibited a trend over Turkey in terms of the performance, it is located behind Turkey in the years 2013, 2014 and 2015 due to its sudden declines.

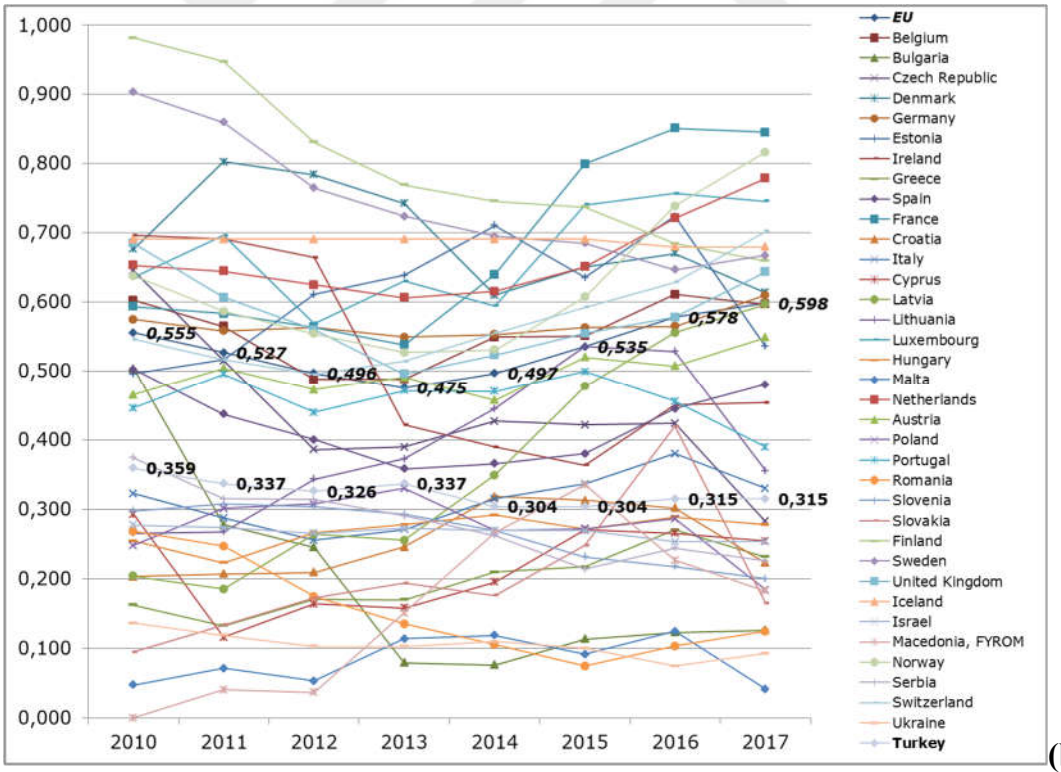
Finance and Support: Turkey also is far below the EU in terms of this dimension (Figure 5. 11b). It has higher values than the human resources and research systems. Although it is not as close to the EU as its innovation-friendly dimension, it still has a promising performance. ‘Finance and Support’ shows a more fluctuating trend compared to the previous dimensions. Some other countries have very dramatic fluctuations and ruptures (Sweden and Finland in the negative direction, France in the positive direction).

Although Turkey has experienced some declines, it can be interpreted that it has not a fluctuating performance as they showed in such an environment.

If Turkey's own performance is evaluated, it is seen that it lost its value in the year 2010 (0.359) and has not reached to this value yet. Although it has increased in 2016 (from 0.304 to 0.315), due to the decreases it experienced in 2011 and 2014 (respectively from 0.359 to 0.337 and from 0.337 to 0.304), it has not recovered itself.



(a)



(b)

Figure 5.11 : Innovation Dimensions: a) Innovation-friendly Environment (Author's own illustration based on the European Commission, 2018b), b) Finance and Support (Author's own illustration based on the European Commission, 2018b).

Firm Investments: This dimension is one of the best trend of Turkey in terms of performance. In fact, it has been showing success over the EU since 2014 (Figure 5.12a). While it was much lower than the EU until 2014, it also passes the EU with its remarkable increase in 2014 (from 0.099 to 0.568). Thus, it is located behind the leading countries in this dimension such as Israel, Switzerland, Sweden, Germany, Austria, Belgium and Finland in 2017, from the country at the bottom. One of the reason for Turkey's high performance in this dimension is being "a positive outlier in 2012 and 2014 (European Commission, 2018a)" in terms of 'Non-R&D innovation expenditures' indicator which is an indicator of 'Firm Investments'.

Innovators: As the EU, Turkey is positioned in the middle of the countries' performance ranking. Turkey shows a similar trend and very close values with the EU. The values of the EU have been decreasing gradually since 2010. For Turkey, although there was a decline until 2015, it was able to improve its performance in 2016 with an increase from 0.439 to 0.480 (Figure 5.12b).

Linkages: Turkey is also below the EU for this dimension (Figure 5.13a). Especially the increase in 2016 is remarkable (from 0.235 to 0.296). The countries behind Turkey's performance each year for are Romania, Poland, Latvia, Bulgaria, Malta and Ukraine.

Macedonia FYROM which generally exhibit under Turkey's performance could only be able to pass Turkey in 2015 with the value as 0.248. Portugal has a performance below the Turkey except the years 2010, 2011 and 2015.

While Cyprus displayed a performance for above the Turkey until 2016, it falled behind the Turkey due to the incredible decline in its own performance in 2016 (from 0.337 to 0.271) and incredible increase in Turkey's performance in 2016 (from 0.235 to 0.296). Although Slovakia was generally above the Turkey, it has fallen behind Turkey only in 2011 (with a value as 0.267).

Beside these countries, Italy has outperformed over and behind Turkey in some years. Turkey is below the Italy in the years 2010, 2011, 2014 and 2015.

Intellectual Assets: Turkey is far below the EU in terms of the 'Intellectual Assets' (Figure 5.13b). In fact, this dimension is one of the worst performance of Turkey.

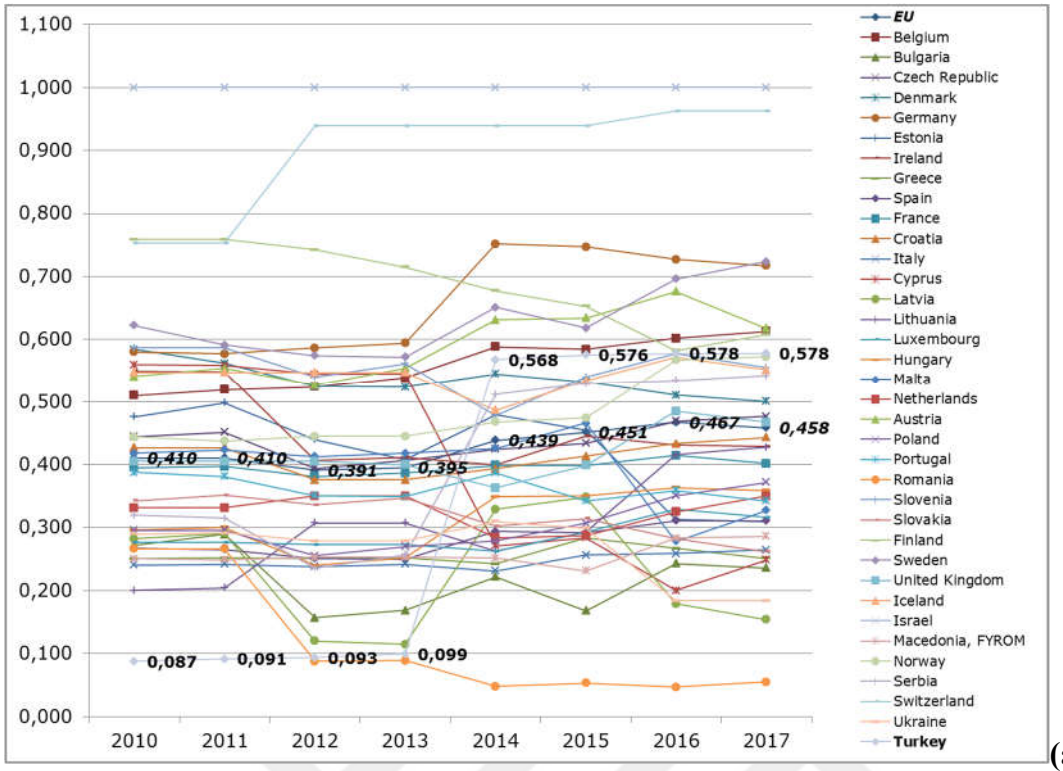
Although Turkey has some small fluctuations in different years, it can be said that it is generally in a more stable condition than the other dimensions. Turkey is one of the two countries that are at the bottom of the ranking of the countries. Macedonia FYROM, the lowest country, positioned below Turkey until 2016, but it increased its performance over Turkey in 2016 and 2017. Thus, Turkey is located at the bottom of the list in 2016 and 2017.

Employment Impacts: Just like the Intellectual Assets, this dimension is one of the lowest performance of Turkey and Turkey is far below the EU (Figure 5.14a). Turkey is at the bottom of the list in the ranking of the countries except the year 2017. Because only in 2017, Turkey (0.058) passed Macedonia FYROM (0.035).

Sales Impacts: Also for this dimension, Turkey is far below the EU, but it has a much better position with respect to other dimensions as human resources, intellectual assets and employment impacts. 'Sales of new-to-market and new-to-firm innovations' indicator, which is an indicator of this dimension, is a positive outlier for 2012 (European Commission, 2018a). According to the performance of Turkey, the country has reached its highest values in 2014 and 2015 (respectively 0.528 and 0.531). However, it could not maintain this rise afterwards (Figure 5.14b).

Finally as a summary of all these explanations, according to the measurement framework of the EIS, the innovation dimensions as ‘Human resources’, ‘Employment Impacts’ and ‘Intellectual Assets’ are the challenges of Turkey in terms of performances.

Therefore, in order to improve its position compared to other countries, Turkey should attach more importance to these innovation dimensions than it does now.

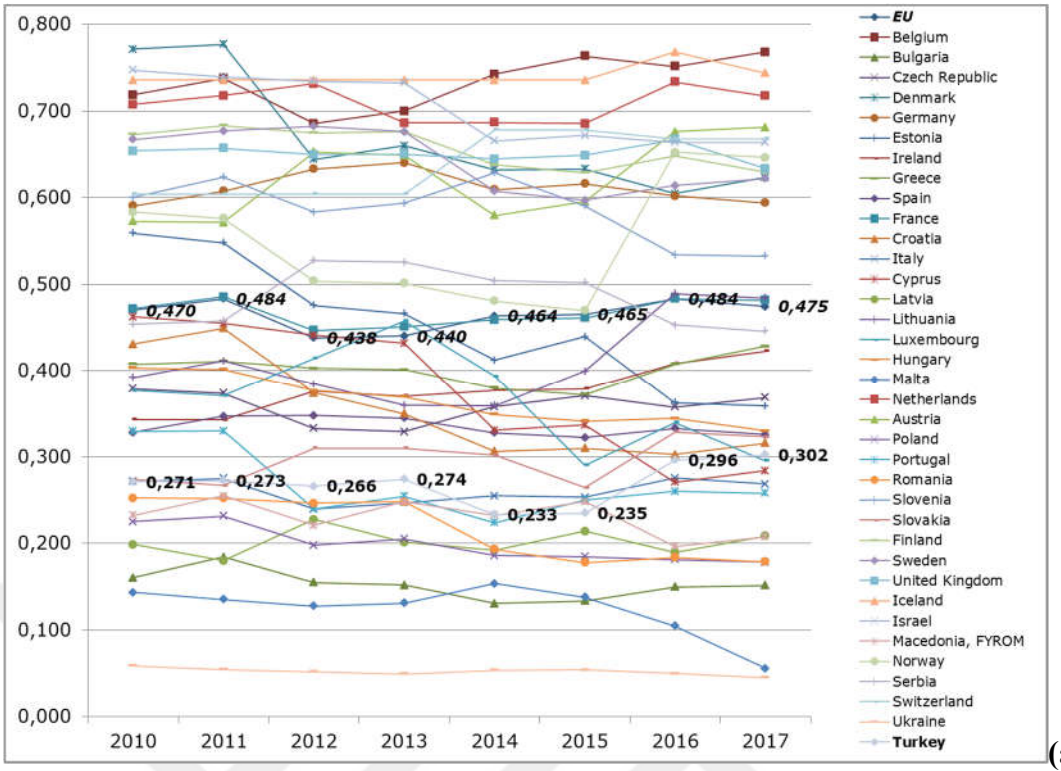


(a)

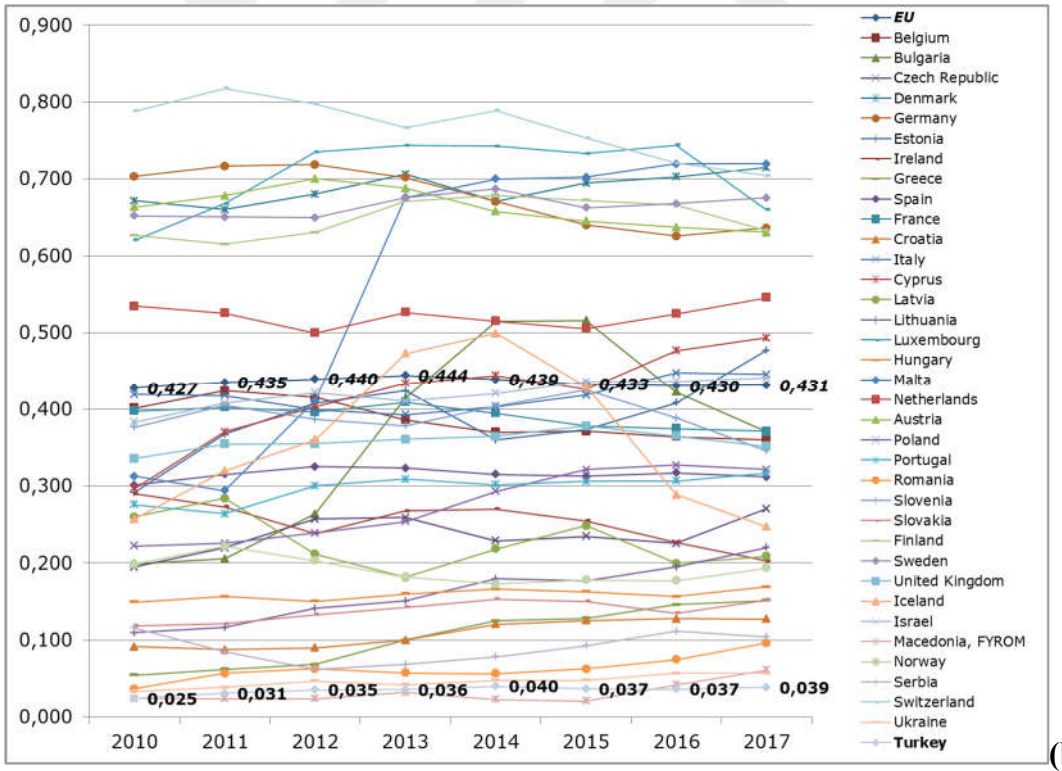


(b)

Figure 5.12 : Innovation Dimensions: a) Firm investments (Author's own illustration based on the European Commission, 2018b), b) Innovators (Author's own illustration based on the European Commission, 2018b).

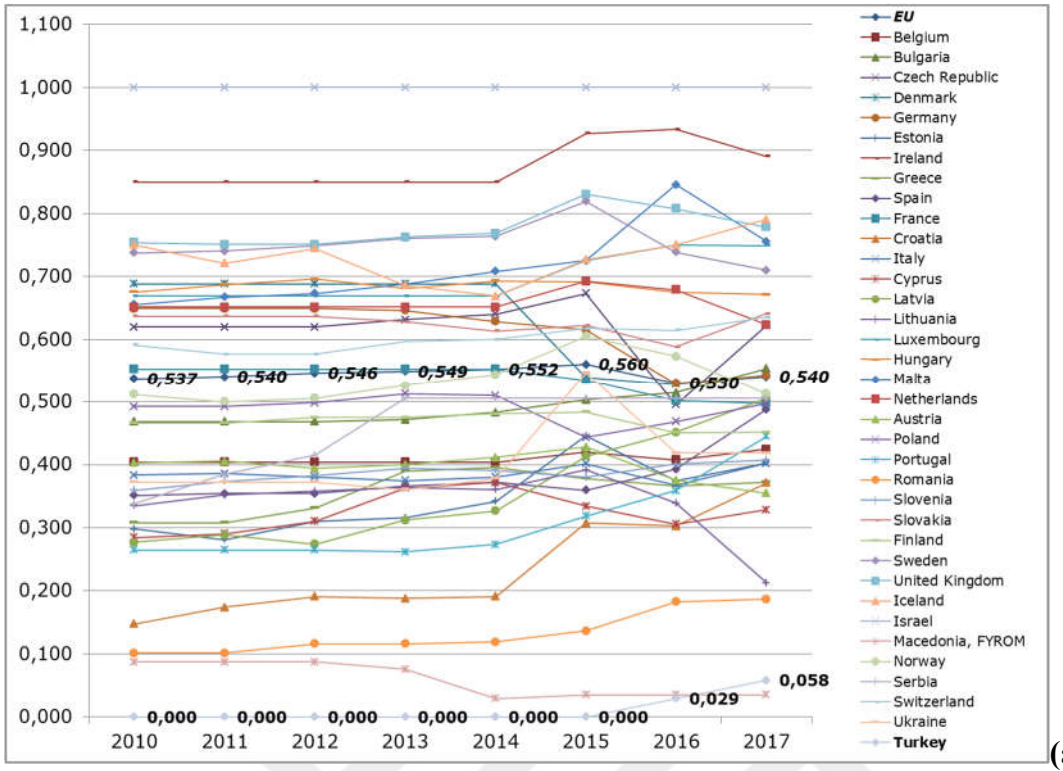


(a)

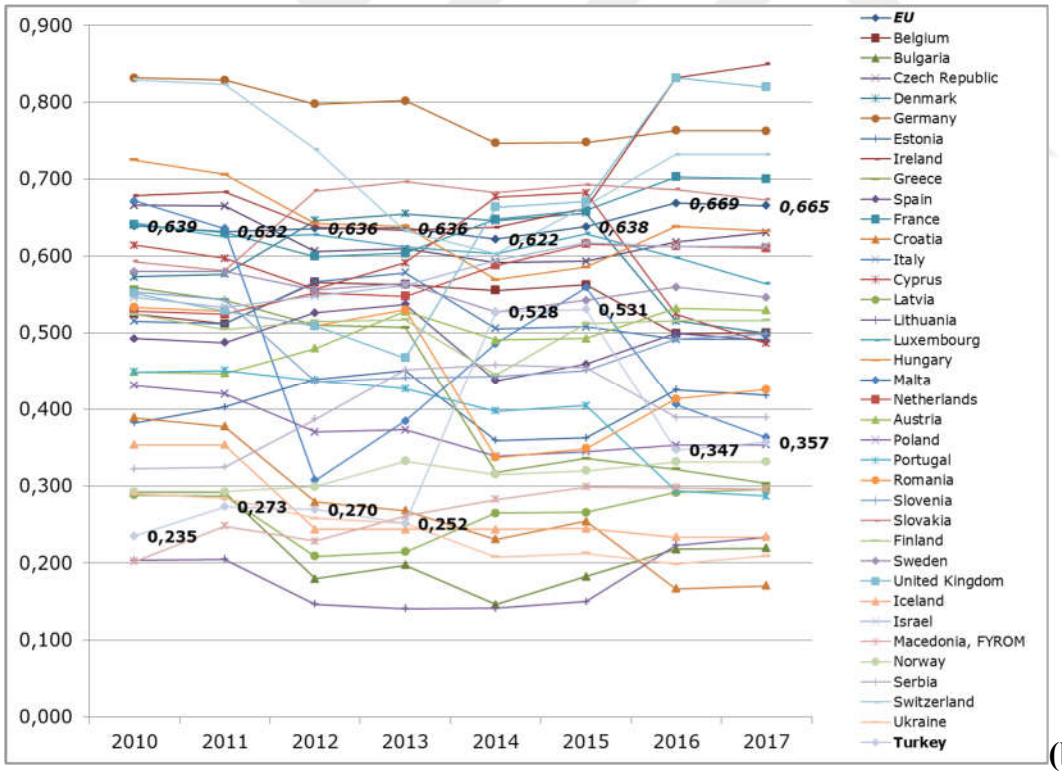


(b)

Figure 5.13 : Innovation Dimensions: a) Linkages (Author's own illustration based on the European Commission, 2018b), b) Intellectual Assets (Author's own illustration based on the European Commission, 2018b).



(a)



(b)

Figure 5.14 : Innovation Dimensions: a) Employment Impacts (Author's own illustration based on the European Commission, 2018b), b) Sales Impacts (Author's own illustration based on the European Commission, 2018b).

Evaluation of All Indicators:

As mentioned previously in Chapter 2 (Figure 2.8), according to the measurement framework of the EIS, there are 27 indicators (European Commission, 2018a). Only 24 of the 27 indicators are available for Turkey; the missing data are 'Venture capital expenditures', 'Enterprises providing ICT training' and 'Employment fast-growing enterprises' (European Commission, 2018b).

'Human resources' includes 3 indicators as (i): 'New doctorate graduates', (ii): 'Population completed tertiary education' and (iii): 'Lifelong learning'.

'Attractive Research Systems' contains 3 indicators as (i): 'International scientific co-publications' (ii): 'Scientific publications among top 10% most cited' and (iii): 'Foreign doctorate students'.

'Innovation-friendly environment' captures two indicators as (i): Broadband penetration and (ii): Opportunity-driven entrepreneurship.

'Finance and support' has only (i): 'R&D expenditure in the public sector' indicator, because other indicator (ii): 'Venture capital investments' is not available for Turkey.

'Firm investments' consists of two indicators as (i): 'R&D expenditure in the business sector' and (ii): 'Non-R&D innovation expenditure'. Another indicator of this dimension, (iii): Enterprises providing ICT training, is not available for Turkey.

'Innovators' includes three indicators as (i): 'SMEs with product or process innovations', (ii): 'SMEs with marketing or organisational innovations' and (iii): 'SMEs innovating in-house'.

'Linkages' contains three indicators as (i): 'Innovative SMEs collaborating with others', (ii): 'Public-private co-publications' and (iii): 'Private co-funding of public R&D expenditures'.

'Intellectual assets' captures different forms of the IPR as (i): 'PCT patent applications', (ii): 'Trademark applications' and (iii): 'Design applications'.

Employment impacts has only one indicator as (i): 'Employment in knowledge-intensive activities' because other indicator of this dimension, (ii): 'Employment fast-growing firms innovative sectors', is not available for Turkey.

‘Sales impacts’ consists of three indicators as (i): ‘Medium & high tech product exports’, (ii): ‘Knowledge-intensive services exports’, and (iii): ‘Sales of new-to-market and new-to-firm innovations’.

Since the number of variables is 24, instead of explaining these variables one by one, it is considered appropriate to examine in general.

If these variables are examined in terms of the performance of Turkey, according to the country ranking Turkey is far below the EU and positioned at the bottom of the rank with the lowest performances in terms of indicators such as ‘New doctorate graduates per 1000 population aged 25-34’, ‘Percentage population aged 25-34 having completed tertiary education’, ‘Foreign doctorate students as a % of all doctorate students’, ‘Public-private co-publications per million population’, ‘PCT patent applications per billion GDP (in PPS)’, ‘Trademark applications per billion GDP (in PPS)’, ‘Design applications per billion GDP (in PPS)’, ‘Employment in knowledge-intensive activities (% of total employment)’ and ‘Knowledge-intensive services exports as % of total services exports’ (Figure 5.15 a,b,f,p,r,s,t,u,w).

The indicators that have better performance compared to these indicators stated above are as follows: ‘Percentage population aged 25-64 involved in lifelong learning’, ‘Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country’, ‘Opportunity-driven entrepreneurship (Motivational index)’, ‘R&D expenditure in the public sector (% of GDP)’, ‘R&D expenditure in the business sector (% of GDP)’, ‘Innovative SMEs collaborating with others (% of SMEs)’, ‘Exports of medium and high technology products as a share of total product exports’, ‘Design applications per billion GDP (in PPS)’ and ‘Sales of new-to-market and new-to-firm innovations as % of turnover’ (Figure 5.15 c,e,h,i,j,o,v,t,x).

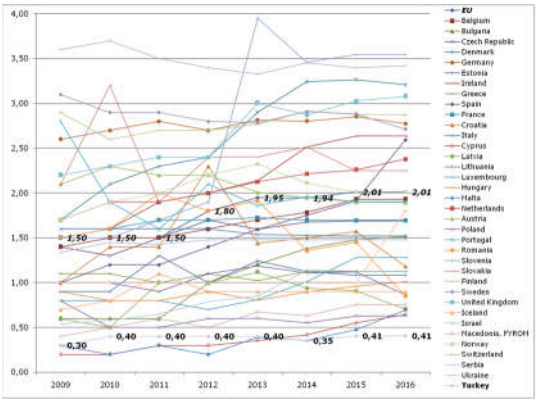
Indicators with the closest to the values of the EU and Turkey are ‘International scientific co-publications per million population’ and ‘Private co-funding of public R&D expenditures (percentage of GDP)’ (Figure 5.15 d,q).

Indicators such as ‘SMEs introducing product or process innovations as % of SMEs’, ‘SMEs introducing marketing or organisational innovations as % of SMEs’ and ‘SMEs innovating in-house as % of SMEs’ have very fluctuating performances (Figure 5.15 l,m,n). The performance of Turkey in terms of ‘SMEs introducing

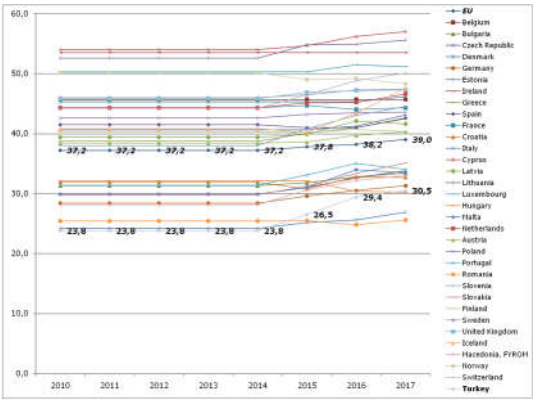
product or process innovations as % of SMEs' indicator is generally below the EU except 2014 and 2015 (Figure 5.15 g). Turkey is above the EU in terms of 'SMEs introducing marketing or organisational innovations as % of SMEs' indicator (Figure 5.15 m) and below the EU in terms of 'SMEs innovating in-house as % of SMEs' Figure 5.15 n).

Turkey's performance in the 'Broadband penetration' indicator is above the EU (Figure 5.15 g).

According to the performances in terms of the 'Non-R&D innovation expenditures (% of turnover)', while Turkey was one of the lowest countries and positioned below the EU until 2012, with an incredible increase in 2012 (from 0.22 to 2.59) it has positioned above the EU since 2012 and has become one of the highest two countries. According to the EU (European Commission, 2018c), Turkey has been described as positive outliers in terms of 'Non-R&D innovation expenditures' (in the years 2012 and 2014) and 'Sales of new-to-market and new-to-firm innovations' (in 2012).

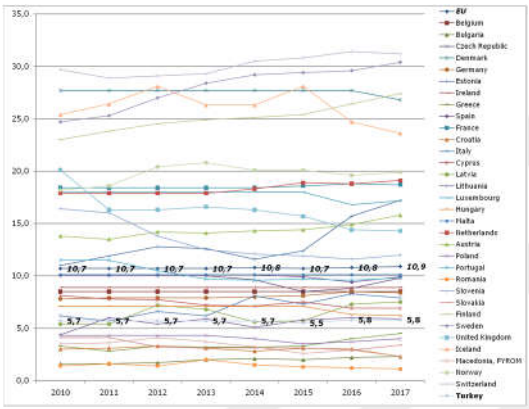


(a)



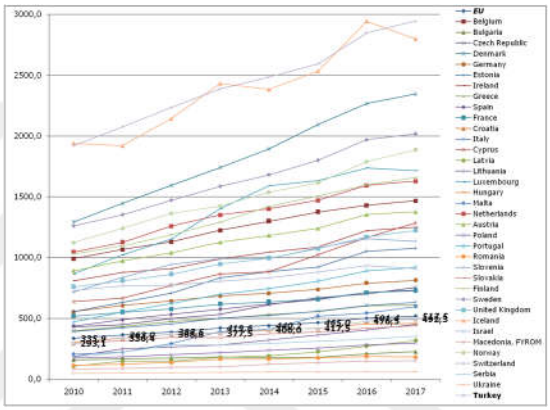
(b)

(*): This indicator is not available for Israel, Serbia and Ukraine.

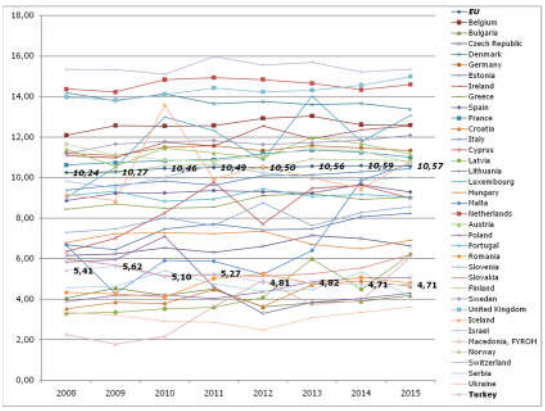


(c)

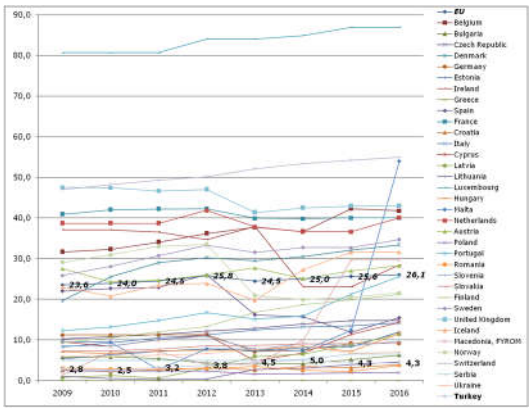
(*): This indicator is not available for Israel, Serbia and Ukraine.



(d)



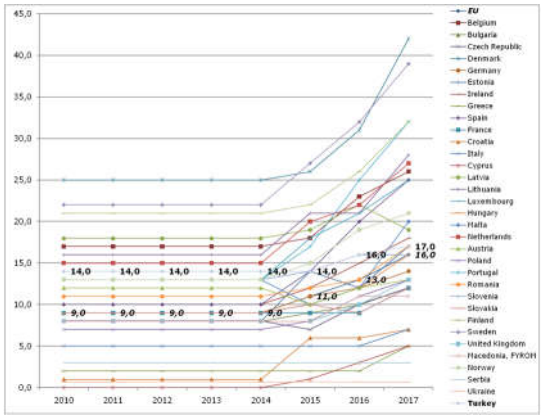
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(f)

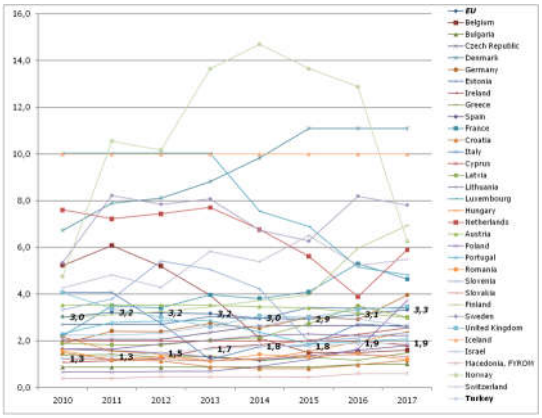
(*): This indicator is not available for Israel.

Figure 5.15 : Indicators: a) New doctorate graduates per 1000 population aged 25-34 b) Percentage population aged 25-34 having completed tertiary education c) Percentage population aged 25-64 involved in lifelong learning d) International scientific co-publications per million population e) Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country f) Foreign doctorate students as a % of all doctorate students (Author's own illustration based on the European Commission, 2018b).



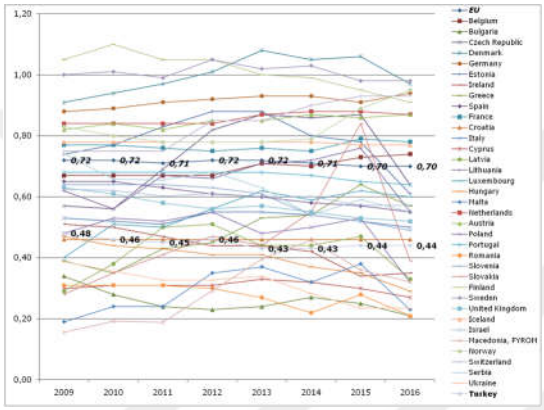
(g)

(*): This indicator is not available for Iceland, Israel and Switzerland.

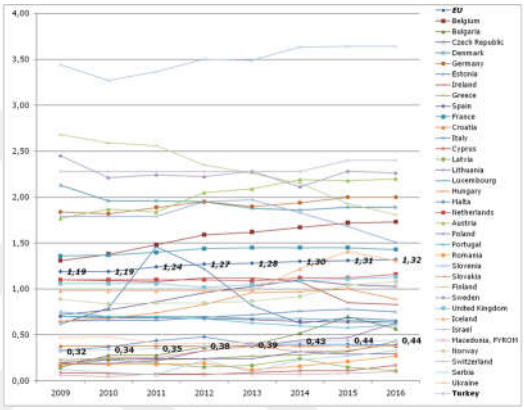


(h)

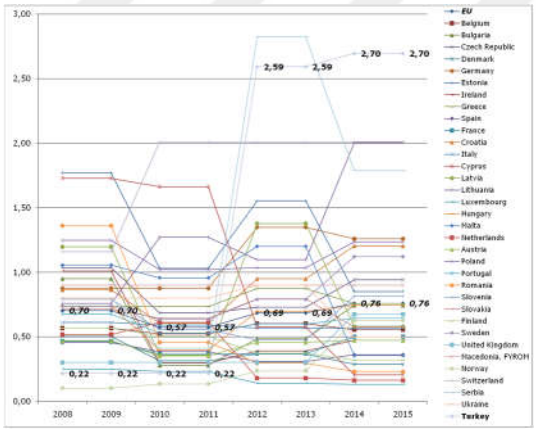
(*): This indicator is not available for Malta, Serbia, and Ukraine.



(i)

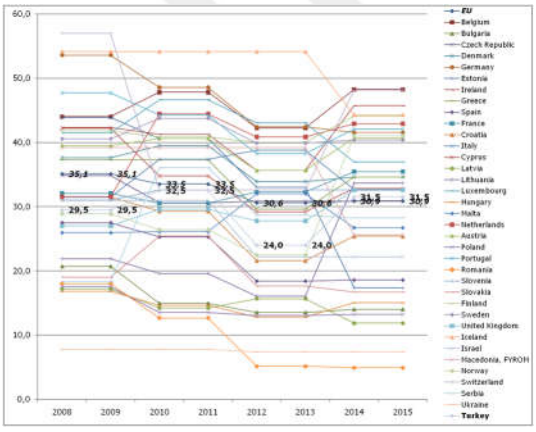


(j)



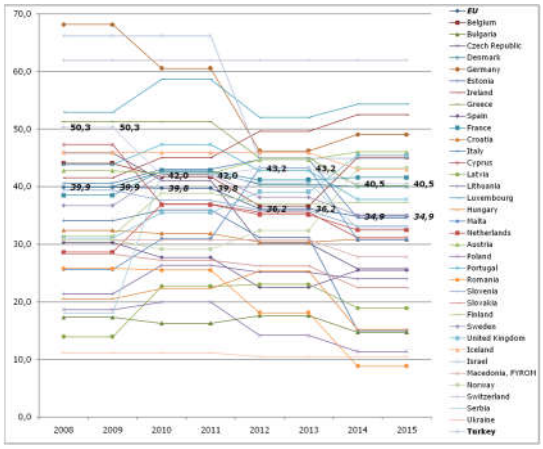
(k)

(*): This indicator is not available for Iceland and Israel.

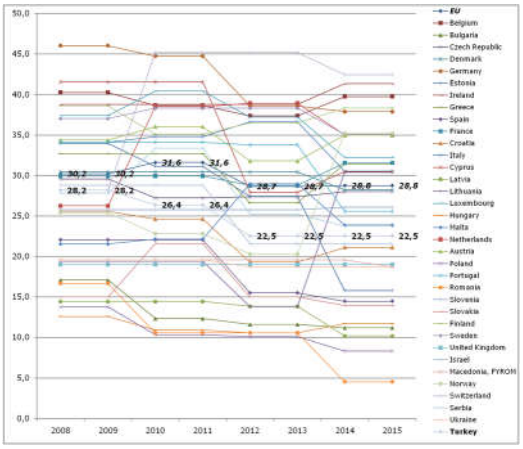


(l)

Figure 5.15 continued: Indicators: g) Broadband penetration, h) Opportunity-driven entrepreneurship (Motivational index), i) R&D expenditure in the public sector (% of GDP), j) R&D expenditure in the business sector (% of GDP), k) Non-R&D innovation expenditures (% of turnover), l) SMEs introducing product or process innovations as % of SMEs (Author's own illustration based on the European Commission, 2018b).

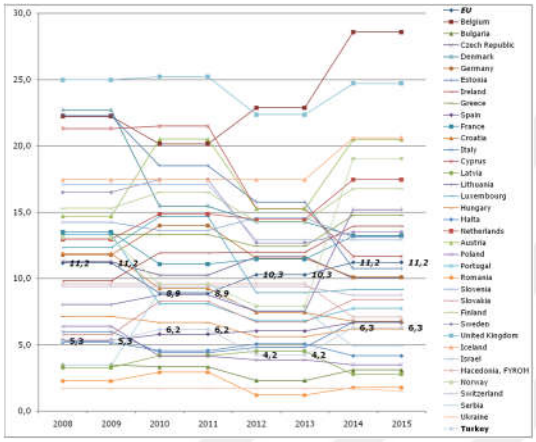


(m)

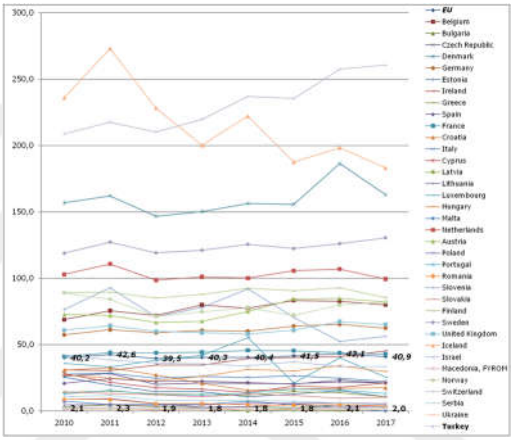


(n)

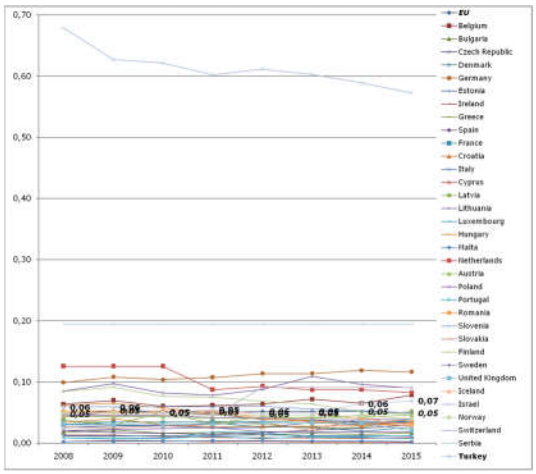
(*): This indicator is not available for Iceland.



(o)

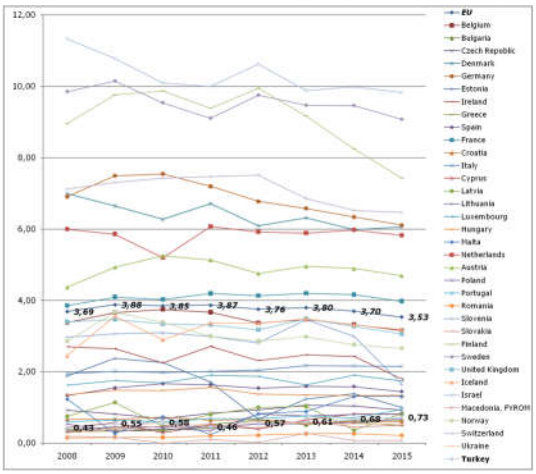


(p)



(q)

(*): This indicator is not available for Macedonia, FYROM and Ukraine.



(r)

(*): This indicator is not available for Serbia.

Figure 5.15 (continued): Indicators: m) SMEs introducing marketing or organisational innovations as % of SMEs, n) SMEs innovating in-house as % of SMEs, o) Innovative SMEs collaborating with others (% of SMEs), p) Public-private co-publications per million population, q) Private co-funding of public R&D expenditures (percentage of GDP), r) PCT patent applications per billion GDP (in PPS) (Author's own illustration based on the European Commission, 2018b).

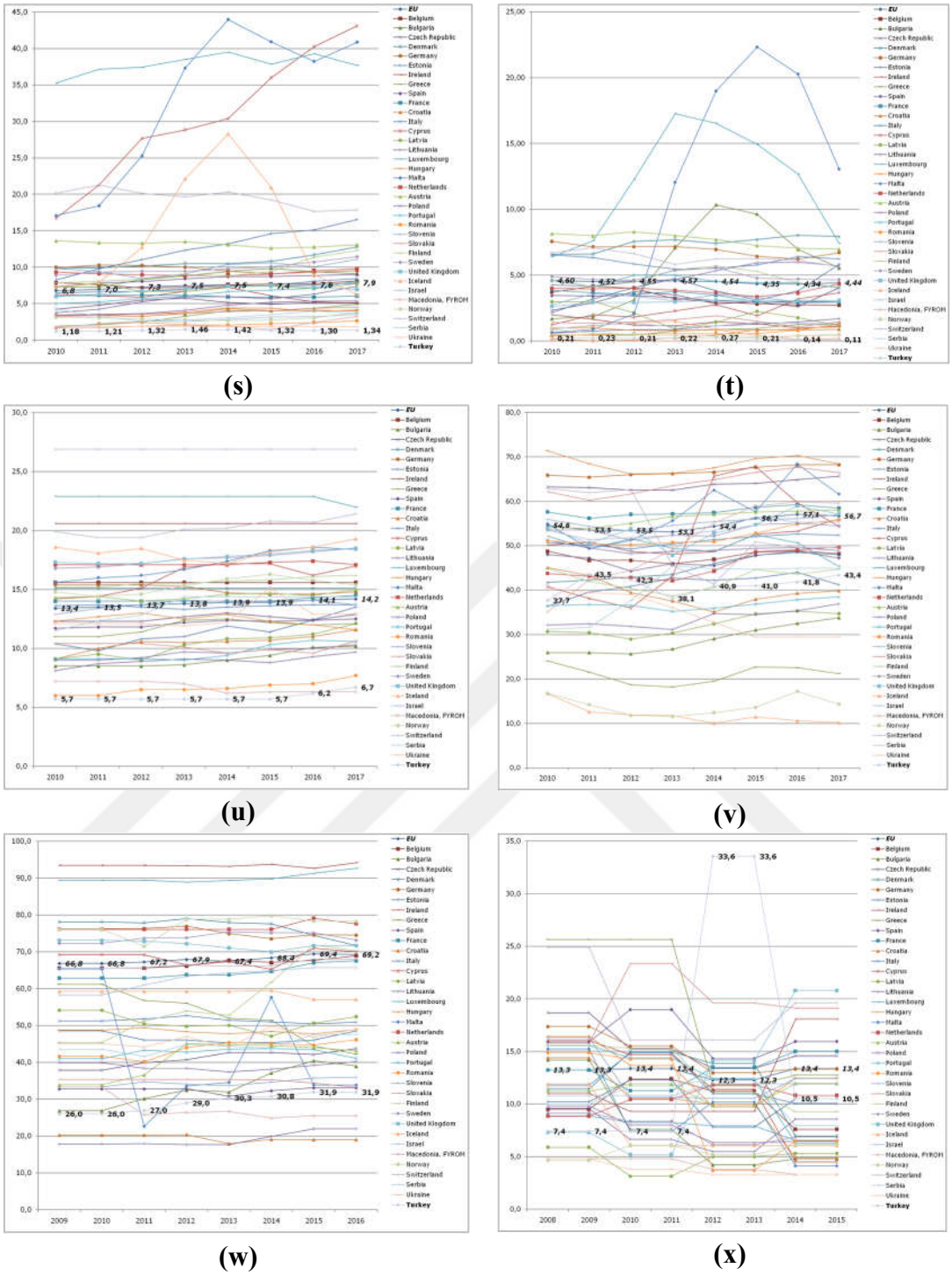
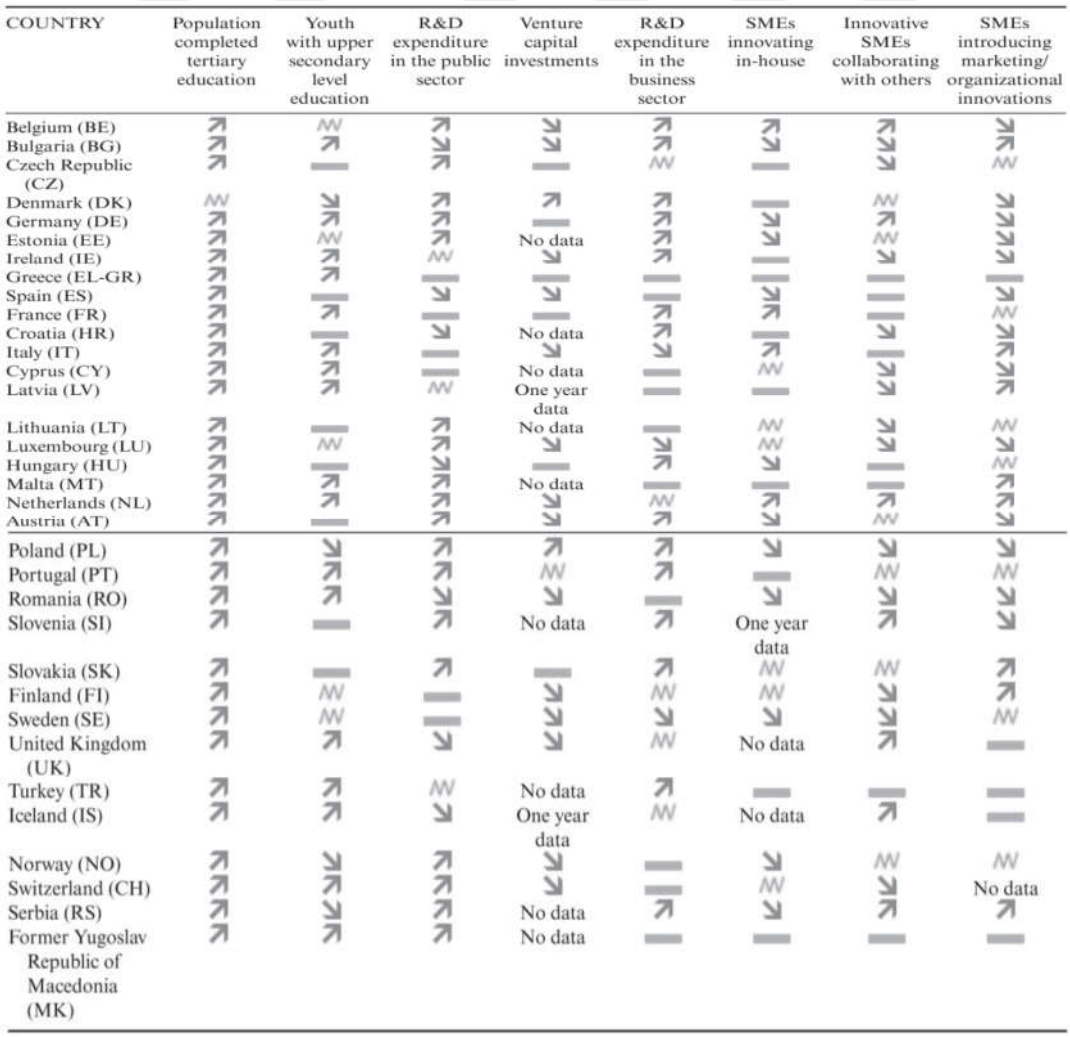


Figure 5.15 (continued): Indicators: s) Trademark applications per billion GDP (in PPS), t) Design applications per billion GDP (in PPS), u) Employment in knowledge-intensive activities (% of total employment), v) Exports of medium and high technology products as a share of total product exports, w) Knowledge-intensive services exports as % of total services exports, x) Sales of new-to-market and new-to-firm innovations as % of turnover (Author's own illustration based on the European Commission, 2018b).

Besides, according to the study on the change of some variables between 2007-2016 and the structure of the EU countries in the effects of the 2008 global economic crisis (Baycan and Özen, 2018), Turkey, with growth rate more than six times the EU average, has experienced an incredible increase in their innovation performance in the face of the crisis and has risen from the lowest to the middle group of countries. As shown in Figure 5.16, Turkey had increasing performances in terms of 'Population completed tertiary education', 'Youth with upper secondary level education' and 'R&D expenditure in the business sector', a fluctuating performance in terms of 'R&D expenditure in the public sector" and stable structure in 'SMEs innovating in-house', 'Innovative SMEs collaborating with others', 'SMEs introducing marketing/organizational innovations' variables (Baycan and Özen, 2018).


COUNTRY
Population completed tertiary education
Youth with upper secondary level education
R&D expenditure in the public sector
Venture capital investments
R&D expenditure in the business sector
SMEs innovating in-house
Innovative SMEs collaborating with others
SMEs introducing marketing/ organizational innovations
Belgium (BE)
Bulgaria (BG)
Czech Republic (CZ)
Denmark (DK)
Germany (DE)
Estonia (EE)
Ireland (IE)
Greece (EL-GR)
Spain (ES)
France (FR)
Croatia (HR)
Italy (IT)
Cyprus (CY)
Latvia (LV)
Lithuania (LT)
Luxembourg (LU)
Hungary (HU)
Malta (MT)
Netherlands (NL)
Austria (AT)
Poland (PL)
Portugal (PT)
Romania (RO)
Slovenia (SI)
Slovakia (SK)
Finland (FI)
Sweden (SE)
United Kingdom (UK)
Turkey (TR)
Iceland (IS)
Norway (NO)
Switzerland (CH)
Serbia (RS)
Former Yugoslav Republic of Macedonia (MK)
No data
One year data
No data
No data
No

5.1.2 Turkey's overall innovation performance profile at national level

Before measuring the regional innovation performance of Turkey in NUTS-3 level, it is important and necessary to evaluate the country profile in general. Firstly, innovation profile of Turkey should be examined in national level.

In this section, a set of indicators (Table 5.7) including patent, utility model, trademark and design gathered from the TÜRKPATENT is used in order to measure the innovation profile of Turkey in national level.

This heading is structured by the supportive question as follows:

- What kind of trend does Turkey have over time on selected indicators?

Table 5.7 : Data set for measuring the innovation profile of Turkey in national level (Author's own illustration).

Source	Data	Time Period
Turkish Patent and Trademark Office (TÜRKPATENT)	Patents - Distribution Of Patent Applications With Respect To Cities - Distribution Of Patent Grants With Respect To Cities Utility Models - Distribution Of Utility Models Applications With Respect To Cities - Distribution Of Utility Model Grants With Respect To Cities Trademarks - Distribution Of Trademark Applications With Respect To Cities - Distribution Of Trademark Registrations With Respect To Cities Industrial Designs - Distribution Of Industrial Design Applications With Respect To Cities - Distribution Of Industrial Designs Registrations With Respect To Cities	Between 2000 and 2017

Before evaluating the innovation profile of Turkey both in the national and regional scales, it is useful to define the indicators as patents, utility models, trademarks, designs which are the different forms of the IPR.

Table 5.8 contains the definitions of these indicators by the TÜRKPATENT (URL-19, URL-20, URL-21). The TÜRKPATENT states the differences between the patents and the utility model as following (Table 5.9): "no inventive step is sought for the utility models. In addition, no utility model protection is possible for the methods, the products resulted from such methods and chemical substances (URL-19)". Besides these differences, "Issuance of utility model certificate is in favour of the applicant in terms of cost and short process time and it is much easier due to the fact that no examination and search procedures are applied (URL-19)".

Table 5.8 : Definitions of selected data by the TÜRKPATENT.

Indicators	Definitions
Patents	"Patent, granted to the inventor for an invention, is one of the industrial property rights and it grants the right to prevent the production, utilisation or sale of the invention by others without permission of the inventor (URL-19)".
Utiliy Models	"The utility model is a system which provides protection of the novel not only in Turkey but also all through the world and industrially applicable inventions. The procedures for the issuance of a utility model certificate are much more convenient than the patent certificates in terms of time and expenses. It has been considered that the simple and inexpensive procedural proceedings for utility models may encourage especially the small and medium scale enterprises (SMEs) and research institutions to make an invention and apply such inventions to the industry. Besides, particularly today, there exists a risk for the imitation of the inventions realised by the small and medium scale industrialists by the competitors in almost the same manner. Even if an invention is small and modest, the issuance of the utility model certificate for such an invention will serve as protection of the SMEs and their perpetuation economically (URL-19)".
Trademarks	"Trademarks are the signs of the goods and services provided by any enterprise to make them distinct from those provided by other enterprises. Words, letters, numbers, drawings, pictures, figures, colours, logos, labels and a combination of these used specifically for the purpose of distinction of such goods and services may be accepted as trademark (URL-20)".
Designs	"The design can best be expressed as the entirety of the various features such as lines, colour, texture, shape, sound, elasticity, material or other characteristics perceived by the human senses of the appearance of the whole or part of a product or its ornamentation (URL-21)".

Table 5.9 : Differences between patents and utiliy models (URL-22).

	Patents	Utiliy Models
Novelty	+	+
Inventive step	+	-
Industrial applicability	+	+
Methods and the products resulted from such methods	+	-
Chemical substances	+	-
Search	+	-*
Examination	+	-
Publication	+	+
Protection Period	20 years: (System with examination) 7 years: (System without examination)	10 years
		*: To be made if claimed by the Applicant.

In order to have a brief and general opinion on the innovation profile of the country, trends of the selected variables are examined over the time between 2000 and 2017.

During the analysis of the variables, determinations were made on both the actual numbers and the values per 1000 people. In general, there is no obvious difference between number and per capita trends.

If all indicators are evaluated generally, it can be interpreted that the indicators other than the patent have a fluctuating tendency and that they are affected by the economic crisis in 2008.

According to the Annual 2009 Report of the TPI (p. 5); "Although there was a certain amount of decrease in trademark and design applications with the impact of the global crisis in 2009, the fact that these decreases are far below the world average

is promising for Turkey. As a matter of fact, Turkey remained as one of the three leading countries in Europe in trademark and industrial design applications in year 2009 again. Along with that, just like year 2008, applications submitted to the institute in 2009 on patents and utility models exceed 10 thousands. The increase in local applications ratio in patent applications compared to the previous years has been evaluated as a promising development".

5.1.2.1 Patent applications and grants

According to the Annual 2009 Report of the TPI (p. 51), "In Turkey, in near period of time, increases far above world average is seen in patent applications too just as all industrial property rights".

As previously stated, if all indicators are evaluated generally, it can be interpreted that local patent applications and registrations are the only indicators that have an increasingly trend and that are not affected by the economic crisis in 2008.

Due to the trends of patent applications and grants, it is obvious that this indicator is not affected by the economic crisis in 2008. Also, TÜRKPATENT supports this review in their Annual 2010 Report of the TPI (p. 72) as following: due to the global crisis, while the number of patent applications in many countries in 2009, especially local patent applications decreased by 8-10%, Turkey is the one of the exceptional few countries in the world which increased its local patent applications in 2009.

According to the Annual 2010 Report (p. 76) of the TPI, in 2010, while the local patent applications increased by 25.6% compared to 2009, this rate was 5.3% in utility model applications. This shows that the invention structure of Turkey is changed and patent application is preferred instead of utility model application. In 2010, for the first time in Turkey local patent applications have surpassed the utility model applications.

There are huge differences between trends of patent applications and grants. Although they both have increasing trends, the increases in local patent applications do not reflect to the local patent grants (Figure 5.17).

The reason that accelerated the patent after 2013 may be the implementation of the new patent support program as of 01.01.2014. According to the 2014 Annual Report of the TPI (p. 47): The TÜBİTAK 1008 Patent Application Incentive and Support

Program, which was implemented in cooperation with the TPI and TÜBİTAK on 09.21.2006, was terminated on 11.15.2013 and the new TÜBİTAK 1602 Patent Support Program was implemented as of 01.01.2014 and 2.398 requests benefited from TÜBİTAK's 1602 incentive.

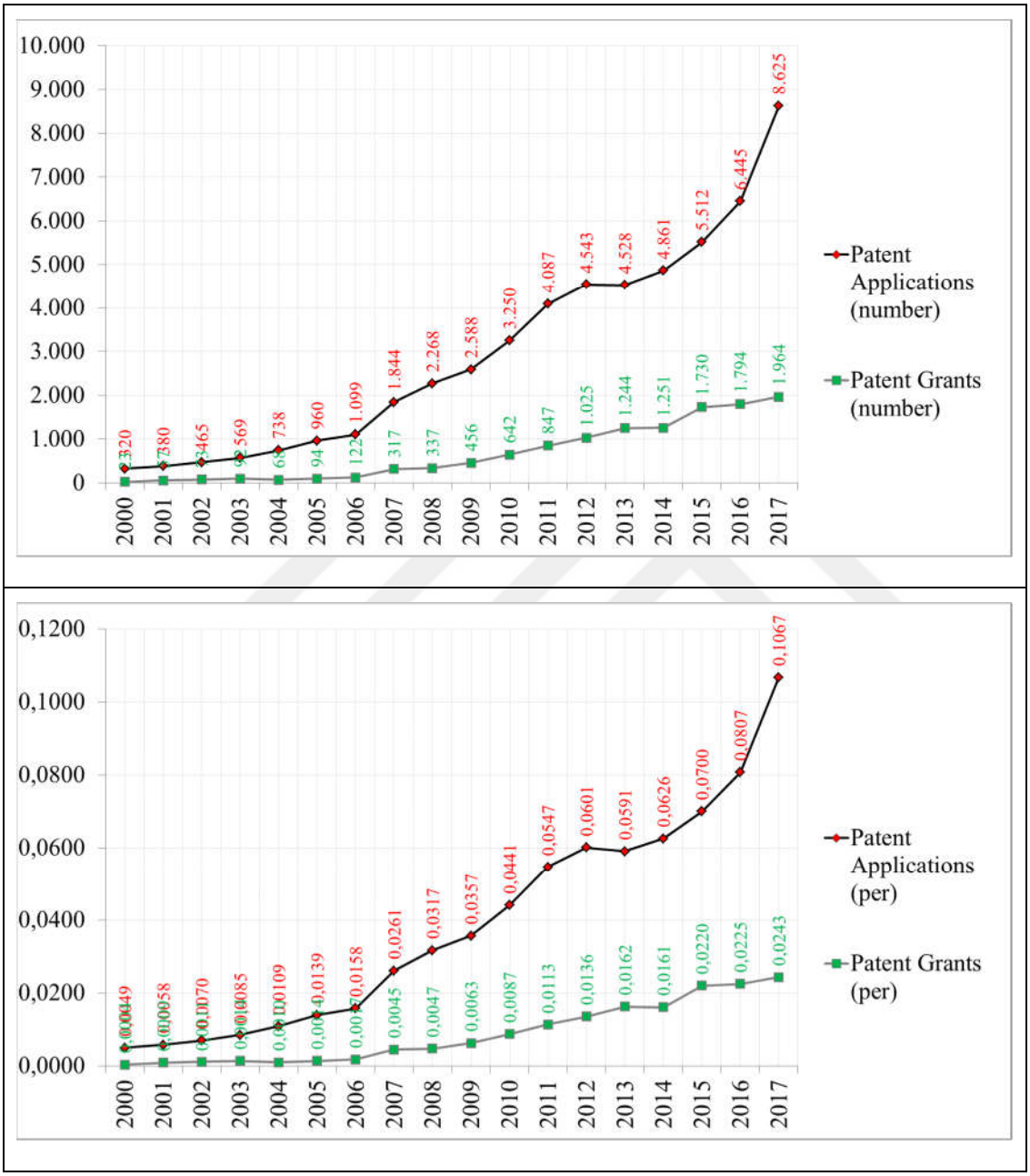


Figure 5.17 : Innovation profile of Turkey in the national level in terms of 'patents' (Author's own illustration based on the statistics of the TÜRKPATENT, URL-23).

5.1.2.2 Utility model applications and grants

In terms of the utility models, due to the amount of applications Turkey had a very significant upward trend until 2008. Although there were small declines in 2008 and 2009 (from 2.968 to 2.942 in 2008 and 2.842 in 2009), with a high increase in 2012

the country reached its highest value with 3.725 applications and could not be able to maintain this increase (Figure 5.18).

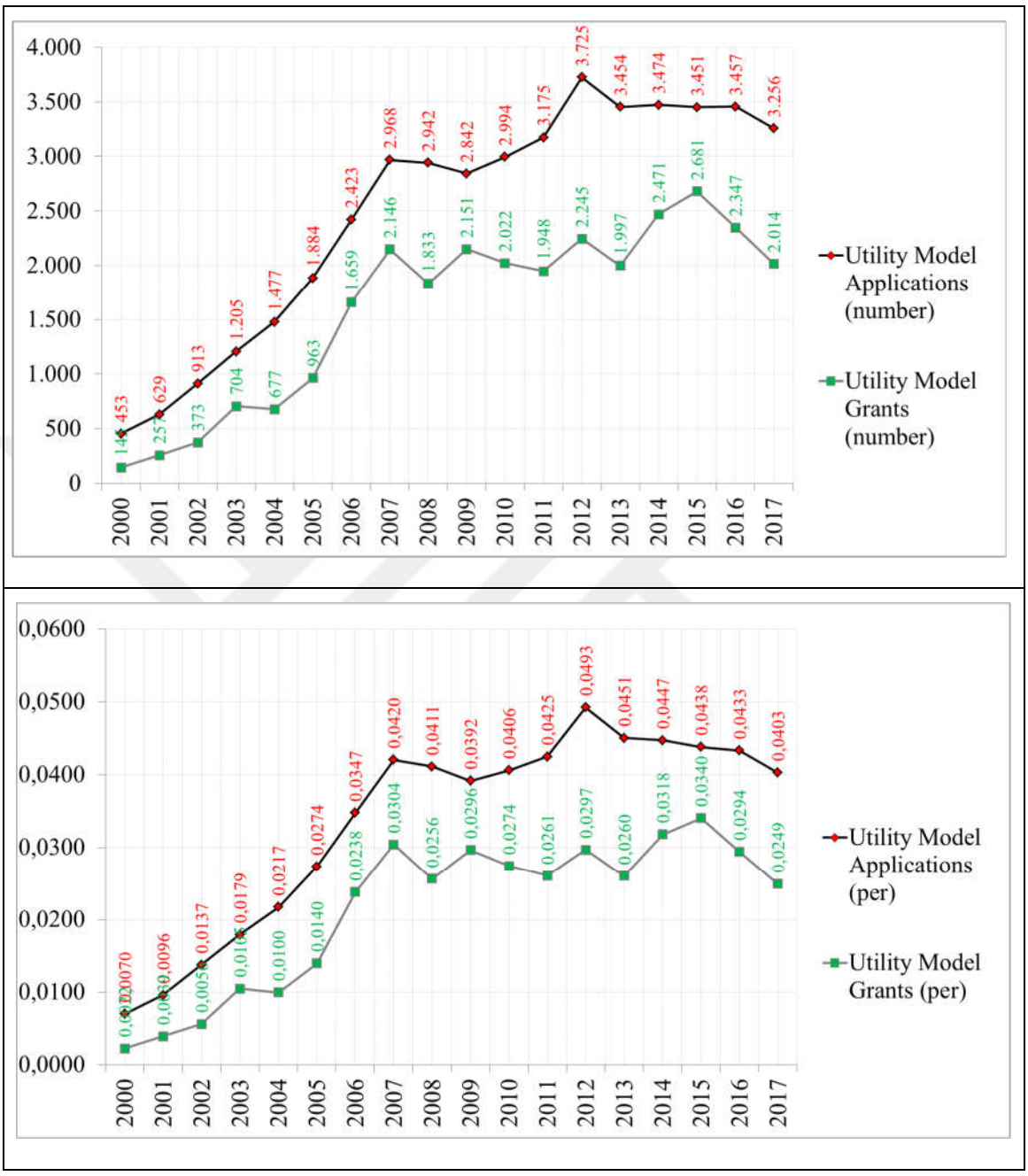


Figure 5.18 : Innovation profile of Turkey in national level in terms of 'utility models' (Author's own illustration based on the statistics of the TÜRKPATENT, URL-24).

According to the 2008 Annual Report of TPI (p. 69), in 2008, the number of utility model applications decreased by 0.77% and it is possible to associate the cause of this decline with the global economic crisis.

Just like the amount of applications, the amount of the grants had a very significant upward trend until 2008. There was a significant decline in 2008 (from 2.146 to 1.833). Due to the grants, the decline in 2008 is much more remarkable than applications'. Especially, the decrease of grants in 2008 shows that, grants had affected by the economic crisis in 2008. Despite the applications, the number of the grants increased and reached the highest value in 2015 with 2.681 grants, but it could not be able to maintain this increase. Significant declines in 2016 and 2017 have made the trends of applications' and grants' different than each other.

Finally it can be interpreted that the applications and grants of utility model have a fluctuating tendency and that they are affected by the economic crisis in 2008. Although the amount of applications and grants of utility model have increased enough to try to recover in 2012 for applications and in 2015 for grants, the downward trends are continuing after 2012.

If a comparison is made over the differences between the applications and grants, it is obvious that grants have a more obvious decline in 2008 (from 2.146 to 1.833) and also have a more fluctuating tendency after 2012 than the applications.

5.1.2.3 Trademark applications and registrations

When the tendency of the applications is examined; although applications increased until 2012, they experienced a decline in and after 2012 and reached their highest level with the increase in 2017 (106.099 applications) (Figure 5.19).

Due to the registrations of trademark, it is obvious that the registrations are affected by the economic crisis in 2008. Because it is observed that registrations fell in 2008 and could not recover until 2012. The increases in 2012 and 2013 are magnificent (from 35.858 to 52.386 in 2012 and from 52.386 to 68.391 in 2013).

If a comparison is made over the differences between the applications and registrations, the trend of applications have a more fluctuating tendency than the registrations'. It is obvious that the registrations are affected by the economic crisis in 2008 more then the applications. Especially the difference between the applications and registrations is apparent in 2017. In 2017, while applications are increasing, registrations are decreasing.

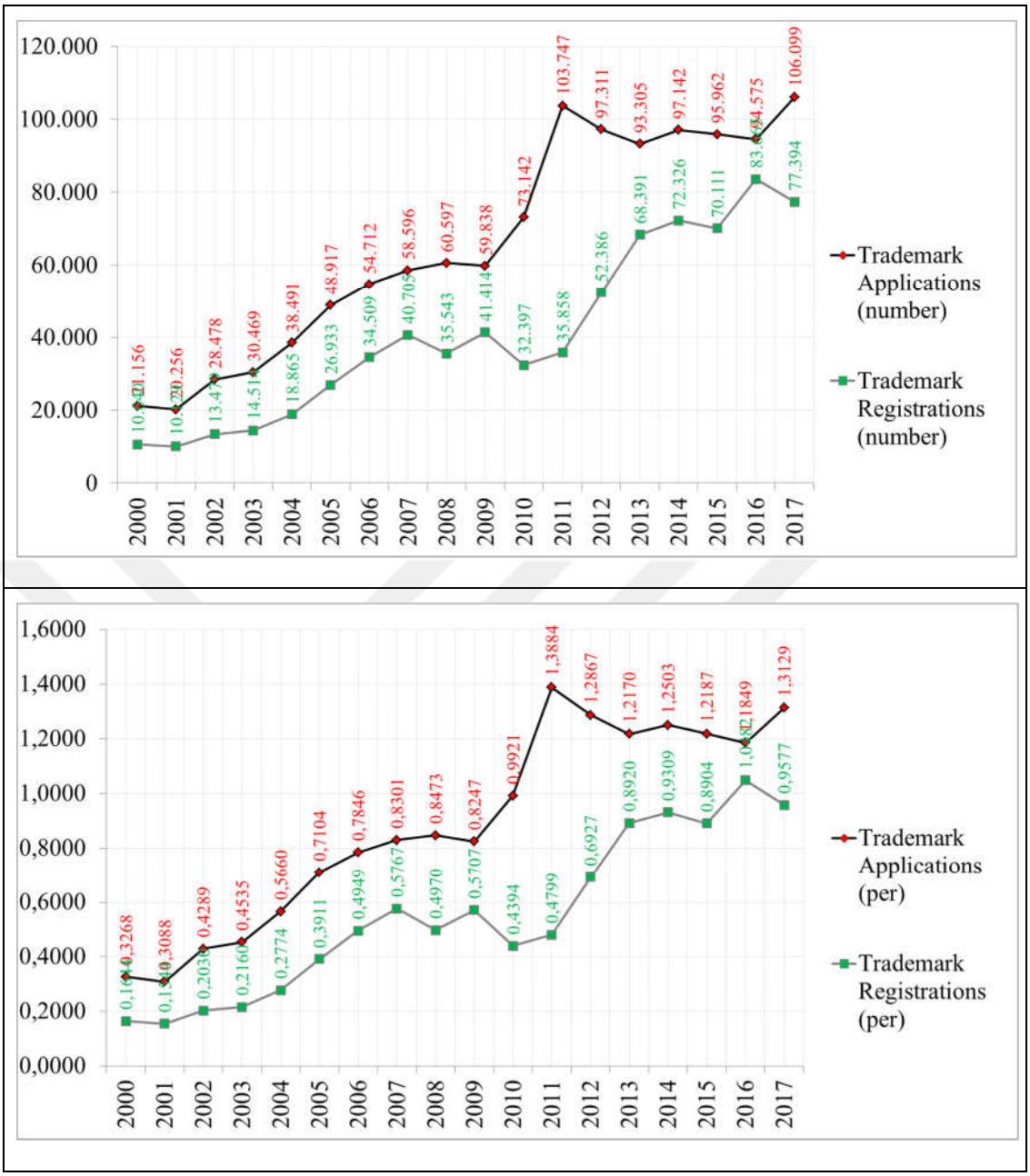


Figure 5.19 : Innovation profile of Turkey in national level in terms of 'trademarks' (Author's own illustration based on the statistics of the TÜRKPATENT, URL-25).

5.1.2.4 Design applications and registrations

This indicator is the closest indicator to the application and registration values, unlike other variables. Especially in 2009, there is a significant decline in both the applications and registrations of design (file). This decline is from 6.093 to 5.927 for the applications and from 5.783 to 5.378 for the registrations (Figure 5.20).

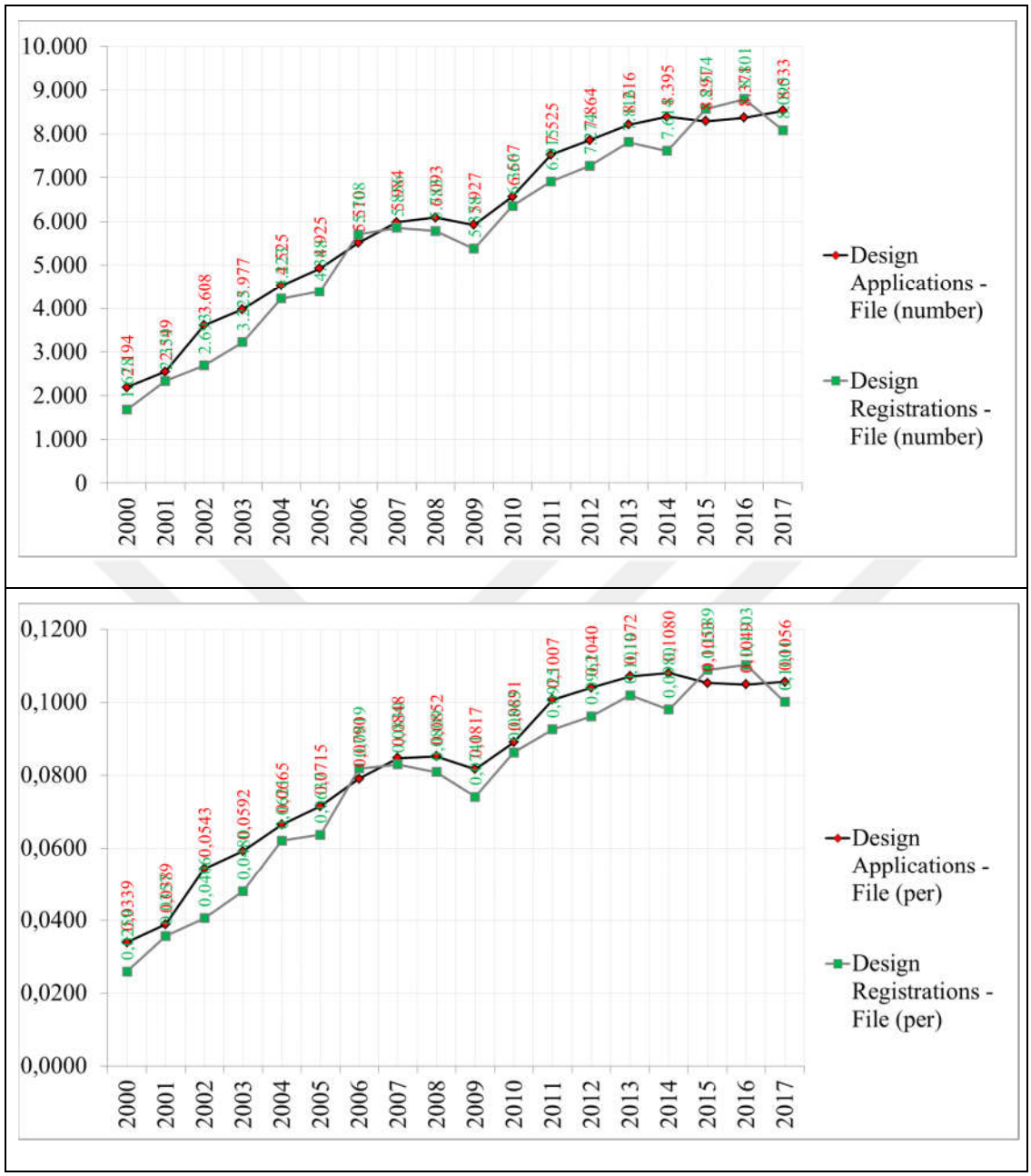


Figure 5.20 : Innovation profile of Turkey in national level in terms of 'designs (file) (Author's own illustration based on the statistics of the TÜRKPATENT, URL-26).

The trend of the design (design) is much more fluctuating than the trend of the design (file). The decline in 2009 of design (design) is more specific than the one of the design (file) (Figure 5.21).

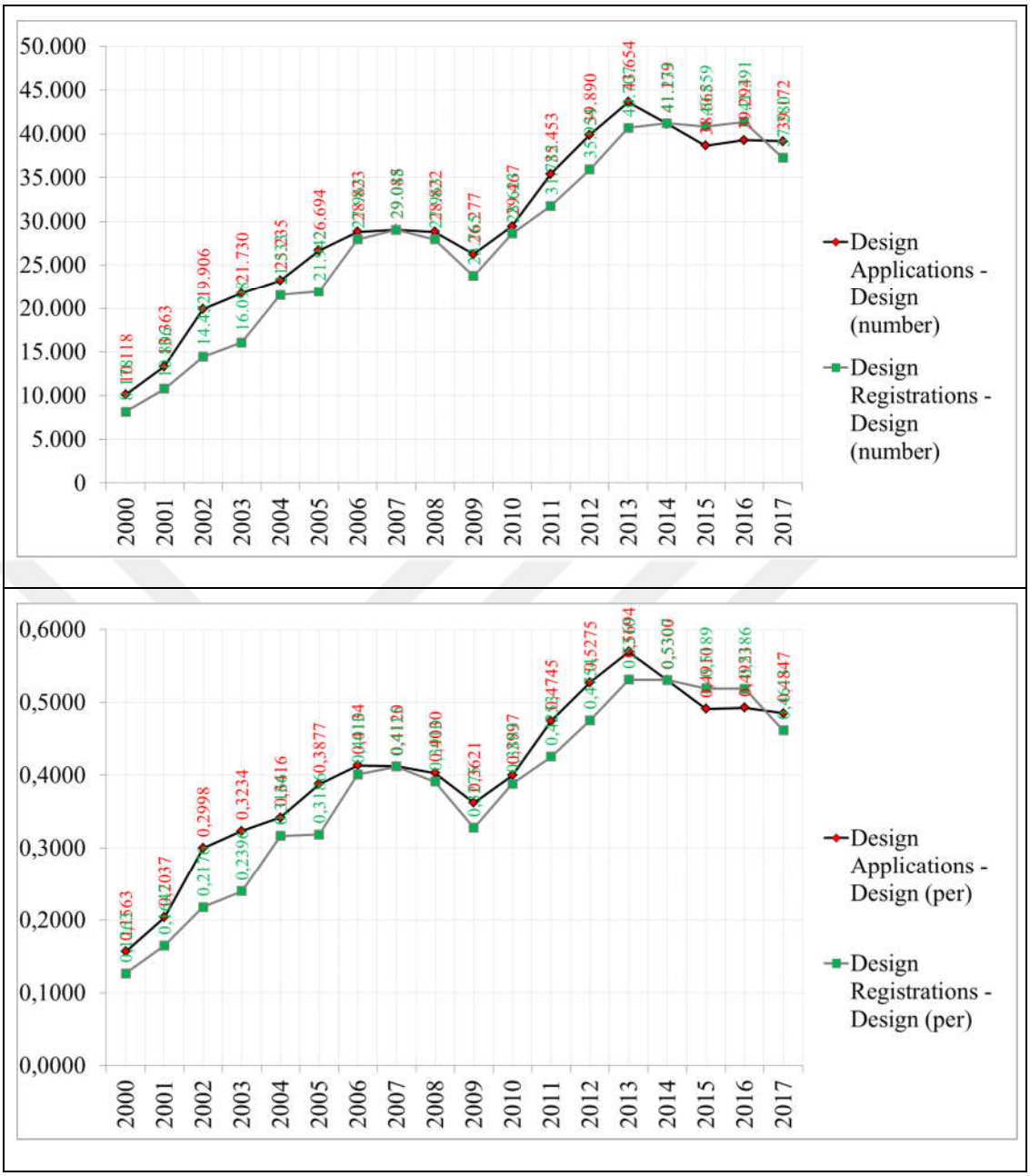


Figure 5.21 : Innovation profile of Turkey in national level in terms of 'designs (design)'(Author's own illustration based on the statistics of the TÜRKPATENT, URL-26).

5.2 Innovation Performance Profile of the Regions in Turkey

For revealing the innovation performance profile of regions, descriptive statistics, Markov Chains and Panel Data analysis are explained respectively.

This heading is structured as follows:

- How is the overall profile of the Turkish regions over time through selected indicators?

- Are there any regional disparities (at NUTS-3 level) in innovation performance in Turkey?
- What are the similarities and differences in innovation performance among regions?
- How do Turkish regions differentiate in innovation performances?
- In what ways and how do regions of Turkey differ from one another?
- What are the reasons for the difference in innovation performance?
- Which regions are the most and the least innovative regions?
- Are metropolitan regions more innovative? Is the performance of metropolitan regions a result of the agglomeration?
- Is there a spatial convergence in terms of innovation performance? Does innovation performance show a sprawl or splash effect? Does the disparity exist across the country or with in the region?
- What are the determinants of the innovation performances of the innovative leaders?

5.2.1 Turkey's overall innovation performance profile at regional level

Data organization and visualization must be analyzed carefully before the proceeding the further stages of this study. Descriptive statistics are used to have a general idea of regions.

Before analyzing the data structure of this study, it is important to give a summary of statistical background.

- Absence of a missing value in a data set increases the accuracy of the study because all observations are measured.
- The range value, which defines the difference between the minimum and maximum values, indicates the area in which the data is valued. It can be said that the wider the range, the wider the data is in value.
- There are various ways to identify the distribution of a data set. After applying these methods, it is determined whether the data is normally distributed or not. Some of these methods are as follows:

- ❖ If the ratio of Fischer's skewness coefficient to its standard error is between +1.96 and -1.96, this indicates that the data is normally distributed (Karaatlı, 2006: p. 6).
- ❖ By applying Normality plots with test, it can be statistically determined whether the data is normally distributed or not. These tests are 'Kolmogorov-Smirnov' and 'Shapiro-Wilk' normality tests. Karaatlı (Karaatlı, 2006: p. 10) states that "The 'Shapiro-Wilk' test can be used when the number of observations is less than 29, and the 'Kolmogorov-Smirnov (Lilliefors)' test when the number of observations is 29 or greater". When the normality analysis of the data is performed, if the P-value for both tests is a value less than 0.05, it means the null hypothesis, ('H_0: Distribution of data fits to normal distribution'), is rejected and the data is not normally distributed (Karaatlı, 2006: p. 13).
- ❖ Besides the normality tests and the ratio of Fisher's skewness coefficient to its standard error, another way is to visualize the data graphically. "Graphics are expressing statistical data in a visible way (Karaatlı, 2006: p. 7)". Therefore, histogram, steam and leaf, boxplots, Q-Q plot graphics can be used to visualize the data.

- Outlier analysis should be done to determine the data causing the distribution to be not normal. It is important to do outlier research in data sets for two reasons: (i) Since outlier/extreme values will distract distribution from normality, they can be removed from the data set. (ii) Outlier values are also sources of information. Outlier values are determined and the reasons are tried to be explained (Karaatlı, 2006: p. 10). Karaatlı (2006: p. 11) states that the extreme values can be intervened in two ways: (i) extreme values can be corrected during the clearing of the data, (ii) the researcher can decide whether or not to remove the extreme values according to the importance of data in the research.

In this context, in order to identify the type of distribution of the data, since the number of regions is 81, the normality test of 'Kolmogorov-Smirnov (Lilliefors)' is preferred and the ratio of Fischer's skewness and kurtosis coefficients to the standard

errors is determined. Finally, the distribution of data is supported by graphical representation. The purpose of using boxplot graphics as a methodology for data visualization is to show the shape of the distribution, the central tendency and the extent of dispersion of the data set.

Descriptive statistics, normality tests and graphs are evaluated both for separately each year and according to the averages of values in the time periods as 2000-2005, 2006-2010 and 2011-2017 in order to examine the general profiles of the regions.

The mean, median, variance, standard deviation, minimum, maximum, range, skewness and kurtosis values of the data have obtained with Analyze-Descriptive Statistics-Explore in the Statistical Package for the Social Sciences (SPSS) program. In addition, outlier analysis is performed from 'Outliers' section of Analyze-Descriptive Statistics-Explore-Statistics. Also in order to visualize the data, Boxplots and histogram graphs from Analyze-Descriptive Statistics-Explore-Plots are preferred. Besides, 'Kolmogorov-Smirnov (Lilliefors)' test was applied with the option of 'normality plots with tests' from the same section.

With this approach, four different evaluations are carried out for each variable. These evaluations are: (i): Evaluation per each year (number), (ii) Evaluation per each year (lg of number), (iii) Evaluation of time periods (mean values), and (iv) Evaluation of time periods (lg of mean values). It has been found appropriate to explain the evaluations regarding the average (Evaluation of time periods (lg of mean values)) in the content of the thesis and to include the statements related to each year in the Appendices.

For all indicators, the presence of every data and the absence of a missing value in a data set increased the accuracy of this study, as all data were measured.

In addition, although there are outlier/extreme values in the indicators, outlier/extreme values are not removed from the data set or the data is not trimmed for three reasons as follows:

- Highest and lowest extreme values provide important information for regional profile. Although the value of some regions is zero, these regions require examination due to their inability to apply or register. Therefore it is decided not to exclude these regions from the data set since this is important. In addition to having a

lot of applications or registrations, it is also important that a region cannot have any applications or registrations.

- Regions as highest and lowest extreme values differ in terms of application and registration of each variable.

- 81 regions (at NUTS-3 level) are asked to be compared, since the possibility of removing different regions from the data set each time would not allow for comparison across the country.

5.2.1.1 Evaluation of patents

Applications: In terms of 'Patent Applications' indicator, there is not a missing value for 81 regions at (NUTS-3 Level) (Table 5.10, Table A.1). There are many regions with a very low patent application value. Although some regions do not have any patent applications in certain years, there is no region that does not apply for a patent for all years in the 2000-2017 period. When descriptive statistics for each year are evaluated, it is seen that range is generally increasing every year from the year 2000 (161) to 2017 (3795) except excluding 2013. According to the ratio of the Fisher's skewness coefficient to its standart error, it is seen that the data is not normally distributed and shows a severe positive skewness (a right skewed distribution) (Table A.3). Another indication that the data is not normally distributed is the P-value of 'Kolmogorov-Smirnov (Lilliefors)'. Since the value (0.000) is less than P=0.05, the H_0 hypothesis ('H_0: Distribution of data fits to normal distribution'), is rejected and the data is proven by normality test that it is not normally distributed (Table A.2). This situation can be clearly seen from histogram and boxplot graphs (Figure A.1 and Figure A.2). The results of the Outlier analysis performed to determine the observations causing the distribution to be not normal are as follows. The years between 2000-2017, the leading region was İstanbul. Ankara and İzmir respectively followed İstanbul between the years 2000 and 2009. In 2010, while İstanbul and Ankara kept their place, Manisa took the third place. In 2011 while Bursa took the second place and Ankara took the third place, this situation reversed between 2012 and 2016. In 2017, Manisa was the second and Ankara the third (Table A.4).

Apart from this, when the descriptive statistics (Table A.7) are examined according to the 2000-2005, 2006-2010 and 2011-2017 time periods, it is seen that the data

does not seem to conform to the normal distribution (Table A.6). As outliers, İstanbul and Ankara were the first two regions for all periods, while İzmir took the third place for the time period 2000-2005 and 2006-2010, and Bursa for 2011-2017 (Table A.8).

The data of logarithmic version of all years are also not normally distributed except the years 2015 and 2017 according to the P-value of Kolmogorov-Smirnov Normality Test (Table A.10). When the descriptive statistics of the logarithmic values of the time periods are examined, it is seen that there is no missing data (Table 5.10) and the data does not show normal distribution according to the ratio of Fisher's skewness coefficient to its standard error, normality tests, frequency distribution and boxplot graphs (Table 5.11, Table 5.12, Figure 5.22 and Figure 5.23). Regions causing not normally distribution were determined by outlier analysis. According to the Outlier analysis, the highest two regions for all time periods were İstanbul and Ankara, while İzmir in time periods of 2000-2005 and 2006-2010 took the third place, Bursa in 2011-2017 time period. The lowest regions vary according to the time periods (Table 5.13). This situation can also be seen from the boxplot graphs. According to the boxplot graphs, İstanbul is extreme for all time periods, while Ankara, İzmir and Bursa are outlier regions. Unlike previous time periods, Manisa and Kocaeli were also added as outlier regions in the 2011-2017 time period (Figure 5.23).

Table 5.10 : Case proccesing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table 5.11 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Mean_2000_2005	0,193	81	0,000	0,791	81	0,000
Lg_Mean_2006_2010	0,142	81	0,000	0,908	81	0,000
Lg_Mean_2011_2017	0,123	81	0,004	0,930	81	0,000
a. Lilliefors Significance Correction						

Table 5.12 : Descriptive statistics.

	Descriptives	Statistic	Std. Error
Lg_Mean_2000_2005	Mean	0,3966	0,05080
	Median	0,2625	
	Variance	0,209	
	Std. Deviation	0,45723	
	Minimum	0,00	
	Maximum	2,46	
	Range	2,46	
	Skewness	2,064	0,267
	Kurtosis	5,626	0,529
Lg_Mean_2006_2010	Mean	0,7691	0,06828
	Median	0,6990	
	Variance	0,378	
	Std. Deviation	0,61455	
	Minimum	0,00	
	Maximum	2,99	
	Range	2,99	
	Skewness	1,187	0,267
	Kurtosis	1,614	0,529
Lg_Mean_2011_2017	Mean	1,0810	0,07458
	Median	1,0000	
	Variance	0,450	
	Std. Deviation	0,67118	
	Minimum	0,06	
	Maximum	3,38	
	Range	3,32	
	Skewness	1,019	0,267
	Kurtosis	1,177	0,529

Table 5.13 : Outlier-Extreme values.

	Extreme Values				
			Case	Region	Value
Lg_Mean_2000_2005	Highest	1	34	İSTANBUL	2,46
		2	6	ANKARA	1,88
		3	35	İZMİR	1,70
		4	16	BURSA	1,42
		5	41	KOCAELİ	1,14
	Lowest	1	80	OSMANİYE	0,00
		2	79	KİLİS	0,00
		3	78	KARABÜK	0,00
		4	75	ARDAHAN	0,00
		5	73	ŞIRNAK	,00[a]
Lg_Mean_2006_2010	Highest	1	34	İSTANBUL	2,99
		2	6	ANKARA	2,41
		3	35	İZMİR	2,13
		4	16	BURSA	2,12
		5	45	MANİSA	1,96
	Lowest	1	75	ARDAHAN	0,00
		2	69	BAYBURT	0,00
		3	36	KARS	0,00
		4	24	ERZİNCAN	0,00
		5	8	ARTVİN	0,00
Lg_Mean_2011_2017	Highest	1	34	İSTANBUL	3,38
		2	6	ANKARA	2,79
		3	16	BURSA	2,61
		4	35	İZMİR	2,44
		5	45	MANİSA	2,43
	Lowest	1	76	IĞDIR	0,06
		2	75	ARDAHAN	0,11
		3	49	MUŞ	0,11
		4	4	AĞRI	0,16
		5	69	BAYBURT	,27[b]

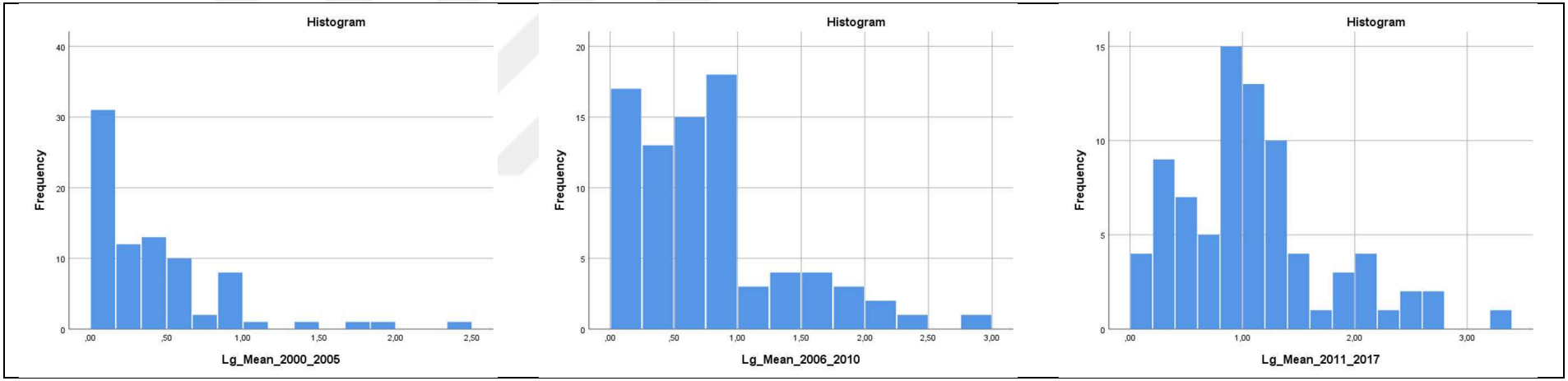


Figure 5.22 : Histogram graphs.

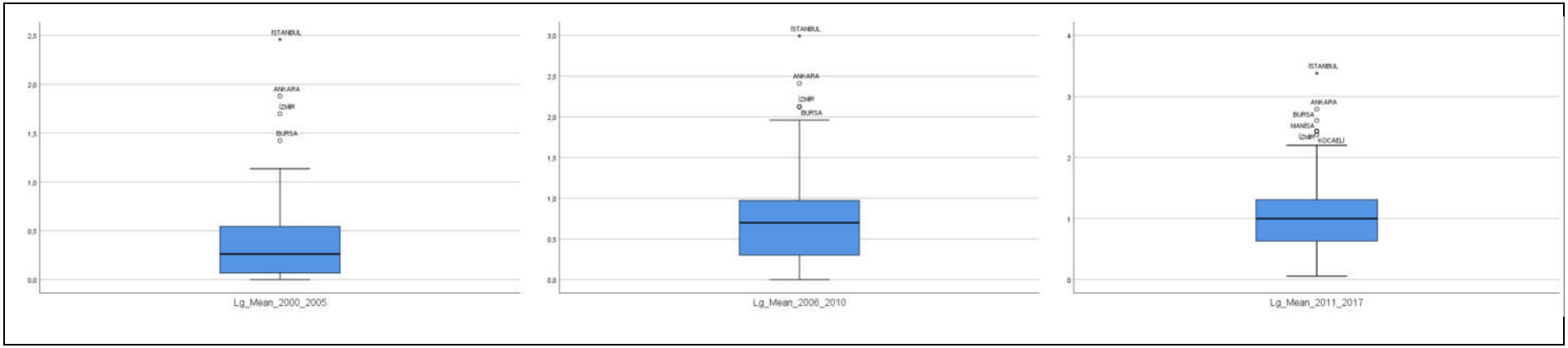


Figure 5.23 : Boxplots.

Grants: When descriptive statistics of the patent grants are examined per each year between the years 2000 and 2017, it is seen that Artvin, Erzincan, Hakkari, Tunceli and Bayburt regions could not obtain patent grants in any year.

When the descriptive statistics are examined per each year, it is seen that there is no missing data for this variable, and the data are not normally distributed according to normality tests, the ratio of Fisher's skewness co-eefficient to its standard error, histogram and boxplot graphs (Table A.14, Table A.15, Figure A.7 and Figure A.8). Although the range value decreases a little in 2004, 2005 and 2008, the range generally increases in other years (Table A.15).

The remarkable issue in patent grants is that Kocaeli's value (10) in 2000 is higher than İstanbul's value (7). According to Outlier analysis, while Kocaeli was the region with the highest value in 2000, it is İstanbul in other years (Table A.16). As can be seen from the histogram (Figure A.7) and boxplot graphs (Figure A.8), the distribution is severely right-skewed distribution.

When the time periods are examined, it is seen that the normal distribution cannot be achieved (Table A.18 and Figure A.9). According to the outlier analysis, İstanbul and Ankara take the lead in all time periods, these regions are followed by İzmir in the first two periods and Bursa in the last period as the third region (Table A.20).

In addition, descriptive statistics of the logarithmic values by years were also examined (Table A.23) and these statistics show that the data are not normally distributed (Table A.22).

Finally, the descriptive statistics of the logarithmic values of the time periods show that there are no missing data (Table 5.14) and the data do not show normal distribution according to normality tests (Table 5.15), descriptive statistics (Table 5.16), histograms (Figure 5.24) and boxplot graphs (Figure 5.25).

It has been statistically determined that the data do not show a normal distribution since the p value was below 0.05 (Table 5.15). The ratio of Fisher's coefficient to its standard error already shows this (Table 5.16).

According to the outlier analysis, İstanbul and Ankara take the lead in all time periods in terms of patent grants. While İzmir was the third highest region in the first two periods, Bursa was in the last period (Table 5.17).

Table 5.14 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table 5.15 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Mean_2000_2005	0,351	81	0,000	0,448	81	0,000
Lg_Mean_2006_2010	0,249	81	0,000	0,700	81	0,000
Lg_Mean_2011_2017	0,176	81	0,000	0,810	81	0,000
a. Lilliefors Significance Correction						

Table 5.16 : Descriptive statistics.

	Descriptives	Statistic	Std. Error
Lg_Mean_2000_2005	Mean	0,0981	0,02743
	Median	0,0000	
	Variance	0,061	
	Std. Deviation	0,24689	
	Minimum	0,00	
	Maximum	1,58	
	Range	1,58	
	Skewness	3,999	0,267
	Kurtosis	18,319	0,529
Lg_Mean_2006_2010	Mean	0,2860	0,04687
	Median	0,1461	
	Variance	0,178	
	Std. Deviation	0,42185	
	Minimum	0,00	
	Maximum	2,32	
	Range	2,32	
	Skewness	2,414	0,267
	Kurtosis	7,051	0,529
Lg_Mean_2011_2017	Mean	0,5540	0,06334
	Median	0,4099	
	Variance	0,325	
	Std. Deviation	0,57006	
	Minimum	0,00	
	Maximum	2,85	
	Range	2,85	
	Skewness	1,793	0,267
	Kurtosis	3,405	0,529

Table 5.17 : Outlier-Extreme values.

		Extreme Values			
			Case	Region	Value
Lg_Mean_2000_2005	Highest	1	34	İSTANBUL	1,58
		2	6	ANKARA	0,95
		3	35	İZMİR	0,85
		4	41	KOCAELİ	0,80
		5	16	BURSA	0,48
	Lowest	1	81	DÜZCE	0,00
		2	80	OSMANİYE	0,00
		3	79	KİLİS	0,00
		4	78	KARABÜK	0,00
		5	77	YALOVA	,00[a]
Lg_Mean_2006_2010	Highest	1	34	İSTANBUL	2,32
		2	6	ANKARA	1,63
		3	35	İZMİR	1,31
		4	16	BURSA	1,30
		5	45	MANİSA	1,11
	Lowest	1	80	OSMANİYE	0,00
		2	79	KİLİS	0,00
		3	78	KARABÜK	0,00
		4	75	ARDAHAN	0,00
		5	73	ŞIRNAK	,00[a]
Lg_Mean_2011_2017	Highest	1	34	İSTANBUL	2,85
		2	6	ANKARA	2,16
		3	16	BURSA	2,09
		4	41	KOCAELİ	1,81
		5	35	İZMİR	1,81
	Lowest	1	76	IĞDIR	0,00
		2	69	BAYBURT	0,00
		3	62	TUNCELİ	0,00
		4	30	HAKKARİ	0,00
		5	24	ERZİNCAN	,00[a]

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.

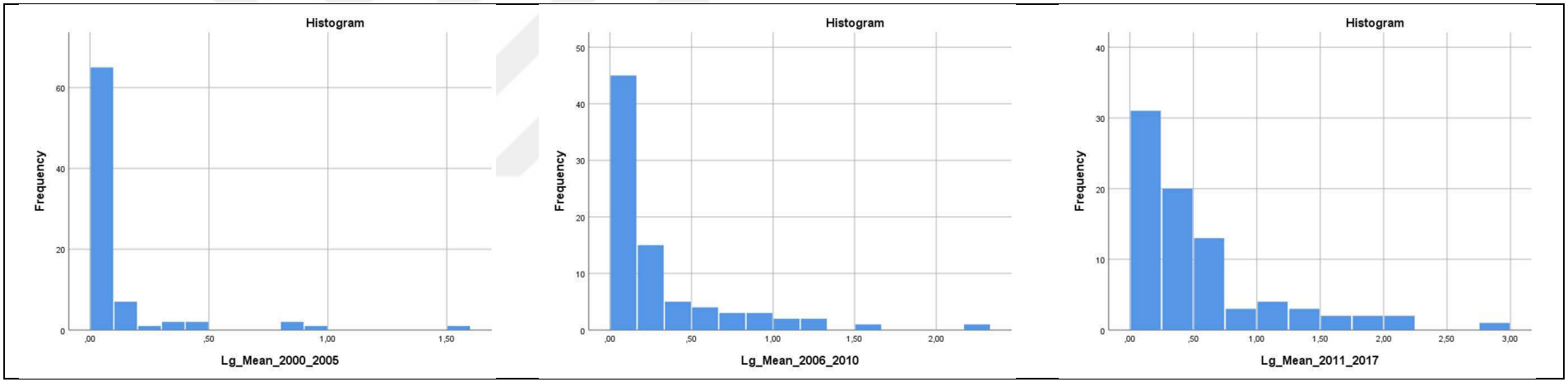


Figure 5.24 : Histogram graphs.

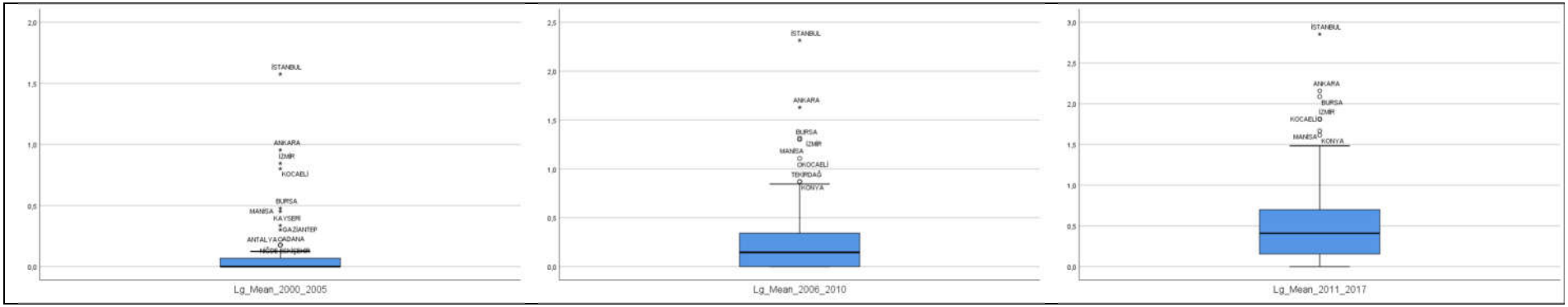


Figure 5.25 : Boxplots.

5.2.1.2 Evaluation of utility models

Applications: In terms of "Utility Model Applications" Indicator, when the data is analyzed per each year, there is not a missing value for 81 regions. Although there are many regions with a very low utility model application value, there are no regions that did not apply for any year between 2000 and 2017.

In order to evaluate utility model applications per each year, descriptive statistics were carried out (Table A.27). According to these descriptive statistics, range showed ups and downs according to years. While the lowest range was in 2000 (163), the highest was in 2012 (1517). According to Fisher's skewness coefficient, it is seen that the data is not normally distributed and shows a severe positive skewness (a right-skewed distribution). Another indication that the data is not normally distributed is the significance level value of 'Kolmogorov-Smirnov (Lilliefors)'. Since the P value (0.000) is less than 0.05, the H0 hypothesis ('H0: Distribution of data fits to normal distribution'), is rejected and the data is proven by normality test that it is not normally distributed (Table A.26). This situation can be clearly seen from histogram and boxplot graphs (Figure A.13 and Figure A.14). The results of the Outlier analysis performed to determine the observations causing the distribution to be not normal are as follows. Between the years 2000 and 2017, the first two regions for Highest outliers never change (the leaders are İstanbul and Ankara, respectively). While İzmir and Bursa compete for the third place in different years, there is a competition between Kayseri and Konya for the fifth place. Konya took the fifth place for 14 years and Kayseri for 4 years (Table A.28).

Since the data is not normally distributed in the analysis made by years, although logarithmic transformation has been applied for each year, the normal distribution did not occur (Table A.34). In order to identify the distribution and visualize the data, descriptive statistics, normality tests, histogram and boxplot graphs are performed over the averages of the number of the utility model applications within each region between three time periods as 2000-2005, 2006-2010 and 2011-2017. These statistical analyzes based on the averages show that the data is not normally distributed (Table A.30). For this reason, since the data of time periods are again excessively skewed, logarithmic transformation is applied and operations are repeated, but once again the normal distribution of the data could not be achieved (Table 5.19). This can be also seen from the histogram and boxplot graphs (Figure

5.26 and Figure 5.27). However, since the most meaningful result as visualization is the logarithmic transformation of the mean values of these three time periods, these results are included in the thesis. Table 5.18 - Table 5.21 show the results according to the evaluation of Lg values of the mean values of the regions within themselves within certain time periods.

Table 5.18 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table 5.19 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Mean_2000_2005	0,215	81	0,000	0,787	81	0,000
Lg_Mean_2006_2010	0,140	81	0,000	0,896	81	0,000
Lg_Mean_2011_2017	0,130	81	0,002	0,913	81	0,000
a. Lilliefors Significance Correction						

Table 5.20 : Descriptive statistics.

	Descriptives	Statistic	Std. Error
Lg_Mean_2000_2005	Mean	0,4850	0,06289
	Median	0,3010	
	Variance	0,320	
	Std. Deviation	0,56604	
	Minimum	0,00	
	Maximum	2,69	
	Range	2,69	
	Skewness	1,797	0,267
	Kurtosis	3,201	0,529
Lg_Mean_2006_2010	Mean	0,7934	0,07272
	Median	0,6435	
	Variance	0,428	
	Std. Deviation	0,65448	
	Minimum	0,00	
	Maximum	3,11	
	Range	3,11	
	Skewness	1,228	0,267
	Kurtosis	1,412	0,529
Lg_Mean_2011_2017	Mean	0,9117	0,07314
	Median	0,7679	
	Variance	0,433	
	Std. Deviation	0,65824	
	Minimum	0,06	
	Maximum	3,14	
	Range	3,08	
	Skewness	1,096	0,267
	Kurtosis	1,038	0,529

Table 5.21 : Outliers-Extreme values.

Extreme Values					
			Case	Region	Value
Lg_Mean_2000_2005	Highest	1	34	İSTANBUL	2,69
		2	6	ANKARA	2,09
		3	16	BURSA	1,98
		4	35	İZMİR	1,97
		5	38	KAYSERİ	1,78
	Lowest	1	80	OSMANİYE	0,00
		2	75	ARDAHAN	0,00
		3	73	ŞIRNAK	0,00
		4	69	BAYBURT	0,00
		5	65	VAN	,00[a]
Lg_Mean_2006_2010	Highest	1	34	İSTANBUL	3,11
		2	6	ANKARA	2,39
		3	35	İZMİR	2,33
		4	16	BURSA	2,31
		5	42	KONYA	2,17
	Lowest	1	73	ŞIRNAK	0,00
		2	56	SİİRT	0,00
		3	30	HAKKARİ	0,00
		4	13	BİTLİS	0,00
		5	12	BİNGÖL	,00[a]
Lg_Mean_2011_2017	Highest	1	34	İSTANBUL	3,14
		2	6	ANKARA	2,57
		3	16	BURSA	2,44
		4	35	İZMİR	2,43
		5	42	KONYA	2,28
	Lowest	1	56	SİİRT	0,06
		2	69	BAYBURT	0,11
		3	62	TUNCELİ	0,11
		4	8	ARTVİN	0,11
		5	4	AĞRI	0,11

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.

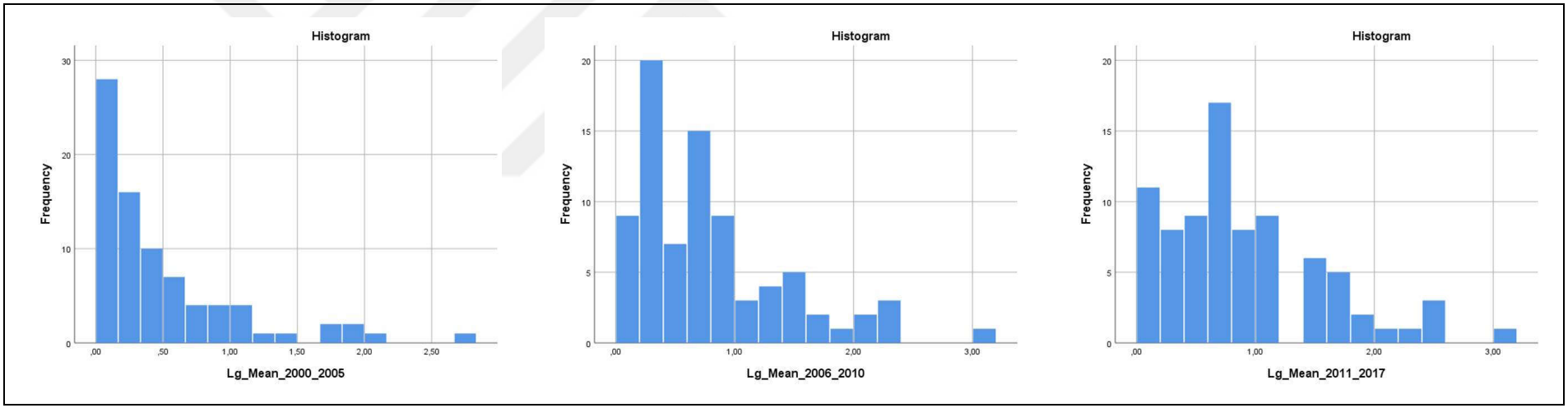


Figure 5.26 : Histogram graphs.

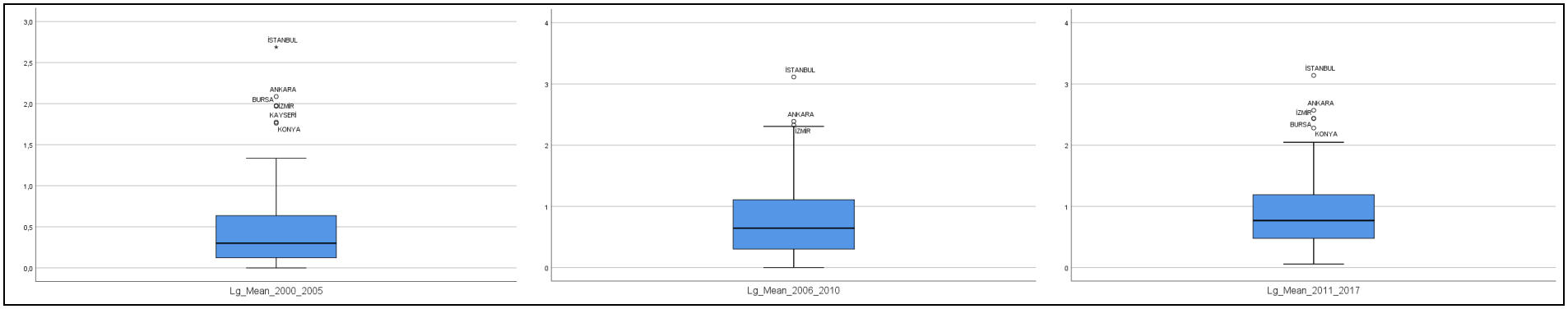


Figure 5.27 : Boxplots.

Grants: When the utility model grants between the years 2000 and 2017 are examined, the region of Ağrı does not have any registration. If the utility model grants are evaluated per each year, the descriptive statistics show that the data do not normally distributed (Table A.38). The range shows ups and downs over the years (Table A.39). According to the evaluation per each year, the leading region for all years is İstanbul. The other highest regions are mostly Ankara, Bursa, İzmir and Konya. This situation changes only with the inclusion of Eskişehir in 2000, Kayseri in 2001 and 2007, and finally Çanakkale in 2010. While Konya is the fifth highest region in general, the ranks of Ankara, İzmir and Bursa vary over the years (Table A.40). When the time periods are examined, it is seen that there is no normal distribution (Table A.42). Although the highest regions other than İstanbul vary by years, there is no change for the time periods. The order is İstanbul, Ankara, İzmir, Bursa and Konya for all time periods (Table A.44). Even though the logarithmic transformation was applied by years, the normal distribution could not be achieved (Table A.46, Figure A.23 and Figure A.24).

According to the logarithmic transformations of the time periods, there is no missing data (Table 5.22) and the P-value (0.000) in the normality test indicates that the data is not distributed normally (Table 5.23). This situation is also obvious from the ratio of Fisher's coefficient to its standard error (Table 5.24). The highest regions do not change for all time periods and are ranked as İstanbul, Ankara, İzmir, Bursa and Konya respectively (Table 5.25). As can be seen from histograms and boxplot graphs, there is a more right-skewed distribution in the first time period compared to the others (Figure 5.28 and Figure 5.29).

Table 5.22 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table 5.23 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Mean_2000_2005	0,255	81	0,000	0,711	81	0,000
Lg_Mean_2006_2010	0,164	81	0,000	0,860	81	0,000
Lg_Mean_2011_2017	0,152	81	0,000	0,881	81	0,000
a. Lilliefors Significance Correction						

Table 5.24 : Descriptive statistics.

	Descriptives	Statistic	Std. Error
Lg_Mean_2000_2005	Mean	0,3394	0,05340
	Median	0,1239	
	Variance	0,231	
	Std. Deviation	0,48064	
	Minimum	0,00	
	Maximum	2,36	
	Range	2,36	
	Skewness	2,165	0,267
	Kurtosis	4,786	0,529
Lg_Mean_2006_2010	Mean	0,6690	0,06967
	Median	0,4472	
	Variance	0,393	
	Std. Deviation	0,62699	
	Minimum	0,00	
	Maximum	2,96	
	Range	2,96	
	Skewness	1,376	0,267
	Kurtosis	1,704	0,529
Lg_Mean_2011_2017	Mean	0,7229	0,07132
	Median	0,5527	
	Variance	0,412	
	Std. Deviation	0,64188	
	Minimum	0,00	
	Maximum	2,98	
	Range	2,98	
	Skewness	1,290	0,267
	Kurtosis	1,476	0,529

Table 5.25 : Outlier-Extreme values.

		Extreme Values			
			Case	Region	Value
Lg_Mean_2000_2005	Highest	1	34	İSTANBUL	2,36
		2	6	ANKARA	1,74
		3	35	İZMİR	1,71
		4	16	BURSA	1,70
		5	42	KONYA	1,48
	Lowest	1	80	OSMANİYE	0,00
		2	78	KARABÜK	0,00
		3	76	IĞDIR	0,00
		4	75	ARDAHAN	0,00
		5	73	ŞIRNAK	,00[a]
Lg_Mean_2006_2010	Highest	1	34	İSTANBUL	2,96
		2	6	ANKARA	2,19
		3	35	İZMİR	2,19
		4	16	BURSA	2,17
		5	42	KONYA	1,99
	Lowest	1	56	SİİRT	0,00
		2	30	HAKKARİ	0,00
		3	29	GÜMÜŞHANE	0,00
		4	13	BİTLİS	0,00
		5	12	BİNGÖL	,00[a]
Lg_Mean_2011_2017	Highest	1	34	İSTANBUL	2,98
		2	6	ANKARA	2,36
		3	35	İZMİR	2,26
		4	16	BURSA	2,25
		5	42	KONYA	2,14
	Lowest	1	75	ARDAHAN	0,00
		2	69	BAYBURT	0,00
		3	4	AĞRI	0,00
		4	62	TUNCELİ	0,06
		5	56	SİİRT	,06[b]

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.
b. Only a partial list of cases with the value ,06 are shown in the table of lower extremes.

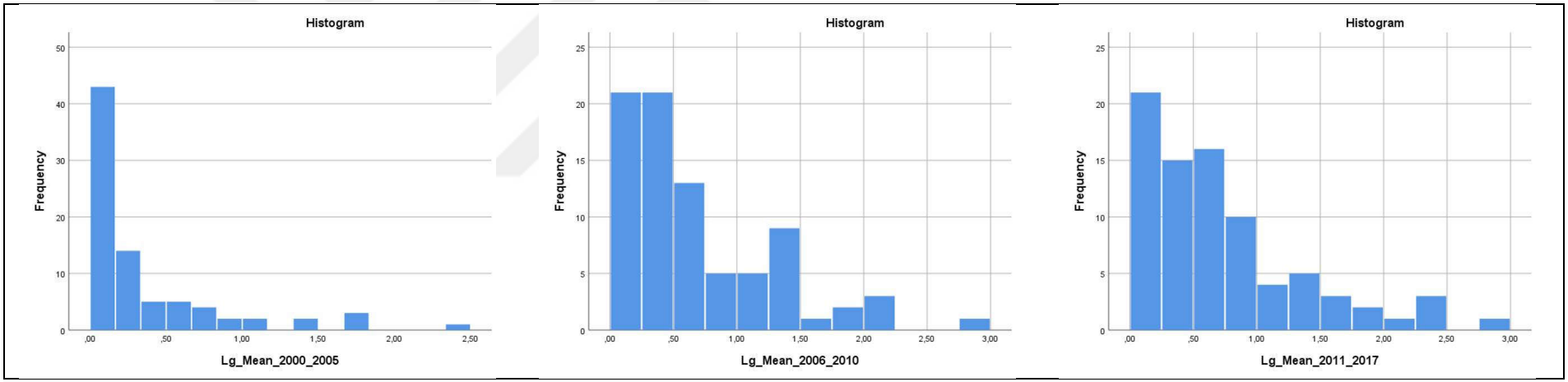


Figure 5.28 : Histogram graphs.

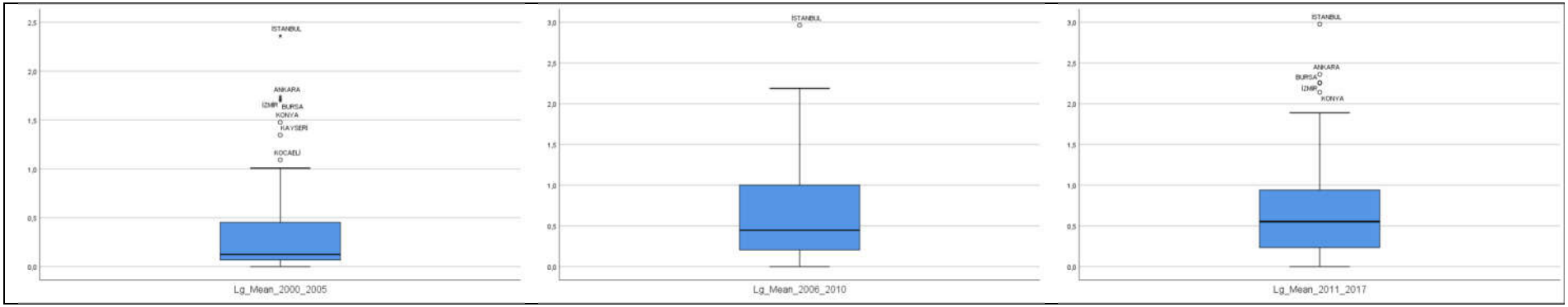


Figure 5.29 : Boxplots.

5.2.1.3 Evaluation of trademarks

Applications: When the trademark applications are examined, although some regions have not made a trademark application in some years, there is no region with zero application number for all years. According to the descriptive statistics applied for evaluating per each year, it was observed that the data were not normally distributed (Table A.50 and Table A.51).

The Outlier analysis shows that İstanbul, Ankara, İzmir and Bursa are respectively the highest regions (only in 2004, İzmir was ahead of Ankara). Although the fifth highest region differs in different years, these regions are Konya, Antalya and Gaziantep (Table A.52).

When descriptive statistics are examined over time periods, the data are not normally distributed (Table A.54). According to the time periods, the four highest regions were same for all time periods and as İstanbul, Ankara, İzmir and Bursa, respectively, while the fifth region was Konya in the first period, Antalya in the second period and Gaziantep in the third period.

When year-by-year log values are examined, it is seen that the data are normally distributed according to the Kolmogorov-Smirnov normality test (Table A.58) and the regions with the highest values are same as above (Table A.60).

When the logarithmic values of the time periods are examined, it is seen that there is no missing data (Table 5.26). Since the P-value is greater than 0.05, the Ho Hypothesis is accepted, and it is said that the data are normally distributed (Table 5.27). Histogram and boxplot graphs also visually support this (Figure 5.30 and Figure 5.31). Descriptive statistics are given in Table 5.28. The four highest regions were same for all time periods and as İstanbul, Ankara, İzmir and Bursa, respectively, while the fifth region was Konya in the first period, Antalya in the second period and Gaziantep in the third period (Table 5.29).

Table 5.26 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table 5.27 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Mean_2000_2005	0,085	81	,200*	0,976	81	0,135
Lg_Mean_2006_2010	0,066	81	,200*	0,974	81	0,095
Lg_Mean_2011_2017	0,090	81	0,157	0,973	81	0,080

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 5.28 : Descriptive statistics.

	Descriptives	Statistic	Std. Error
Lg_Mean_2000_2005	Mean	1,7601	0,08108
	Median	1,7048	
	Variance	0,532	
	Std. Deviation	0,72971	
	Minimum	0,37	
	Maximum	4,22	
	Range	3,85	
	Skewness	0,557	0,267
	Kurtosis	0,748	0,529
Lg_Mean_2006_2010	Mean	2,1095	0,07730
	Median	2,0878	
	Variance	0,484	
	Std. Deviation	0,69568	
	Minimum	0,76	
	Maximum	4,50	
	Range	3,73	
	Skewness	0,659	0,267
	Kurtosis	0,788	0,529
Lg_Mean_2011_2017	Mean	2,3166	0,07762
	Median	2,2480	
	Variance	0,488	
	Std. Deviation	0,69854	
	Minimum	1,01	
	Maximum	4,69	
	Range	3,68	
	Skewness	0,674	0,267
	Kurtosis	0,731	0,529

Table 5.29 : Outlier-Extreme values.

Extreme Values					
			Case	Region	Value
Lg_Mean_2000_2005	Highest	1	34	İSTANBUL	4,22
		2	6	ANKARA	3,36
		3	35	İZMİR	3,29
		4	16	BURSA	3,17
		5	42	KONYA	2,94
	Lowest	1	69	BAYBURT	0,37
		2	30	HAKKARİ	0,40
		3	75	ARDAHAN	0,52
		4	62	TUNCELİ	0,64
		5	56	SİİRT	,67[a]
Lg_Mean_2006_2010	Highest	1	34	İSTANBUL	4,50
		2	6	ANKARA	3,67
		3	35	İZMİR	3,55
		4	16	BURSA	3,41
		5	7	ANTALYA	3,25
	Lowest	1	62	TUNCELİ	0,76
		2	69	BAYBURT	0,83
		3	75	ARDAHAN	0,93
		4	13	BİTLİS	1,08
		5	76	IĞDIR	1,23
Lg_Mean_2011_2017	Highest	1	34	İSTANBUL	4,69
		2	6	ANKARA	3,89
		3	35	İZMİR	3,80
		4	16	BURSA	3,63
		5	27	GAZİANTEP	3,48
	Lowest	1	69	BAYBURT	1,01
		2	75	ARDAHAN	1,04
		3	62	TUNCELİ	1,14
		4	29	GÜMÜŞHANE	1,34
		5	30	HAKKARİ	1,38

a. Only a partial list of cases with the value ,67 are shown in the table of lower extremes.

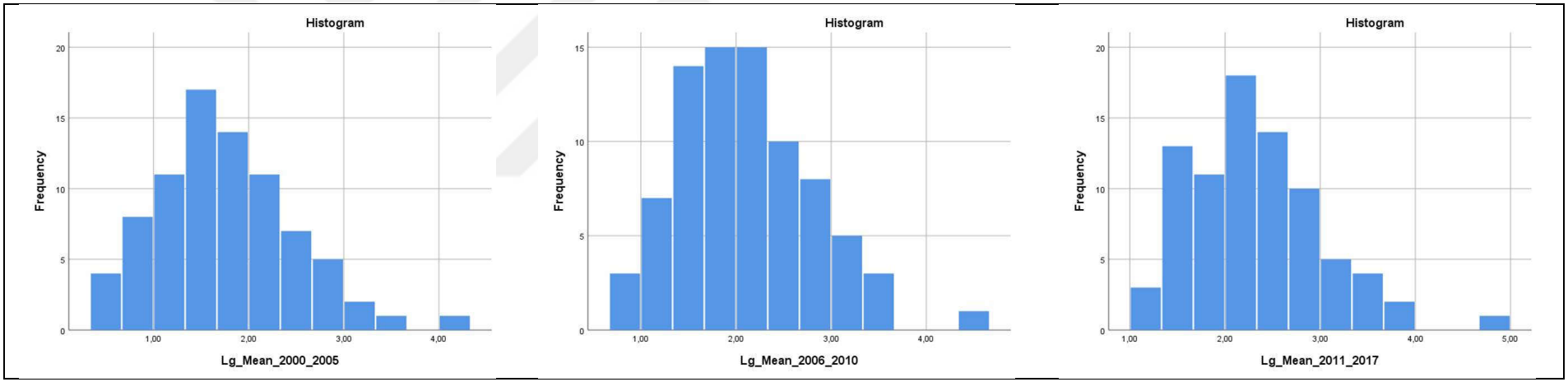


Figure 5.30 : Histogram graphs.

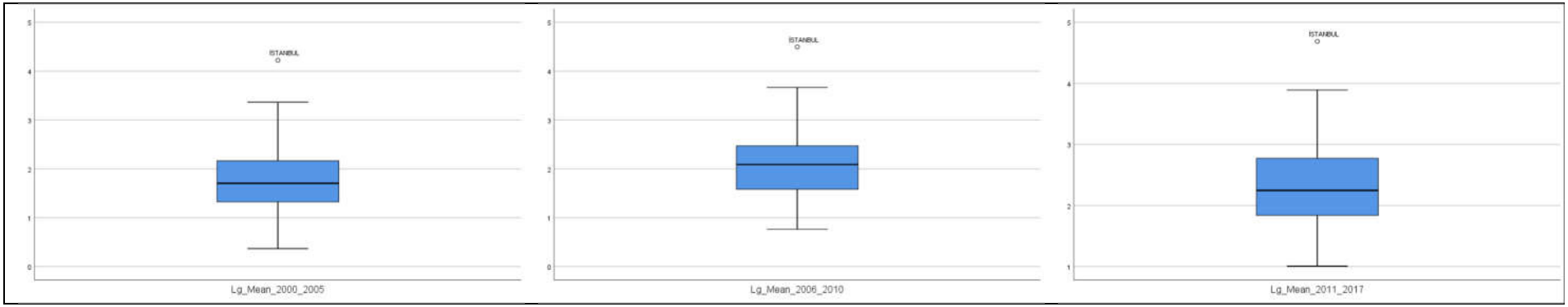


Figure 5.31 : Boxplots.

Registrations: When the trademark registrations are examined, although very few regions do not have registrations in some years, there are no regions with zero registration number for all years. When the year-by-year evaluation is made, the data is not normally distributed because the P-value is less than 0.05 (Table A.62). Although the range increases over the years, some decreases are seen in the range in years 2008, 2010, 2015 and 2017 (Table A.63). The first four regions are İstanbul, Ankara, İzmir and Bursa. İstanbul is located in the first place and Bursa in the fourth place. The locations of Ankara and İzmir vary over the years among themselves. For the fifth place, Konya, Antalya and Gaziantep are competing according to years. While Konya has fixed the fifth place including 2008, it loses/replaces its place to Antalya and Gaziantep in the following years (Table A.64). The right-skewed distribution is clearly visible from the histogram and boxplot graphs (Figure A.31 and Figure A.32).

When logarithmic transformation was applied by years, data is normally distributed except the year 2016 according to the Kolmogorov-Smirnov Normality Test (Table A.70).

According to the time periods, the data are not normally distributed (Table A.66). When the logarithmic transformations of time periods are examined, there is not a missing value (Table 5.30) and depending on the normality tests H0 hypothesis is accepted because the P-value is greater than 0.05, that means the data are normally distributed (Table 5.31). This can be seen from the histogram and boxplot plots (Figure 5.32 and Figure 5.33). The regions with the highest value are İstanbul, Ankara, İzmir and Bursa regions in registration as well as in application (Table 5.33).

Table 5.30 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table 5.31 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Mean_2000_2005	0,057	81	,200*	0,983	81	0,377
Lg_Mean_2006_2010	0,071	81	,200*	0,974	81	0,097
Lg_Mean_2011_2017	0,065	81	,200*	0,975	81	0,107

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 5.32 : Descriptive statistics.

	Descriptives	Statistic	Std. Error
Lg_Mean_2000_2005	Mean	1,4088	0,08758
	Median	1,3222	
	Variance	0,621	
	Std. Deviation	0,78826	
	Minimum	-0,17	
	Maximum	3,93	
	Range	4,10	
	Skewness	0,349	0,267
	Kurtosis	0,411	0,529
Lg_Mean_2006_2010	Mean	1,8535	0,08004
	Median	1,7938	
	Variance	0,519	
	Std. Deviation	0,72039	
	Minimum	0,56	
	Maximum	4,28	
	Range	3,72	
	Skewness	0,629	0,267
	Kurtosis	0,606	0,529
Lg_Mean_2011_2017	Mean	2,1187	0,07948
	Median	2,0391	
	Variance	0,512	
	Std. Deviation	0,71531	
	Minimum	0,76	
	Maximum	4,52	
	Range	3,76	
	Skewness	0,628	0,267
	Kurtosis	0,638	0,529

Table 5.33 : Outlier-Extreme values.

Extreme Values					
			Case	Region	Value
Lg_Mean_2000_2005	Highest	1	34	İSTANBUL	3,93
		2	6	ANKARA	3,04
		3	35	İZMİR	3,01
		4	16	BURSA	2,89
		5	42	KONYA	2,68
	Lowest	1	69	BAYBURT	-0,17
		2	30	HAKKARİ	-0,08
		3	62	TUNCELİ	0,07
		4	75	ARDAHAN	0,12
		5	13	BİTLİS	0,12
Lg_Mean_2006_2010	Highest	1	34	İSTANBUL	4,28
		2	6	ANKARA	3,44
		3	35	İZMİR	3,34
		4	16	BURSA	3,20
		5	42	KONYA	3,07
	Lowest	1	69	BAYBURT	0,56
		2	62	TUNCELİ	0,64
		3	75	ARDAHAN	0,68
		4	76	IĞDIR	0,76
		5	13	BİTLİS	,89[a]
Lg_Mean_2011_2017	Highest	1	34	İSTANBUL	4,52
		2	6	ANKARA	3,70
		3	35	İZMİR	3,62
		4	16	BURSA	3,44
		5	7	ANTALYA	3,28
	Lowest	1	69	BAYBURT	0,76
		2	75	ARDAHAN	0,85
		3	62	TUNCELİ	0,89
		4	29	GÜMÜŞHANE	1,08
		5	13	BİTLİS	1,21

a. Only a partial list of cases with the value ,89 are shown in the table of lower extremes.

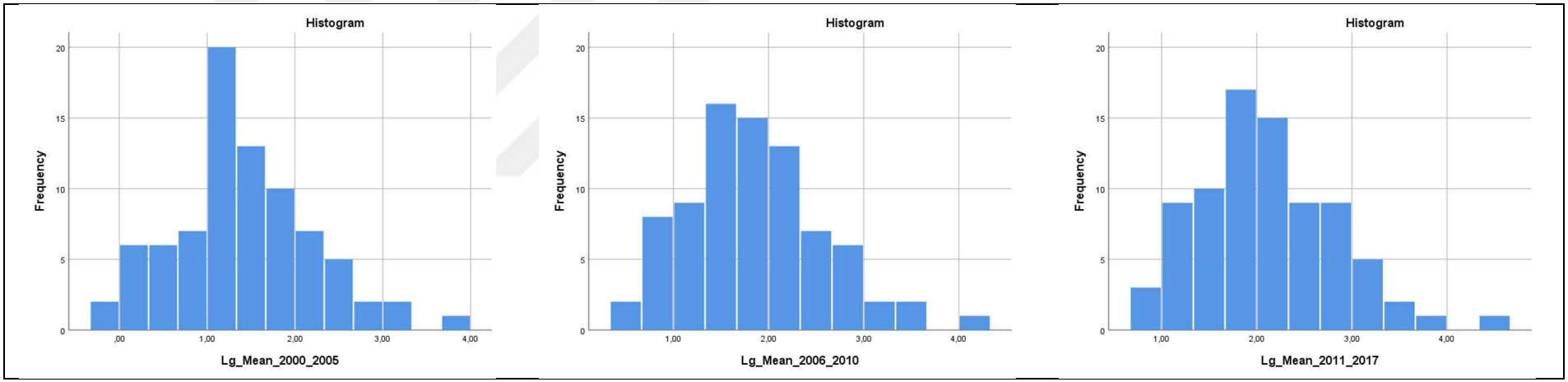


Figure 5.32 : Histogram graphs.

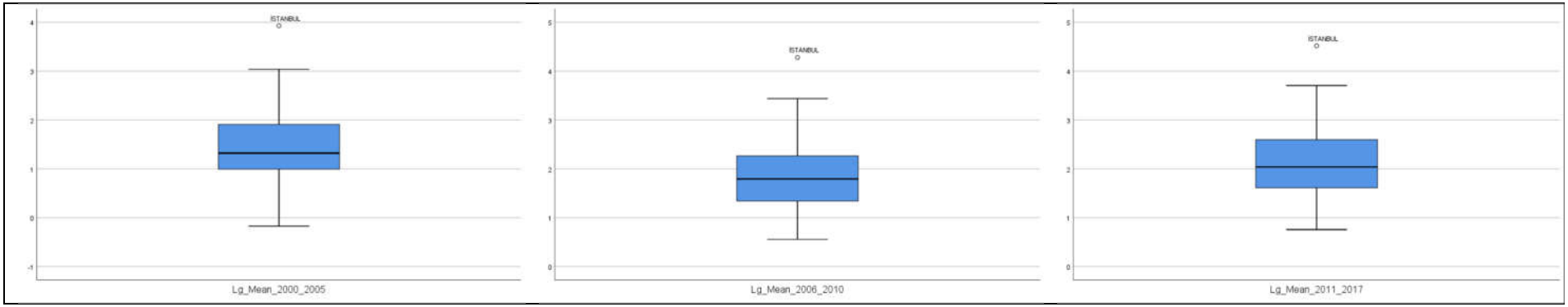


Figure 5.33 : Boxplots.

5.2.1.4 Evaluation of designs

Applications (File): Within the scope of design applications (file), Bitlis region did not make any design applications between the years 2000 and 2017. Apart from Bitlis, it is seen that many regions do not apply for certain years, not for every year.

When the design applications are examined by years, it is seen that the data is not normally distributed (Table A.74). A right-skewed distribution can be seen from the histogram and boxplot graphs (Figure A.37 and Figure A.38). The range increases and decreases in some years. For example, it decreases in 2008, 2013, 2014, 2015 and 2016 (Table A.75). The year in which design applications reached the maximum value is 2012, and this value belongs to İstanbul region with 3974. İstanbul maintains its leadership by a great difference compared to other regions for all years. The other four regions with the highest values are Bursa, İzmir, Ankara and Kayseri regions, although their locations vary between years. This situation changes only in 2000 because Konya is located instead of Kayseri (Table A.76).

When the logarithmic transformation is applied to the values of the years, a normal distribution could not be achieved except 2017 according to the Kolmogorov-Smirnov Normality Test (Table A.82).

In addition, the data is not distributed normally according to the time periods (Table A.78).

There is no missing data in terms of design applications (file) (Table 5.34). When the logarithmic transformation is applied to the values related to the time periods, a normal distribution could not be achieved again. This has been statistically proven with the P-value being less than 0.05 in normality tests (Table 5.35). In addition to normality tests, rates of standard errors of Fisher's skewness coefficients also show the severe right-skewed structure (Table 5.36). Histogram and boxplot graphics also reflect this visually (Figure 5.34 and Figure 5.35). According to the outlier analysis, İstanbul again takes the lead. Bursa and Ankara are in competition for the second place, İzmir and Kayseri for the fourth place (Table 5.37).

Table 5.34 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table 5.35 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Mean_2000_2005	0,166	81	0,000	0,857	81	0,000
Lg_Mean_2006_2010	0,134	81	0,001	0,906	81	0,000
Lg_Mean_2011_2017	0,126	81	0,003	0,937	81	0,001
a. Lilliefors Significance Correction						

Table 5.36 : Descriptive statistics.

	Descriptives	Statistic	Std. Error
Lg_Mean_2000_2005	Mean	0,7036	0,08074
	Median	0,4771	
	Variance	0,528	
	Std. Deviation	0,72667	
	Minimum	0,00	
	Maximum	3,27	
	Range	3,27	
	Skewness	1,326	0,267
	Kurtosis	1,446	0,529
Lg_Mean_2006_2010	Mean	0,8842	0,08697
	Median	0,6812	
	Variance	0,613	
	Std. Deviation	0,78273	
	Minimum	0,00	
	Maximum	3,50	
	Range	3,50	
	Skewness	1,021	0,267
	Kurtosis	0,676	0,529
Lg_Mean_2011_2017	Mean	1,0779	0,08622
	Median	0,9542	
	Variance	0,602	
	Std. Deviation	0,77599	
	Minimum	0,00	
	Maximum	3,57	
	Range	3,57	
	Skewness	0,889	0,267
	Kurtosis	0,605	0,529

Table 5.37 : Outlier-Extreme values.

		Extreme Values			
			Case	Region	Value
Lg_Mean_2000_2005	Highest	1	34	İSTANBUL	3,27
		2	16	BURSA	2,57
		3	6	ANKARA	2,47
		4	35	İZMİR	2,41
		5	38	KAYSERİ	2,18
	Lowest	1	76	IĞDIR	0,00
		2	73	ŞIRNAK	0,00
		3	69	BAYBURT	0,00
		4	65	VAN	0,00
		5	62	TUNCELİ	,00[a]
Lg_Mean_2006_2010	Highest	1	34	İSTANBUL	3,50
		2	6	ANKARA	2,69
		3	16	BURSA	2,66
		4	35	İZMİR	2,56
		5	38	KAYSERİ	2,52
	Lowest	1	76	IĞDIR	0,00
		2	73	ŞIRNAK	0,00
		3	65	VAN	0,00
		4	62	TUNCELİ	0,00
		5	56	SİİRT	,00[a]
Lg_Mean_2011_2017	Highest	1	34	İSTANBUL	3,57
		2	16	BURSA	2,89
		3	6	ANKARA	2,80
		4	38	KAYSERİ	2,73
		5	35	İZMİR	2,70
	Lowest	1	13	BİTLİS	0,00
		2	12	BİNGÖL	0,00
		3	75	ARDAHAN	0,06
		4	66	YOZGAT	0,06
		5	36	KARS	0,06

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.

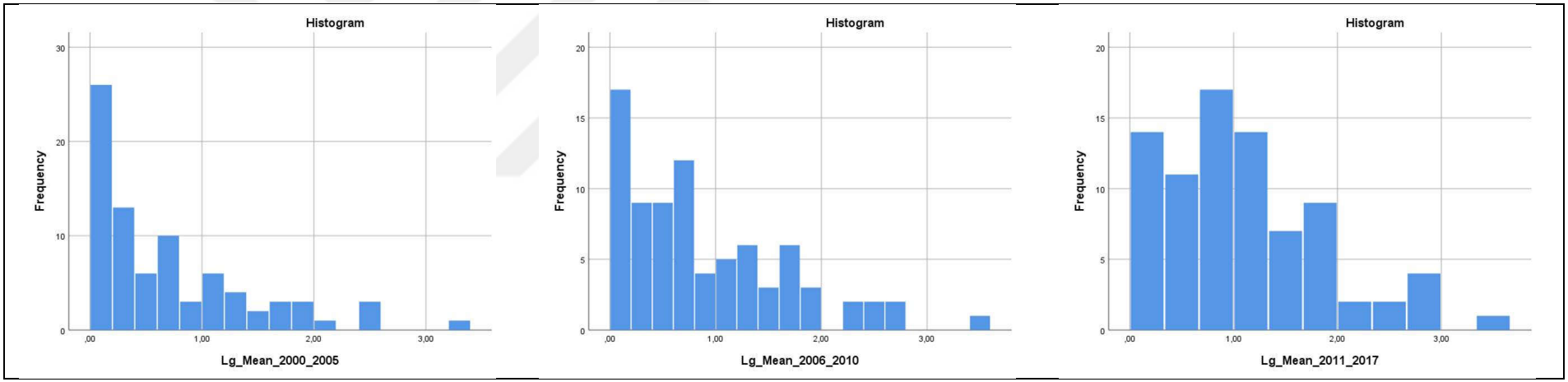


Figure 5.34 : Histogram graphs.

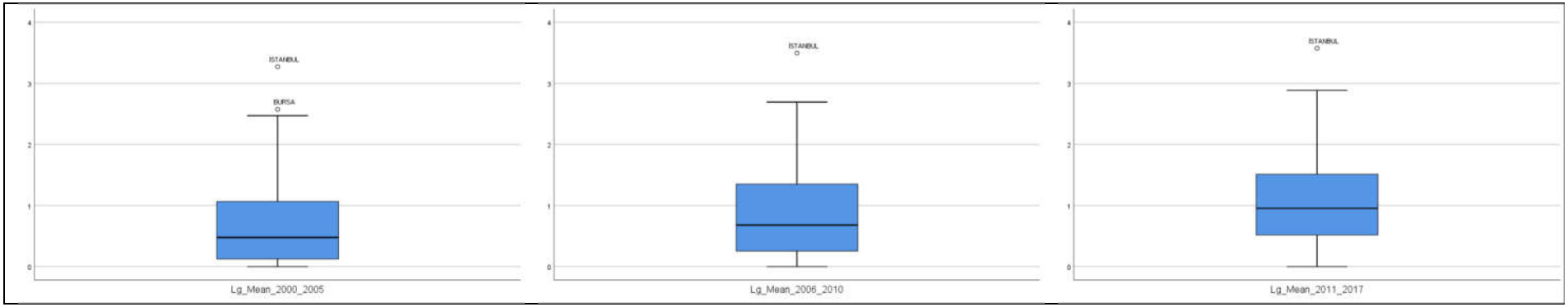


Figure 5.35 : Boxplots.

Registrations (File): There is no missing data in the design registrations (file) (Table 5.38). As a reflection of the application, many regions have not been registered in certain years. The Tunceli region has no design registration for any year.

If the evaluation is made year by year, it is seen that the data is not distributed normally (Table A.86). The maximum value in design registrations belongs to İstanbul in 2013 with 3788. According to the outlier analysis, the highest regions are the same regions for all years and are İstanbul, Bursa, İzmir, Ankara and Kayseri. While only İstanbul maintains its leadership far among these regions, the positions of the four remaining regions change among themselves over the years (Table A.88). Although the logarithmic transformation was applied to the year-based data, a normal distribution could not be achieved except the years 2016 and 2017 according to the Kolmogorov-Smirnov Normality Test (Table A.94).

Normal distribution is not also seen in the time periods (Table A.90), therefore logarithmic transformation is applied for the time periods. In this case, P-value in the normality tests which is less than 0.05 indicate that the data are not distributed normally (Table 5.39). As can be seen from Table 5.40, the severe right-swewed structure is evident from the ratio of Fisher's skewness coefficient to the standard errors. Histogram and boxplot graphs visually support this (Figure 5.36 and Figure 5.37). According to the outlier analysis, the regions with the highest values are the same as in the applications. While İstanbul maintains its leadership in all time periods, Bursa and Ankara compete for the second place and İzmir and Kayseri for the fourth place according to the different periods (Table 5.41).

Table 5.38 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table 5.39 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Mean_2000_2005	0,186	81	0,000	0,834	81	0,000
Lg_Mean_2006_2010	0,151	81	0,000	0,898	81	0,000
Lg_Mean_2011_2017	0,129	81	0,002	0,935	81	0,001
a. Lilliefors Significance Correction						

Table 5.40 : Descriptive statistics.

	Descriptives	Statistic	Std. Error
Lg_Mean_2000_2005	Mean	0,6430	0,07904
	Median	0,3979	
	Variance	0,506	
	Std. Deviation	0,71139	
	Minimum	0,00	
	Maximum	3,20	
	Range	3,20	
	Skewness	1,429	0,267
	Kurtosis	1,721	0,529
Lg_Mean_2006_2010	Mean	0,8566	0,08728
	Median	0,6435	
	Variance	0,617	
	Std. Deviation	0,78549	
	Minimum	0,00	
	Maximum	3,48	
	Range	3,48	
	Skewness	1,052	0,267
	Kurtosis	0,701	0,529
Lg_Mean_2011_2017	Mean	1,0557	0,08618
	Median	0,9400	
	Variance	0,602	
	Std. Deviation	0,77562	
	Minimum	0,00	
	Maximum	3,56	
	Range	3,56	
	Skewness	0,907	0,267
	Kurtosis	0,642	0,529

Table 5.41 : Outlier-Extreme values.

		Extreme Values			
			Case	Region	Value
Lg_Mean_2000_2005	Highest	1	34	İSTANBUL	3,20
		2	16	BURSA	2,53
		3	6	ANKARA	2,38
		4	35	İZMİR	2,35
		5	38	KAYSERİ	2,12
	Lowest	1	76	IĞDIR	0,00
		2	73	ŞIRNAK	0,00
		3	69	BAYBURT	0,00
		4	65	VAN	0,00
		5	62	TUNCELİ	,00[a]
Lg_Mean_2006_2010	Highest	1	34	İSTANBUL	3,48
		2	6	ANKARA	2,68
		3	16	BURSA	2,66
		4	35	İZMİR	2,55
		5	38	KAYSERİ	2,50
	Lowest	1	76	IĞDIR	0,00
		2	74	BARTIN	0,00
		3	73	ŞIRNAK	0,00
		4	65	VAN	0,00
		5	62	TUNCELİ	,00[a]
Lg_Mean_2011_2017	Highest	1	34	İSTANBUL	3,56
		2	16	BURSA	2,87
		3	6	ANKARA	2,77
		4	38	KAYSERİ	2,72
		5	35	İZMİR	2,68
	Lowest	1	62	TUNCELİ	0,00
		2	36	KARS	0,00
		3	12	BİNGÖL	0,00
		4	75	ARDAHAN	0,06
		5	66	YOZGAT	,06[b]

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.
b. Only a partial list of cases with the value ,06 are shown in the table of lower extremes.

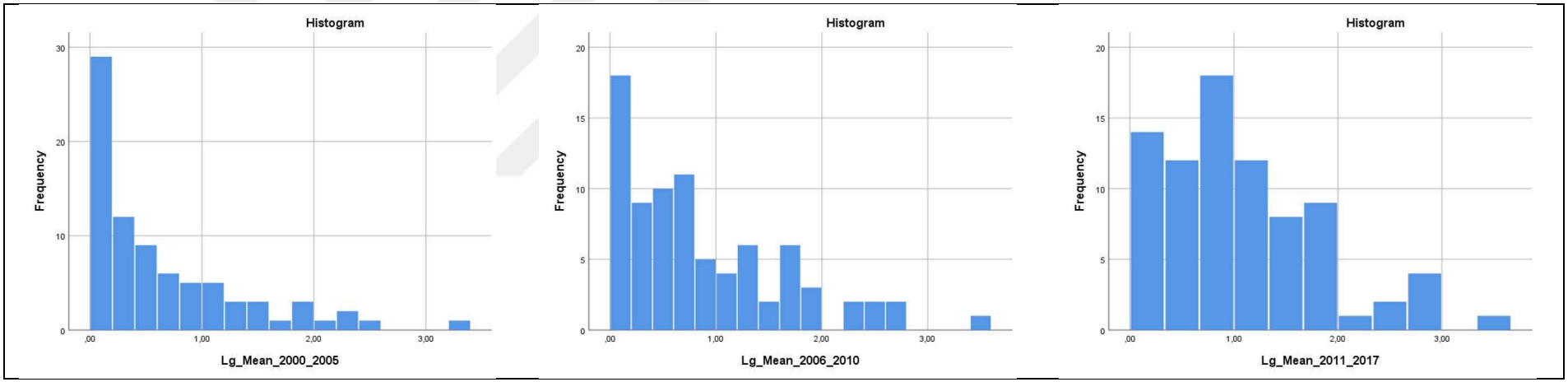


Figure 5.36 : Histogram graphs.

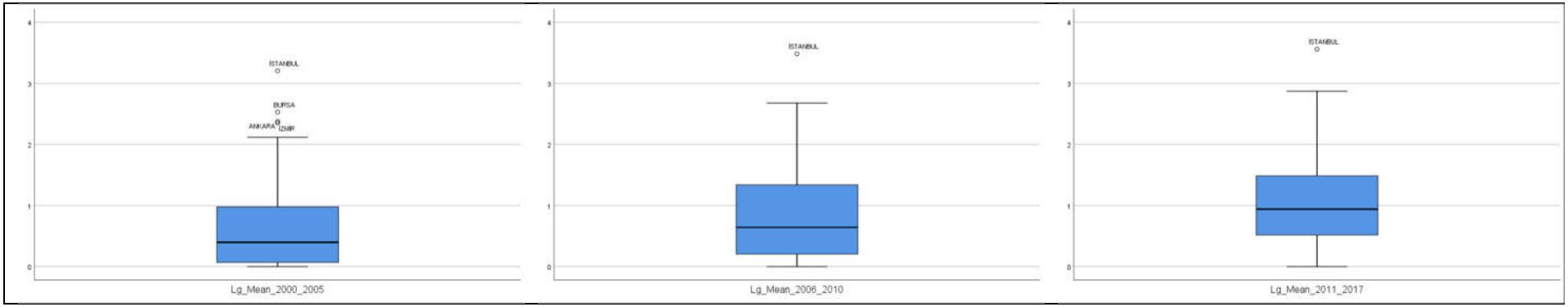


Figure 5.37 : Boxplots.

Applications (Design): There is no missing data in the design applications (design) (Table 5.42). There are no design applications (design) for any year in Bitlis region. There are many regions that do not apply for some years.

When the evaluation is made according to years, the data is not normally distributed (Table A.98). The highest value (18965) belongs to İstanbul region in 2012. According to the outlier analysis (Table A.100), İstanbul makes a clear difference and take the lead by far. Other highest regions are Bursa, İzmir, Denizli, Ankara, Gaziantep and Kayseri. İzmir and Ankara could not be positioned just behind İstanbul for this variable. Although it varies over the years, the other regions mentioned above generally show a better trend than these two metropolitan regions.

The application of logarithmic transformation over values by years was not sufficient to form a normal distribution except the years 2012 and after 2014 according to Kolmogorov-Smirnov Normality Test (Table A.106).

The normal distribution could not be provided according to the time periods (Table A.102). As a result of the application of the logarithmic transformation to values of time periods, there is a distribution closer to the normal distribution only in the last two periods. Considering the normality tests, while there is a normal distribution according to the significance level in the Kolmogorov-Smirnov Normality Test, it is possible to mention that the distribution close to normal distribution with the P-value in the Shapiro-Wilk Normality Test (Table 5.43). However, as mentioned before, it should be noted that the distribution is normal according to the Kolmogorov-Smirnov Normality Test since the number of observations is 81. The fact that the ratio of Fisher's skewness coefficient to the standard error obtained from Descriptive Statistics is in the range of + - 1.96 is an indicator of the normal distribution (Table 5.44). The transition from the severe right-skewed structure in the first two periods to the normal distribution in the last period can also be seen visually from the histogram and boxplot graphs (Figure 5.38 and Figure 5.39). According to the outlier analysis, İstanbul takes the lead in all time periods. Also Bursa, Gaziantep and Ankara were the regions with the highest values for all periods. İzmir, which was among the highest in the first two periods, lost its place to Kayseri in the last period (Table 5.45).

Table 5.42 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table 5.43 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Mean_2000_2005	0,143	81	0,000	0,902	81	0,000
Lg_Mean_2006_2010	0,095	81	0,069	0,949	81	0,003
Lg_Mean_2011_2017	0,061	81	,200*	0,969	81	0,049

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 5.44 : Descriptive statistics.

	Descriptives	Statistic	Std. Error
Lg_Mean_2000_2005	Mean	1,0589	0,10968
	Median	0,7536	
	Variance	0,974	
	Std. Deviation	0,98715	
	Minimum	0,00	
	Maximum	3,97	
	Range	3,97	
	Skewness	0,840	0,267
	Kurtosis	-0,051	0,529
Lg_Mean_2006_2010	Mean	1,3100	0,11100
	Median	1,1271	
	Variance	0,998	
	Std. Deviation	0,99902	
	Minimum	0,00	
	Maximum	4,17	
	Range	4,17	
	Skewness	0,544	0,267
	Kurtosis	-0,305	0,529
Lg_Mean_2011_2017	Mean	1,5338	0,10879
	Median	1,4472	
	Variance	0,959	
	Std. Deviation	0,97910	
	Minimum	0,00	
	Maximum	4,23	
	Range	4,23	
	Skewness	0,441	0,267
	Kurtosis	-0,210	0,529

Table 5.45 : Outlier-Extreme values.

		Extreme Values			
			Case	Region	Value
Lg_Mean_2000_2005	Highest	1	34	İSTANBUL	3,97
		2	16	BURSA	3,51
		3	27	GAZİANTEP	3,04
		4	6	ANKARA	3,00
		5	35	İZMİR	2,94
	Lowest	1	76	IĞDIR	0,00
		2	73	ŞIRNAK	0,00
		3	69	BAYBURT	0,00
		4	65	VAN	0,00
		5	62	TUNCELİ	,00[a]
Lg_Mean_2006_2010	Highest	1	34	İSTANBUL	4,17
		2	16	BURSA	3,42
		3	6	ANKARA	3,29
		4	27	GAZİANTEP	3,24
		5	35	İZMİR	3,09
	Lowest	1	76	IĞDIR	0,00
		2	69	BAYBURT	0,00
		3	65	VAN	0,00
		4	62	TUNCELİ	0,00
		5	56	SİİRT	,00[a]
Lg_Mean_2011_2017	Highest	1	34	İSTANBUL	4,23
		2	27	GAZİANTEP	3,60
		3	16	BURSA	3,54
		4	38	KAYSERİ	3,49
		5	6	ANKARA	3,44
	Lowest	1	13	BİTLİS	0,00
		2	12	BİNGÖL	0,00
		3	75	ARDAHAN	0,06
		4	36	KARS	0,06
		5	76	IĞDIR	,16[b]

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.
b. Only a partial list of cases with the value ,16 are shown in the table of lower extremes.

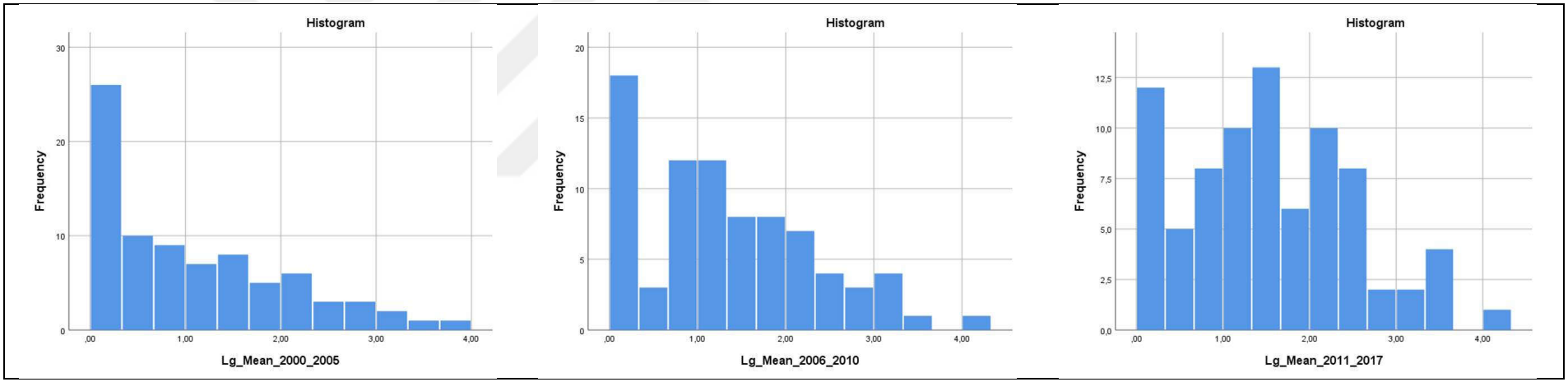


Figure 5.38 : Histogram graphs.

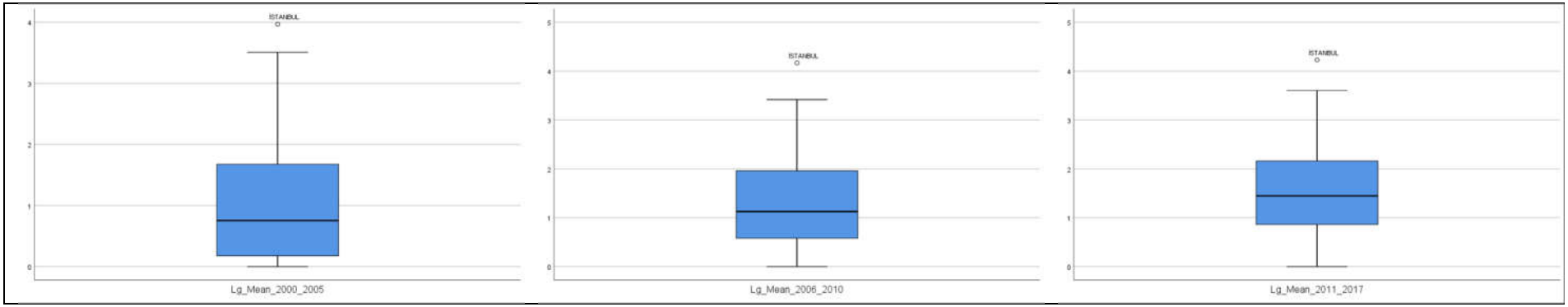


Figure 5.39 : Boxplots.

Registrations (Design): There is no missing data in the design registrations (design) (Table 5.46). As a reflection of the application, many regions have not been registered in certain years. Similar to the registration of design (file) indicator, Tunceli region has no design registration for any year. If the evaluation is made year by year, it is seen that the data is not normally distributed (Table A.110). The maximum value in design registrations (design) belongs to İstanbul in 2013 with 17833. According to the outlier analysis, İstanbul takes the lead by far. Bursa and Ankara are among the highest regions for each year. The other highest regions are predominantly Gaziantep and Kayseri, less frequently İzmir and Denizli (Table A.112). Although the logarithmic transformation was applied to the year-based data, a normal distribution could not be achieved except the years 2013, 2014, 2016 and 2017 according to the Kolmogorov-Smirnov Normality Test (Table A.118). Normal distribution is not seen in the time periods (Table A.114), therefore logarithmic transformation is applied for time periods. In this case, according to Kolmogorov-Smirnov and Shapiro-Wilk Normality Tests, while there is no normal distribution for the first two time periods, it has been statistically proven with P-values that there is a normal distribution in the last period (Table 5.47). For the last period, the ratio of Fisher's skewness coefficient to standard error in the range of + - 1.96 is also an indicator of the normal distribution (Table 5.48). This situation can also be seen from histogram and boxplot graphs (Figure 5.40 and Figure 5.41). İstanbul is the leader in all time periods. In addition to İstanbul region, Bursa, Ankara and Gaziantep are among the highest regions in all time periods. İzmir, which was the highest for the first two time periods, has recently transferred its place to Kayseri (Table 5.49).

Table 5.46 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Lg_Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table 5.47 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Mean_2000_2005	0,158	81	0,000	0,881	81	0,000
Lg_Mean_2006_2010	0,105	81	0,027	0,940	81	0,001
Lg_Mean_2011_2017	0,063	81	,200*	0,969	81	0,050

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 5.48 : Descriptive statistics.

	Descriptives	Statistic	Std. Error
Lg_Mean_2000_2005	Mean	0,9619	0,10654
	Median	0,6532	
	Variance	0,919	
	Std. Deviation	0,95882	
	Minimum	0,00	
	Maximum	3,88	
	Range	3,88	
	Skewness	0,982	0,267
	Kurtosis	0,237	0,529
Lg_Mean_2006_2010	Mean	1,2616	0,11200
	Median	1,1004	
	Variance	1,016	
	Std. Deviation	1,00803	
	Minimum	0,00	
	Maximum	4,15	
	Range	4,15	
	Skewness	0,604	0,267
	Kurtosis	-0,302	0,529
Lg_Mean_2011_2017	Mean	1,5147	0,10978
	Median	1,4624	
	Variance	0,976	
	Std. Deviation	0,98800	
	Minimum	0,00	
	Maximum	4,22	
	Range	4,22	
	Skewness	0,417	0,267
	Kurtosis	-0,252	0,529

Table 5.49 : Outlier-Extreme values.

		Extreme Values			
			Case	Region	Value
Lg_Mean_2000_2005	Highest	1	34	İSTANBUL	3,88
		2	16	BURSA	3,45
		3	6	ANKARA	2,90
		4	35	İZMİR	2,87
		5	27	GAZİANTEP	2,86
	Lowest	1	76	IĞDIR	0,00
		2	73	ŞIRNAK	0,00
		3	69	BAYBURT	0,00
		4	65	VAN	0,00
		5	62	TUNCELİ	,00[a]
Lg_Mean_2006_2010	Highest	1	34	İSTANBUL	4,15
		2	16	BURSA	3,45
		3	6	ANKARA	3,27
		4	27	GAZİANTEP	3,21
		5	35	İZMİR	3,08
	Lowest	1	76	IĞDIR	0,00
		2	74	BARTIN	0,00
		3	69	BAYBURT	0,00
		4	65	VAN	0,00
		5	62	TUNCELİ	,00[a]
Lg_Mean_2011_2017	Highest	1	34	İSTANBUL	4,22
		2	27	GAZİANTEP	3,59
		3	16	BURSA	3,53
		4	38	KAYSERİ	3,43
		5	6	ANKARA	3,42
	Lowest	1	66	YOZGAT	0,00
		2	62	TUNCELİ	0,00
		3	36	KARS	0,00
		4	12	BİNGÖL	0,00
		5	75	ARDAHAN	,06[b]

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.
b. Only a partial list of cases with the value ,06 are shown in the table of lower extremes.

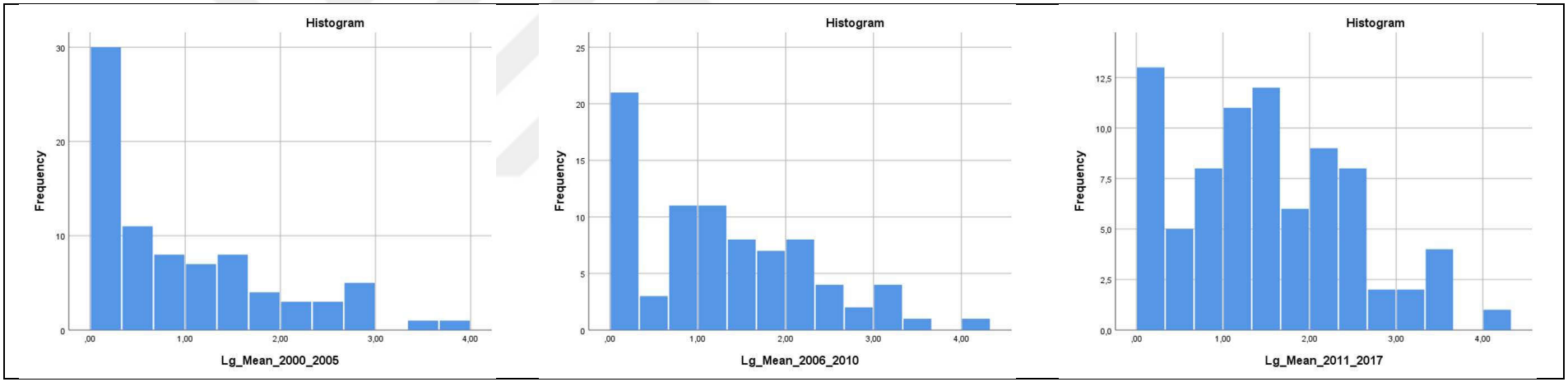


Figure 5.40 : Histogram graphs.

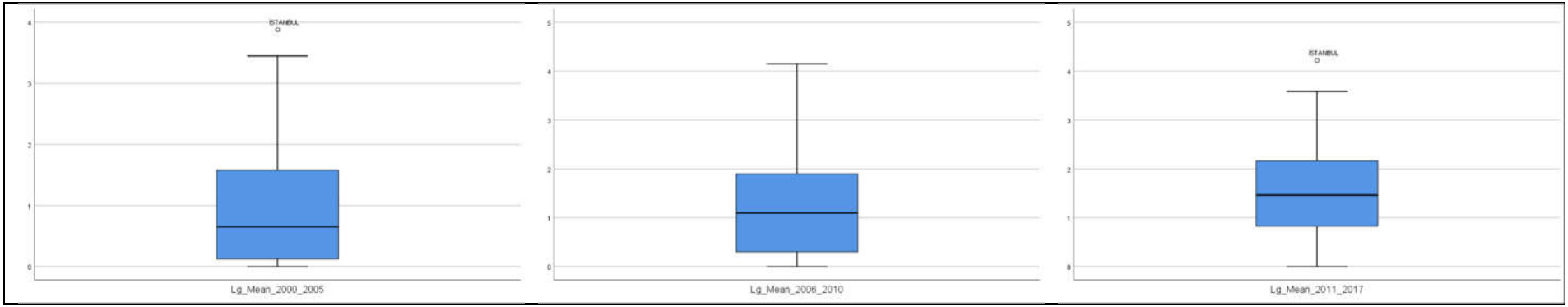


Figure 5.41 : Boxplots.

5.2.2 Classification of regions in terms of innovation performances

In this thesis, for classifying the regions, Markov Chains are used to evaluate the innovation performances of regions through the direct indicators of innovation as patents, utility models, trademarks and designs. After the Markov Chains have been established, classification will be analysed in detail through the indirect variables of innovation with the panel data analysis.

In the detailed descriptive statistics analysis of the variables, although there is a normal or close to normal distribution in some rare years or periods, in general, it was observed that the data were not distributed normally and showed a severely right-skewed distribution. Although there were too many highest and lowest outlier regions, no outlier regions were excluded from the study in order to evaluate 81 regions (at NUTS-3 level) together, because non existance of any application and registration of the regions is also important. Therefore, rather than extracting outlier values, the determinants of the states of these values were tried to be explained.

5.2.2.1 Concept of Markov Chains

Markov Chains, which were derived from the studies of the Russian mathematician Andrey Markov carried out in 1907, are known for that they contain different strings of events in time, and that the transitions contain a random process since they comprise the probabilities from one state to another (URL-27). “It is a descriptive technique that results in probabilistic information (URL-28)”.

Markov Chains are used to examine the differences in the states of variables according to the changes in the different time periods and to predict the future states of variables (Levin and Kirkpatrick, 1975; Adamu and Danbaba, 2014). Adamu and Danbaba (2014) claim that Markov Chains are an ideal method to model the varying data and transitions through time and that it is possible to classify individuals and issues according to different categories and states in dealing with many problems the world faces today.

As in many disciplines, Markov Chains are also used in various fields of urban and regional planning including land use changes, urban growth and urban sprawl (Bell, 1974; Bell and Hinojosa, 1977; Muller and Middleton, 1994; Ayila et al., 2014; Owoeye and Popoola, 2017), spatial organizations (Aydemir et al, 1993),

demographic issues like migration and child mortality (Joseph, 1974; Gambrah and Adzadu, 2013), and innovation studies (Purchase et al., 2014; Todo et al., 2016; Uğur et al., 2016).

Markov Chains are also used in such sub-headings of innovation as innovation network trajectories, (Purchase et al., 2014), knowledge diffusion, (Todo et al., 2016), and R&D and productivity in firms (Uğur et al., 2016) (Table 5.50). Using Markov Chains, Purchase et al (2014) studied how variations in network resource bundles affected the achievements of innovation networks and how they changed trajectories over time. Todo et al. (2016) studied the effects of the structure of supply chain networks on productivity and innovation capability through knowledge diffusion. Uğur et al. (2016) described R&D and productivity in OECD firms and industries using Markov Chains.

5.2.2.2 Results of Markov Chains

The purpose of this study is to determine in which aspects the regions of Turkey differ from each other and intra-regional level over time with reference to their innovation performances. Therefore, a dynamic analysis of the transitions of states defined by selected variables between 2000 and 2017 is made for 81 regions of Turkey at NUTS-3 level.

This study used the Markov Chains to investigate the changes of states in innovation performances of the regions in different time periods. It is important to review Turkey's historical development of innovation in order to determine the different time periods. With the rise in the number of regulations and institutions as from 2000, it can be said that Turkey has legally and administratively entered into a reconstruction process in the field of innovation. Given Turkey's historical innovation process (Figure 3.8), 2000-2005 (t-1), 2006-2010 (t) and 2011-2017 (t+1) time periods are identified as important milestones. Reconstructions in the regions gained importance especially with the Law (no. 5449) on the Establishment, Coordination and Duties of Development Agencies enacted on January 25, 2006. Primarily within the scope of the IRE Network, Mersin and Eskişehir regional innovation projects, the first two innovative experiences, were initiated and followed by many others later. 2011 was a turning point in that it was the time when the Ministry of Science, Industry and Technology was established, whose duties are "to

determine, develop and implement scientific, technological and innovative policies in cooperation with other related institutions in line with economic, military and social goals, to support research, development and innovation projects in industries, to take and implement incentive measures and to make arrangements and inspection in related subjects and fields (Decree on the Organization and Duties of the Ministry of Science, Industry and Technology (2011)". In the framework of the defined time periods, the study conducted a dynamic analysis of inter-state transitions with reference to selected variables for 81 regions with NUTS-3 level in Turkey. To define these variables, the study closely reviewed primarily the literature on regional innovation system and tried to determine the factors affecting regional innovation systems. The study also used the number of patent, utility model, trademark and design applications and registrations taken from the TÜRKPATENT.

The following assumptions were considered as the basic frameworks in the formation of the Markov Chains (Table 5.50):

Table 5.50 : Data and Methodology (Author's own illustration).

Methodology	Data	Source	Time periods	Innovation Performance Groups
Markov Chains	-Patent Applications and Grants -Utility Model Applications and Grants -Trademark Applications and Registrations -Design Applications and Registrations (both file and design)	Turkish Patent and Trademark Office	2000-2005 (t-1), 2006-2010 (t) and 2011-2017 (t+1)	- The upper group as innovation leaders, - The upper-middle group as strong innovators, - The lower-middle group as moderate innovators and - The lower group as modest innovators.
Legend of the Markov Matrices in this heading: Upgraded regions increasing their innovation performance Stable regions remained their status Retrograded regions decreasing their innovation performance				

- The mean values (Methodology 1) and the new values obtained by the distance of the observation from the median values (Methodology 2) of the number of the Patent, Utility Model, Trademark and Design applications and registrations between the periods 2000-2005 (t-1), 2006-2010 (t) and 2011-2017 (t+1) were taken as the basis of the analysis.
- The study statistically used the quartiles to form the performance groups.
- States are assumed to remain fixed in three different time periods and therefore no change is attempted in describing the performance groups. As mentioned in the introduction chapter, four different performance groups,

which were also accepted by the EU, were identified in the evaluation of regional innovation performances. As a result of classification based on the quartiles, the upper group is defined as innovation leaders, the upper-middle group as strong innovators, the lower-middle group as moderate innovators and finally the lower group as modest innovators.

- In response to the research questions of the study, the transitions of the regions (at NUTS-3 level) in Turkey from one state to the other were determined according to the time periods in terms of their innovation performances which previously defined as four states/classes as a result of the four quartiles. The Shorrocks Trace Index (Shorrocks, 1978), which has been widely used in many fields considering socioeconomic dimensions, is preferred as mobility index for the transitions between states to indicate whether the regions were mobile or not. This mobility index is based on the trace of the transition matrices of Markov Chains. If the mobility index value is 0, it corresponds to immobility, whereas 1 corresponds to perfect mobility. Thus, a higher value of the index refers to a higher level of mobility. The formula of the standardized Shorrocks index (μ1nor) is given in Equation (1) as follows:

$$\mu 1nor = 1 - \frac{tr(P)}{n} \quad (1)$$

where n is the number of states/classes, P is the transition probability matrix and $\mathrm{tr}(\mathrm{P})$ is the trace of P which refers to the sum of its diagonal elements.

For measuring the regional innovation performance of Turkish regions, revising the data set according to important periods which emphasize specific features at innovation gains importance. For determination of important periods, it is important to analyse the historical background of Turkey on innovation. The increase in the number of regulations and institutions since 2000s shows that Turkey has initiatives in innovation and has entered into a restructuring process both legally and institutionally (Figure 3.4).

The Markov Chains have been formed based on two different methods to measure regional innovation performances (Table 5.51).

- Methodology 1: This methodology considers mean values of the amount (count number) of the data by three time periods. These time periods are determined as 2000-2005 (t-1), 2006-2010 (t) and 2011-2017 (t+1). By using counts (mean values of each region in themselves) considering time periods.
- Methodology 2: This methodology considers median values of the amount (count number) of the data by three time periods. These time periods are determined as 2000-2005 (t-1), 2006-2010 (t) and 2011-2017 (t+1). By using counts (distance of mean values to the median of 81 regions) considering time periods.

In Markov Chains analysis, the average values of each region within the specified time periods were taken as basis in both two methods to eliminate the effects (earthquake, crisis, etc.) of certain years. In Methodology 1, the quartiles were processed based on the average values obtained. In Methodology 2, new values were created according to the distance of the average values of each region to the median value of the 81 regions (that is, a new value was obtained for each region by subtracting the median value from the average of the region for each time period). Then the quartiles were processed based on the new values created. Thus, regions that behaved better than the median stepped up their innovation performance status and those who behaved worse went down.

In this context, Methodology 2 is detailed at below, and the results of Methodology 1 are also given in the Appendix B. In addition, in order to compare the results of these two methodologies, a list of the innovation performance groups of all regions according to the Methodology 1 and Methodology 2 is given in Appendix C.

Table 5.51 : Markov Chains based on two different methods (Author's own illustration).

Methodology	Values	Number of time zones	Definition of time zones
Methodology 1	Mean	Three	2000-2005, 2006-2010, 2011-2017.
Methodology 2	Distance from the average values to the median	Three	2000-2005, 2006-2010, 2011-2017.

- **Results of Methodology 2:**

In this method, it is assumed that all regions are in the same place in the 2000-2005 time period, and there are no regions in the 4th group of modest innovators in 2000-2005.

- Evaluation of "patent applications" indicator:

When the 2000-2005 (t-1) and 2006-2010 (t) time periods are analyzed, it is seen that only 34 regions held their innovation performances and preserved their places (Table 5.52).

There were 13 regions in innovation leaders in both two periods, and these regions were İstanbul, Ankara, İzmir, Bursa, Manisa, Kocaeli, Konya, Tekirdağ, Kayseri, Adana, Antalya, Eskişehir and Gaziantep regions. The common characteristic of these regions is that they are metropolitan regions[19]. Erzurum, Afyonkarahisar, Kütahya, Samsun, Hatay, Malatya, Çorum, Kırklareli, Trabzon, Aydın, Bilecik, Isparta, Ordu, Uşak and Düzce regions were the 15 strong innovators in both two time periods. The remaining 6 regions that managed to maintain their innovation performances were Kırşehir, Edirne, Rize, Karabük, Amasya and Şanlıurfa regions which located in moderate innovators in two time periods (Table 5.53).

For this variable, 13 regions succeeded in increasing their innovation performances. These regions consisted of 7 regions (Diyarbakır, Elazığ, Gümüşhane, Sivas, Nevşehir, Tokat and Zonguldak) which moved from moderate innovators to strong innovators and 6 regions (Sakarya, Denizli, Mersin, Balıkesir, Kahramanmaraş and Muğla) that passed the innovation leaders from the strong innovators (Table 5.53).

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[19] The regions referred to as metropolitan provinces in this study are defined such that each has a large population (more than 750 000 inhabitants) with surrounding suburbs and other neighboring communities in Turkey. This is based on the "Metropolitan Municipality Law no. 5216" (2004) which adopted on 10/7/2004. Important changes were made in this law on 12/11/2012. In this context, the details of these changes are as follows:

- According to Article 3: "The metropolitan municipality refers to the public legal entity whose decision body is selected by decision making voters; to fulfill the duties and responsibilities given by law and exercising powers; to provide the coordination between county municipalities with boundaries as provincial civil boundaries.
- According to Article 5, the boundaries of metropolitan municipalities are provincial civil boundaries.

In contrast to these regions, 34 regions could not maintain their innovation performances and declined their status. Çanakkale, Niğde, Bolu, Burdur, Yalova and Aksaray which declined from strong innovators to moderate innovators, and Adıyaman, Sinop, Osmaniye, Kastamonu, Yozgat, Van, Karaman, Kırıkkale, Batman, Mardin, Çankırı, Bitlis, Hakkari, Muş, Siirt, Bartın, Iğdır, Kilis, Ağrı, Bingöl, Tunceli, Şırnak, Artvin, Erzincan, Kars, Bayburt and Ardahan which moved from the moderate innovators to the modest innovators are from these regions. However, apart from these regions, the most striking one was Giresun, which had moved from the strong innovators to the modest innovators and declined with a two-stage downward mobility (Table 5.53).

Table 5.52 : Methodology 2 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	0	0	0	0	0
	3	27	6	7	0	40
	2	1	6	15	6	28
	1	0	0	0	13	13
		28	12	22	19	81
		2006-2011 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,00	0,00	0,00	0,00	0,00
	Medium-low	0,68	0,15	0,18	0,00	0,49
	Medium-up	0,04	0,21	0,54	0,21	0,35
	Upper	0,00	0,00	0,00	1,00	0,16
	Margin	0,35	0,15	0,27	0,23	
		Mobility Index	0,58			

Table 5.53 : Methodology 2 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	0	0	0	0	0
	Moderate Innovators	27: ADIYAMAN AĞRI ARTVİN BİNGÖL BİTLİS ÇANKIRI ERZİNCAN HAKKARİ KARS KASTAMONU MARDİN MUŞ SİİRT SİNOP TUNCELİ VAN YOZGAT BAYBURT KARAMAN KIRIKKALE BATMAN ŞIRNAK BARTIN ARDAHAN IĞDIR KİLİS OSMANİYE	6: AMASYA EDİRNE KIRŞEHİR RİZE ŞANLIURFA KARABÜK	7: DİYARBAKIR ELAZIĞ GÜMÜŞHANE NEVŞEHİR SİVAS TOKAT ZONGULDAK	0	40
	Strong Innovators	1: GİRESUN	6: BOLU BURDUR ÇANAKKALE NİĞDE AKSARAY YALOVA	15: AFYONKARAHİSAR AYDIN BİLECİK ÇORUM ERZURUM HATAY ISPARTA KIRKLARELİ KÜTAHYA MALATYA ORDU SAMSUN TRABZON UŞAK DÜZCE	6: BALIKESİR DENİZLİ MERSİN KAHRAMANMARAŞ MUĞLA SAKARYA	28
	Innovation Leaders	0	0	0	13: ADANA ANKARA ANTALYA BURSA ESKİŞEHİR GAZİANTEP İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA TEKİRDAĞ	13
		28	12	22	19	81

Comparing the 2006-2010 (t) and 2011-2017 (t+1) time periods, 54 regions were able to maintain keeping their innovation performances (Table 5.54). As a reflection of this, after comparing two Markov matrices used to explain the transitions (Table 5.52 and Table 5.54), it was observed that the mobility decreased as an indicator with the mobility indices from 0,58 to 0,38. Distribution of these 54 regions were; 19 regions (İstanbul, Ankara, Bursa, İzmir, Manisa, Kocaeli, Konya, Gaziantep, Sakarya, Tekirdağ, Eskişehir, Kayseri, Antalya, Adana, Denizli, Mersin, Balıkesir, Muğla and Kahramanmaraş) in innovation leaders, 7 regions (Malatya, Sivas, Erzurum, Afyonkarahisar, Kırklareli, Zonguldak and Tokat) in strong innovators, 3

regions (Çanakkale, Aksaray and Karabük) in the moderate innovators and finally 25 regions (Osmaniye, Karaman, Kırıkkale, Van, Yozgat, Batman, Çankırı, Erzincan, Mardin, Bitlis, Siirt, Kilis, Sinop, Bingöl, Hakkari, Artvin, Kars, Şırnak, Bartın, Tunceli, Bayburt, Ağrı, Muş, Ardahan and Iğdır) in modest innovators (Table 5.55). All regions in innovation leaders are metropolitan regions.

There are 18 regions that have succeeded to increase their innovation performances. The region that attracted the most attention was Rize, who achieved a two-stage upward mobility from moderate innovators to innovation leaders. The other 17 regions were able to experience a one-stage upward mobility. These regions were Kastamonu, Adıyaman and Giresun, which moved from modest innovators to moderate innovators; Şanlıurfa, Edirne, Yalova, Bolu and Burdur from moderate innovators to strong innovators; and finally Samsun, Aydın, Trabzon, Çorum, Hatay, Kütahya, Isparta, Elazığ and Düzce regions which moved from strong innovators to innovation leaders (Table 5.55).

Unlike these regions, innovation performances of 9 regions decreased. Especially Gümüşhane, Ordu and Nevşehir regions were the most striking ones because of the two-stage decline from the strong innovators to the modest innovators. In addition, Diyarbakır, Uşak and Bilecik regions have declined from strong innovators to moderate innovators, and Niğde, Amasya and Kırşehir from moderate innovators to modest innovators (Table 5.55).

Depending on the patent applications, transitions regarding innovation performances of all regions in all time periods are visualized in Figure 5.42.

Table 5.54 : Methodology 2 – Changes between t and t+1 time periods.

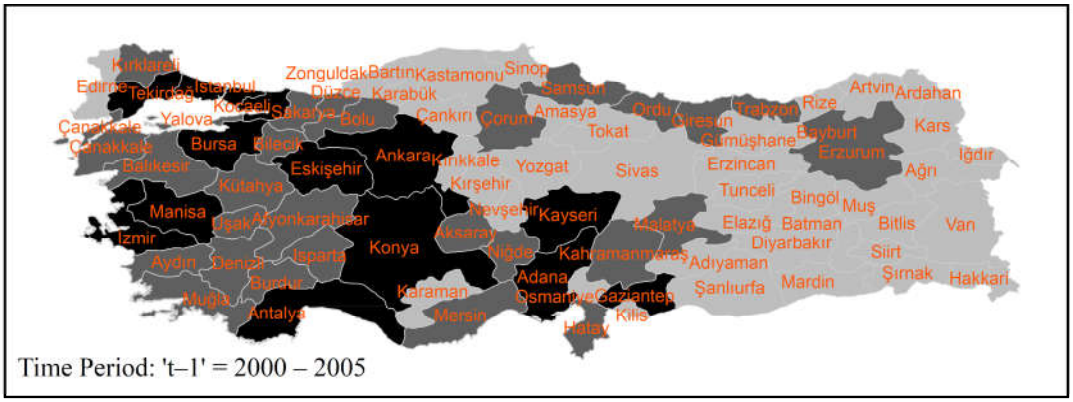
		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	25	3	0	0	28
	3	3	3	5	1	12
	2	3	3	7	9	22
	1	0	0	0	19	19
		31	9	12	29	81

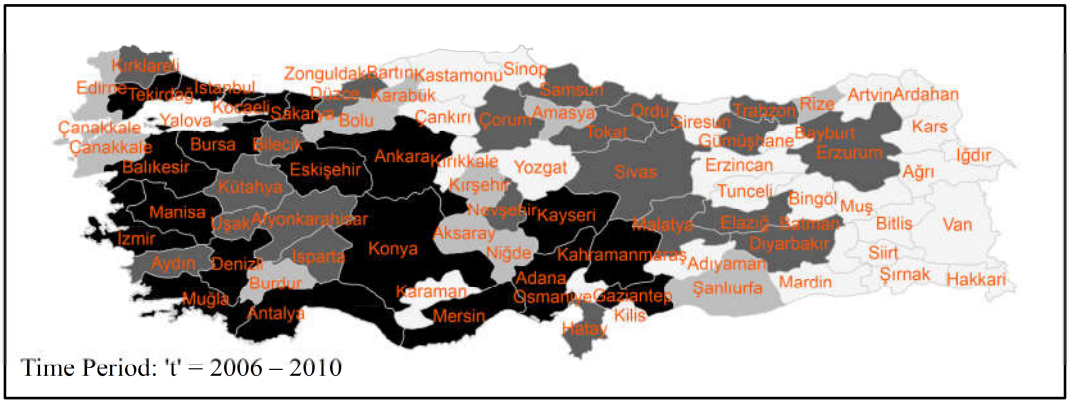
		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,89	0,11	0,00	0,00	0,35
	Medium-low	0,25	0,25	0,42	0,08	0,15
	Medium-up	0,14	0,14	0,32	0,41	0,27
	Upper	0,00	0,00	0,00	1,00	0,23
	Margin	0,38	0,11	0,15	0,36	
		Mobility Index	0,38			

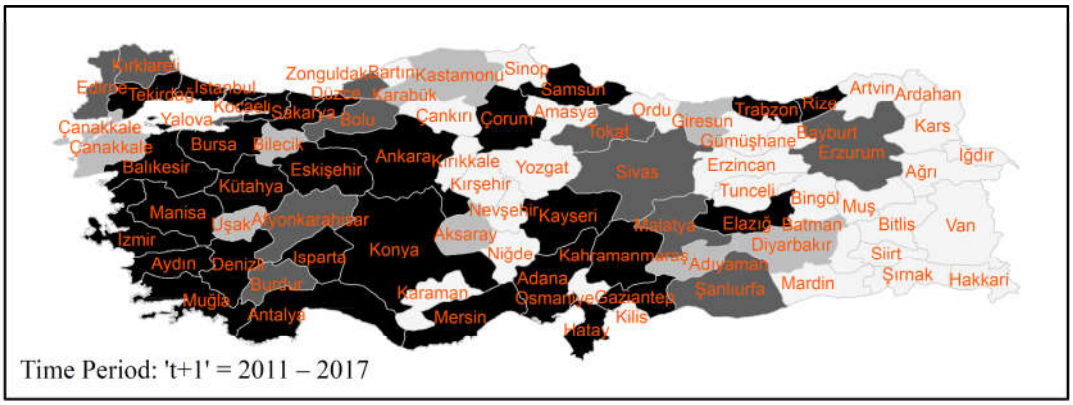
Table 5.55 : Methodology 2 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	25: AĞRI ARTVİN BİNGÖL BİTLİS ÇANKIRI ERZİNCAN HAKKARİ KARS MARDİN MUŞ SİİRT SİNOP TUNCELİ VAN YOZGAT BAYBURT KARAMAN KIRIKKALE BATMAN ŞIRNAK BARTIN ARDAHAN IĞDIR KİLİS OSMANİYE	3: ADIYAMAN GİRESUN KASTAMONU	0	0	28
	Moderate Innovators	3: AMASYA KIRŞEHİR NİĞDE	3: ÇANAKKALE AKSARAY KARABÜK	5: BOLU BURDUR EDİRNE ŞANLIURFA YALOVA	1: RİZE	12
	Strong Innovators	3: GÜMÜŞHANE NEVŞEHİR ORDU	3: BİLECİK DİYARBAKIR UŞAK	7: AFYONKARAHİSAR ERZURUM KIRKLARELİ MALATYA SİVAS TOKAT ZONGULDAK	9: AYDIN ÇORUM ELAZIĞ HATAY ISPARTA KÜTAHYA SAMSUN TRABZON DÜZCE	22
	Innovation Leaders	0	0	0	19: ADANA ANKARA ANTALYA BALIKESİR BURSA DENİZLİ ESKİŞEHİR GAZİANTEP MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA KAHRAMANMARAŞ MUĞLA SAKARYA TEKİRDAĞ	19
		31	9	12	29	81

Patent Applications - Methodology 2







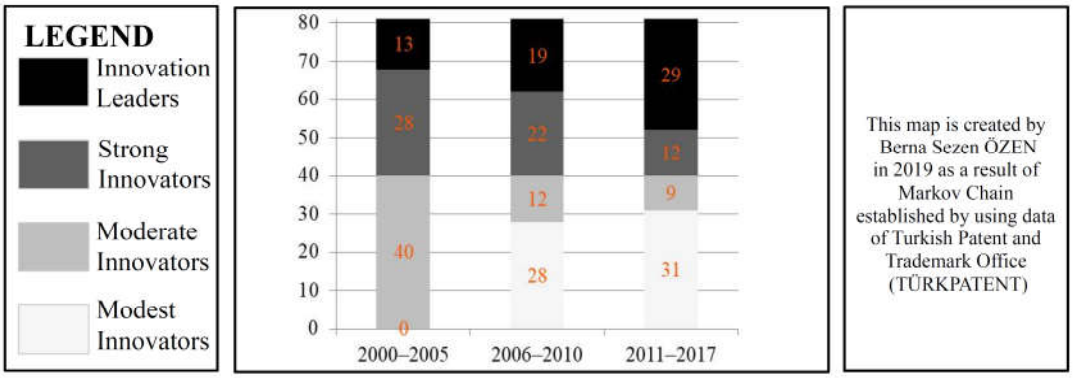


Figure 5.42 : Methodology 2 – Regional maps of 'patent applications'.

- **Evaluation of "patent grants" indicator:**

In the 2000-2005 (t-1) time period, only 9 regions were in the innovation leaders, while the remaining 72 regions were all agglomerated in the strong innovators (Table 5.56). All of these 9 regions in the innovation leaders are metropolitan regions (Table 5.57). In this variable, unlike other variables, there is no region in the moderate innovators in both the 2000-2005 (t-1) and 2006-2010 (t+1) time periods.

Upon comparing the 2000-2005 (t-1) and 2006-2010 (t+1) time periods, there were 29 regions that maintained their innovation performances for both two time periods. As stated before, 9 of them were the regions located in the innovation leaders and were İstanbul, Ankara, İzmir, Bursa, Manisa, Kocaeli, Gaziantep, Antalya and Kayseri regions. The remaining 20 regions were in the strong innovators in both two periods and consisted of Çanakkale, Çorum, Isparta, Kütahya, Sivas, Uşak, Aydın, Hatay, Ordu, Samsun, Tokat, Trabzon, Zonguldak, Burdur, Elazığ, Erzurum, Gümüşhane, Kahramanmaraş, Kırıkkale and Düzce regions.

While 14 regions succeeded in increasing their innovation performances by moving from strong innovators to innovation leaders, 38 regions could not maintain their innovation performances and declined by moving from strong innovators to moderate innovators. Regions that increased their innovation performances were Konya, Tekirdağ, Adana, Denizli, Eskişehir, Sakarya, Afyonkarahisar, Bilecik, Bolu, Mersin, Balıkesir, Niğde, Giresun and Muğla.

Diyarbakır, Edirne, Kırklareli, Malatya, Rize, Sinop, Şanlıurfa, Bartın, Iğdır, Yalova, Adıyaman, Ağrı, Amasya, Artvin, Bingöl, Bitlis, Çankırı, Erzincan, Hakkari, Kars, Kastamonu, Kırşehir, Mardin, Muş, Nevşehir, Siirt, Tunceli, Van, Yozgat, Aksaray, Bayburt, Karaman, Batman, Şırnak, Ardahan, Karabük, Kilis and Osmaniye regions are among those that failed to maintain their innovation performances (Table 5.57).

Table 5.56 : Methodology 2 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	0	0	0	0	0
	3	0	0	0	0	0
	2	0	38	20	14	72
	1	0	0	0	9	9
		0	38	20	23	81
		2006-2011 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,00	0,00	0,00	0,00	0,00
	Medium-low	0,00	0,00	0,00	0,00	0,00
	Medium-up	0,00	0,53	0,28	0,19	0,89
	Upper	0,00	0,00	0,00	1,00	0,11
	Margin	0,00	0,47	0,25	0,28	
		Mobility Index	0,68			

Table 5.57 : Methodology 2 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	0	0	0	0	0
	Moderate Innovators	0	0	0	0	0
	Strong Innovators	0	38: ADIYAMAN AĞRI AMASYA ARTVİN BİNGÖL BİTLİS ÇANKIRI DİYARBAKIR EDİRNE ERZİNCAN HAKKARİ KARS KASTAMONU KIRKLARELİ KIRŞEHİR MALATYA MARDİN MUŞ NEVŞEHİR RİZE SİİRT SİNOP TUNCELİ ŞANLIURFA VAN YOZGAT AKSARAY BAYBURT KARAMAN BATMAN ŞIRNAK BARTIN ARDAHAN IĞDIR YALOVA KARABÜK KİLİS OSMANİYE	20: AYDIN BURDUR ÇANAKKALE ÇORUM ELAZIĞ ERZURUM GÜMÜŞHANE HATAY ISPARTA KÜTAHYA KAHRAMANMARAŞ ORDU SAMSUN SİVAS TOKAT TRABZON UŞAK ZONGULDAK KIRIKKALE DÜZCE	14: ADANA AFYONKARAHİSAR BALIKESİR BİLECİK BOLU DENİZLİ ESKİŞEHİR GİRESUN MERSİN KONYA MUĞLA NİĞDE SAKARYA TEKİRDAĞ	72
	Innovation Leaders	0	0	0	9: ANKARA ANTALYA BURSA GAZİANTEP İSTANBUL İZMİR KAYSERİ KOCAELİ MANİSA	9
		0	38	20	23	81

When the 2006-2010 (t) and 2011-2017 (t+1) time periods are examined, it is seen that only 25 regions could be able to maintain their innovation performances. The increase in the mobility index from 0.68 in the first period to 0.73 in the second is a reflection of this and is an expression of the increase in mobility for this variable (Table 5.56 and Table 5.58). Due to the increase in mobility for the first time, the variable of patent grants differs from all other variables.

The 25 regions that preserved their innovation performances are İstanbul, Ankara, Bursa, Kocaeli, İzmir, Manisa, Konya, Tekirdağ, Sakarya, Eskişehir, Kayseri, Antalya, Gaziantep, Adana, Denizli, Mersin, Afyonkarahisar and Balıkesir in innovation leaders; Uşak, Burdur, Zonguldak, Erzurum and Kahramanmaraş in strong innovators; finally Adıyaman and Şanlıurfa regions in the moderate innovators in both two periods (Table 5.59).

There were 16 regions that increased their innovation performances. The most striking of these were Malatya, Kırklareli and Edirne regions which achieved a two-stage upward mobility from moderate innovators to innovation leaders. Apart from these regions, Kastamonu, Rize, Yalova and Nevşehir regions from the moderate innovators to the strong innovators, and Samsun Aydın, Isparta, Kütahya, Düzce, Hatay, Çorum, Trabzon and Elazığ regions from the strong innovators to the innovation leaders were also the regions that have managed to increase their innovation performances by skipping one stage.

Another remarkable issue in this variable is the decline of the innovation performances of 40 regions. Especially 7 regions attract a lot of attention. Niğde and Bolu regions decreased three stages and were positioned in the modest innovators from innovation leaders. This is the first time among all variables. The other 5 regions that attract attention are Çanakkale, Ordu, Gümüşhane, Kırıkkale and Tokat regions, which have moved from strong innovators to modest innovators and decreased two stages. The remaining 33 regions faced a single stage decline. These regions were Muğla, Bilecik and Giresun which moved from innovation leaders to strong innovators; Sivas that moved from strong innovators to moderate innovators; and finally Karaman, Amasya, Çankırı, Diyarbakır, Yozgat, Bartın, Karabük, Kırşehir, Bingöl, Mardin, Sinop, Aksaray, Osmaniye, Kars, Van, Batman, Şırnak, Ağrı, Bitlis, Muş, Siirt, Ardahan, Kilis, Artvin, Erzincan, Hakkari, Tunceli, Bayburt

and Iğdır regions which moved from moderate innovators to modest innovators (Table 5.59).

As a result, this variable differs from other variables because it is the variable in which mobility increased for the first time in 2006-2010 (t) and 2011-2017 (t+1) time periods and the mobility index reached the highest value (0.73). In addition, as stated before, for the first time in this variable, there is a three-stage movement in terms of innovation performances, and the existence of regions that declined from innovation leaders to modest innovators is another feature that distinguishes this variable from other variables. Depending on the patent grants, transitions regarding innovation performances of all regions in all time periods are visualized in Figure 5.43.

Table 5.58 : Methodology 2 – Changes between t and t+1 time periods.

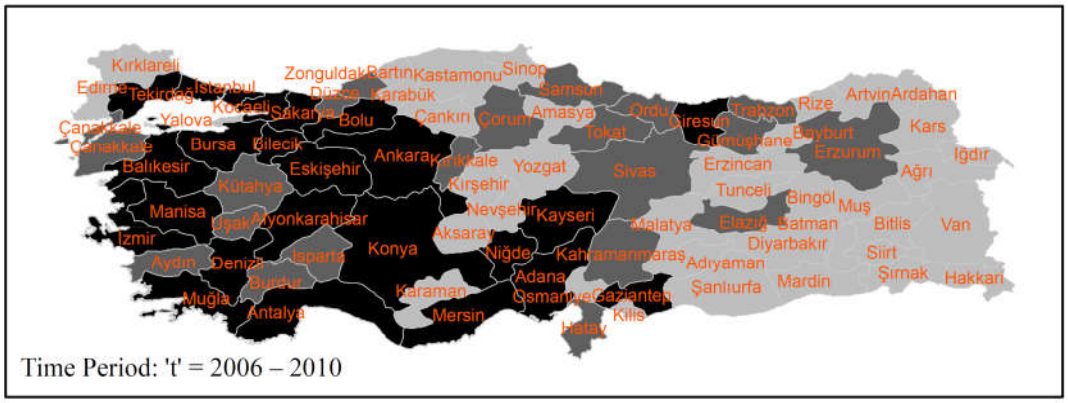
		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	0	0	0	0	0
	3	29	2	4	3	38
	2	5	1	5	9	20
	1	2	0	3	18	23
		36	3	12	30	81
		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,00	0,00	0,00	0,00	0,00
	Medium-low	0,76	0,05	0,11	0,08	0,47
	Medium-up	0,25	0,05	0,25	0,45	0,25
	Upper	0,09	0,00	0,13	0,78	0,28
	Margin	0,44	0,04	0,15	0,37	
		Mobility Index	0,73			

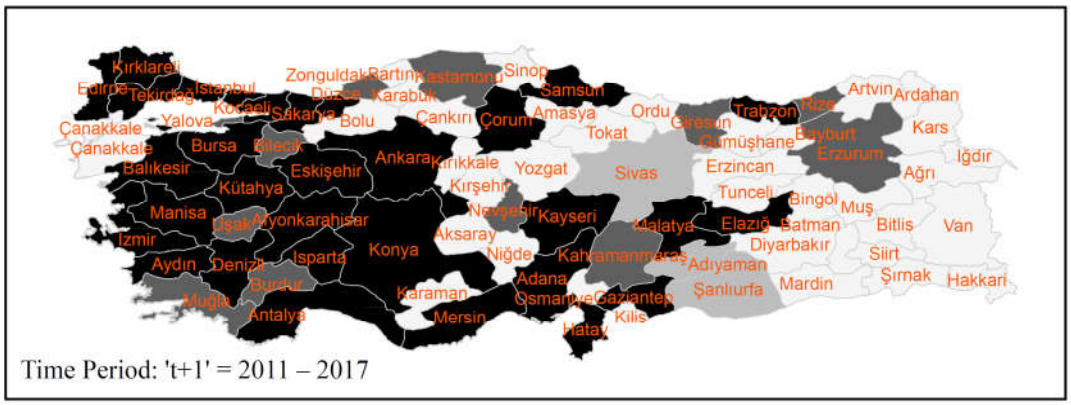
Table 5.59 : Methodology 2 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	0	0	0	0	0
	Moderate Innovators	29: AĞRI AMASYA ARTVİN BİNGÖL BİTLİS ÇANKIRI DİYARBAKIR ERZİNCAN HAKKARİ KARS KIRŞEHİR MARDİN MUŞ SİİRT SİNOP TUNCELİ VAN YOZGAT AKSARAY BAYBURT KARAMAN BATMAN ŞIRNAK BARTIN ARDAHAN IĞDIR KARABÜK KİLİS OSMANİYE	2: ADIYAMAN ŞANLIURFA	4: KASTAMONU NEVŞEHİR RİZE YALOVA	3: EDİRNE KIRKLARELİ MALATYA	38
	Strong Innovators	5: ÇANAKKALE GÜMÜŞHANE ORDU TOKAT KIRIKKALE	1: SİVAS	5: BURDUR ERZURUM KAHRAMANMARAŞ UŞAK ZONGULDAK	9: AYDIN ÇORUM ELAZIĞ HATAY ISPARTA KÜTAHYA SAMSUN TRABZON DÜZCE	20
	Innovation Leaders	2: BOLU NİĞDE	0	3: BİLECİK GİRESUN MUĞLA	18: ADANA AFYONKARAHİSAR ANKARA ANTALYA BALIKESİR BURSA DENİZLİ ESKİŞEHİR GAZİANTEP MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA SAKARYA TEKİRDAĞ	23
		36	3	12	30	81

Patent Grants - Methodology 2







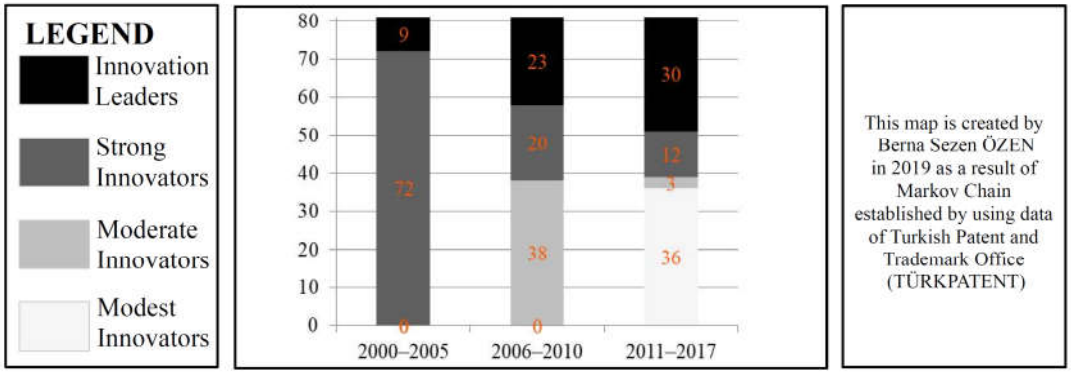


Figure 5.43 : Methodology 2 – Regional maps of 'patent grants'.

- **Evaluation of "utility models applications" indicator:**

When the 2000-2005 (t-1) and 2006-2010 (t) time periods are compared for the utility model applications variable, there were 15 regions with the characteristics of innovation leaders in both two time periods as İstanbul, Ankara, İzmir, Bursa, Konya, Kayseri, Kocaeli, Antalya, Sakarya, Manisa, Adana, Denizli, Eskişehir, Mersin and Balıkesir regions, all of which are metropolitan regions (Table 5.60 and Table 5.61).

There were 15 strong innovators in both two time periods as Muğla, Düzce, Isparta, Kütahya, Hatay, Kahramanmaraş, Afyonkarahisar, Çanakkale, Sivas, Bilecik, Malatya, Amasya, Yalova, Trabzon and Karaman. Moderate innovators in both two time perios were Ordu, Bolu, Sinop and Rize regions. In this case, there were a total of 34 regions that maintain their current places in the 2000-2005 (t-1) and 2006-2010 (t) time periods.

There are a total of 13 regions that have increased their innovation performances. 6 strong innovators in 2000-2005 (t-1) as Gaziantep, Aydın, Tekirdağ, Samsun, Çorum and Burdur were promoted to the innovation leaders in 2006-2010 (t) time period. The remaining 7 regions were Nevşehir, Tokat, Erzurum, Uşak, Diyarbakır, Kırklareli and Zonguldak regions that had risen from the moderate innovators to the strong innovators.

Unlike these upgraded regions increasing their innovation performances, there are a total of 34 regions, whose innovation performances in the 2000-2005 (t-1) time period declined in the 2006-2010 (t) time period. Giresun, Şanlıurfa and Kırıkkale regions are the most striking regions among these regions with declining performance. These regions, which were in the strong innovators group in the first period, declined with a two-stage downward mobility to the modest innovators group in the 2006-2010 (t) time period. The remaining 31 regions consisted of 3 regions (Kastamonu, Elazığ and Aksaray) which declined from the strong innovators to the moderate innovators, and 28 regions (Edirne, Yozgat, Kırşehir, Mardin, Osmaniye, Adıyaman, Karabük, Çankırı, Kars, Niğde, Van, Batman, Erzincan, Bartın, Iğdır, Artvin, Gümüşhane, Muş, Kilis, Tunceli, Bayburt, Ardahan, Ağrı, Bingöl, Bitlis, Hakkari, Siirt and Şırnak) from the moderate innovators to the modest innovators.

Table 5.60 : Methodology 2 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	0	0	0	0	0
	3	28	4	7	0	39
	2	3	3	15	6	27
	1	0	0	0	15	15
		31	7	22	21	81
		2006-2011 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,00	0,00	0,00	0,00	0,00
	Medium-low	0,72	0,10	0,18	0,00	0,48
	Medium-up	0,11	0,11	0,56	0,22	0,33
	Upper	0,00	0,00	0,00	1,00	0,19
	Margin	0,38	0,09	0,27	0,26	
		Mobility Index	0,59			

Table 5.61 : Methodology 2 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	0	0	0	0	0
	Moderate Innovators	28: ADIYAMAN AĞRI ARTVİN BİNGÖL BİTLİS ÇANKIRI EDİRNE ERZİNCAN GÜMÜŞHANE HAKKARİ KARS KIRŞEHİR MARDİN MUŞ NİĞDE SİİRT TUNCELİ VAN YOZGAT BAYBURT BATMAN ŞIRNAK BARTIN ARDAHAN IĞDIR KARABÜK KİLİS OSMANİYE	4: BOLU ORDU RİZE SİNOP	7: DİYARBAKIR ERZURUM KIRKLARELİ NEVŞEHİR TOKAT UŞAK ZONGULDAK	0	39
	Strong Innovators	3: GİRESUN ŞANLIURFA KIRIKKALE	3: ELAZIĞ KASTAMONU AKSARAY	15: AFYONKARAHİSAR AMASYA BİLECİK ÇANAKKALE HATAY ISPARTA KÜTAHYA MALATYA KAHRAMANMARAŞ MUĞLA SİVAS TRABZON KARAMAN YALOVA DÜZCE	6: AYDIN BURDUR ÇORUM GAZİANTEP SAMSUN TEKİRDAĞ	27
	Innovation Leaders	0	0	0	15: ADANA ANKARA ANTALYA BALIKESİR BURSA DENİZLİ ESKİŞEHİR MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA SAKARYA	15
		31	7	22	21	81

Upon comparing the 2006-2010 (t) and 2011-2017 (t+1) time periods for the utility model applications variable, it is seen that the mobility decreased with the decline of the mobility index in the first matrix from 0.59 to 0.28 (Table 5.60 and Table 5.62).

Table 5.62 : Methodology 2 – Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	27	2	2	0	31
	3	1	4	2	0	7
	2	2	4	11	5	22
	1	0	0	1	20	21
		30	10	16	25	81
		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,87	0,06	0,06	0,00	0,38
	Medium-low	0,14	0,57	0,29	0,00	0,09
	Medium-up	0,09	0,18	0,50	0,23	0,27
	Upper	0,00	0,00	0,05	0,95	0,26
	Margin	0,37	0,12	0,20	0,31	
		Mobility Index	0,28			

The presence of 62 regions that maintained their places in performance groups is an indication of this situation. The distribution of these regions is 27 (Şanlıurfa, Osmaniye, Edirne, Niğde, Kırıkkale, Adıyaman, Bartın, Karabük, Erzincan, Gümüşhane, Mardin, Şırnak, Batman, Bingöl, Kars, Kırşehir, Hakkari, Muş, Ardahan, Iğdır, Kilis, Bitlis, Ağrı, Artvin, Tunceli, Bayburt and Siirt) in the modest innovators; 4 (Kastamonu, Ordu, Elazığ and Bolu) in the moderate innovators; 11 (Trabzon, Isparta, Kütahya, Malatya, Nevşehir, Zonguldak, Amasya, Erzurum, Sivas, Uşak and Çanakkale) in strong innovators; and 20 regions (İstanbul, Ankara, Bursa, İzmir, Konya, Kayseri, Kocaeli, Antalya, Sakarya, Manisa, Denizli, Gaziantep, Adana, Eskişehir, Aydın, Mersin, Tekirdağ, Samsun, Balıkesir and Burdur) in innovation leaders. In the 2011-2017 (t+1) time period, 11 regions increased their previous innovation performances. The most striking of these regions are the Çankırı and Giresun regions which achieved a two-stage upward mobility from the modest to the strong innovators. Remaining 9 regions achieved a one-stage upward mobility. These regions were Yozgat and Van which increased their innovation performances from the modest to the moderate innovators; Rize and Aksaray from moderate to strong innovators; and finally Afyonkarahisar, Hatay, Kahramanmaraş, Muğla and Düzce regions from strong innovators to the innovation leaders. There are 8 regions where innovation performances are declining. The most striking of these regions are Kırklareli and Bilecik, which were in the strong innovators at the 2006-2010 (t) time period, but declined to the modest innovators at the 2011-2017 (t+1) time period.

Innovation performances of remaining 6 regions declined one stage. Sinop declined from moderate innovators to the modest innovators. Karaman, Yalova, Diyarbakır and Tokat moved from the strong innovators to the moderate innovators. Finally Çorum region declined from innovation leaders to strong innovators (Table 5.63). Depending on the utility model applications, transitions regarding innovation performances of all regions in all time periods are visualized in Figure 5.44.

Table 5.63 : Methodology 2 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	27: ADIYAMAN AĞRI ARTVİN BİNGÖL BİTLİS EDİRNE ERZİNCAN GÜMÜŞHANE HAKKARİ KARS KIRŞEHİR MARDİN MUŞ NİĞDE SİİRT TUNCELİ ŞANLIURFA BAYBURT KIRIKKALE BATMAN ŞIRNAK BARTIN ARDAHAN IĞDIR KARABÜK KİLİS OSMANİYE	2: VAN YOZGAT	2: ÇANKIRI GİRESUN	0	31
	Moderate Innovators	1: SİNOP	4: BOLU ELAZIĞ KASTAMONU ORDU	2: RİZE AKSARAY	0	7
	Strong Innovators	2: BİLECİK KIRKLARELİ	4: DİYARBAKIR TOKAT KARAMAN YALOVA	11: AMASYA ÇANAKKALE ERZURUM ISPARTA KÜTAHYA MALATYA NEVŞEHİR SİVAS TRABZON UŞAK ZONGULDAK	5: AFYONKARAHİSAR HATAY KAHRAMANMARAŞ MUĞLA DÜZCE	22
	Innovation Leaders	0	0	1: ÇORUM	20: ADANA ANKARA ANTALYA AYDIN BALIKESİR BURDUR BURSA DENİZLİ ESKİŞEHİR GAZİANTEP MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA SAKARYA SAMSUN TEKİRDAĞ	21
		30	10	16	25	81

Utility Model Applications - Methodology 2

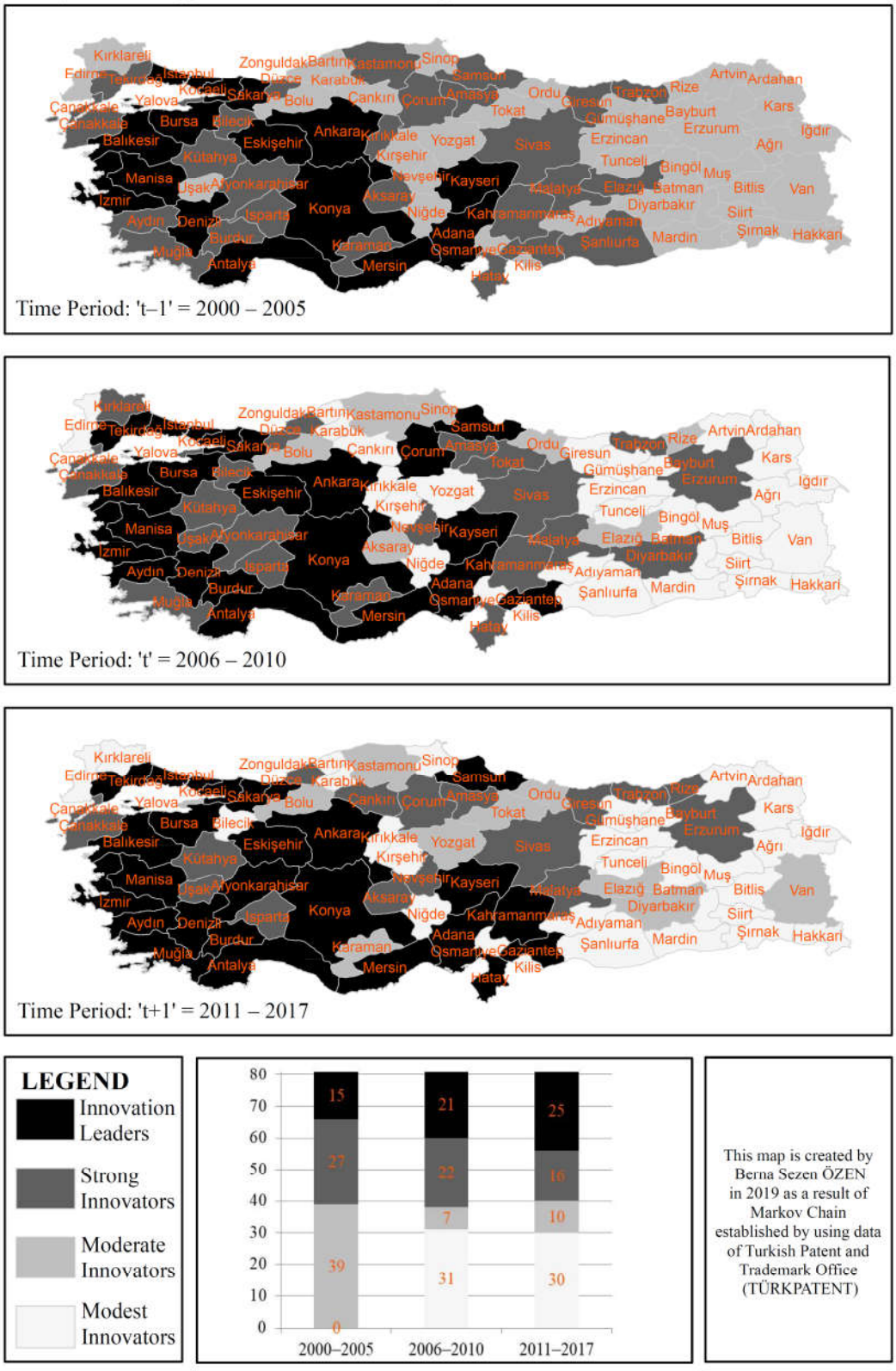


Figure 5.44 : Methodology 2 – Regional maps of 'utility model applications'.

- **Evaluation of "utility models grants" indicator:**

Depending on the utility model grants, there are 34 regions that maintained their innovation performances in the 2000-2005 (t-1) and 2006-2010 (t) time periods (Table 5.64).

Table 5.64 : Methodology 2 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	0	0	0	0	0
	3	21	7	5	0	33
	2	5	6	15	10	36
	1	0	0	0	12	12
		26	13	20	22	81
		2006-2011 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,00	0,00	0,00	0,00	0,00
	Medium-low	0,64	0,21	0,15	0,00	0,41
	Medium-up	0,14	0,17	0,42	0,28	0,44
	Upper	0,00	0,00	0,00	1,00	0,15
	Margin	0,32	0,16	0,25	0,27	
		Mobility Index	0,59			

12 regions (İstanbul, Ankara, İzmir, Bursa, Konya, Kayseri, Kocaeli, Antalya, Manisa, Adana, Eskişehir and Balıkesir) of these were in the innovation leaders, all of which are metropolitan regions. 15 regions in the strong innovators in both two time periods were Hatay, Kütahya, Muğla, Afyonkarahisar, Isparta, Kahramanmaraş, Sivas, Uşak, Tokat, Karaman, Kırklareli, Malatya, Trabzon, Amasya and Kastamonu regions. Finally, the remaining 7 regions that preserved their innovation performances were Zonguldak, Rize, Sinop, Diyarbakır, Edirne, Erzurum and Karabük, which were located in the moderate innovators (Table 5.65).

Upon comparing the two time periods, 15 regions have increased their innovation performances. 10 of these regions were Sakarya, Çanakkale, Denizli, Gaziantep, Aydın, Tekirdağ, Mersin, Çorum, Samsun and Burdur regions, which were promoted from strong innovators to innovation leaders and 5 of them were Bolu, Bilecik, Nevşehir, Ordu and Aksaray regions, which rose from moderate innovators to strong innovators (Table 5.65).

Unlike these regions, the innovation performances of 32 regions declined. 5 of these regions are the most striking ones, and they were Mardin, Muş, Niğde, Kırıkkale and Çankırı regions, which dropped two stages from the strong innovators to the modest innovators. 21 regions (Artvin, Erzincan, Ardahan, Adıyaman, Van, Yozgat, Iğdır, Osmaniye, Kars, Tunceli, Bayburt, Batman, Şırnak, Bartın, Kilis, Ağrı, Bingöl, Bitlis, Gümüşhane, Hakkari and Siirt) which were in the moderate innovators in

2000-2005 (t-1) time period and declined to the modest innovators in 2006-2010 (t) time period. In addition 6 regions (Elazığ, Şanlıurfa, Yalova, Düzce, Giresun and Kırşehir) declined to moderate innovators from strong innovators (Table 5.65).

Table 5.65 : Methodology 2 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	0	0	0	0	0
	Moderate Innovators	21: ADIYAMAN AĞRI ARTVİN BİNGÖL BİTLİS ERZİNCAN GÜMÜŞHANE HAKKARİ KARS SİİRT TUNCELİ VAN YOZGAT BAYBURT BATMAN ŞIRNAK BARTIN ARDAHAN IĞDIR KİLİS OSMANİYE	7: DİYARBAKIR EDİRNE ERZURUM RİZE SİNOP ZONGULDAK KARABÜK	5: BİLECİK BOLU NEVŞEHİR ORDU AKSARAY	0	33
	Strong Innovators	5: ÇANKIRI MARDİN MUŞ NİĞDE KIRIKKALE	6: ELAZIĞ GİRESUN KIRŞEHİR ŞANLIURFA YALOVA DÜZCE	15: AFYONKARAHİSAR AMASYA HATAY ISPARTA KASTAMONU KIRKLARELİ KÜTAHYA MALATYA KAHRAMANMARAŞ MUĞLA SİVAS TOKAT TRABZON UŞAK KARAMAN	10: AYDIN BURDUR ÇANAKKALE ÇORUM DENİZLİ GAZİANTEP MERSİN SAKARYA SAMSUN TEKİRDAĞ	36
	Innovation Leaders	0	0	0	12: ADANA ANKARA ANTALYA BALIKESİR BURSA ESKİŞEHİR İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA	12
		26	13	20	22	81

When the 2006-2010 (t) and 2011-2017 (t+1) time periods are compared, it is seen that 59 regions preserved their places and as a reflection of this, the mobility index in the first Markov matrix fell from 0.59 to 0.35 (Table 5.64 and Table 5.66). This indicates that mobility has decreased. Most of these 59 regions were in innovation leaders and modest innovators groups. Regions with innovation leaders in both two time periods were İstanbul, Ankara, İzmir, Bursa, Konya, Kayseri, Kocaeli, Antalya, Manisa, Denizli, Sakarya, Gaziantep, Adana, Aydın, Eskişehir, Tekirdağ, Samsun, Mersin, Balıkesir, Burdur and Çorum regions. All of these 21 regions, except Burdur

and Çorum, are metropolitan regions. 11 regions located in the strong innovators, which maintained their innovation performances in both two time periods, were Nevşehir, Trabzon, Kütahya, Malatya, Aksaray, Uşak, Amasya, Karaman, Bolu, Kırklareli and Sivas. In addition, Elazığ and Zonguldak regions were located in the moderate innovators in both two periods. Remanining 25 regions that maintained their innovation performances were positioned in the modest innovators and they were Niğde, Osmaniye, Kırıkkale, Bartın, Adıyaman, Van, Mardin, Batman, Çankırı, Artvin, Gümüşhane, Erzincan, Hakkari, Şırnak, Iğdır, Kilis, Bingöl, Bitlis, Kars, Muş, Siirt, Tunceli, Ağrı, Bayburt and Ardahan regions (Table 5.67).

11 regions increased their previous innovation performances in the 2011-2017 (t+1) time period. Among these regions, Düzce is the most noticeable region by achieving a two-stage upward mobility and it has succeeded in raising its performance from moderate innovators to innovation leaders. The remaining 10 regions increased their innovation performances by one stage. Yozgat has risen from modest innovators to the moderate innovators. While Giresun, Erzurum, Rize and Yalova regions were in the moderate innovators in the 2006-2010 (t) time period, they increased their innovation performances to the strong innovators group in the next time period. Finally, the 5 regions that managed to improve their performances were Kahramanmaraş, Isparta, Afyonkarahisar, Muğla and Hatay regions, which were promoted from strong innovators to innovation leaders.

Table 5.66 : Methodology 2 – Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	25	1	0	0	26
	3	6	2	4	1	13
	2	1	3	11	5	20
	1	0	1	0	21	22
		32	7	15	27	81
		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,96	0,04	0,00	0,00	0,32
	Medium-low	0,46	0,15	0,31	0,08	0,16
	Medium-up	0,05	0,15	0,55	0,25	0,25
	Upper	0,00	0,05	0,00	0,95	0,27
	Margin	0,40	0,09	0,19	0,33	
		Mobility Index	0,35			

In contrast to these 11 upgraded regions, there are 11 other regions whose performances declined. Among these regions, the most noticeable regions that had a two-stage downward mobility were Çanakkale which moved from the innovation leaders to the moderate innovators and Bilecik from the strong innovators to the modest innovators. Apart from these, the performances of 9 regions decreased by one

stage. Ordu, Kastamonu and Tokat regions have declined from strong innovators to moderate innovators, Diyarbakır, Edirne, Sinop, Şanlıurfa, Karabük and Kırşehir regions from the moderate innovators to the modest innovators. Depending on the utility model grants, transitions regarding innovation performances of all regions in all time periods are visualized in Figure 5.45.

Table 5.67 : Methodology 2 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	25: ADIYAMAN AĞRI ARTVİN BİNGÖL BİTLİS ÇANKIRI ERZİNCAN GÜMÜŞHANE HAKKARİ KARS MARDİN MUŞ NİĞDE SİİRT TUNCELİ VAN BAYBURT KIRIKKALE BATMAN ŞIRNAK BARTIN ARDAHAN IĞDIR KİLİS OSMANİYE	1: YOZGAT	0	0	26
	Moderate Innovators	6: DİYARBAKIR EDİRNE KIRŞEHİR SİNOP ŞANLIURFA KARABÜK	2: ELAZIĞ ZONGULDAK	4: ERZURUM GİRESUN RİZE YALOVA	1: DÜZCE	13
	Strong Innovators	1: BİLECİK	3: KASTAMONU ORDU TOKAT	11: AMASYA BOLU KIRKLARELİ KÜTAHYA MALATYA NEVŞEHİR SİVAS TRABZON UŞAK AKSARAY KARAMAN	5: AFYONKARAHİSAR HATAY ISPARTA KAHRAMANMARAŞ MUĞLA	20
	Innovation Leaders	0	1: ÇANAKKALE	0	21: ADANA ANKARA ANTALYA AYDIN BALIKESİR BURDUR BURSA ÇORUM DENİZLİ ESKİŞEHİR GAZİANTEP MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA SAKARYA SAMSUN TEKİRDAĞ	22
		32	7	15	27	81

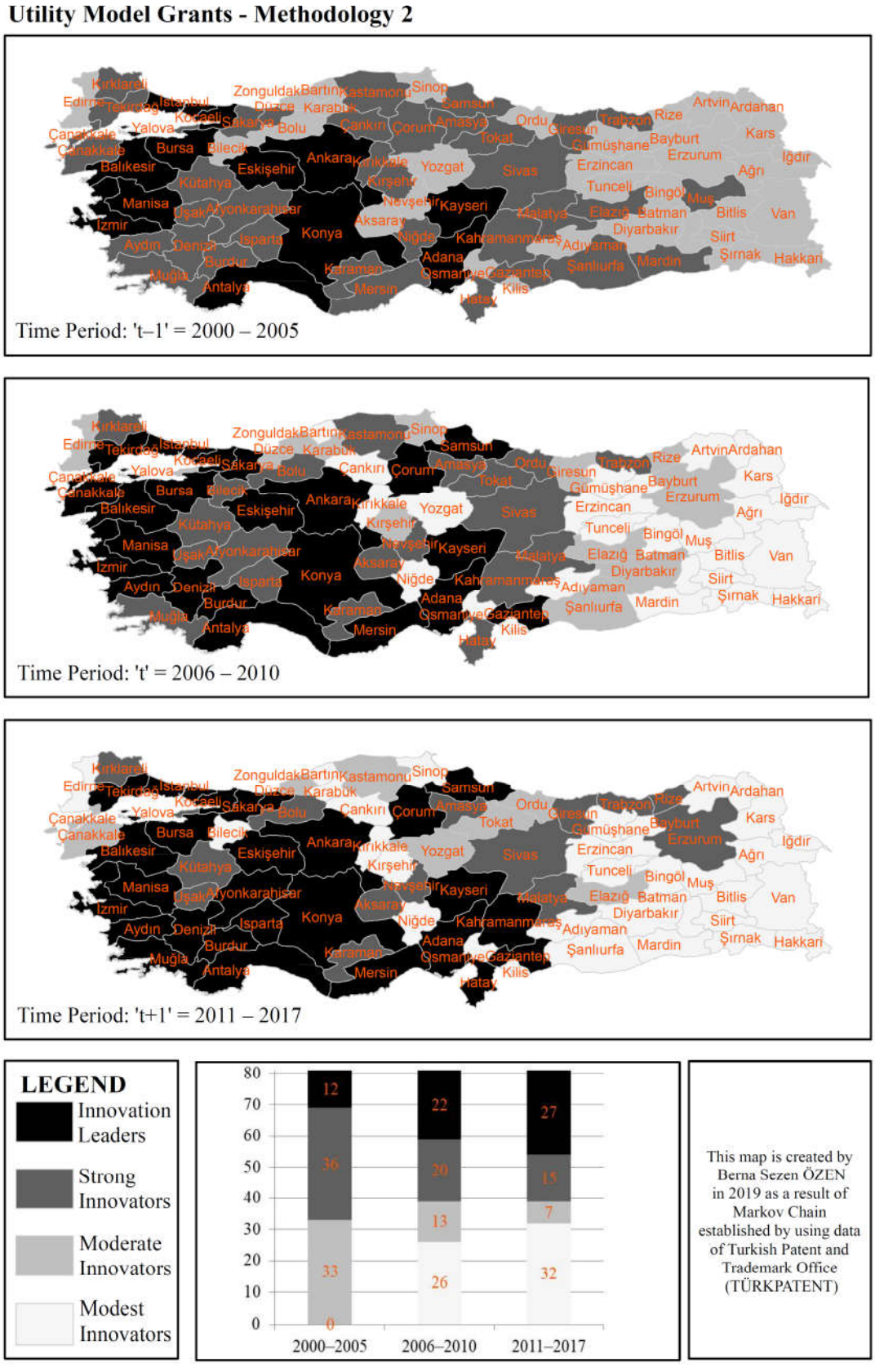


Figure 5.45 : Methodology 2 – Regional maps of 'utility model grants'.

- **Evaluation of "trademark applications" indicator:**

When the 2000-2005 (t-1) and 2006-2010 (t) time periods are examined for the 'trademark applications' indicator, there are 44 regions that maintained their innovation performances (Table 5.68).

Table 5.68 : Methodology 2 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	0	0	0	0	0
	3	29	10	1	0	40
	2	0	1	19	5	25
	1	0	0	1	15	16
		29	11	21	20	81
		2006-2011 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,00	0,00	0,00	0,00	0,00
	Medium-low	0,73	0,25	0,03	0,00	0,49
	Medium-up	0,00	0,04	0,76	0,20	0,31
	Upper	0,00	0,00	0,06	0,94	0,20
	Margin	0,36	0,14	0,26	0,25	
		Mobility Index	0,51			

15 of these regions were in the innovation leaders in both two time periods as İstanbul, Ankara, İzmir, Bursa, Antalya, Gaziantep, Konya, Kocaeli, Adana, Kayseri, Mersin, Denizli, Eskişehir, Manisa and Balıkesir regions. As in other variables, the common feature of these regions is that they are all metropolitan regions. 19 regions (namely Tekirdağ, Trabzon, Malatya, Afyonkarahisar, Kahramanmaraş, Şanlıurfa, Kütahya, Elazığ, Diyarbakır, Karaman, Isparta, Çanakkale, Tokat, Erzurum, Çorum, Ordu, Kırklareli, Sivas and Edirne) kept their innovation performances and located in the strong innovators in both two time periods. Finally the remaining 10 regions in the moderate innovators that maintained their innovation performances in both two time periods were Düzce, Yalova, Van, Uşak, Batman, Zonguldak, Nevşehir, Osmaniye, Aksaray and Burdur regions (Table 5.69).

In this variable, only 6 regions managed to increase their innovation performances, while 31 regions could not be able to maintain their innovation performances and had to decline one stage.

Regions that increased their innovation performances were Mardin region from the moderate innovators to the strong innovators and Muğla, Sakarya, Samsun, Aydın and Hatay regions from the strong innovators to the innovation leaders.

Unlike these upgraded regions, Rize region declined from innovation leaders to strong innovators, Bolu from strong innovators to moderate innovators and Adıyaman, Amasya, Giresun, Kastamonu, Erzincan, Niğde, Karabük, Yozgat, Bartın,

Kırıkkale, Bilecik, Çankırı, Kırşehir, Kars, Sinop, Kilis, Şırnak, Muş, Ağrı, Gümüşhane, Hakkari, Artvin, Siirt, Bingöl, Iğdır, Bitlis, Ardahan, Bayburt and Tunceli regions from moderate innovators to modest innovators by being unable to maintain their innovation performances.

Table 5.69 : Methodology 2 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	0	0	0	0	0
	Moderate Innovators	29: ADIYAMAN AĞRI AMASYA ARTVİN BİLECİK BİNGÖL BİTLİS ÇANKIRI ERZİNCAN GİRESUN GÜMÜŞHANE HAKKARİ KARS KASTAMONU KIRŞEHİR MUŞ NİĞDE SİİRT SİNOP TUNCELİ YOZGAT BAYBURT KIRIKKALE ŞIRNAK BARTIN ARDAHAN IĞDIR KARABÜK KİLİS	10: BURDUR NEVŞEHİR UŞAK VAN ZONGULDAK AKSARAY BATMAN YALOVA OSMANİYE DÜZCE	1: MARDİN	0	40
	Strong Innovators	0	1: BOLU	19: AFYONKARAHİSAR ÇANAKKALE ÇORUM DİYARBAKIR EDİRNE ELAZIĞ ERZURUM ISPARTA KIRKLARELİ KÜTAHYA MALATYA KAHRAMANMARAŞ ORDU SİVAS TEKİRDAĞ TOKAT TRABZON ŞANLIURFA KARAMAN	5: AYDIN HATAY MUĞLA SAKARYA SAMSUN	25
	Innovation Leaders	0	0	1: RİZE	15: ADANA ANKARA ANTALYA BALIKESİR BURSA DENİZLİ ESKİŞEHİR GAZİANTEP MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA	16
		29	11	21	20	81

When the time periods of 2006-2010 (t) and 2011-2017 (t+1) are examined, it is seen that 68 regions preserved their places and as a reflection of this, the mobility index in

the first matrix declined from 0.51 to 0.21 and mobility decreased (Table 5.68 and Table 5.70). This variable is the variable in which mobility most decreased and reached the lowest value.

Table 5.70 : Methodology 2 – Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	28	1	0	0	29
	3	3	6	2	0	11
	2	1	1	14	5	21
	1	0	0	0	20	20
		32	8	16	25	81

		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,97	0,03	0,00	0,00	0,36
	Medium-low	0,27	0,55	0,18	0,00	0,14
	Medium-up	0,05	0,05	0,67	0,24	0,26
	Upper	0,00	0,00	0,00	1,00	0,25
	Margin	0,40	0,10	0,20	0,31	
		Mobility Index	0,21			

The majority of these 68 regions maintained their innovation performances were consisted of the modest innovators with 28 regions as Adıyaman, Karabük, Kastamonu, Niğde, Amasya, Erzincan, Bilecik, Kırıkkale, Kırşehir, Bartın, Yozgat, Sinop, Kilis, Şırnak, Iğdır, Ağrı, Çankırı, Artvin, Siirt, Kars, Bingöl, Bitlis, Muş, Hakkari, Gümüşhane, Tunceli, Ardahan and Bayburt regions. In addition, Bolu, Batman, Van, Aksaray, Yalova and Uşak regions were in the moderate innovators in both two periods. The 14 regions located in the strong innovators in both two time periods were Çanakkale, Afyonkarahisar, Malatya, Elazığ, Mardin, Kütahya, Karaman, Rize, Isparta, Edirne, Çorum, Sivas, Erzurum and Ordu regions. The last remaining 20 regions that maintained their innovation performances were in the innovation leaders. These regions were İstanbul, Ankara, İzmir, Bursa, Gaziantep, Antalya, Konya, Kocaeli, Adana, Kayseri, Denizli, Mersin, Muğla, Hatay, Eskişehir, Balıkesir, Sakarya, Manisa, Samsun and Aydın regions, all of which are metropolitan regions (Table 5.71).

Table 5.71 : Methodology 2 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	28: ADIYAMAN AĞRI AMASYA ARTVİN BİLECİK BİNGÖL BİTLİS ÇANKIRI ERZİNCAN GÜMÜŞHANE HAKKARİ KARS KASTAMONU KIRŞEHİR MUŞ NİĞDE SİİRT SİNOP TUNCELİ YOZGAT BAYBURT KIRIKKALE ŞIRNAK BARTIN ARDAHAN IĞDIR KARABÜK KİLİS	1: GİRESUN	0	0	29
	Moderate Innovators	3: BURDUR ZONGULDAK OSMANİYE	6: BOLU UŞAK VAN AKSARAY BATMAN YALOVA	2: NEVŞEHİR DÜZCE	0	11
	Strong Innovators	1: TOKAT	1: KIRKLARELİ	14: AFYONKARAHİSAR ÇANAKKALE ÇORUM EDİRNE ELAZIĞ ERZURUM ISPARTA KÜTAHYA MALATYA MARDİN ORDU RİZE SİVAS KARAMAN	5: DİYARBAKIR KAHRAMANMARAŞ TEKİRDAĞ TRABZON ŞANLIURFA	21
	Innovation Leaders	0	0	0	20: ADANA ANKARA ANTALYA AYDIN BALIKESİR BURSA DENİZLİ ESKİŞEHİR GAZİANTEP HATAY MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA MUĞLA SAKARYA SAMSUN	20
		32	8	16	25	81

While 8 regions were able to increase their innovation performances by one stage, the performances of other 5 regions have decreased for this variable. These upgraded regions were Giresun region which has risen from the modest innovators to the moderate innovators; Düzce and Nevşehir from the moderate innovators to the strong innovators; and finally Tekirdağ, Trabzon, Kahramanmaraş, Şanlıurfa and Diyarbakır regions from strong innovators to innovation leaders.

Tokat is the most noticeable region of the 5 regions with declining performances. Because, while it was in the strong innovators in the 2006-2010 (t) time period, it declined to the modest innovators in the 2011-2017 (t+1) time period with a two-stage downward mobility. Other regions have declined by one stage. These regions were Zonguldak, Osmaniye and Burdur regions which moved from moderate innovators to modest innovators; and Kırklareli region from strong innovators to moderate innovators.

Depending on the trademark applications, transitions regarding innovation performances of all regions in all time periods are visualized in Figure 5.46.

Trademark Applications - Methodology 2

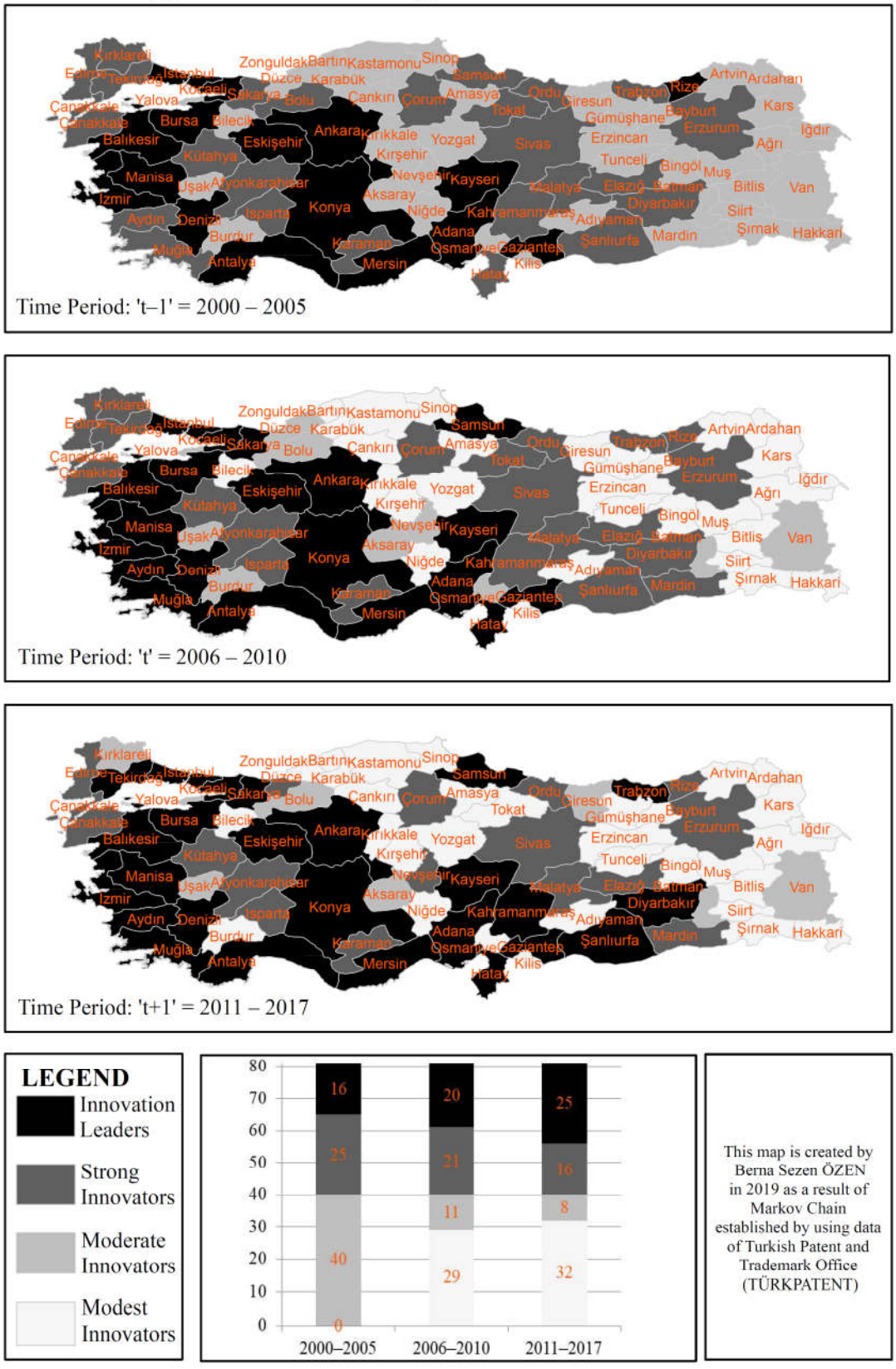


Figure 5.46 : Methodology 2 – Regional maps of 'trademark applications'.

- **Evaluation of "trademark registrations" indicator:**

Upon comparing the 2000-2005 (t-1) and 2006-2010 (t) time periods, it is seen that 39 regions preserved their status (Table 5.72). 12 of these regions in the innovation leaders were İstanbul, Ankara, İzmir, Bursa, Konya, Gaziantep, Antalya, Kocaeli, Adana, Kayseri, Denizli and Eskişehir regions. As with other variables, the common feature of these regions is that they are metropolitan regions. The 16 regions in the strong innovators in both two time periods consisted of Kütahya, Kahramanmaraş, Afyonkarahisar, Karaman, Malatya, Trabzon, Şanlıurfa, Tokat, Çorum, Elazığ, Isparta, Çanakkale, Erzurum, Sivas, Edirne and Kırklareli regions. The remaining 11 regions that preserved their innovation performances were Yalova, Düzce, Uşak, Burdur, Amasya, Osmaniye, Zonguldak, Aksaray, Van, Batman and Kastamonu regions in moderate innovators in both two time periods (Table 5.73).

For this variable, 12 regions increased their innovation performances, while 30 regions could not be able to to maintain their performances. The most noticeable one of these regions is Giresun, which dropped two stages and moved from strong innovators to the modest innovators. Other regions have declined by one stage. These regions were respectively Rize region that moved from innovation leaders to strong innovators; Bolu and Nevşehir regions from strong innovators to moderate innovators; and finally Adıyaman, Erzincan, Niğde, Bartın, Yozgat, Bilecik, Karabük, Çankırı, Kars, Kırşehir, Kırıkkale, Sinop, Kilis, Gümüşhane, Hakkari, Muş, Ağrı, Bingöl, Siirt, Şırnak, Artvin, Bitlis, Iğdır, Ardahan, Tunceli and Bayburt regions from moderate innovators to the modest innovators (Table 5.73).

Contrary to these regions, 12 regions that succeeded in increasing their innovation performances consisted of Mersin, Manisa, Sakarya, Balıkesir, Muğla, Samsun, Aydın, Hatay and Tekirdağ regions which moved from strong innovators to innovation leaders group; and Diyarbakır, Ordu and Mardin regions from the moderate innovators to the strong innovators (Table 5.73).

Table 5.72 : Methodology 2 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	0	0	0	0	0
	3	26	11	3	0	40
	2	1	2	16	9	28
	1	0	0	1	12	13
		27	13	20	21	81

		2006-2011 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,00	0,00	0,00	0,00	0,00
	Medium-low	0,65	0,28	0,08	0,00	0,49
	Medium-up	0,04	0,07	0,57	0,32	0,35
	Upper	0,00	0,00	0,08	0,92	0,16
	Margin	0,33	0,16	0,25	0,26	
		Mobility Index	0,56			

Table 5.73 : Methodology 2 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	0	0	0	0	0
	Moderate Innovators	26: ADIYAMAN AĞRI ARTVİN BİLECİK BİNGÖL BİTLİS ÇANKIRI ERZİNCAN GÜMÜŞHANE HAKKARİ KARS KIRŞEHİR MUŞ NİĞDE SİİRT SİNOP TUNCELİ YOZGAT BAYBURT KIRIKKALE ŞIRNAK BARTIN ARDAHAN IĞDIR KARABÜK KİLİS	11: AMASYA BURDUR KASTAMONU UŞAK VAN ZONGULDAK AKSARAY BATMAN YALOVA OSMANİYE DÜZCE	3: DİYARBAKIR MARDİN ORDU	0	40
	Strong Innovators	1: GİRESUN	2: BOLU NEVŞEHİR	16: AFYONKARAHİSAR ÇANAKKALE ÇORUM EDİRNE ELAZIĞ ERZURUM ISPARTA KIRKLARELİ KÜTAHYA MALATYA KAHRAMANMARAŞ SİVAS TOKAT TRABZON ŞANLIURFA KARAMAN	9: AYDIN BALIKESİR HATAY MERSİN MANİSA MUĞLA SAKARYA SAMSUN TEKİRDAĞ	28
	Innovation Leaders	0	0	1: RİZE	12: ADANA ANKARA ANTALYA BURSA DENİZLİ ESKİŞEHİR GAZİANTEP İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA	13
		27	13	20	21	81

When the time periods of 2006-2010 (t) and 2011-2017 (t+1) are compared, it is seen that the mobility index, which was 0.56 in the first matrix, decreased to 0.30 (Table 5.72 and Table 5.74).

Table 5.74 : Methodology 2 – Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	26	1	0	0	27
	3	8	3	2	0	13
	2	0	2	12	6	20
	1	0	0	0	21	21
		34	6	14	27	81

		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,96	0,04	0,00	0,00	0,33
	Medium-low	0,62	0,23	0,15	0,00	0,16
	Medium-up	0,00	0,10	0,60	0,30	0,25
	Upper	0,00	0,00	0,00	1,00	0,26
	Margin	0,42	0,07	0,17	0,33	
		Mobility Index	0,30			

The reason for this is that 62 regions keep their places and mobility is reduced. Most of these regions were located in innovation leaders (21 regions) and modest innovators (26 regions). Regions as innovation leaders in both two time periods were İstanbul, Ankara, İzmir, Bursa, Antalya, Gaziantep, Konya, Kocaeli, Adana, Kayseri, Denizli, Mersin, Eskişehir, Muğla, Hatay, Balıkesir, Sakarya, Manisa, Aydın, Samsun and Tekirdağ regions and all of them are metropolitan regions. Other 12 regions that maintained their performances and located in the strong innovators were Karaman, Malatya, Kütahya, Mardin, Elazığ, Rize, Isparta, Çorum, Edirne, Sivas, Erzurum and Ordu regions. In addition, Bolu, Batman and Van regions were in the moderate innovators in both two time periods. Finally, 26 regions that maintained their innovation performances were located in the modest innovators and consisted of Karabük, Adıyaman, Niğde, Erzincan, Bilecik, Kırıkkale, Kırşehir, Bartın, Yozgat, Kilis, Sinop, Ağrı, Çankırı, Şırnak, Artvin, Siirt, Bingöl, Hakkari, Kars, Muş, Iğdır, Bitlis, Gümüşhane, Tunceli, Ardahan and Bayburt regions.

While 9 regions increased their performances, 10 regions could not be able to maintain their performances for this variable. The common issue for both cases is that the change is valid only for one stage; there is no region that rose or fell by two stages (Table 5.75).

Table 5.75 : Methodology 2 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	26: ADIYAMAN AĞRI ARTVİN BİLECİK BİNGÖL BİTLİS ÇANKIRI ERZİNCAN GÜMÜŞHANE HAKKARİ KARS KIRŞEHİR MUŞ NİĞDE SİİRT SİNOP TUNCELİ YOZGAT BAYBURT KIRIKKALE ŞIRNAK BARTIN ARDAHAN IĞDIR KARABÜK KİLİS	1: GİRESUN	0	0	27
	Moderate Innovators	8: AMASYA BURDUR KASTAMONU UŞAK ZONGULDAK AKSARAY YALOVA OSMANİYE	3: BOLU VAN BATMAN	2: NEVŞEHİR DÜZCE	0	13
	Strong Innovators	0	2: KIRKLARELİ TOKAT	12: ÇORUM EDİRNE ELAZIĞ ERZURUM ISPARTA KÜTAHYA MALATYA MARDİN ORDU RİZE SİVAS KARAMAN	6: AFYONKARAHİSAR ÇANAKKALE DİYARBAKIR KAHRAMANMARAŞ TRABZON ŞANLIURFA	20
	Innovation Leaders	0	0	0	21: ADANA ANKARA ANTALYA AYDIN BALIKESİR BURSA DENİZLİ ESKİŞEHİR GAZİANTEP HATAY MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA MUĞLA SAKARYA SAMSUN TEKİRDAĞ	21
		34	6	14	27	81

Regions that increased their performances were Giresun region that moved from the modest innovators to the moderate innovators; Düzce and Nevşehir regions which moved from the moderate innovators to the strong innovators; and Trabzon, Kahramanmaraş, Şanlıurfa, Afyonkarahisar, Çanakkale and Diyarbakır regions that rose from strong innovators to the innovation leaders group.

Contrary to these regions, Kırklareli and Tokat regions which moved from strong innovators to moderate innovators; and Uşak, Yalova, Zonguldak, Osmaniye, Aksaray, Kastamonu, Burdur and Amasya regions which moved from moderate innovators to the modest innovators could not be able to maintain their innovation performances (Table 5.75).

Depending on the trademark registrations, transitions regarding innovation performances of all regions in all time periods are visualized in Figure 5.47.

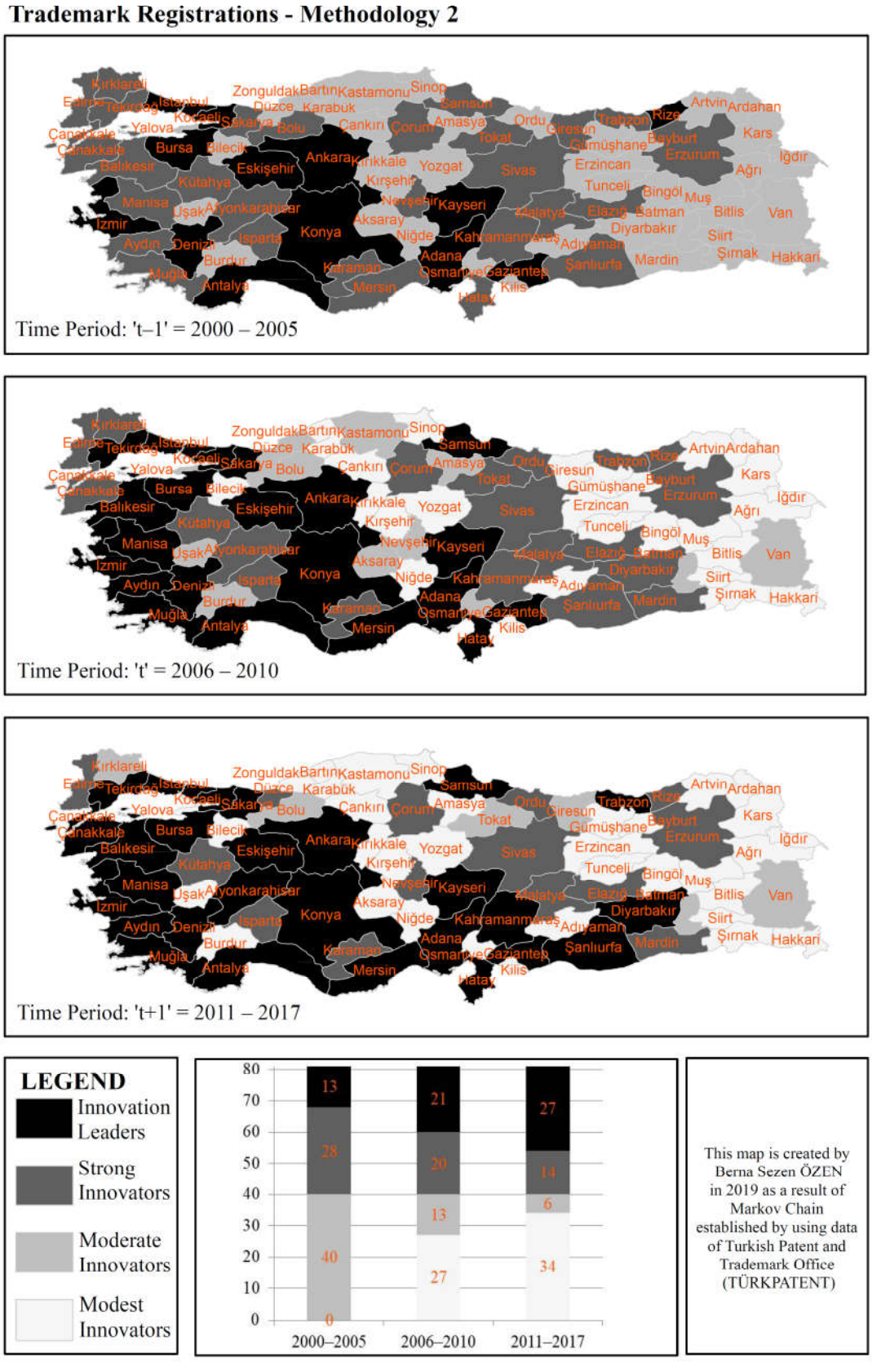


Figure 5.47 : Methodology 2 – Regional maps of 'trademark registrations'.

- **Evaluation of "design applications (file)" indicator:**

According to this variable when the 2000-2005 (t-1) and 2006-2010 (t) time periods are compared, it is seen that 36 regions maintained their innovation performances (Table 5.76). 14 of these regions were İstanbul, Ankara, Bursa, İzmir, Kayseri, Gaziantep, Konya, Kocaeli, Denizli, Manisa, Adana, Kütahya, Sakarya and Eskişehir regions which were in innovation leaders in both two time periods. All of these regions except Kütahya are metropolitan regions. Trabzon, Balıkesir, Tekirdağ, Afyonkarahisar, Uşak, Şanlıurfa, Muğla, Isparta, Niğde, Bilecik, Çorum, Amasya, Giresun, Düzce and Kırklareli regions were located in the strong innovators. In addition, the remaining 7 regions consisted of Tokat, Sinop, Malatya, Elazığ, Mardin, Aksaray and Karabük regions which located in moderate innovators for both two time periods (Table 5.77). There are 14 regions that have managed to increase their innovation performances. These regions were Ordu, Diyarbakır, Yalova, Burdur, Erzurum and Nevşehir regions that moved from moderate innovators to strong innovators; and Antalya, Hatay, Çanakkale, Mersin, Aydın, Samsun, Kahramanmaraş and Karaman regions that have passed to the innovation leaders from the strong innovators.

Unlike these regions, Bolu, Zonguldak, Sivas and Rize regions declined from strong innovators to the moderate innovators and Batman, Çankırı, Kastamonu, Ağrı, Kırşehir, Kilis, Osmaniye, Edirne, Yozgat, Kırıkkale, Artvin, Bingöl, Bayburt, Ardahan, Adıyaman, Erzincan, Muş, Bartın, Bitlis, Gümüşhane, Hakkari, Kars, Siirt, Tunceli, Van, Şırnak and Iğdır regions declined from moderate innovators to the modest innovators. Thus 31 regions could not be able to maintain their innovation performances (Table 5.77).

Table 5.76 : Methodology 2 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	0	0	0	0	0
	3	27	7	6	0	40
	2	0	4	15	8	27
	1	0	0	0	14	14
		27	11	21	22	81

		2006-2011 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,00	0,00	0,00	0,00	0,00
	Medium-low	0,68	0,18	0,15	0,00	0,49
	Medium-up	0,00	0,15	0,56	0,30	0,33
	Upper	0,00	0,00	0,00	1,00	0,17
	Margin	0,33	0,14	0,26	0,27	
		Mobility Index	0,57			

Table 5.77 : Methodology 2 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	0	0	0	0	0
	Moderate Innovators	27: ADIYAMAN AĞRI ARTVİN BİNGÖL BİTLİS ÇANKIRI EDİRNE ERZİNCAN GÜMÜŞHANE HAKKARİ KARS KASTAMONU KIRŞEHİR MUŞ SİİRT TUNCELİ VAN YOZGAT BAYBURT KIRIKKALE BATMAN ŞIRNAK BARTIN ARDAHAN IĞDIR KİLİS OSMANİYE	7: ELAZIĞ MALATYA MARDİN SİNOP TOKAT AKSARAY KARABÜK	6: BURDUR DİYARBAKIR ERZURUM NEVŞEHİR ORDU YALOVA	0	40
	Strong Innovators	0	4: BOLU RİZE SİVAS ZONGULDAK	15: AFYONKARAHİSAR AMASYA BALIKESİR BİLECİK ÇORUM GİRESUN ISPARTA KIRKLARELİ MUĞLA NİĞDE TEKİRDAĞ TRABZON ŞANLIURFA UŞAK DÜZCE	8: ANTALYA AYDIN ÇANAKKALE HATAY MERSİN KAHRAMANMARAŞ SAMSUN KARAMAN	27
	Innovation Leaders	0	0	0	14: ADANA ANKARA BURSA DENİZLİ ESKİŞEHİR GAZİANTEP İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA SAKARYA	14
		27	11	21	22	81

When comparing the 2006-2010 (t) and 2011-2017 (t+1) time periods, 59 regions maintained their innovation performances. As a reflection of this, mobility has decreased with the decline of the mobility index which was 0.57 in the first matrix to 0.36 (Table 5.76 and Table 5.78). The majority of these 59 regions consisted of 22 regions in innovation leaders and 24 regions in modest innovators. Regions in innovation leaders in both two time periods were Adana, Ankara, Antalya, Aydın, Bursa, Çanakkale, Denizli, Eskişehir, Gaziantep, Hatay, Mersin, İstanbul, İzmir, Kayseri, Kocaeli, Konya, Kütahya, Manisa, Kahramanmaraş, Sakarya, Samsun and Karaman regions all of which were metropolitan regions except Kütahya, Çanakkale

and Karaman. The regions that were in strong innovators in both two time periods were Afyonkarahisar, Amasya, Burdur, Çorum, Diyarbakır, Giresun, Isparta, Kırklareli, Muğla, Şanlıurfa, Yalova and Düzce regions. Malatya region was located in the moderate innovators group. Finally, remaining 24 regions that maintained their innovation performances were located in modest innovators as Adıyaman, Ağrı, Artvin, Bingöl, Bitlis, Çankırı, Erzincan, Gümüşhane, Hakkari, Kars, Kastamonu, Muş, Siirt, Tunceli, Van, Yozgat, Bayburt, Kırıkkale, Şırnak, Bartın, Ardahan, Iğdır, Kilis and Osmaniye regions (Table 5.79).

A total of 9 regions managed to increase their innovation performances. The most noticeable of these regions is Kırşehir, which was in the modest innovators in the 2006-2010 (t) time period and moved to the strong innovators in the next time period by achieving a two-stage upward mobility. The other 8 regions increased their innovation performances by one stage. Edirne and Batman regions moved from modest to moderate innovators; Bolu, Sivas and Zonguldak regions from moderate to strong innovators; and finally, Balıkesir, Tekirdağ and Trabzon regions from strong innovators to innovation leaders (Table 5.79).

Unlike these regions, the most noticeable of the 13 regions with declining performances were Niğde, Ordu and Uşak regions which were unable to maintain their current innovation performances and experienced a two-stage downward mobility. Thus, their positions in the strong innovators changed to the modest innovators in the 2011-2017 (t+1) time period. The other 10 regions declined by one stage. Bilecik, Erzurum and Nevşehir regions fell from strong innovators to moderate innovators, and Elazığ, Mardin, Rize, Sinop, Tokat, Aksaray and Karabük regions from moderate innovators to modest innovators (Table 5.79).

Table 5.78 : Methodology 2 – Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	24	2	1	0	27
	3	7	1	3	0	11
	2	3	3	12	3	21
	1	0	0	0	22	22
		34	6	16	25	81

		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,89	0,07	0,04	0,00	0,33
	Medium-low	0,64	0,09	0,27	0,00	0,14
	Medium-up	0,14	0,14	0,57	0,14	0,26
	Upper	0,00	0,00	0,00	1,00	0,27
	Margin	0,42	0,07	0,20	0,31	
		Mobility Index	0,36			

Table 5.79 : Methodology 2 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	24: ADIYAMAN AĞRI ARTVİN BİNGÖL BİTLİS ÇANKIRI ERZİNCAN GÜMÜŞHANE HAKKARİ KARS KASTAMONU MUŞ SİİRT TUNCELİ VAN YOZGAT BAYBURT KIRIKKALE ŞIRNAK BARTIN ARDAHAN IĞDIR KİLİS OSMANİYE	2: EDİRNE BATMAN	1: KIRŞEHİR	0	27
	Moderate Innovators	7: ELAZIĞ MARDİN RİZE SİNOP TOKAT AKSARAY KARABÜK	1: MALATYA	3: BOLU SİVAS ZONGULDAK	0	11
	Strong Innovators	3: NİĞDE ORDU UŞAK	3: BİLECİK ERZURUM NEVŞEHİR	12: AFYONKARAHİSAR AMASYA BURDUR ÇORUM DİYARBAKIR GİRESUN ISPARTA KIRKLARELİ MUĞLA ŞANLIURFA YALOVA DÜZCE	3: BALIKESİR TEKİRDAĞ TRABZON	21
	Innovation Leaders	0	0	0	22: ADANA ANKARA ANTALYA AYDIN BURSA ÇANAKKALE DENİZLİ ESKİŞEHİR GAZİANTEP HATAY MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA KAHRAMANMARAŞ SAKARYA SAMSUN KARAMAN	22
		34	6	16	25	81

Depending on the design applications (file), transitions regarding innovation performances of all regions in all time periods are visualized in Figure 5.48.

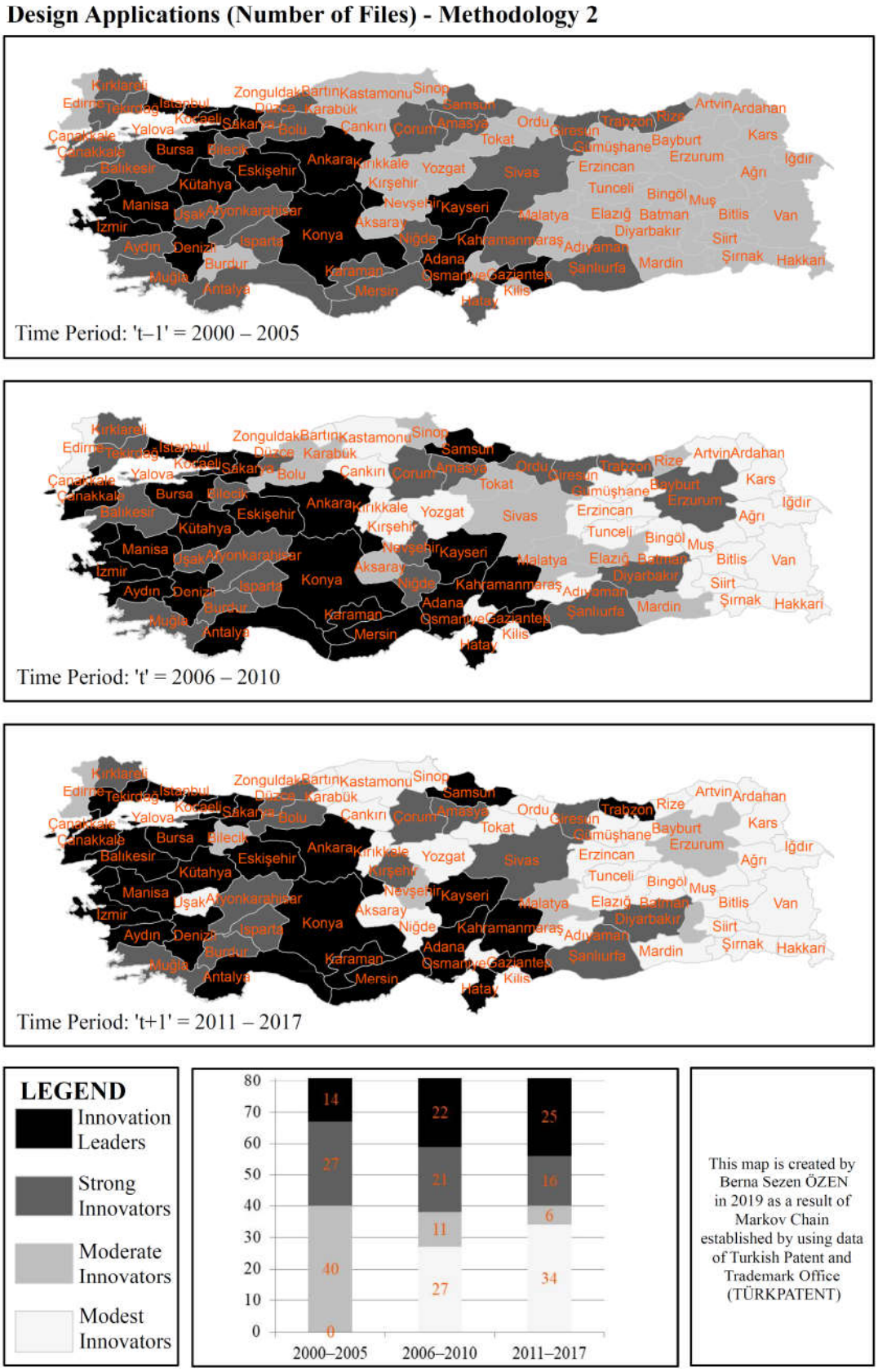


Figure 5.48 : Methodology 2 – Regional maps of 'design applications (file)'.

- **Evaluation of "design registrations (file)" indicator:**

When the 2000-2005 and 2006-2010 time periods are examined, it is seen that 36 regions maintained their first period performances also in the 2006-2010 time period (Table 5.80). Fourteen of these regions were Adana, Ankara, Bursa, Denizli, Eskişehir, Gaziantep, İstanbul, İzmir, Kayseri, Kocaeli, Konya, Kütahya, Manisa and Sakarya regions that located in innovation leaders. Only Kütahya is not the metropolitan region among these regions. Afyonkarahisar, Amasya. Balıkesir, Bilecik, Çorum, Giresun, Isparta, Kırklareli, Muğla, Niğde, Tekirdağ, Trabzon, Şanlıurfa, Uşak and Düzce regions were the other 15 regions that maintained their innovation performances in the strong innovators. Finally, the remaining 7 regions that located in the moderate innovators in both two time periods and maintained their performances were Erzurum, Malatya, Mardin, Nevşehir, Tokat, Batman and Karabük regions (Table 5.81).

Table 5.80 : Methodology 2 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	0	0	0	0	0
	3	27	7	4	0	38
	2	0	6	15	8	29
	1	0	0	0	14	14
		27	13	19	22	81

		2006-2011 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,00	0,00	0,00	0,00	0,00
	Medium-low	0,71	0,18	0,11	0,00	0,47
	Medium-up	0,00	0,21	0,52	0,28	0,36
	Upper	0,00	0,00	0,00	1,00	0,17
	Margin	0,33	0,16	0,23	0,27	
		Mobility Index	0,57			

Twelve regions have managed to increase their performances by being upgraded. Four of these regions were Burdur, Diyarbakır, Ordu and Yalova regions that raised from moderate to strong innovators and the other 8 regions were Antalya, Aydın, Çanakkale, Hatay, Mersin, Kahramanmaraş, Samsun and Karaman regions from strong innovators to innovation leaders (Table 5.81).

Unlike these upgraded regions, 33 regions could not be able to maintain their first period innovation performances in the following period and declined by one stage. 6 of these regions were Bolu, Elazığ, Rize, Sivas, Zonguldak and Aksaray regions, which have moved from strong innovators to moderate innovators. The remaining 27 regions fell from moderate innovators to modest innovators. These regions were Adıyaman, Ağrı, Artvin, Bingöl, Bitlis, Çankırı, Edirne, Erzincan, Gümüşhane,

Hakkari, Kars, Kastamonu, Kırşehir, Muş, Siirt, Sinop, Tunceli, Van, Yozgat, Bayburt, Kırıkkale, Şırnak, Bartın, Ardahan, Iğdır, Kilis and Osmaniye regions (Table 5.81).

Table 5.81 : Methodology 2 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	0	0	0	0	0
	Moderate Innovators	27: ADIYAMAN AĞRI ARTVİN BİNGÖL BİTLİS ÇANKIRI EDİRNE ERZİNCAN GÜMÜŞHANE HAKKARİ KARS KASTAMONU KIRŞEHİR MUŞ SİİRT SİNOP TUNCELİ VAN YOZGAT BAYBURT KIRIKKALE ŞIRNAK BARTIN ARDAHAN IĞDIR KİLİS OSMANİYE	7: ERZURUM MALATYA MARDİN NEVŞEHİR TOKAT BATMAN KARABÜK	4: BURDUR DİYARBAKIR ORDU YALOVA	0	38
	Strong Innovators	0	6: BOLU ELAZIĞ RİZE SİVAS ZONGULDAK AKSARAY	15: AFYONKARAHİSAR AMASYA BALIKESİR BİLECİK ÇORUM GİRESUN ISPARTA KIRKLARELİ MUĞLA NİĞDE TEKİRDAĞ TRABZON ŞANLIURFA UŞAK DÜZCE	8: ANTALYA AYDIN ÇANAKKALE HATAY MERSİN KAHRAMANMARAŞ SAMSUN KARAMAN	29
	Innovation Leaders	0	0	0	14: ADANA ANKARA BURSA DENİZLİ ESKİŞEHİR GAZİANTEP İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA SAKARYA	14
		27	13	19	22	81

Upon comparing the 2006-2010 (t) and 2011-2017 (t+1) time periods, mobility index value decreased from 0.57 to 0.28 (Table 5.80 and Table 5.82). One indication of this is that 63 regions maintained their innovation performances between the 2006-2010 (t) and 2011-2017 (t+1) time periods (Table 5.83). The distribution of these regions is as follows: 22 of them were in innovation leaders, 12 in strong innovators, 4 in

moderate innovators and finally 25 in modest innovators. Adana, Ankara, Antalya, Aydın, Bursa, Çanakkale, Denizli, Eskişehir, Gaziantep, Hatay, Mersin, İstanbul, İzmir, Kayseri, Kocaeli, Konya, Kütahya, Manisa, Kahramanmaraş, Sakarya, Samsun and Karaman regions were positioned at innovation leaders. All of these regions except Çanakkale, Kütahya and Karaman are metropolitan regions. Afyonkarahisar, Amasya, Burdur, Çorum, Diyarbakır, Giresun, Isparta, Kırklareli, Muğla, Şanlıurfa, Yalova and Düzce regions were the regions in strong innovators. Erzurum, Malatya, Nevşehir and Batman regions were in the moderate innovators. Finally, Adıyaman, Ağrı, Artvin, Bingöl, Bitlis, Çankırı, Erzincan, Gümüşhane, Hakkari, Kars, Kastamonu, Muş, Siirt, Sinop, Tunceli, Van, Yozgat, Bayburt, Kırıkkale, Şırnak, Bartın, Ardahan, Iğdır, Kilis and Osmaniye regions were located in the modest innovators (Table 5.83).

Table 5.82 : Methodology 2 – Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	25	1	1	0	27
	3	6	4	3	0	13
	2	3	1	12	3	19
	1	0	0	0	22	22
		34	6	16	25	81

		2011-2017 (t+1)				
		Lower	**Lower**	**Lower**	**Lower**	Margin
2006-2010 (t)	**Lower**	0,93	0,04	0,04	0,00	0,33
	Medium-low	0,46	0,31	0,23	0,00	0,16
	Medium-up	0,16	0,05	0,63	0,16	0,23
	Upper	0,00	0,00	0,00	1,00	0,27
	Margin	0,42	0,07	0,20	0,31	
		Mobility Index	0,28			

While 8 regions managed to increase their innovation performances in terms of 2006-2010 (t) and 2011-2017 (t+1) time periods, innovation performances of 10 regions decreased. The most noticeable of these 8 regions that increased their innovation performances was Kırşehir region, which managed to increase its performance from modest innovators to strong innovators by achieving a two-stage upward mobility. The other 7 regions had a one-stage progress. These regions were as follows: Edirne region, which has risen from modest innovators to moderate innovators; Bolu, Sivas and Zonguldak regions from moderate innovators to strong innovators, and finally Balıkesir, Tekirdağ and Trabzon regions from strong innovators to innovation leaders (Table 5.83). Among the 10 regions with declining innovation performances, the most noticable ones were Niğde, Ordu and Uşak regions, which declined from strong innovators to modest innovators by having a two-stage downward mobility. The other 7 regions showed a one-stage decline.

These regions were; Bilecik region, which has declined from strong innovators to moderate innovators, and Elazığ, Mardin, Rize, Tokat, Aksaray and Karabük regions from moderate innovators to modest innovators (Table 5.83).

Table 5.83 : Methodology 2 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	25: ADIYAMAN AĞRI ARTVİN BİNGÖL BİTLİS ÇANKIRI ERZİNCAN GÜMÜŞHANE HAKKARİ KARS KASTAMONU MUŞ SİİRT SİNOP TUNCELİ VAN YOZGAT BAYBURT KIRIKKALE ŞIRNAK BARTIN ARDAHAN IĞDIR KİLİS OSMANİYE	1: EDİRNE	1: KIRŞEHİR	0	27
	Moderate Innovators	6: ELAZIĞ MARDİN RİZE TOKAT AKSARAY KARABÜK	4: ERZURUM MALATYA NEVŞEHİR BATMAN	3: BOLU SİVAS ZONGULDAK	0	13
	Strong Innovators	3: NİĞDE ORDU UŞAK	1: BİLECİK	12: AFYONKARAHİSAR AMASYA BURDUR ÇORUM DİYARBAKIR GİRESUN ISPARTA KIRKLARELİ MUĞLA ŞANLIURFA YALOVA DÜZCE	3: BALIKESİR TEKİRDAĞ TRABZON	19
	Innovation Leaders	0	0	0	22: ADANA ANKARA ANTALYA AYDIN BURSA ÇANAKKALE DENİZLİ ESKİŞEHİR GAZİANTEP HATAY MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA KAHRAMANMARAŞ SAKARYA SAMSUN KARAMAN	22
		34	6	16	25	81

Depending on the design registrations (file), transitions regarding innovation performances of all regions in all time periods are visualized in Figure 5.49.

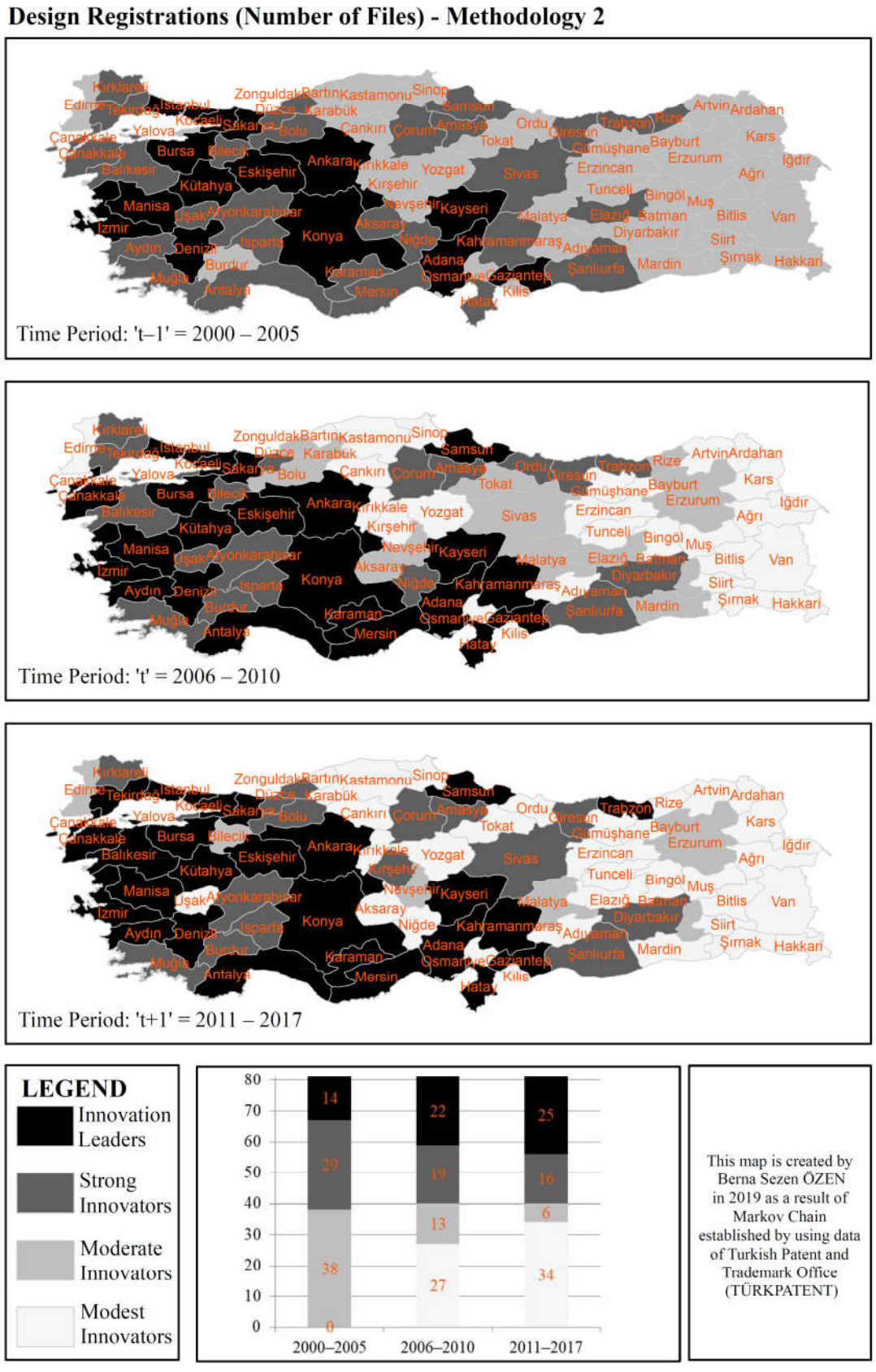


Figure 5.49 : Methodology 2 – Regional maps of 'design registrations (file)'.

- **Evaluation of "Design Applications (Design) Indicator:**

When the 2000-2005 and 2006-2010 time periods are compared, it is seen that 40 regions maintained their innovation performances. 16 of these regions were in innovation leaders, 15 in strong innovators, and 9 in moderate innovators (Table 5.84). Regions in innovation leaders were Adana, Ankara, Bursa, Denizli, Eskişehir, Gaziantep, Hatay, İstanbul, İzmir, Kayseri, Kocaeli, Konya, Kütahya, Manisa, Sakarya and Tekirdağ regions. All of these regions except Kütahya are metropolitan regions. Regions in strong innovators were Afyonkarahisar, Amasya, Balıkesir, Bilecik, Bolu, Çorum, Mersin, Muğla, Samsun, Trabzon, Şanlıurfa, Uşak, Aksaray, Karaman and Düzce regions. Finally, Giresun, Malatya, Mardin, Nevşehir, Sinop, Tokat, Yozgat, Batman and Yalova regions were located in moderate innovators (Table 5.85).

While 9 regions managed to increase their innovation performances, 32 regions could not maintain their innovation performances and declined their status. The most striking of these 9 upgraded regions was Çanakkale region, which has risen from moderate innovators to innovation leaders by achieving a two-stage upward mobility. The other 8 regions made a one-stage improvement. 5 of these regions were Burdur, Erzurum, Isparta, Ordu and Şırnak regions that rose from moderate to strong innovators, and 3 of these regions were Antalya, Aydın and Niğde regions that rose from strong innovators to innovation leaders (Table 5.85).

Contrary to these upgraded regions, among the 32 regions whose innovation performance has declined, the most striking ones were Adıyaman and Kırşehir regions, which fell from strong innovators to modest innovators by having a two-stage downward mobility. Regions that declined by one stage were Kahramanmaraş region that moved from innovation leaders to strong innovators; Diyarbakır, Kırklareli, Rize, Sivas and Zonguldak regions that moved from strong innovators to moderate innovators, and finally Ağrı, Artvin, Bingöl, Bitlis, Çankırı, Edirne, Elazığ, Erzincan, Gümüşhane, Hakkari, Kars, Kastamonu, Muş, Siirt, Tunceli, Van, Bayburt, Kırıkkale, Bartın, Ardahan, Iğdır, Karabük, Kilis and Osmaniye regions which moved from moderate innovators to modest innovators (Table 5.85).

Table 5.84 : Methodology 2 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	0	0	0	0	0
	3	24	9	5	1	39
	2	2	5	15	3	25
	1	0	0	1	16	17
		26	14	21	20	81

		2006-2011 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,00	0,00	0,00	0,00	0,00
	Medium-low	0,62	0,23	0,13	0,03	0,48
	Medium-up	0,08	0,20	0,60	0,12	0,31
	Upper	0,00	0,00	0,06	0,94	0,21
	Margin	0,32	0,17	0,26	0,25	
		Mobility Index	0,56			

Table 5.85 : Methodology 2 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	0	0	0	0	0
	Moderate Innovators	24: AĞRI ARTVİN BİNGÖL BİTLİS ÇANKIRI EDİRNE ELAZIĞ ERZİNCAN GÜMÜŞHANE HAKKARİ KARS KASTAMONU MUŞ SİİRT TUNCELİ VAN BAYBURT KIRIKKALE BARTIN ARDAHAN IĞDIR KARABÜK KİLİS OSMANİYE	9: GİRESUN MALATYA MARDİN NEVŞEHİR SİNOP TOKAT YOZGAT BATMAN YALOVA	5: BURDUR ERZURUM ISPARTA ORDU ŞIRNAK	1: ÇANAKKALE	39
	Strong Innovators	2: ADIYAMAN KIRŞEHİR	5: DİYARBAKIR KIRKLARELİ RİZE SİVAS ZONGULDAK	15: AFYONKARAHİSAR AMASYA BALIKESİR BİLECİK BOLU ÇORUM MERSİN MUĞLA SAMSUN TRABZON ŞANLIURFA UŞAK AKSARAY KARAMAN DÜZCE	3: ANTALYA AYDIN NİĞDE	25
	Innovation Leaders	0	0	1: KAHRAMANMARAŞ	16: ADANA ANKARA BURSA DENİZLİ ESKİŞEHİR GAZİANTEP HATAY İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA SAKARYA TEKİRDAĞ	17
		26	14	21	20	81

Mobility index value decreased from 0.56 to 0.35 (Table 5.84 and Table 5.86). Upon comparing the 2006-2010 (t) and 2011-2017 (t+1) time periods, the reason of this situation is that 57 regions maintained their innovation performances. 11 regions managed to increase their innovation performances, while 13 regions could not maintain their innovation performances and their ranks fell. Regions that maintained their innovation performances were Adana, Ankara, Antalya, Aydın, Bursa, Çanakkale, Denizli, Eskişehir, Gaziantep, Hatay, İstanbul, İzmir, Kayseri, Kocaeli, Konya, Kütahya, Manisa, Sakarya and Tekirdağ regions (all of that are metropolitan regions except Çanakkale and Kütahya regions) in innovation leaders; Afyonkarahisar, Amasya, Bilecik, Bolu, Çorum, Isparta, Muğla, Samsun, Trabzon, Aksaray and Düzce regions located in strong innovators; Giresun, Nevşehir and Batman regions in the moderate innovators; and finally Adıyaman, Ağrı, Artvin, Bingöl, Bitlis, Elazığ, Erzincan, Gümüşhane, Hakkari, Kars, Kastamonu, Kırşehir, Muş, Siirt, Tunceli, Van, Bayburt, Kırıkkale, Bartın, Ardahan, Iğdır, Karabük, Kilis and Osmaniye regions in modest innovators (Table 5.87). Among the 11 regions that increased their innovation performances, the most notable ones were Edirne region that rose from modest innovators to strong innovators; and Kırklareli region from moderate innovators to innovation leaders with experiencing a two-stage upward mobility. In addition to these regions, Çankırı region that moved from modest innovators to moderate innovators; Diyarbakır, Sivas, Zonguldak and Yalova regions that moved from moderate innovators to strong innovators; and Balıkesir, Mersin, Kahramanmaraş and Karaman regions which moved from strong innovators to innovation leaders were the regions that have succeeded to increase their innovation performances by one stage (Table 5.87).

Table 5.86 : Methodology 2 – Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	24	1	1	0	26
	3	6	3	4	1	14
	2	4	2	11	4	21
	1	0	0	1	19	20
		34	6	17	24	81

		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,92	0,04	0,04	0,00	0,32
	Medium-low	0,43	0,21	0,29	0,07	0,17
	Medium-up	0,19	0,10	0,52	0,19	0,26
	Upper	0,00	0,00	0,05	0,95	0,25
	Margin	0,42	0,07	0,21	0,30	
		Mobility Index	0,35			

Table 5.87 : Methodology 2 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	24: ADIYAMAN AĞRI ARTVİN BİNGÖL BİTLİS ELAZIĞ ERZİNCAN GÜMÜŞHANE HAKKARİ KARS KASTAMONU KIRŞEHİR MUŞ SİİRT TUNCELİ VAN BAYBURT KIRIKKALE BARTIN ARDAHAN IĞDIR KARABÜK KİLİS OSMANİYE	1: ÇANKIRI	1: EDİRNE	0	26
	Moderate Innovators	6: MALATYA MARDİN RİZE SİNOP TOKAT YOZGAT	3: GİRESUN NEVŞEHİR BATMAN	4: DİYARBAKIR SİVAS ZONGULDAK YALOVA	1: KIRKLARELİ	14
	Strong Innovators	4: ERZURUM ORDU UŞAK ŞIRNAK	2: BURDUR ŞANLIURFA	11: AFYONKARAHİSAR AMASYA BİLECİK BOLU ÇORUM ISPARTA MUĞLA SAMSUN TRABZON AKSARAY DÜZCE	4: BALIKESİR MERSİN KAHRAMANMARAŞ KARAMAN	21
	Innovation Leaders	0	0	1: NİĞDE	19: ADANA ANKARA ANTALYA AYDIN BURSA ÇANAKKALE DENİZLİ ESKİŞEHİR GAZİANTEP HATAY İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA SAKARYA TEKİRDAĞ	20
		34	6	17	24	81

Among the 13 regions with declining innovation performances, the most striking ones were Erzurum, Ordu, Uşak and Şırnak regions, which declined from strong to modest innovators with a two-stage downward mobility. In addition to these regions, Niğde region that moved from innovation leaders to strong innovators; Burdur and Şanlıurfa regions from strong to moderate innovators; and Malatya, Mardin, Rize, Sinop, Tokat and Yozgat regions from moderate to modest innovators were other regions whose innovation performances have declined. Depending on the design

applications (design), transitions regarding innovation performances of all regions in all time periods are visualized in Figure 5.50.

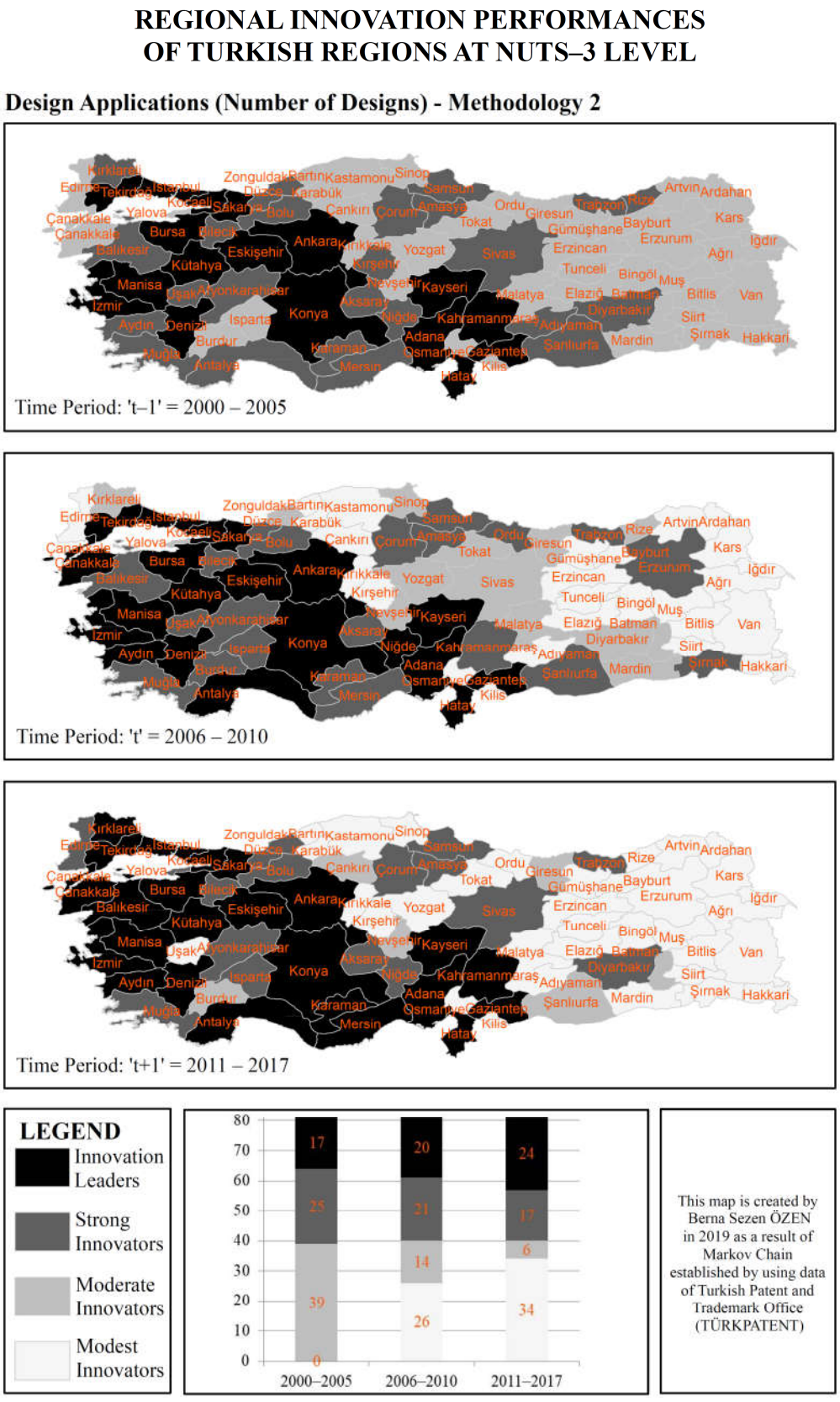


Figure 5.50 : Methodology 2 – Regional maps of 'design applications (design)'.

- **Evaluation of "Design Registrations (Design)" Indicator:**

When the 2000-2005 (t-1) and 2006-2010 (t) time periods are examined, it is seen that 11 regions have increased their innovation performances, 41 regions have maintained their performances and 29 regions have decreased their innovation performances. The distribution of the regions that maintained their innovation performances is as follows: 15 regions were in innovation leaders, 14 in strong innovators and 12 in moderate innovators (Table 5.88). Regions that took place in innovation leaders in both two periods were Adana, Ankara, Bursa, Denizli, Eskişehir, Gaziantep, İstanbul, İzmir, Kayseri, Kocaeli, Konya, Kütahya, Manisa, Sakarya and Tekirdağ regions. All of these regions except Kütahya are metropolitan regions. For 2000-2005 (t-1) and 2006-2010 (t) time periods, regions in strong innovators were Afyonkarahisar, Amasya, Balıkesir, Bilecik, Çorum, Mersin, Muğla, Samsun, Trabzon, Şanlıurfa, Uşak, Aksaray, Karaman and Düzce regions. The remaining 12 regions in the moderate innovators consisted of Diyarbakır, Edirne, Giresun, Kastamonu, Malatya, Mardin, Nevşehir, Sivas, Tokat, Batman, Yalova and Karabük regions (Table 5.89).

Bolu, Burdur, Erzurum, Isparta, Ordu and Şırnak regions have increased their innovation performances from moderate innovators to strong innovators, while Antalya, Aydın, Çanakkale, Hatay and Niğde regions have increased their innovation performances from strong innovators to innovation leaders (Table 5.89).

The most noticeable of the 29 regions, whose innovation performance has declined, were the regions of Adıyaman and Kırıkkale, which declined to modest innovators from the strong innovators with a two-stage downward mobility. Besides these regions, other regions which could not be able to maintain and declined their innovations performances were Ağrı, Artvin, Bingöl, Bitlis, Çankırı, Elazığ, Erzincan, Gümüşhane, Hakkari, Kars, Kırşehir, Muş, Siirt, Sinop, Tunceli, Van, Bayburt, Bartın, Ardahan, Iğdır, Kilis and Osmaniye regions which moved from moderate innovators to modest innovators group; Kırklareli, Rize, Yozgat and Zonguldak regions from strong innovators to moderate innovators; and Kahramanmaraş region from innovation leaders to strong innovators (Table 5.89).

Table 5.88 : Methodology 2 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	0	0	0	0	0
	3	22	12	6	0	40
	2	2	4	14	5	25
	1	0	0	1	15	16
		24	16	21	20	81

		2006-2011 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,00	0,00	0,00	0,00	0,00
	Medium-low	0,55	0,30	0,15	0,00	0,49
	Medium-up	0,08	0,16	0,56	0,20	0,31
	Upper	0,00	0,00	0,06	0,94	0,20
	Margin	0,30	0,20	0,26	0,25	
		Mobility Index	0,55			

Table 5.89 : Methodology 2 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	0	0	0	0	0
	Moderate Innovators	22: AĞRI ARTVİN BİNGÖL BİTLİS ÇANKIRI ELAZIĞ ERZİNCAN GÜMÜŞHANE HAKKARİ KARS KIRŞEHİR MUŞ SİİRT SİNOP TUNCELİ VAN BAYBURT BARTIN ARDAHAN IĞDIR KİLİS OSMANİYE	12: DİYARBAKIR EDİRNE GİRESUN KASTAMONU MALATYA MARDİN NEVŞEHİR SİVAS TOKAT BATMAN YALOVA KARABÜK	6: BOLU BURDUR ERZURUM ISPARTA ORDU ŞIRNAK	0	40
	Strong Innovators	2: ADIYAMAN KIRIKKALE	4: KIRKLARELİ RİZE YOZGAT ZONGULDAK	14: AFYONKARAHİSAR AMASYA BALIKESİR BİLECİK ÇORUM MERSİN MUĞLA SAMSUN TRABZON ŞANLIURFA UŞAK AKSARAY KARAMAN DÜZCE	5: ANTALYA AYDIN ÇANAKKALE HATAY NİĞDE	25
	Innovation Leaders	0	0	1: KAHRAMANMARAŞ	15: ADANA ANKARA BURSA DENİZLİ ESKİŞEHİR GAZİANTEP İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA SAKARYA TEKİRDAĞ	16
		24	16	21	20	81

Mobility index value decreased from 0.55 to 0.33 (Table 5.88 and Table 5.90). Upon comparing 2006-2010 (t) and 2011-2017 (t+1) time periods, 10 regions were able to increase their innovation performances, 57 regions maintained their innovation performances, and finally, innovation performance of 14 regions declined.

19 of the regions that maintained their innovation performances were located in innovation leaders. These regions were Adana, Ankara, Antalya, Aydın, Bursa, Çanakkale, Denizli, Eskişehir, Gaziantep, Hatay, İstanbul, İzmir, Kayseri, Kocaeli, Konya, Kütahya, Manisa, Sakarya and Tekirdağ, all of them are metropolitan regions except Çanakkale and Kütahya. The regions in strong innovators were Afyonkarahisar, Amasya, Bilecik, Bolu, Çorum, Erzurum, Isparta, Muğla, Samsun, Aksaray and Düzce regions. Diyarbakır, Giresun and Nevşehir regions were in moderate innovators in both two time periods. Regions in modest innovators were Adıyaman, Ağrı, Artvin, Bingöl, Bitlis, Çankırı, Elazığ, Erzincan, Gümüşhane, Hakkari, Kars, Kırşehir, Muş, Siirt, Sinop, Tunceli, Van, Bayburt, Kırıkkale, Bartın, Ardahan, Iğdır, Kilis and Osmaniye regions (Table 5.91).

Table 5.90 : Methodology 2 – Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	24	0	0	0	24
	3	8	3	4	1	16
	2	5	0	11	5	21
	1	0	0	1	19	20
		37	3	16	25	81

		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	1,00	0,00	0,00	0,00	0,30
	Medium-low	0,50	0,19	0,25	0,06	0,20
	Medium-up	0,24	0,00	0,52	0,24	0,26
	Upper	0,00	0,00	0,05	0,95	0,25
	Margin	0,46	0,04	0,20	0,31	
		Mobility Index	0,33			

The most striking region in the regions with increased innovation performances was Kırklareli region, which passed from moderate innovators to innovation leaders with a two-stage upward mobility. Other regions have achieved one-stage improvement. These regions were Edirne, Sivas, Zonguldak and Yalova regions, which moved from moderate innovators to strong innovators, and Balıkesir, Mersin, Kahramanmaraş, Trabzon and Karaman regions that moved from strong innovators to innovation leaders (Table 5.91).

Five of the 14 regions whose innovation performances have declined were Burdur, Ordu, Şanlıurfa, Uşak and Şırnak regions, which have moved from strong to modest

innovators by two stages. In addition, Niğde, which moved from innovation leaders to strong innovators, and Kastamonu, Malatya, Mardin, Rize, Tokat, Yozgat, Batman and Karabük regions that moved from moderate to modest innovators were also the regions where innovation performances have declined (Table 5.91).

Table 5.91 : Methodology 2 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	24: ADIYAMAN AĞRI ARTVİN BİNGÖL BİTLİS ÇANKIRI ELAZIĞ ERZİNCAN GÜMÜŞHANE HAKKARİ KARS KIRŞEHİR MUŞ SİİRT SİNOP TUNCELİ VAN BAYBURT KIRIKKALE BARTIN ARDAHAN IĞDIR KİLİS OSMANİYE	0	0	0	24
	Moderate Innovators	8: KASTAMONU MALATYA MARDİN RİZE TOKAT YOZGAT BATMAN KARABÜK	3: DİYARBAKIR GİRESUN NEVŞEHİR	4: EDİRNE SİVAS ZONGULDAK YALOVA	1: KIRKLARELİ	16
	Strong Innovators	5: BURDUR ORDU ŞANLIURFA UŞAK ŞIRNAK	0	11: AFYONKARAHİSAR AMASYA BİLECİK BOLU ÇORUM ERZURUM ISPARTA MUĞLA SAMSUN AKSARAY DÜZCE	5: BALIKESİR MERSİN KAHRAMANMARAŞ TRABZON KARAMAN	21
	Innovation Leaders	0	0	1: NİĞDE	19: ADANA ANKARA ANTALYA AYDIN BURSA ÇANAKKALE DENİZLİ ESKİŞEHİR GAZİANTEP HATAY İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA SAKARYA TEKİRDAĞ	20
		37	3	16	25	81

Depending on the design registrations (design), transitions regarding innovation performances of all regions in all time periods are visualized in Figure 5.51.

Design Registrations (Number of Designs) - Methodology 2

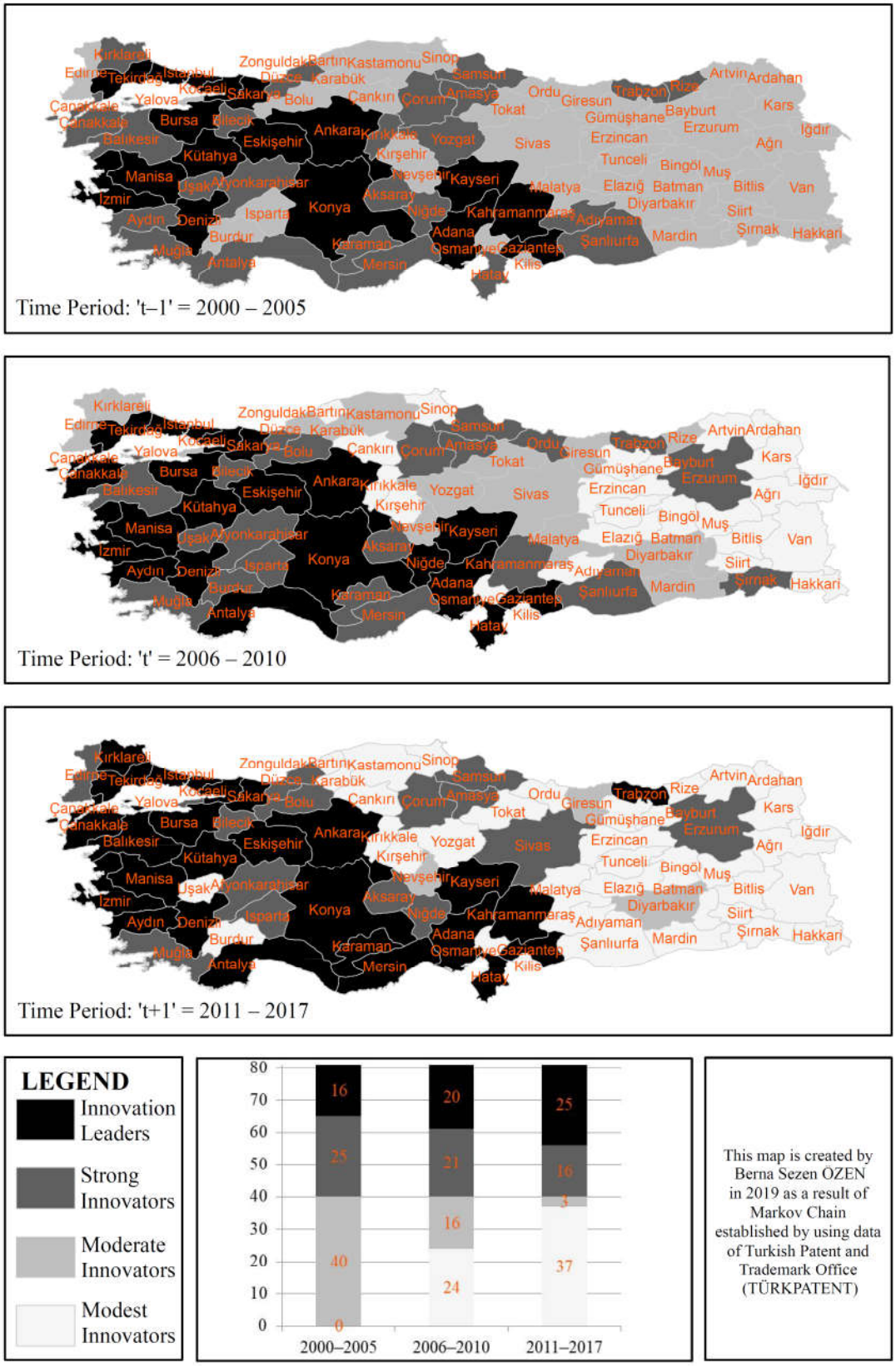


Figure 5.51 : Methodology 2 – Regional maps of 'design registrations (design)'.

5.2.3 Determinants of the regions in terms of innovation performances: A Panel Data Analysis for the innovation leaders in the Markov Analysis

In this title, panel data analysis is briefly explained as a methodology. First the concept of panel data analysis is described. Then the fields using panel data analysis as a methodology are mentioned. Also the use of panel data analysis in innovation is examined and the relevant indicators are identified.

Finally, in order to define the determinants of the innovation performance of the regions, a panel data analysis is carried out for the regions that were innovation leaders in the last time period (2011-2017) in the Markov Analysis. For this reason five different models are applied and different regression estimators were performed.

- **The concept of panel data analysis:**

Panel data analysis is a combination of time series and cross-sections (Greene, 1993) of households, firms, regions, countries etc. over several time periods (Baltagi, 2005) and "becoming more common in econometric research since it is very valuable for comparing the performance of units (Aali-Bujari et al, 2017)". A sample of panel data set is given in Table 5.92.

Table 5.92 : Form of a panel data set (URL-29).

i	t	Y_{it}	$X1_{it}$	…	XK_{it}
1	1	Y_{11}	X_{11}		XK_{11}
.	.	.	.	…	.
1	T	Y_{1T}	X_{1T}		XK_{1T}
.	.	.	.	.	.
.	.	.	.	.	.
N	1	Y_{N1}	X_{N1}		XK_{N1}
.	.	.	.	…	.
N	T	Y_{NT}	X_{NT}		XK_{NT}

i=1…n, Cross-Section
t=1…T, time
Y and X: variables

In order to decide between fixed or random effects, a Hausman (1978) test can be run. In the Hausman test (1978), the null hypothesis is that the preferred model is random effects vs. the alternative the fixed effects (Green, 2008). "It basically tests whether the unique errors (ui) are correlated with the regressors, the null hypothesis is they are not (URL-30)".

Panel data analysis can be done in various spatial scales from micro to macro such as from a neighborhood level (Andresen, 2012) to province level (Bai, 2013; Jiao et al,

2016; Yi and Xiao-li, 2018; Zhao, 2016; Zhang and Dong, 2016; Yun, 2011) and state levels and finally to country levels (Nordin and Nordin, 2016; Law et al, 2017).

Panel data analysis is mainly used in many fields of urban and regional planning; for example (i) economic issues such as exports and growth (Kónya, 2006), foreign direct investment (FDI) (Hsu et al, 2011), R&D Investments (Jiao et al, 2016), (ii) environmental issues such as energy consumption (Olanrewaju et al, 2019), CO2 emissions (Bargaoui and Nouri, 2017; Ghouali et al, 2015) (iii) social issues such as migration (Franc et al, 2019; Ruyssen et al, 2012) etc.

As shown in Table 5.93, panel data analysis also can be used in innovation issues (Bai, 2013; Jiao et al, 2016; Nordin and Nordin, 2016; Law et al, 2017; Yi and Xiao-li, 2018; Zhao, 2016; Zhang and Dong, 2016; Yun, 2011; Rodeiro Pazos et al, 2012).

Table 5.93 : Use of panel data in innovation by analyzing selected papers (Author's own illustration).

Authors	Aim of the Paper	Time Period	Methodology	Variables	Level	Results
Bai, 2013	"The main goals of this paper were to estimate the regional innovation efficiency in China and to investigate major factors affecting efficiency scores".	1998 to 2007	Stochastic frontier analysis (SFA)	Dependent variable (s): Number of invention patents granted Independent variable (s): K: R&D capital inventory L: Full-time-equivalent R&D personnel GOV: Impact of local government, which is signified by the proportion of government allocation to the total R&D spending Finance: Support of financial institutions, which is signified by the proportion of loans from financial institutions to the total R&D spending Participate: Degree of participation of the enterprise, universities and research institutions, which is signified by the proportion of enterprises to the total capital R&D allocation in a region Link1: Interplay between enterprises and universities, which is signified by the proportion of capital raised from enterprises to the total research funding for universities Link2: Interplay between enterprises and research institutions, which is signified by the proportion of capital raised from enterprise to the total research funding for research institutions Labor: Number of college students per million of the population Base: Proportion of total post office business revenue in regional gross domestic product Industry: Proportion of high-technology industry in the output increment of the large-scale industrial corporations Geog: Dummy variable: 1 for eastern, and 0 for central and western regions	Provincial (30 provincial-level regions)	"The empirical results show that innovation efficiency in China remained at a lower level and had much room for improvement. The impact of major factors and their interplay with innovation efficiency was negative. This indicated that internal construction of the regional innovation system was far from perfect. The innovation efficiency in the eastern regions was higher than that in the central and western regions."
Jiao et al, 2016	This study examines "how R&D Investment from firms, universities and research institutes (Core component of Triple Helix Innovation) helps build regional innovation systems and its contingencies in China's emerging economy"	2002 to 2011	Panel fixed-effects estimations	Dependent variable (s): Patents (the number of patent applications) Explanatory variable (s): Firm (R&D investment from firms), UniAndIns (R&D investment from universities and research institutes) TechMkt (The value of contract deals in domestic technology markets, PerGDP (GDP per capita), GOV (The share of local financial revenue spent on S&T activity by regional governments), EDU (Education Investment), FDI (Foreign direct investment)	Provincial (30 provincial-level regions)	"When the interaction between local producers and users of knowledge becomes increasingly active, R&D investment from firms, universities and research institutes has a stronger effect on the building of regional innovation system. Moreover, the interaction between local producers and users of knowledge has an inverted U-shaped relationship with the building of regional innovation systems."

Table 5.93 (continued): Use of panel data in innovation by analyzing selected papers (Author's own illustration).

Authors	Aim of the Paper	Time Period	Methodology	Variables	Level	Results
Nordin and Nordin, 2016	"This study aims to examine empirically the determinants of innovation in developing countries"	2000 to 2010	Panel Generalized Method of Moments (GMM) Estimations	Dependent Variable = R is the logarithm of expenditure on R&D as a percentage of GDP as a proxy of innovation Independent Variable (s): OP is the logarithm of trade openness calculated as a ratio the total import over GDP, RG is the logarithm of regulation measure based on rule of law, MC is the logarithm of the stock market that measure based on stock market capitalization of listed companies and measurement based on percentage of GDP, T is the logarithm of trademark based on the number of total trademark application, P is the logarithm of patent based on total patent granted H is logarithm of human capital measured based on life expectancy."	Country level (52 countries)	"The result addressed that trade openness has played a significant and important role as a determinant of innovation in developing countries and surprisingly our results indicate that the stock market and trademark showed a negative impact on innovation".
Law et al, 2017	"This paper examines the non-linear relationship between financial development and innovation".	1996 to 2010	Dynamic panel system GMM estimators	Dependent Variable (s): Innovation as; - Total patent application per labor (PA/L) and - Total patent grants per labor (PG/L) Independent Variable (s): Financial Development as; - Private sector credit (PSC) and - Domestic credit (DC) Institutional quality (INS) as; - GDP per-capita (GDPC) - Trade openness (TO) - FDI inflow (FDI)	Country-level (75 developed and developing countries)	"The results obtained from panel estimations imply that finance enhances innovation only up to a certain level. Beyond that level, further development of finance tends to affect innovation adversely. The institution interaction term was included to examine its role in the relation- ship between finance and innovation. The results suggest that the finance-innovation curve varies with different settings of institutional quality. Specifically, the finance-innovation relationships followed an inverted U curve only for countries with high institutional quality. Hence, sound institutional quality is a prerequisite for financial development to benefit innovation."

Table 5.93 (continued): Use of panel data in innovation by analyzing selected papers (Author's own illustration).

Authors	Aim of the Paper	Time Period	Methodology	Variables	Level	Results
Yi and Xiao-li, 2018	"This paper applies a panel threshold regression model to explore the impact of the regional technological innovation level on regional sustainable development using the regional economic development level as the threshold variable and panel data."	2009 to 2015	Hansen threshold regression model	Dependent variable (s): regional sustainable development ability Independent variable (s): regional economic development level, regional economic development level, regional technological innovation level and production value of the secondary industry relative to the GDP and investments in industrial pollution treatment	Provincial (31 provincial-level regions)	"The empirical research results show a significant double threshold effect of the regional technological innovation level on regional sustainable development. Positive interrelationships are observed between the regional technological innovation level and regional sustainable development when the regional economic development level does not exceed 0.301".
Zhao, 2016	"The paper conducts empirical analysis of influence of financial development on regional innovation through establishing effect regression model of panel data."	2003 to 2014	Panel Fixed Effect Model	Dependent variable (s): LNY: Regional innovation output: denoted with invention patent granted. Independent variable (s): LNFIR: Financial intermediary development level: denoted with financial organization loans and deposits balance/GDP. LNSTK: Credit market development level: denoted with gross value of stock market price/GDP. LNRDE: Research and development capital input: denoted with capital stock calculated with perpetual inventory method. LNRDP: Research and development personnel input: denoted with Research and development personnel equivalent. LNFDI: FDI: denoted with actual FDI amount.	Provincial (31 provincial-level regions)	"The results show that in the nationwide respective, whether the development of financial intermediary or security market has obvious positive influence on the regional innovation output, while the influence degree of the former is larger than the latter. In the regional perspective, the development of security market in the eastern region generates more obvious influence on the regional innovation, and the financial intermediary in central and western region generates more obvious effect in driving the growth of regional innovation output, while the development of security market has no obvious effect in the regional innovation output growth in central and western region."
Zhang and Dong, 2016	"In this paper, the effect of VC on technological innovation was examined in two perspectives- "capital-increase effect" and "innovation propensity-increase effect".	2009 to 2013	Panel Fixed Effect Model	Dependent Variable (s): Internal R&D expenditure logarithm, The number of patent applications received, The number of invention patent applications authorized. Independent Variable (s): Venture Capital logarithm, The level of education, Regional economic openness, The wage level	Provincial (29 provincial-level regions)	"The results showed that VC had a positive role in regional innovation promoting, and "capital-increase effect" can be verified. VC was to produce more innovations while reducing blind innovation input so as to improve innovation efficiency. The "innovation propensity-increase effect" can be verified."

Table 5.93 (continued): Use of panel data in innovation by analyzing selected papers (Author's own illustration).

Authors	Aim of the Paper	Time Period	Methodology	Variables	Level	Results
Yun, 2011	"The aim is to test the dynamical innovation efficiency of different provinces and municipalit ies and find out what cause these change."	1998 to 2007.	Panel Fixed Effect Model and Malmquist index analysis	Dependent Variable (s): PAT = Patent application Independent Variable (s): I: The research and development expenditures of research institutions, E: The research and development expenditures of large and medium-size enterprises, U: The research and development expenditures of colleges. FDI: Foreign Direct Investment FDIRD: as the indicator testing the two-face of R&D FIN: which represents the technology opportunity that can be obtained from local government	Provincial (30 provincial-level regions)	The results imply that "the regional innovation pattern is not efficiency-oriented. Great difference among areas may result in the innovation trajectory which includes R&D, technological opportunity, and the innovation has the auto-enhancement effect." "They find R&D is very important, considering the significant "two face" effect, especially R&D coming from enterprises. On the other hand, the selforgnization effect of innovation that the former innovation has positive impact on the latter, under the ground of the condition that learning and absorbing capacity cause the innovation efficiency. The result reinforces our former conclusion that innovation trajectory do exist."
Rodeiro Pazos et al, 2012	"the objective of this paper is to understand why some Spanish universities are more successful than others at generating spin-offs".	2002 to 2006	Panel Regression Analysis	Dependent variable (s): As a measure of the university spin-off activity Spinoffs: Spin-offs created by university in a given year. Independent variables A set of factors which may determine university spin-off activity. Pastusos Spin-offs created by university before a given year. %d_eng_life: % of dissertations in the engineering and life sciences %phd_acad: % of the academics with a PhD Npub_phd: Number of publications by PhD academic L_tresexp: Natural log of total research expenditure L_indresexp: Natural log of the amount of industry-funded research Financialsup: Whether or not university has specific funds to make investments in new spin-off companies (1 or 0) N_TTOstaff: Number of TTO staff (FTEs) Incub: Whether or not university has an incubator (1 or 0) %R&D: % of regional GNP spent on R&D National Statistics Inventions: Number of inventions disclosed to the TTO	University-level (47 Spanish Public Universities)	"The results showed that university spin-offs are significantly positively associated with industry-funded research, the tradition of the university spin-off activity, the research orientation, and the existence of incubation services in the university."

Panel Data Analysis in this thesis/Model specification, data sources and description

Panel data analysis is selected as a methodology because it (i) combines the cross-section observations within a certain period of time, (ii) helps to question the determinants and (iii) is a widely used tool in analyzing the innovation performances both in regional and national scales.

This title aims to examine the determinants of the regional innovation performances of the regions, identified as innovation leaders in the Markov Analysis, over the time period between the years of 2011 and 2017 with a panel data analysis. The panel data analysis is performed with Stata Program.

Indicators measuring the regional innovation performance are previously mentioned in the Figure 2.8 in Chapter 2: 'Innovation Systems'. As previously mentioned three of the 27 indicators of the EIS measured by the EU at the country-level which visualized in Figure 2.8 are not available for Turkey. A number of other variables are not measured at the NUTS-3 level in Turkey. For this reason, some variables are accepted as in the EU (Figure 2.8 and Table 2.14), and proxy variables were used based on the literature studies instead of some variables not available at NUTS-3 level in Turkey. As an example, the indicators as R&D expenditures in the public sector, R&D expenditures in the business sector and Non R&D innovation expenditures are not available in Turkey in the NUTS-3 level. Therefore as a dynamic of economic growth, GDP is used as an indicator.

The data set consists of various indicators (Table 5.94 and Table 5.95) gathered from the TÜRKPATENT, the Turkish Statistical Institute (TURKSTAT), Banking Regulation and Supervision Agency (BRSA) and The Information and Communication Technologies Authority (BTK). In these models, in order to examine the determinants of the regional innovation performance, the dependent variables are determined as patent, utility model, trademark and design applications[20] which are different forms of intellectual assets (Table 5.94), and the independent variables consist of total population, youth dependency, Gross domestic product (GDP), exports, number of enterprises, total cash loans, population aged 25-34 with tertiary

[20] Since there are too many zero values in the registrations, only applications are considered as dependent variables within the scope of the study.

education, number of teaching staff within own unit for higher education institutions, number of graduated participants, fixed broadband penetration, immigrated population with tertiary education over age 15 (Table 5.95).

Table 5.94 : Data set / dependent variables (Author's own illustration).

		Indicators	Source	Description	Reason for choice
Dependent variables (y)	$lny1$	Utility Model Applications	TURKPATENT Official Statistics Program	Natural logarithmic values of the number of the utility model applications	An important indicator measuring the RIS as a form of the Intellectual Property Rights Dependent variables correspond to the Intellectual Assets in the EIS.
	$lny3$	Trademark Applications	TURKPATENT Official Statistics Program	Natural logarithmic values of the number of the trademark applications	
	$lny5$	Patent Applications	TURKPATENT Official Statistics Program	Natural logarithmic values of the number of the patent applications	
	$lny7$	Design (File) Applications	TURKPATENT Official Statistics Program	Natural logarithmic values of the number of the design (file) applications	
	$lny9$	Design (Design) Applications	TURKPATENT Official Statistics Program	Natural logarithmic values of the number of the design (design) applications	

Table 5.95 : Data set / independent variables (Author's own illustration).

		Indicators	Source	Description	Reason for choice
Independent variables (x)	$lnx1$	Population size / Total population	TURKSTAT, The results of Address Based Population Registration System (ABPRS)	Natural logarithmic values of the number of person	Unlike the EU, population data was added as a demographic indicator for market size and human capital.
	$x17$	Youth dependency ratio (%)	TURKSTAT, The results of Address Based Population Registration System (ABPRS)	Youth dependency ratio: The number of persons at "0-14" age group per 100 persons at "15-64" age group. Youth dependency ratio = $\frac{P_{0-14}}{P_{15-64}} * 100$ Where; P_{0-14} : Population at 0-14 age group P_{15-64} : Population at 15-64 age group	Unlike the EU, youth dependency ratio was added as a demographic and economic indicator for human resources and economic productivity.
	$lnx24$	Gross domestic product (GDP) (Thousand TL)	TURKSTAT, Regional Accounts	Natural logarithmic values of GDP	Unlike the EU, GDP was added as an economic indicator for market size and economic development and growth.

Table 5.95 (continued) : Data set / independent variables (Author's own illustration).

		Indicators	Source	Description	Reason for choice
Independent variables (x)	$lnx40$	Exports	TURKSTAT, Foreign Trade Statistics	Natural logarithmic values of exports	Although exports are examined in more detail under the EU's 'Sales Impacts' dimension, since data in this detail is not available on NUTs 3 level, exports were added in general as an indicator of proximity to market and trade openness.
	$lnx50$	Number of enterprises	TURKSTAT, Industry, Enterprises Statistics, Business Registers data.	Natural logarithmic values of Total Number of enterprises according to business registers	Just like in exports, entrepreneurship data is not identical. Although enterprises are examined in more detail under the EU's 'Innovators' dimension, the number of enterprises is added to data.
	$lnx56$	Total cash loans	BRSA, Banking Sector Data	Total cash loans: It shows the total of cash loans and non-performing loans. Natural logarithmic values of total cash loans	In order to adapt to the "Investments" issue of the EU, total cash loans were added to data. This indicator is also important for market size.
	$x65$	Population aged 25-34 with tertiary education	TURKSTAT, National Education Statistics Database, Attained education level by provinces.	The ratio was recalculated with TURKSTAT'S calculation logic. For this, firstly information for the age groups of 25-29 and 30-34 was collected for the 25-34 age group. As a second step, for the educational status, the external total was calculated by subtracting the population with unknown educational status from the general total. Finally, the population with higher education was proportioned to the external total achieved. For this, A= Population aged 25-34 with higher education was obtained by the sum of the number of person with the faculty graduate (universities and other higher educational institutions), Master's degree graduate (including 5 or 6 years faculties) and Doctorate graduate B= The number of people of the external total in the age group 25-34 calculated by subtracting the population with unknown educational status from the general total. (A/B)*100	Identical with the "Human Resources" of the EU'.
	$lnx66$	Number of teaching staff within own unit for higher education institutions	TURKSTAT, Regional Accouns, Education, Higher Education Statistics	Natural logarithmic values of the number of the total teaching staff	"Number of the total teaching staff" indicator can be interpreted as "Human Resources" and "Attractive Research Systems".
	$lnx74$	Number of graduated participants	TURKSTAT, Non-formal Education Activities Survey	Natural logarithmic values of the number of graduated participants	Identical with the "Human Resources" of the EU' because this data is accepted as the "Life long learning" indicator by TURKSTAT.

Table 5.95 (continued): Data set / independent variables (Author's own illustration).

	Indicators	Source	Description	Reason for choice
$x95$	Fixed broadband penetration	The Information and Communication Technologies Authority (BTK)	The Penetration Ratio at provincial level is the ratio of the number of subscribers in the province to the population of the province. The Penetration Ratio = (Number of Fixed Broadband Subscriptions – Total including Fiber, xDSL, Cable and other in the province / Total population of the province)*100	An indicator correspond to the "broadband penetration" of the "Innovation-friendly environment" of the EU'.
$lnx103$	In-migrated population with tertiary education over age 15.	TURKSTAT, The results of Address Based Population Registration System (ABPRS), Educational status of in migrated population (according to the Education Level)	Natural logarithmic values of the number of higher education graduates according to the Educational Status of the Population (Provincial in-migration) over age 15. This value was obtained by the sum of the number of person with the faculty graduate (universities and other higher educational institutions), Master's degree graduate (including 5 or 6 years faculties) and Doctorate graduate.	Unlike the EU, in-migrated population with tertiary education was added as high-skilled immigration for "Human Resources" and "Attractive Research Systems".

Before mentioning the model findings, it is useful to give brief information about the technique of panel data analysis used in this thesis.

Hausman (1978) test is used to decide on the model of regression. If test is significant, fixed effects must be applied, otherwise random effects. After determining the type of the panel data model with the Hausman (1978) test, various tests applied for heteroskedasticity, autocorrelation and cross-sectional dependence and then appropriate regression estimators are selected to solve these problems. Within the scope of this thesis, different robust standard estimators have been selected by considering the problems contained in the model. Details on this subject are given in the relevant model titles.

As a result of these explanations, as a final step, according to the model specification, five different models are established as given by the following equations (5.1-5.5).

Model 1 used in this study can be specified as follows:

$$lny1_{it} = \beta_0 + \beta_1 lnx1_{it} + \beta_2 x17_{it} + \beta_3 lnx24_{it} + \beta_4 lnx40_{it} + \beta_5 lnx50_{it} + \beta_6 lnx56_{it} + \beta_7 x65_{it} + \beta_8 lnx66_{it} + \beta_9 lnx74_{it} + \beta_{10} x95_{it} + \beta_{11} lnx103_{it} + u_{it}$$

i=1,…,N; t=1,…,T (5.1)

Model 2 used in this study can be specified as follows:

$$lny3_{it} = \beta_0 + \beta_1 lnx1_{it} + \beta_2 x17_{it} + \beta_3 lnx24_{it} + \beta_4 lnx40_{it} + \beta_5 lnx50_{it} + \beta_6 lnx56_{it} + \beta_7 x65_{it} + \beta_8 lnx66_{it} + \beta_9 lnx74_{it} + \beta_{10} x95_{it} + \beta_{11} lnx103_{it} + u_{it}$$

i=1,…,N; t=1,…,T (5.2)

Model 3 used in this study can be specified as follows:

$$lny5_{it} = \beta_0 + \beta_1 lnx1_{it} + \beta_2 x17_{it} + \beta_3 lnx24_{it} + \beta_4 lnx40_{it} + \beta_5 lnx50_{it} + \beta_6 lnx56_{it} + \beta_7 x65_{it} + \beta_8 lnx66_{it} + \beta_9 lnx74_{it} + \beta_{10} x95_{it} + \beta_{11} lnx103_{it} + u_{it}$$

i=1,…,N; t=1,…,T (5.3)

Model 4 used in this study can be specified as follows:

$$lny7_{it} = \beta_0 + \beta_1 lnx1_{it} + \beta_2 x17_{it} + \beta_3 lnx24_{it} + \beta_4 lnx40_{it} + \beta_5 lnx50_{it} + \beta_6 lnx56_{it} + \beta_7 x65_{it} + \beta_8 lnx66_{it} + \beta_9 lnx74_{it} + \beta_{10} x95_{it} + \beta_{11} lnx103_{it} + u_{it}$$

i=1,…,N; t=1,…,T (5.4)

Model 5 used in this study can be specified as follows:

$$lny9_{it} = \beta_0 + \beta_1 lnx1_{it} + \beta_2 x17_{it} + \beta_3 lnx24_{it} + \beta_4 lnx40_{it} + \beta_5 lnx50_{it} + \beta_6 lnx56_{it} + \beta_7 x65_{it} + \beta_8 lnx66_{it} + \beta_9 lnx74_{it} + \beta_{10} x95_{it} + \beta_{11} lnx103_{it} + u_{it}$$

i=1,…,N; t=1,…,T (5.5)

where

- β_0 is the constant
- β_1, …, β_{11} are the coefficients of the x variables,
- all y are dependent variables,
    - $lny1$: Natural logarithmic values of the number of the utility model applications
    - $lny3$: Natural logarithmic values of the number of the trademark applications
    - $lny5$: Natural logarithmic values of the number of the patent applications
    - $lny7$: Natural logarithmic values of the number of the design (file) applications

- $lny9$: Natural logarithmic values of the number of the design (design) applications

- all x represent independent variables,

- $lnx1$: Natural logarithmic values of total population
- $x17$: Youth dependency ratio (%)
- $lnx24$: Natural logarithmic values of GDP
- $lnx40$: Natural logarithmic values of exports
- $lnx50$: Natural logarithmic values of total number of enterprises according to business registers
- $lnx56$: Natural logarithmic values of total cash loans
- $x65$: Population aged 25-34 with tertiary education
- $lnx66$: Natural logarithmic values of the number of the total teaching staff
- $lnx74$: Natural logarithmic values of the number of graduated participants
- $x95$: Fixed broadband penetration ratio
- $lnx103$: Natural logarithmic values of the number of higher education graduates of the in-migrated population over age 15.

- u is the error term,

with i denoting the regions/the cross-section dimensions (innovation leader regions derived from the Markov Analysis) and t denoting time/time-series dimension (7 years as the time period of Markov analysis including the years between 2011 and 2017).

Model 1: Determinants of the utility model applications

According to the last time period of the Markov analysis, the innovation leaders in the utility model applications are Adana, Afyonkarahisar, Ankara, Antalya, Aydın, Balıkesir, Burdur, Bursa, Denizli, Eskişehir, Gaziantep, Hatay, Mersin, İstanbul,

İzmir, Kayseri, Kocaeli, Konya, Manisa, Kahramanmaraş, Muğla, Sakarya, Samsun, Tekirdağ and Düzce (Table 5.96).

Table 5.96 : Innovation leaders in the last time period of the Markov Analysis in terms of the utility model applications (Author's own illustration).

Model No	Dependent Variable	Number of regions	Innovation Leaders
Model 1	lny1: Natural logarithmic values of the number of the Utility model applications	25	ADANA AFYONKARAHİSAR ANKARA ANTALYA AYDIN BALIKESİR BURDUR BURSA DENİZLİ ESKİŞEHİR GAZİANTEP HATAY MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA KAHRAMANMARAŞ MUĞLA SAKARYA SAMSUN TEKİRDAĞ DÜZCE

Table 5.97 shows the regression estimations of the Model 1. Since the Hausman (1978) test statistics are statistically significant at 5% (0.0434) significance level, fixed effects method was preferred to random effects method. Modified Wald test was applied for groupwise heteroskedasticity; Modified Bhargava, Franzini and Narendranathan (1982) Durbin Watson test for autocorrelation; and finally Pesaran's test of cross-sectional dependence for cross-section dependency. Since the fixed effects model had both heteroskedasticity and autocorrelation problems according to heteroskedasticity (1% (0.0000) significance level) and autocorrelation (1.720361<2) tests, but not cross-sectional dependency, in order to solve these problems the fixed effects model was revised with Arellano, Froot and Rogers Estimator. According to the findings, it was determined that the variables lnx24 and lnx74 had positive effects (respectively 1.64397 and 0.1236119) on lny1. A 1% increase in the lnx24 variable increases the lny1 variable by approximately 1.64% and a 1% increase in the lnx74 variable increases the lny1 variable by approximately 0.12%.

Table 5.97 : The results of regression estimations of Model 1 (Author's own illustration).

Variables	Fixed Effects		Random Effects		Arellano, Froot ve Rogers Estimator	
	Coefficients and Standard Errors	P-Value	Coefficients and Standard Errors	P-Value	Coefficients and Standard Errors	P-Value
lnx1	-0.51178	0.828	0.0337093	0.971	-0.51178	0.840
	(2.351509)		(0.9335628)		(2.501409)	
x17	0.0920216	0.121	-0.0122439	0.562	0.0920216	0.172
	(0.059058)		(0.0211166)		(0.0653595)	
lnx24	1.64397**	0.015	1.29413***	0.008	1.64397**	0.026
	(0.6669694)		(0.4877084)		(0.6915475)	
lnx40	-0.075897	0.640	0.0128879	0.904	-0.075897	0.622
	(0.1617125)		(0.1073573)		(0.1519282)	
lnx50	-2.174414	0.260	0.2506559	0.758	-2.174414	0.283
	(1.92237)		(0.813498)		(1.981585)	
lnx56	-0.2961905	0.367	-0.567769**	0.038	-0.2961905	0.282
	(0.3269936)		(0.2735376)		(0.269144)	
x65	-0.000657	0.977	-0.0114734	0.561	-0.000657	0.968
	(0.0223674)		(0.019724)		(0.0162881)	
lnx66	0.3392016	0.199	0.5708898***	0.001	0.3392016	0.366
	(0.2629755)		(0.1761257)		(0.3682287)	
lnx74	0.1236119*	0.051	0.1098716*	0.063	0.1236119**	0.016
	(0.0626751)		(0.059144)		(0.0477998)	
x95	-0.0712917	0.202	-0.0484883	0.212	-0.0712917	0.241
	(0.0556375)		(0.0388278)		(0.0592762)	
lnx103	-0.2511318	0.286	-0.3166109	0.148	-0.2511318	0.207
	(0.234697)		(0.2186661)		(0.1935543)	
Constant	9.82019	0.646	-13.34391***	0.000	9.82019	0.694
	(21.34266)		(3.474798)		(24.63716)	
R^2	0.4416		0.8306		0.4416	
F Statistics	2.12**	0.0224			3.43***	0.0056
Wald χ^2			150.61***	0.0000		
Hausman Test Statistics	20.15**	0.0434				
Modified Wald test for groupwise heteroskedasticity	889.91***	0.0000				
Modified Bhargava, Franzini ve Narendranathan Durbin Watson test for autocorrelation	1.720361					
Pesaran's test of cross sectional independence	-0.056	0.9550				
Number of observation	175					
Number of cross-section	25					

Note: Asteriks (***, **, *) denote respectively to significance at the 1%, 5% and 10% level.
Values in parentheses indicate standard errors.

Model 2: Determinants of the trademark applications

According to the last time period of Markov analysis, the innovation leaders in the trademark applications are Adana, Ankara, Antalya, Aydın, Balıkesir, Bursa, Denizli, Diyarbakır, Eskişehir, Gaziantep, Hatay, Mersin, İstanbul, İzmir, Kayseri, Kocaeli, Konya, Manisa, Kahramanmaraş, Muğla, Sakarya, Samsun, Tekirdağ, Trabzon, and Şanlıurfa (Table 5.98).

Table 5.98 : Innovation leaders in the last time period of the Markov Analysis in terms of the trademark applications (Author's own illustration).

Model No	Dependent Variable	Number of regions	Innovation Leaders
Model 2	lny3: Natural logarithmic values of the number of the Trademark applications	25	ADANA ANKARA ANTALYA AYDIN BALIKESİR BURSA DENİZLİ DİYARBAKIR ESKİŞEHİR GAZİANTEP HATAY MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA KAHRAMANMARAŞ MUĞLA SAKARYA SAMSUN TEKİRDAĞ TRABZON ŞANLIURFA

Table 5.99 shows the regression estimations of the Model 2. Since the Hausman (1978) test statistics are statistically significant at 5% (0.0075) significance level, fixed effects method was preferred to random effects method.

Modified Wald test was applied for groupwise heteroskedasticity; Modified Bhargava, Franzini ve Narendranathan Durbin Watson test for autocorrelation; and finally Pesaran's test of cross-sectional dependence for cross-section dependency. Since the fixed effects model had both heteroskedasticity and cross-sectional dependency problems according to heteroskedasticity (1% (0.0000) significance level) and cross-sectional dependency (1% (0.0001) significance level) tests, but not autocorrelation problems (2.0348253>2). In order to solve these problems the fixed effects model was revised with clustered estimations (vce cluster instead of FGLS/xtgls command since N>T in this case[21]).

According to the findings, it was determined that the variables lnx1, lnx24 and lnx40 had positive effects (respectively 2.029097; 0.3333544 and 0.1197249) on lny3. A 1% increase in the lnx1 variable increases the lny3 variable by approximately 2.03%. A 1% increase in the lnx24 variable increases the lny3 variable by approximately

[21] According to Hoechle (2007), N < T is required for feasibility of xtgls command. Instead of xtgls command, vce cluster command can be run when N > T (URL-31 and URL-32).

0.33% and a 1% increase in the lnx40 variable increases the lny3 variable by approximately 0.12%.

In addition the variables lnx56, x65 and lnx66 had negative effects (respectively -0.2490393; -0.017846 and -0.1576481) on lny3. A 1% increase in the lnx56 decreases the lny3 variable by approximately -0.25%. A one-unit increase in x65 variable decreases the lny3 variable by approximately -0.02%. A 1% increase in the lnx66 decreases the lny3 variable by approximately -0.16%.

Table 5.99 : The results of regression estimations of Model 2 (Author's own illustration).

Variables	Fixed Effects		Random Effects		Clustered Estimation vce cluster	
	Coefficients and Standard Errors	P-Value	Coefficients and Standard Errors	P-Value	Coefficients and Standard Errors	P-Value
lnx1	2.029097*** (0.7372069)	0.007	0.3120715 (0.405356)	0.441	2.029097*** (0.624696)	0.003
x17	0.0032846 (0.0174442)	0.851	-0.0028598 (0.0069634)	0.681	0.0032846 (0.0158427)	0.838
lnx24	0.3333544 (0.229367)	0.148	0.0621977 (0.1931613)	0.747	0.3333544* (0.1779639)	0.073
lnx40	0.1197249** (0.050301)	0.019	0.1723254*** (0.0400757)	0.000	0.1197249** (0.0556395)	0.042
lnx50	-0.0041101 (0.6463836)	0.995	0.8537606** (0.3401162)	0.012	-0.0041101 (0.6161634)	0.995
lnx56	-0.2490393** (0.1182555)	0.037	-0.1542041 (0.1062809)	0.147	-0.2490393** 0.1054634	0.027
x65	-0.017846** (0.0080911)	0.029	-0.018247** (0.0078806)	0.021	-0.017846** 0.0081091	0.038
lnx66	-0.1576481* (0.0928522)	0.092	0.0322372 (0.0749032)	0.667	-0.1576481* (0.0877392)	0.085
lnx74	-0.01581 (0.02245)	0.482	-0.0032382 (0.0231492)	0.889	-0.01581 (0.02258)	0.491
x95	0.0220016 (0.0186727)	0.241	0.0344996** (0.0159576)	0.031	0.0220016 (0.0147532)	0.149
lnx103	0.1259993 (0.0797099)	0.116	0.1396026* (0.0806688)	0.084	0.1259993 (0.085492)	0.154
Constant	-25.43505*** (7.047831)	0.000	-10.24744*** (1.648984)	0.000	-25.43505*** (4.635759)	0.000
R^2	0.7914		0.9295		0.7914	
F Statistics	7.54***	0.0000			19.76***	0.0000
Wald χ^2			544.95***	0.0000		
Hausman Test Statistics	25.58***	0.0075				
Modified Wald test for groupwise heteroskedasticity	11464.21***	0.0000				
Modified Bhargava, Franzini ve Narendranathan Durbin Watson test for autocorrelation	2.0348253					
Pesaran's test of cross sectional independence	3.930***	0.0001				
Number of observation	175					
Number of cross-section	25					

Note: Asteriks (***, **, *) denote respectively to significance at the 1%, 5% and 10% level.
Values in parentheses indicate standard errors.

Model 3: Determinants of the patent applications

According to the last time period of Markov analysis, the innovation leaders in the patent applications are Adana, Ankara, Antalya, Aydın, Balıkesir, Bursa, Çorum, Denizli, Elazığ, Eskişehir, Gaziantep, Hatay, Isparta, Mersin, İstanbul, İzmir, Kayseri, Kocaeli, Konya, Kütahya, Manisa, Kahramanmaraş, Muğla, Rize, Sakarya, Samsun, Tekirdağ, Trabzon, and Düzce (Table 5.100).

Table 5.100 : Innovation leaders in the last time period of the Markov Analysis in terms of the patent applications (Author's own illustration).

Model No	Dependent Variable	Number of regions	Innovation Leaders
Model 3	lny5: Natural logarithmic values of the number of the Patent applications	29	ADANA ANKARA ANTALYA AYDIN BALIKESİR BURSA ÇORUM DENİZLİ ELAZIĞ ESKİŞEHİR GAZİANTEP HATAY ISPARTA MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA KAHRAMANMARAŞ MUĞLA RİZE SAKARYA SAMSUN TEKİRDAĞ TRABZON DÜZCE

Table 5.101 shows the regression estimations of the Model 3. Since the Hausman (1978) test statistics are statistically significant at 10% (0.0738) significance level, fixed effects method was preferred to random effects method.

Modified Wald test was applied for groupwise heteroskedasticity; Modified Bhargava, Franzini ve Narendranathan Durbin Watson test for autocorrelation; and finally Pesaran's test of cross-sectional dependence for cross-section dependency. Since the fixed effects model had both heteroskedasticity and autocorrelation problems according to heteroskedasticity (1% (0.0000) significance level) and autocorrelation (1.3804716<2) tests, but not cross-sectional dependency, in order to solve these problems the fixed effects model was revised with Arellano, Froot and Rogers Estimator. According to the findings (Table 5.101), it was determined that the

variables lnx24 has a positive effect (1.81837) on lny5. Also the variables x17 and lnx74 have negative effects (respectively -0.2759402 and -0.1626735) on lny5. A 1% increase in the lnx24 variable increases the lny5 variable by approximately 1.82%. A one unit increase in the x17 variable decreases the lny5 variable by approximately -0.28%. Besides a 1% increase in the lnx74 decreases the lny5 variable by approximately -0.16%.

Table 5.101 : The results of regression estimations of Model 3 (Author's own illustration).

Variables	Fixed Effects		Random Effects		Arellano, Froot ve Rogers Estimator	
	Coefficients and Standard Errors	P-Value	Coefficients and Standard Errors	P-Value	Coefficients and Standard Errors	P-Value
lnx1	0.8490462	0.764	0.254056	0.816	0.8490462	0.766
	(2.827017)		(1.089192)		(2.83125)	
x17	-0.2759402***	0.001	-0.0390921*	0.082	-0.2759402**	0.039
	(0.0780805)		(0.0224705)		(0.1273894)	
lnx24	1.81837*	0.055	2.42265***	0.000	1.81837*	0.056
	(0.9425654)		(0.5845342)		(0.9121813)	
lnx40	0.0189543	0.890	0.1759772*	0.081	0.0189543	0.925
	(0.1365924)		(0.1007952)		(0.199447)	
lnx50	-1.748769	0.494	-0.8826005	0.348	-1.748769	0.647
	(2.553699)		(0.9404668)		(3.780164)	
lnx56	-0.7258862	0.120	-0.4793461	0.174	-0.7258862	0.219
	(0.463947)		(0.3527644)		(0.5769758)	
x65	0.0151519	0.616	-0.0199071	0.402	0.0151519	0.736
	(0.0301111)		(0.0237584)		(0.0445808)	
lnx66	-0.1164188	0.742	0.3681266**	0.050	-0.1164188	0.681
	(0.3530827)		(0.1874726)		(0.2800912)	
lnx74	-0.1626735*	0.061	-0.0638463	0.426	-0.1626735*	0.063
	(0.0861727)		(0.0801744)		(0.0838898)	
x95	-0.0381905	0.580	-0.063978	0.177	-0.0381905	0.450
	(0.0688785)		(0.0473449)		(0.0498783)	
lnx103	-0.6498942**	0.040	-0.5164515*	0.070	-0.6498942	0.122
	(0.3146407)		(0.2851998)		(0.4070684)	
Constant	10.16985	0.686	-21.82032***	0.000	10.16985	0.663
	(25.13645)		(3.751591)		(23.07553)	
R^2	0.0339		0.8328		0.0339	
F Statistics	8.89***	0.0000			9.09***	0.0000
Wald χ^2			250.04***	0.0000		
Hausman Test Statistics	17.02*	0.0738				
Modified Wald test for groupwise heteroskedasticity	38883.64***	0.0000				
Modified Bhargava, Franzini ve Narendranathan Durbin Watson test for autocorrelation	1.3804716					
Pesaran's test of cross sectional independence	-0.381	0.7035				
Number of observation	203					
Number of cross-section	29					

Note: Asteriks (***, **, *) denote respectively to significance at the 1%, 5% and 10% level.
Values in parentheses indicate standard errors.

Model 4: Determinants of the design applications (file)

According to the last time period of Markov analysis, the innovation leaders in the design applications (file) are Adana, Ankara, Antalya, Aydın, Balıkesir, Bursa, Çanakkale, Denizli, Eskişehir, Gaziantep, Hatay, Mersin, İstanbul, İzmir, Kayseri, Kocaeli, Konya, Kütahya, Manisa, Kahramanmaraş, Sakarya, Samsun, Tekirdağ, Trabzon, Karaman (Table 5.102).

Table 5.102 : Innovation leaders in the last time period of the Markov Analysis in terms of the design applications (file) (Author's own illustration).

Model No	Dependent Variable	Number of regions	Innovation Leaders
Model 4	lny7: Natural logarithmic values of the number of the Design Applications (File)	25	ADANA ANKARA ANTALYA AYDIN BALIKESİR BURSA ÇANAKKALE DENİZLİ ESKİŞEHİR GAZİANTEP HATAY MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA KAHRAMANMARAŞ SAKARYA SAMSUN TEKİRDAĞ TRABZON KARAMAN

Table 5.103 shows the regression estimations of the Model 4. Since the Hausman (1978) test statistics are not statistically significant, random effects method was preferred to fixed effects method. Levene, Brown and Forsythe Test was applied for heteroskedasticity; Modified Bhargava, Franzini ve Narendranathan Durbin Watson test for autocorrelation; and finally Pesaran's test of cross-sectional dependence for cross-section dependency. Since the random effects model has both heteroskedasticity (with 0.00000510 significance level), autocorrelation (1.5439096<2) and cross-section dependency problems (with 5% (0.0394) significance level) according to heteroskedasticity, autocorrelation and cross-section dependency tests, in order to solve these problems the random effects model was revised with the Driscoll and Kraay (1998) covariance matrix estimator with pooled ordinary least squares (OLS) estimation. According to the findings (Table 5.103), it was determined that the variables lnx1 and lnx40 variables have positive effects

(respectively 3.478036 and 0.2736724) and x17, lnx50, x65 and lnx103 variables have negative effects (respectively -0.0574205; -2.841715; -0.0541178 and -0.4485771) on lny7. A 1% increase in the lnx1 and lnx40 variables increase the lny7 variable by approximately respectively 3.48% and 0.27%. A one-unit increase in the x17 and x65 variables decrease the lny7 variable by approximately respectively -0.06 % and -0.05%. Also 1% increases in the lnx50 and lnx103 variables decrease the lny7 variable by approximately respectively -2.84% and -0.45%.

Table 5.103 : The results of regression estimations of Model 4 (Author's own illustration).

Variables	Fixed Effects		Random Effects		Driscoll-Kraay Estimator	
	Coefficients and Standard Errors	P-Value	Coefficients and Standard Errors	P-Value	Coefficients and Standard Errors	P-Value
lnx1	6.71286***	0.004	3.478036***	0.010	3.478036*	0.058
	(2.272078)		(1.352308)		(1.487373)	
x17	-0.1814991***	0.004	-0.0574205**	0.035	-0.0574205**	0.023
	(0.0612518)		(0.0271674)		(0.0188268)	
lnx24	-0.0137351	0.984	0.0211699	0.970	0.0211699	0.964
	(0.6944852)		(0.5634964)		(0.4513422)	
lnx40	0.2402989	0.136	0.2736724**	0.035	0.2736724**	0.044
	(0.1601437)		(0.1299314)		(0.1079687)	
lnx50	-3.530737*	0.073	-2.841715**	0.018	-2.841715*	0.073
	(1.957718)		(1.202893)		(1.310799)	
lnx56	0.2346417	0.509	0.5402968*	0.072	0.5402968	0.107
	(0.3544287)		(0.3001286)		(0.2851926)	
x65	-0.0381549	0.108	-0.0541178**	0.012	-0.0541178**	0.012
	(0.0235923)		(0.021583)		(0.0152866)	
lnx66	-0.3344048	0.203	0.0224883	0.912	0.0224883	0.899
	(0.2616697)		(0.2045804)		(0.1703625)	
lnx74	0.0753671	0.251	0.1249405**	0.046	0.1249405	0.125
	(0.0653696)		(0.0626384)		(0.0701512)	
x95	-0.0153585	0.789	0.0085421	0.856	0.0085421	0.817
	(0.0571447)		(0.0472173)		(0.0352553)	
lnx103	-0.5753184**	0.026	-0.4485771*	0.065	-0.4485771*	0.069
	(0.2548637)		(0.2433323)		(0.2032564)	
Constant	-46.43772**	0.025	-23.55095***	0.000	-23.55095***	0.010
	(20.43257)		(5.443047)		(6.40471)	
R^2	0.5158		0.6777		0.6777	
F Statistics	3.07***	0.0010				
Wald χ^2			83.18***	0.0000	206.08***	0.0000
Hausman Test Statistics	0.78	1.0000				
Levene, Brown and Forsythe Test for heteroskedasticity			W0 = 3.2716970***	0.00000510		
			W50 = 2.4213323***	0.0006587		
			W10 = 3.2716970***	0.00000510		
Modified Bhargava, Franzini ve Narendranathan Durbin Watson test for autocorrelation			1.5439096			
Pesaran's test of cross sectional independence			2.060**	0.0394		
Number of observation	175					
Number of cross-section	25					

Note: Asteriks (***, **, *) denote respectively to significance at the 1%, 5% and 10% level.
Values in parentheses indicate standard errors.

Model 5: Determinants of the design applications (design)

According to the last time period of Markov analysis, the innovation leaders in the design applications (design) are Adana, Ankara, Antalya, Aydın, Balıkesir, Bursa, Çanakkale, Denizli, Eskişehir, Gaziantep, Hatay, Mersin, İstanbul, İzmir, Kayseri, Kırklareli, Kocaeli, Konya, Kütahya, Manisa, Kahramanmaraş, Sakarya, Tekirdağ and Karaman (Table 5.104).

Table 5.104 : Innovation leaders in the last time period of the Markov Analysis in terms of the design applications (design) (Author's own illustration).

Model No	Dependent Variable	Number of regions	Innovation Leaders
Model 5	lny9: Natural logarithmic values of the number of the Design Applications (Design)	24	ADANA ANKARA ANTALYA AYDIN BALIKESİR BURSA ÇANAKKALE DENİZLİ ESKİŞEHİR GAZİANTEP HATAY MERSİN İSTANBUL İZMİR KAYSERİ KIRKLARELİ KOCAELİ KONYA KÜTAHYA MANİSA KAHRAMANMARAŞ SAKARYA TEKİRDAĞ KARAMAN

Table 5.105 shows the regression estimations of the Model 5. Since the Hausman (1978) test statistics are not statistically significant, random effects method was preferred to fixed effects method.

Levene, Brown and Forsythe Test was applied for heteroskedasticity; Modified Bhargava, Franzini ve Narendranathan Durbin Watson test for autocorrelation; and finally Pesaran's test of cross-sectional dependence for cross-section dependency. Since the random effects model has both heteroskedasticity (with 0.00000006 significance level), autocorrelation (1.3102785<2), but not cross-sectional dependency, in order to solve these problems the random effects model was revised with Arellano, Froot and Rogers Estimator.

According to the findings, it was determined that the lnx40, lnx56, lnx66 and lnx74 variables have positive (respectively 0.7448552; 1.007015; 0.7371715 and 0.2182853) effects on lny9. A 1% increase in the lnx40, lnx56, lnx66 and lnx74

variables increase the lny9 variable by approximately respectively 0.74%, 1.01%, 0.74% and 0.22%.

Table 5.105 : The results of regression estimations of Model 5 (Author's own illustration).

Variables	Fixed Effects		Random Effects		Arellano, Froot ve Rogers Estimator	
	Coefficients and Standard Errors	P-Value	Coefficients and Standard Errors	P-Value	Coefficients and Standard Errors	P-Value
lnx1	5.99542	0.127	3.551608*	0.065	3.551608	0.138
	(3.908112)		(1.926737)		(2.392001)	
x17	-0.0182795	0.877	-0.0428045	0.245	-0.0428045	0.273
	(0.1175849)		(0.036812)		(0.0390709)	
lnx24	-1.791294	0.130	-1.893422**	0.025	-1.893422	0.189
	(1.175435)		(0.8471947)		(1.442992)	
lnx40	0.952065***	0.000	0.7448552***	0.000	0.7448552*	0.079
	(0.2187177)		(0.1746891)		(0.4237475)	
lnx50	-7.182153**	0.036	-3.063849*	0.073	-3.063849	0.145
	(3.395484)		(1.709902)		(2.102944)	
lnx56	1.115358*	0.085	1.007015**	0.038	1.007015*	0.080
	(0.641882)		(0.4849649)		(0.5752462)	
x65	-0.0442741	0.301	-0.0465617	0.190	-0.0465617	0.397
	(0.0426114)		(0.035495)		(0.0550038)	
lnx66	0.4861189	0.271	0.7371715**	0.015	0.7371715*	0.053
	(0.4395293)		(0.302792)		(0.3817461)	
lnx74	0.2470865**	0.040	0.2182853**	0.039	0.2182853**	0.045
	(0.1191214)		(0.1058589)		(0.108657)	
x95	0.0348245	0.714	0.0480771	0.509	0.0480771	0.454
	(0.0947328)		(0.0727918)		(0.0642774)	
lnx103	-0.4235177	0.343	-0.373115	0.355	-0.373115	0.451
	(0.445076)		(0.4034006)		(0.4947415)	
Constant	-10.42822	0.767	-14.47161**	0.050	-14.47161	0.125
	(35.19458)		(7.391281)		(9.421859)	
R^2	0.0364		0.6398		0.6398	
F Statistics	4.38***	0.0000				
Wald χ^2			88.36***	0.0000	161.72***	0.0000
Hausman Test Statistics	11.62	0.3111				
Levene, Brown and Forsythe Test for heteroskedasticity			W0 =4.1393681*** W50=3.1411450*** W10=4.1393681***	0.00000006 0.00001584 0.00000006		
Modified Bhargava, Franzini ve Narendranathan Durbin Watson test for autocorrelation			1.3102785			
Pesaran's test of cross sectional independence			-0.980	0.3273		
Number of observation	168					
Number of cross-section	24					

Note: Asteriks (***, **, *) denote respectively to significance at the 1%, 5% and 10% level.
Values in parentheses indicate standard errors.

5.3 Evaluation of the Chapter

The evaluation in the empirical chapter will be on international, national and regional scales.

- International scale:

* The positive aspects can be listed as follows:

- Even though Turkey's innovation index is far below the EU average, its innovation growth rate is much above the EU average (Özen and Baycan, 2014).
- When the innovation performance change between 2010 and 2017 is examined, it is seen that Turkey's SII is far below the EU average. The EU has a more stable structure and that Turkey has a more pronounced change in its performance. Except decline in the year 2012, Turkey has generally increased its value.
- Compared to the annual growth rates; Turkey showed a phenomenal growth especially in 2014-2015 and partially less in 2010-2011. Average annual growth rate of Turkey is much higher than the EU's (4,57 and 0,80 respectively) (Table 5.6).
- As a comparison of Summary Innovation Index in 2014 and 2018, the most striking issue regarding Turkey is the rise of the innovation performance group from Modest Innovator to Moderate Innovator.
- 'Firm investments' dimension is one of the best trend of Turkey in terms of performance. In fact, it has been showing success over the EU since 2014 (Figure 5.12a). One of the reason for Turkey's high performance in this dimension is being "a positive outlier in 2012 and 2014 (European Commission, 2018a)" in terms of 'Non-R&D innovation expenditures' indicator which is an indicator of 'Firm Investments'.
- For 'Sales Impacts' dimension, Turkey is far below the EU, but it has a much better position with respect to other dimensions as human resources, intellectual assets and employment impacts. 'Sales of new-to-market and new-to-firm innovations' indicator, which is an indicator of this dimension, is a positive outlier for 2012 (European Commission, 2018a).
- If all innovation indicators are examined, indicators with the closest to the values of the EU and Turkey are 'International scientific co-publications per

million population' and 'Private co-funding of public R&D expenditures (percentage of GDP)' (Figure 5.15 d,q).

- Indicators such as 'SMEs introducing product or process innovations as % of SMEs', 'SMEs introducing marketing or organisational innovations as % of SMEs' and 'SMEs innovating in-house as % of SMEs' have very fluctuating performances (Figure 5.15 l,m,n). The performance of Turkey in terms of 'SMEs introducing product or process innovations as % of SMEs' indicator is generally below the EU except 2014 and 2015 (Figure 5.15 g). Turkey is above the EU in terms of 'SMEs introducing marketing or organisational innovations as % of SMEs' indicator (Figure 5.15 m) and below the EU in terms of 'SMEs innovating in-house as % of SMEs' Figure 5.15 n).
- Turkey's performance in the 'Broadband penetration' indicator is above the EU (Figure 5.15 g).
- According to the performances in terms of the 'Non-R&D innovation expenditures (% of turnover)', while Turkey was one of the lowest countries and positioned below the EU until 2012, with an incredible increase in 2012 (from 0.22 to 2.59) it has positioned above the EU since 2012 and has become one of the highest two countries. According to the EU (European Commission, 2018c), Turkey has been described as positive outliers in terms of 'Non-R&D innovation expenditures' (in the years 2012 and 2014) and 'Sales of new-to-market and new-to-firm innovations' (in 2012).
- Turkey has efforts/plans/programmes to reach the vision in innovation.
- Turkey must be able to accelerate its increasing growth rate in order to close the gap and catch up the EU. Because its ability to catch the EU is not only dependent on its own performance, but also on the performance of the EU.

* The negative aspects can be listed as follows:

- According to the evaluation of the innovation dimensions, Turkey's innovation performance is far below the EU average in some innovation dimensions.

- Turkey's performance in terms of 'Human Resources' is still far below the EU, although it has a steadily rising especially after 2014 especially with a little increase in 2016 (from 0.098 to 0.137) (Figure 5.10a).
- Turkey's performance in terms of 'Research Systems' is another dimension which is also far below the EU (Figure 5.10b).
- Turkey also is far below the EU in terms 'Finance and Support' dimension (Figure 5. 11b). It has higher values than the human resources and research systems.
- Turkey is also below the EU for 'Linkages' dimension (Figure 5.13a).
- Turkey is far below the EU in terms of the 'Intellectual Assets' (Figure 5.13b). In fact, this dimension is one of the worst performance of Turkey.
- Just like Intellectual Assets, 'Employment Impacts' is one of the lowest performance of Turkey and Turkey is far below the EU (Figure 5.14a).
- Finally as a summary of all these explanations, innovation dimensions as 'Human resources', 'Employment Impacts' and 'Intellectual Assets' are the challenges of Turkey in terms of performances.
- Turkey has efforts to catch up the EU according to growth rate of the indicators which are below the EU average (Table 5.2). Performance scores (European Commission, 2014b) of human resources, research systems, firm investments, linkages & entrepreneurship, intellectual assets and economic effects are below the EU average. These dimensions require time because the effects and results of the changes in these dimensions may appear a long time.
- If all innovation indicators are examined in terms of the performance of Turkey, according to the country ranking Turkey is far below the EU and positioned at the bottom of the rank with the lowest performances in terms of indicators such as 'New doctorate graduates per 1000 population aged 25-34', 'Percentage population aged 25-34 having completed tertiary education', 'Foreign doctorate students as a % of all doctorate students', 'Public-private co-publications per million population', 'PCT patent applications per billion GDP (in PPS)', 'Trademark applications per billion GDP (in PPS)', 'Design applications per billion GDP (in PPS)', 'Employment in knowledge-intensive

activities (% of total employment)' and 'Knowledge-intensive services exports as % of total services exports' (Figure 5.15 a,b,f,p,r,s,t,u,w).

- "Turkey is performing well below the average of the EU for all dimensions except Firms investments - due to high relative performance in Non-R&D innovation expenditures - and on almost all indicators. Another strong relative performance is observed for Sales share of new innovations. The most significant relative weaknesses are in License and patent revenues from abroad, Public-private scientific copublications, Community designs, and Community trademarks. In nearly all dimensions - especially Firm investments - and most indicators, performance has improved. Particularly high growth is observed for Non-R&D innovation expenditures (43%), Sales share of new product innovations (24%), PCT patent applications in societal challenges (22%), and Community trademarks (19%). The few declines in performance are minor, with the relatively largest ones in Community designs (-7.0%) and Public-private scientific co-publications (-3.6%) (European Commission, 2017c)".
- The fact that Turkey attached importance to the innovation systems later to developed countries.
- According to the EU's innovation indices, Turkey was placed in the 'modest innovators' group until 2016 and then moved from modest to moderate innovators by improving its innovation performances (European Commission, 2017c). Unfortunately, the country could not recently sustain its position and fell back to the group of emerging countries (European Commission, 2021a). Even though Turkey's innovation index is far below the EU average, its innovation growth rate is much above it (European Commission, 2017c). According to its growth rate in innovation performance, Turkey is one of the countries that resisted the 2008 global economic crisis and had a rising trend mainly in indicators as 'population completed tertiary education', 'youth with upper secondary level education' and 'R&D expenditure in the business sector' (Baycan and Özen, 2018). In recent years, Turkey has made strong efforts to strengthen the innovation systems. According to the 'European Innovation Scoreboard 2018' (European Commission, 2018a), the strongest innovation dimensions of Turkey are 'Firm investments' and 'Innovators'.

‘Firm investments’ dimension is one of the best trends of Turkey. In terms of this dimension, Turkey got ahead of the EU with its remarkable increase in 2014 (from 0.099 to 0.568) and was located behind the leading countries such as Israel, Switzerland, Sweden, Germany, Austria, Belgium and Finland in 2017. One of the reasons for Turkey’s high performance in this dimension is being “a positive outlier in 2012 and 2014 (European Commission, 2018a)” in terms of ‘Non-R&D innovation expenditures’ indicator. In contrast, ‘Intellectual assets’ and ‘Employment impacts’ are the weakest innovation dimensions of Turkey. Although Turkey showed little increases in some years for these dimensions, these increases could not prevent Turkey from being one of the lowest ranking countries. Therefore, Turkey must deeply focus on and spent much more efforts on these dimensions. The reasons that Turkey being a large and diverse country and also an emerging country with a higher growth rate in terms of innovation performances and having some challenges on innovation increase the need for and importance of innovation-related research.

- National scale:

* The positive aspects can be listed as follows:

- The patent is not affected by the global economic crisis in 2008.
- The reason that accelerated the patent after 2013 may be the implementation of the new patent support program as of 01.01.2014. According to the TPI 2014 Annual Report: “The TÜBİTAK 1008 Patent Application Incentive and Support Program, which was implemented in cooperation with the TPI and TÜBİTAK on 09.21.2006, was terminated on 11.15.2013 and the new TÜBİTAK 1602 Patent Support Program was implemented as of 01.01.2014 and 2.398 requests benefited from TÜBİTAK's 1602 incentive”.

* The negative aspects can be listed as follows:

- It is observed that the indicators of intellectual assets except patent have fluctuating tendencies and that they were affected by the economic crisis in 2008. Although the crisis was not managed well in terms of these variables, recovery of the trend afterwards can be seen as positive.

- Utility Model and Trademark were affected by the crisis in 2008. Design, on the other hand, was affected by the crisis in 2009, later than the utility model and trademark.
- According to Annual 2009 Report of TPI (p. 5); “Although there was a certain amount of decrease in trademark and design applications with the impact of global crisis in 2009, the fact that these decreases are far below the world average is promising for Turkey”.
- There are huge differences between trends of patent applications and grants. Although they both have increasing trends, the increases in local patent applications do not reflect to the local patent grants (Figure 5.17).

    - Regional scale:

* The negative aspects can be listed as follows:

- There are many regions that cannot obtain patent registration for any year. When descriptive statistics of the patent grants are examined per each year between the years 2000 and 2017, it is seen that Artvin, Erzincan, Hakkari, Tunceli and Bayburt regions could not obtain patent grants in any year.
- When the utility model grants between the years 2000 and 2017 are examined, the region of Ağrı does not have any registration.
- Within the scope of design applications (file), Bitlis region did not make any design applications between the years 2000 and 2017.
- Tunceli region has no design registration (file) for any year.
- There are no design applications (design) for any year in Bitlis region.
- Tunceli region has no design registration (design) for any year.
- In the detailed descriptive statistics analysis of the variables of intellectual assets, although there is a close to normal or normal distribution in some years or some periods very rare, it was observed that the data were not distributed normally and showed a severely right-skewed distribution in general.
- The Markov Chains based on Methodology 2, which used to to investigate the changes of states in innovation performances of the regions in different

time periods in this study, has revealed that there are regional disparities (at NUTS-3 level) in terms of innovation performances in Turkey. When the innovation performance groups obtained with the Markov Chains are visualized with mapping, the following spatial inferences are made:

i. There are regional disparities (at NUTS-3 level) in terms of innovation performances in Turkey.

ii. The innovation leaders with the highest innovation performances in all time periods for all variables (as patent, utility model, trademark and design applications and registrations) are Ankara, Bursa, İstanbul, İzmir, Kayseri and Kocaeli regions.

iii. Regions with the lowest innovation performances (not only modest innovator regions, because modest innovator regions were sometimes not existed as the lowest categories in different time periods in different variables) in all time periods for all variables (as patent, utility model, trademark and design applications and registrations) are Ağrı, Artvin, Bingöl, Bitlis, Erzincan, Hakkari, Kars, Siirt, Tunceli, Bayburt, Bartın, Ardahan, Iğdır and Kilis regions.

iv. The maps (Figure 5.42 – Figure 5.51) show that there is a spatial segragation / spatial polarization between the west and east of the country.

v. As can be seen from the maps (Figure 5.42 – Figure 5.51), it can be interpreted that metropolitan regions are generally more innovative.

- Five different panel data models reveal that different innovation indicators may differently affect the different types of the intellectual property rights. While one independent variable positively affects one dependent variable, it may affect the other dependent variable negatively. For example, when the results of five different panel data models are examined, ‘total cash loans’ and ‘number of teaching staff within own unit for higher education institutions’ variables have negative effects on the trademark applications, but have strikingly positive effect on the design applications (design). Likewise, ‘life-long learning’ variable positively affects utility models and design applications (design), it negatively affects patent applications (Table 5.106).

Table 5.106 : Comparison of five panel data models in determining variables affecting innovation performances of the innovation leaders (Author's own illustration).

PANEL DATA MODELS	Model 1: Fixed Effects with Arellano, Froot ve Rogers Estimator	Model 2: Fixed Effects with Clustered Estimation - vce cluster	Model 3: Fixed Effects with Arellano, Froot ve Rogers Estimator	Model 4: Random Effects with Driscoll-Kraay Estimator	Model 5: Random Effects with Arellano, Froot ve Rogers Estimator
DEPENDENT/ INDEPENDENT VARIABLES	*Utility model applications* ***lny1***	*Trademark applications* ***lny3***	*Patent applications* ***lny5***	*Design applications (file)* ***lny7***	*Design applications (design)* ***lny9***
Population size **lnx1**		2.029097***		3.478036*	
Youth dependency ratio (%) **x17**			-0.2759402**	-0.0574205**	
Gross domestic product (GDP) **lnx24**	1.64397**	0.3333544*	1.81837*		
Exports **lnx40**		0.1197249**		0.2736724**	0.7448552*
Number of enterprises **lnx50**				-2.841715*	
Total cash loans **lnx56**		-0.2490393**			1.007015*
Population aged 25-34 with tertiary education **x65**		-0.017846**		-0.0541178**	
Number of teaching staff within own unit for higher education institutions **lnx66**		-0.1576481*			0.7371715*
Life long learning **lnx74**	0.1236119**		-0.1626735*		0.2182853**
Fixed broadband penetration **x95**					
High-skilled immigration **lnx103**				-0.4485771*	
Number of cross-section	25 regions as innovation leaders	25 regions as innovation leaders	29 regions as innovation leaders	25 regions as innovation leaders	24 regions as innovation leaders

Note: Asteriks (***, **, *) denote respectively to significance at the 1%, 5% and 10% level.

Legend

Positive effects

Negative effects

6. DISCUSSIONS

An answer to the supportive question of "Are innovation performances related to the historical development processes of the innovation systems in both national and regional level?" is sought in this section.

Evaluations of different chapters show that the historical development processes of the innovation systems in both national and regional level affect the innovation performances. These effects are discussed as follows:

- **International scale:**

* The positive aspects can be listed as follows:

- Even though Turkey's innovation index is far below the EU average, its innovation growth rate is much above the EU average (Özen and Baycan, 2014).
- When the innovation performance change between 2010 and 2017 is examined, it is seen that Turkey's SII is far below the EU average. The EU has a more stable structure and that Turkey has a more pronounced change in its performance. Except decline in the year 2012, Turkey has generally increased its value.
- Compared to the annual growth rates; Turkey showed a phenomenal growth especially in 2014-2015 and partially less in 2010-2011. Average annual growth rate of Turkey is much higher than the EU's (respectively 4,57 and 0,80) (Table 5.6).
- As a comparison of SII in 2014 and 2018, the most striking issue regarding Turkey is the rise of the innovation performance group from Modest Innovator to Moderate Innovator.
- 'Firm investments' dimension is one of the best trend of Turkey in terms of performance. In fact, it has been showing success over the EU since 2014 (Figure 5.12a). One of the reason for Turkey's high performance in this

dimension is being “a positive outlier in 2012 and 2014 (European Commission, 2018a)” in terms of ‘Non-R&D innovation expenditures’ indicator which is an indicator of ‘Firm Investments’.

- For ‘Sales Impacts’ dimension, Turkey is far below the EU, but it has a much better position with respect to other dimensions as human resources, intellectual assets and employment impacts. 'Sales of new-to-market and new-to-firm innovations' indicator, which is an indicator of this dimension, is a positive outlier for 2012 (European Commission, 2018a).
- If all innovation indicators are examined, indicators with the closest to the values of the EU and Turkey are ‘International scientific co-publications per million population’ and ‘Private co-funding of public R&D expenditures (percentage of GDP)’ (Figure 5.15 d,q).
- Indicators such as ‘SMEs introducing product or process innovations as % of SMEs’, ‘SMEs introducing marketing or organisational innovations as % of SMEs’ and ‘SMEs innovating in-house as % of SMEs’ have very fluctuating performances (Figure 5.15 l,m,n). The performance of Turkey in terms of ‘SMEs introducing product or process innovations as % of SMEs’ indicator is generally below the EU except 2014 and 2015 (Figure 5.15 g). Turkey is above the EU in terms of ‘SMEs introducing marketing or organisational innovations as % of SMEs’ indicator (Figure 5.15 m) and below the EU in terms of ‘SMEs innovating in-house as % of SMEs’ Figure 5.15 n).
- Turkey’s performance in the ‘Broadband penetration’ indicator is above the EU (Figure 5.15 g).
- According to the performances in terms of the ‘Non-R&D innovation expenditures (% of turnover)’, while Turkey was one of the lowest countries and positioned below the EU until 2012, with an incredible increase in 2012 (from 0.22 to 2.59) it has positioned above the EU since 2012 and has become one of the highest two countries. According to the EU (European Commission, 2018c), Turkey has been described as positive outliers in terms of ‘Non-R&D innovation expenditures’ (in the years 2012 and 2014) and ‘Sales of new-to-market and new-to-firm innovations’ (in 2012).
- Turkey has efforts/plans/programmes to reach the vision in innovation.

- Turkey must be able to accelerate its increasing growth rate in order to close the gap and catch up the EU. Because its ability to catch the EU is not only dependent on its own performance, but also on the performance of the EU.

* The negative aspects can be listed as follows:

- According to the evaluation of the innovation dimensions, Turkey's innovation performance is far below the EU average in some innovation dimensions.
- Turkey's performance in terms of 'Human Resources' is still far below the EU, although it has a steadily rising especially after 2014 especially with a little increase in 2016 (from 0.098 to 0.137) (Figure 5.10a).
- Turkey's performance in terms of 'Research Systems' is another dimension which is also far below the EU (Figure 5.10b).
- Turkey also is far below the EU in terms 'Finance and Support' dimension (Figure 5. 11b). It has higher values than the human resources and research systems.
- Turkey is also below the EU for 'Linkages' dimension (Figure 5.13a).
- Turkey is far below the EU in terms of the 'Intellectual Assets' (Figure 5.13b). In fact, this dimension is one of the worst performance of Turkey.
- Just like Intellectual Assets, 'Employment Impacts' is one of the lowest performance of Turkey and Turkey is far below the EU (Figure 5.14a).
- Finally as a summary of all these explanations, innovation dimensions as 'Human resources', 'Employment Impacts' and 'Intellectual Assets' are the challenges of Turkey in terms of performances.
- Turkey has efforts to catch up the EU according to growth rate of the indicators which are below the EU average (Table 5.2). Performance scores (European Commission, 2014b) of human resources, research systems, firm investments, linkages & entrepreneurship, intellectual assets and economic effects are below the EU average. These dimensions require time because the effects and results of the changes in these dimensions may appear a long time.

- If all innovation indicators are examined in terms of the performance of Turkey, according to the country ranking Turkey is far below the EU and positioned at the bottom of the rank with the lowest performances in terms of indicators such as 'New doctorate graduates per 1000 population aged 25-34', 'Percentage population aged 25-34 having completed tertiary education', 'Foreign doctorate students as a % of all doctorate students', 'Public-private co-publications per million population', 'PCT patent applications per billion GDP (in PPS)', 'Trademark applications per billion GDP (in PPS)', 'Design applications per billion GDP (in PPS)', 'Employment in knowledge-intensive activities (% of total employment)' and 'Knowledge-intensive services exports as % of total services exports' (Figure 5.15 a,b,f,p,r,s,t,u,w).
- "Turkey is performing well below the average of the EU for all dimensions except Firms investments - due to high relative performance in Non-R&D innovation expenditures - and on almost all indicators. Another strong relative performance is observed for Sales share of new innovations. The most significant relative weaknesses are in License and patent revenues from abroad, Public-private scientific copublications, Community designs, and Community trademarks. In nearly all dimensions - especially Firm investments - and most indicators, performance has improved. Particularly high growth is observed for Non-R&D innovation expenditures (43%), Sales share of new product innovations (24%), PCT patent applications in societal challenges (22%), and Community trademarks (19%). The few declines in performance are minor, with the relatively largest ones in Community designs (-7.0%) and Public-private scientific co-publications (-3.6%). (European Commission, 2017c)".
- The fact that Turkey attached importance to the innovation systems later to developed countries.
- According to the EU's innovation indices, Turkey was placed in the 'modest inno-vators' group until 2016 and then moved from modest to moderate innovators by improving its innovation performances (European Commission, 2017c). Unfortunately, the country could not recently sustain its position and fell back to the group of emerging countries (European Commission, 2021a). Even though Turkey's innovation index is far below the

EU average, its innovation growth rate is much above it (European Commission, 2017c). According to its growth rate in innovation performance, Turkey is one of the countries that resisted the 2008 global economic crisis and had a rising trend mainly in indicators as 'population completed tertiary education', 'youth with upper secondary level education' and 'R&D expenditure in the business sector' (Baycan and Özen, 2018). In recent years, Turkey has made strong efforts to strengthen the innovation systems. According to the 'European Innovation Scoreboard 2018' (European Commission, 2018a), the strongest innovation dimensions of Turkey are 'Firm investments' and 'Innovators'. 'Firm investments' dimension is one of the best trends of Turkey. In terms of this dimension, Turkey got ahead of the EU with its remarkable increase in 2014 (from 0.099 to 0.568) and was located behind the leading countries such as Israel, Switzerland, Sweden, Germany, Austria, Belgium and Finland in 2017. One of the reasons for Turkey's high performance in this dimension is being "a positive outlier in 2012 and 2014 (European Commission, 2018a)" in terms of 'Non-R&D innovation expenditures' indicator. In contrast, 'Intellectual assets' and 'Employment impacts' are the weakest innovation dimensions of Turkey. Although Turkey showed little increases in some years for these dimensions, these increases could not prevent Turkey from being one of the lowest ranking countries.

- **National Scale**

* The positive aspects can be listed as follows:

- The patent is not affected by the global economic crisis in 2008 (Figure 5.17).
- The reason that accelerated the patent after 2013 may be the implementation of the new patent support program as of 01.01.2014. According to the TPI 2014 Annual Report: "The TÜBİTAK 1008 Patent Application Incentive and Support Program, which was implemented in cooperation with the TPI and TÜBİTAK on 09.21.2006, was terminated on 11.15.2013 and the new TÜBİTAK 1602 Patent Support Program was implemented as of 01.01.2014 and 2.398 requests benefited from TÜBİTAK's 1602 incentive".

* The negative aspects can be listed as follows:

- Turkey attaches importance to innovation systems later than developed countries.
- Falling behind the innovation targets specified in the development plans and not reaching the targets.
- Especially with the Turkish Science and Technology Policy: 1993-2003 document in 1993, technology policies and innovation-oriented policy designs came to the fore. (i) Donations and supports by TÜBİTAK and TTGV in terms of financing R&D investments in the 1990s, (ii) KOSGEB since 1991, in order to make technology transfer operational, to develop university-industry collaborations and to support SMEs' R&D activities. (Acar, 2008)", (iii) Turkey's inclusion in The Fifth Framework Program (1998-2002) in the EU in 1998, (iv) in the same year Providing capital support with Communiqué on Research & Development Aid (Communiqué No: 98/10) (Communiqué on Research and Development (R&D) Assistance), (v) the establishment of Development Agencies in 2006 and agency support coming into effect and (vi) In 2008; More tangible results have been achieved in terms of innovation, thanks to the financial support provided by legislation such as Law on Supporting Research and Development Activities (Law Number: 5746) and Communiqué on the Design Support (Communiqué No: 2008/2).
- Innovation-specific documents such as "Draft Information Society Strategy and Action Plan (2014-2018)", "National Science Technology and Innovation Strategy (2011-2016)" and "National Science and Technology Human Resources Strategy and Action Plan 2011-2016" have not been renewed.
- The absence of a holistic innovation-oriented strategy and policy framework, and the fact that innovation is generally handled with fragmented approaches.
- Although there are many national and regional institutions in Turkey, there is a lack of an integrated institutional framework.

- SPO, one of the most important actors of the innovation system, was abolished in 2011 and the Ministry of Development was established instead with the (Repealed) Decree-Law Number 541[22]. Turkey has entered into a new institutional structuring process after the transition to a presidential system by July 2018. Instead of the SPO, which was leading innovation with the development plans since its establishment year 1960, the Presidency of Strategy and Budget now prepares the development plans after the Presidential System. The High Planning Council (HPC), where economic, social and cultural targets and the issues that will constitute the basis for the determination of the policies were discussed, is another institution removed by the Presidential system with the Decree-Law Number: 70323.

The SPO was a structure that gained experience in terms of knowledge, skills and staff in the strategic plan of the country. At least, the SPO had mastered the targets knowing the past. The absence of the SPO can create a situation like a memory loss. There may be problems in the reorganization of that structure by deteriorating, or there may be a situation such as the deactivation of some of the past masters in the current staff.

- The impact of the new Presidential System of Turkish Republic on innovation has not yet been determined because the reflection of the new structuring that will occur in innovation performance will take time.
- It is observed that the indicators of intellectual assets except patent have fluctuating tendencies and that they were affected by the economic crisis in 2008. Although the crisis was not managed well in terms of these variables, recovery of the trend afterwards can be seen as positive.
- Utility models and trademarks were affected by the crisis in 2008 (Figure 5.18 and Figure 5.19). Design, on the other hand, was affected by the crisis in 2009 (Figure 5.20 and 5.21), later than the utility model and trademark.

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[22] Declaration on Some Committees Relating to Development. Date of Decree-Law: 3/June/2011, No: 641 Date of Authorization Law: 6/April/2011, No: 6223 Date of Official Gazette: 8/June/2011, No : 27958 Repeated.

[23] Declaration on the Change in Some Law and Legal Decisions in order to Adapt to the Amendments made to the Constitution. Date of Decree-Law: 2/July/2018 No: 703 Date of Authorization Law: 18/October/1982 No: 2709 10/May/2018 No: 7142 Date of Publication in Official Gazette: 9/July/2018 No: 30473 (3rd repeated) Published Code: Arrangement: 5 Volumes: 60

- According to Annual 2009 Report of The TPI (p. 5); “Although there was a certain amount of decrease in trademark and design applications with the impact of global crisis in 2009, the fact that these decreases are far below the world average is promising for Turkey”.
- There are huge differences between trends of patent applications and grants. Although they both have increasing trends, the increases in local patent applications do not reflect to the local patent grants (Figure 5.17).

    - Regional Scale:

* The positive aspects can be listed as follows:

- Ensuring the existence of universities in each region, each with "a university in each province" policy. Many state and mostly foundation universities have been rapidly established after "a university in each province" policy with the law no 5467 in 1st March 2006.
- There is a rapid increase in the number of the R&D centers after 2016 with the general communique within the framework of the legal regulation. Only 219 of the 1213 R&D centers have a document date before 2016. Incredible increase in the number of the R&D centers after 2016 can be associated with the General Communiqué on the Law 5746 on the Support of the Research, Development and Design Activities[24].
- The deficiency in the law numbered 5746 is eliminated with the law number 6676 dated 16.02.2016 and the phrase 'design' is included in the first sub-article of the Article 1 of the law and thus the design gains a legal dimension. With this legal dimension, the fact that design centers started to be established in 2016 is important for innovation.
- The Regional Innovation Systems approach have only been on the agenda in Turkey since the 2000s. (The declaration of Turkey as an official candidate in the EU with the 1999 Helsinki Summit, Turkey, in consequence of the EU Cohesion Policy; Accepting the NUTS classification and defined its new regions compatible to NUTS in 2002 by the Decree of the Council of

[24] General Communiqué on the Law 5746 on the Support of the Research, Development and Design Activities, Official Gazette Date: September 30/2016, Official Gazette Date: September 30/2016, Official Gazette Number: 29843

Ministers numbered 4720 on 28th September 2002 and deciding to establish the DAs with a result of the Law on the Establishment, Coordination and Duties of Development Agencies numbered 5449 on 25th January 2006 (published in Official Gazette on 8th February 2006 with number 26074); Mersin and Eskişehir RIS Projects within the scope of the IRE Network in 2005 (Metin, 2010); Preparation of regional plans in 24 of the 26 NUTS II regions under the coordination of the DAs in the 2011 Progress Report (European Commission, 2011b: p. 82); The production of regional innovation strategy documents in two RDAs (İZKA and OKA) in 2012).

- In 2012, İZKA and OKA, two of the RDAs, created the regional innovation strategy documents for their regions and were a model for other RDAs in this regard (Figure 4.11).

* The negative aspects can be listed as follows:

- Turkey has given late importance to the regional innovation system approach.
- Existence of planned TDZs that could not be completed in a long time. Unfortunately, it is observed that some of the technology development zones whose infrastructure is still in progress have a long history, but are still not operational. These are the ASO Technopark Technology Development Zone in Ankara, which was established in 2008, the Finance Technopark Technology Development Zone in İstanbul, which was established in 2014, Karaman Technology Development Zone in Karaman and Muğla Technology Development Zone in Muğla which were established in 2015.
- Firms in the TDZs, R&D centers and Design centers are agglomerated only in certain sectors. For example firms in TDZs are agglomerated in the ‘Computer Programming Activities’ (Table 4.3), R&D centers in the 'Machinery and Equipment Manufacturing', 'Automotive Sub-Industry', 'Software', 'Computer and Communication Technologies', 'Electric-Electronic', 'Textile' and 'Chemistry' sectors (Figure 4.4) and design centers in the ‘Textile’, ‘Engineering/Architectural Activities’, ‘Manufacturing Industry’ and ‘Machinery and Equipment Manufacturing’ sectors (Figure 4.6).

i. In terms of sectoral distribution, the majority of the firms (there are a total of 5472 firms in Turkey) in TDZs in Turkey (41%) are on the computer programming activities (Table 4.3).

ii. According to the sectoral distributions of the 1213 R&D centers in Turkey, 'Machinery and Equipment Manufacturing (176)', 'Automotive Sub-Industry' (129), 'Software' (110), 'Computer and Communication Technologies' (80), 'Electric-Electronic' (77), 'Textile' (77) and 'Chemistry' (71) sectors come to the fore (Figure 4.4).

iii. According to the sectoral distribution of 356 Design Centers, the highest number of sectors are in 'textile' (65), 'engineering/architectural activities' (48), 'manufacturing industry' (43) and 'machinery and equipment manufacturing' (32) sectors (Figure 4.6).

- Agglomeration of innovation-oriented institutions and centers, especially in the largest metropolitan regions.

i. Universities and institutes of technology: İstanbul (61), Ankara (21), İzmir (10) (Figure 4.1), As of June 2019 the units as Universities and Institutes of Technology in Turkey increased to 207 in total. When the distribution of the units as Universities and Institutes of Technology by regions at NUTS-3 level is examined, İstanbul takes the lead with 61 universities. Ankara and İzmir follows İstanbul respectively with 21 and 10 universities (Figure 4.1).

ii. TDZs: İstanbul (11), Ankara (10), Kocaeli (5), İzmir (4) (Figure 4.2). As of November 2019, there are a total of 85 technology development zones in Turkey. The spatial distribution of these zones are 11 in İstanbul, 10 in Ankara, 5 in Kocaeli, 4 in İzmir, 2 in Konya, Gaziantep, Antalya, Mersin and Hatay, 1 each in Kayseri, Trabzon, Adana, Erzurum, Isparta, Eskişehir, Bursa, Denizli, Edirne, Elazığ, Sivas, Diyarbakır, Tokat, Sakarya, Bolu, Kütahya, Samsun, Malatya, Urfa, Düzce, Çanakkale, Kahramanmaraş, Tekirdağ, Van, Çorum, Manisa, Niğde, Burdur, Yozgat, Kırıkkale, Balıkesir, Karaman, Muğla, Afyonkarahisar, Aydın, Batman, Osmaniye, Zonguldak, Karabük, Nevşehir, Çankırı, Kastamonu,

Kırklareli, Giresun and Rize (Figure 4.2). 66 of these 85 TDZs continue their activities and 19 of them have not started to operate due to the ongoing infrastructure works (Figure 4.2).

iii. R&D Centers: İstanbul (414), Bursa (129), Kocaeli (127), Ankara (115) and İzmir (88) (Figure 4.3). As of November 2019, there are 1213 R&D centers in Turkey. When the spatial distribution of the R&D centers by regions is examined, the regions of İstanbul (414), Bursa (129), Kocaeli (127), Ankara (115) and İzmir (88) are located in the upper ranks, respectively (Figure 4.3).

iv. Design Centers: İstanbul (167), Ankara (41), İzmir (29), Bursa (26) (Figure 4.5). According to the distribution of design centers by regions (at NUTS-3 level), only 25 regions have design centers. These regions are given according to their numerical majority: İstanbul (167), Ankara (41), İzmir (29), Bursa (26), Denizli (20), Kocaeli (18), Tekirdağ (13), Adana (8), Konya (5), Manisa (4), Gaziantep, Kütahya and Sakarya regions (3), Aydın, Eskişehir, Kayseri and Düzce regions (2) and finally Amasya, Antalya, Giresun, Mersin, Kırklareli, Kahramanmaraş, Niğde and Yalova regions (1).

- There are too many regions without R&D (32 regions) and design centers (56 regions).

    i. There are 32 regions (at NUTs 3 level) without R&D centers. These regions are Afyonkarahisar, Ağrı, Artvin, Bingöl, Bitlis, Diyarbakır, Edirne, Erzurum, Giresun, Gümüşhane, Hakkari, Kars, Kastamonu, Kırşehir, Mardin, Muş, Nevşehir, Rize, Siirt, Sinop, Tokat, Tunceli, Van, Yozgat, Bayburt, Kırıkkale, Batman, Şırnak, Bartın, Ardahan, Iğdır and Kilis (Figure 4.3).

    ii. Regions (56 regions) as Adıyaman, Afyonkarahisar, Ağrı, Artvin, Balıkesir, Bilecik, Bingöl, Bitlis, Bolu, Burdur, Çanakkale, Çankırı, Çorum, Diyarbakır, Edirne, Elazığ, Erzincan, Erzurum, Gümüşhane, Hakkari, Hatay, Isparta, Kars, Kastamonu, Kırşehir, Malatya, Mardin, Muğla, Muş, Nevşehir, Ordu, Rize, Samsun, Siirt, Sinop, Sivas, Tokat, Trabzon, Tunceli, Şanlıurfa, Uşak, Van,

Yozgat, Zonguldak, Aksaray, Bayburt, Karaman, Kırıkkale, Batman, Şırnak, Bartın, Ardahan, Iğdır, Karabük, Kilis and Osmaniye do not have a design center (Figure 4.5).

- It is a problem that regions that stand out with some of their features and sectors do not have an innovation center related to that sector. It is disappointing that there is no R&D center for mining in a region such as Zonguldak that stands out with mining. So the problem is that existing values cannot be transformed into potential in terms of contribution to improving innovation performances of such regions.
- Regional institutional structure for innovation is very lacking in the east of the country.

  i. The regions without the TDZs are concentrated in the east of the country.

  ii. The regions without the R&D centers are concentrated in the east of the country (almost no R&D center except for a few metropolitan regions in the east of Ankara, this is also the case in design centers).

  iii. The design centers are also concentrated in the west of the country and there are a few design centers in the east (Just like in R&D centers, there are almost no centers in the east of Ankara except for two or three metropolitan regions).
- There is a huge numerical difference in terms of the enterprises such as İstanbul (944954), Ankara (283076), İzmir (238802), Antalya (159407), Bursa (153435). On the contrary, Gümüşhane (4959), Ardahan (3511), Tunceli (3419) and Bayburt (3091) regions (Figure 4.7).
- There are very few science centers, especially those within the scope of the 4003 Science Center Establishment Support Program. There are 6 TÜBİTAK Science Centers within the scope of the 4003 Science Center Establishment Support Program (Figure 4.8).
- Although İZKA and OKA created the regional innovation strategy documents for their regions and they were a model for other RDAs in this regard, it is a

problem that a limited number of the DAs follow these agencies and create their innovation strategies but could not spread them to the general. Only 14 of 26 RDAs have the regional innovation strategy (Figure 4.11).

- There are many regions that cannot obtain patent registration for any year. When descriptive statistics of the patent grants are examined per each year between the years 2000 and 2017, it is seen that Artvin, Erzincan, Hakkari, Tunceli and Bayburt regions could not obtain patent grants in any year.
- When the utility model grants between the years 2000 and 2017 are examined, the region of Ağrı does not have any registration.
- Within the scope of design applications (file), Bitlis region did not make any design applications between the years 2000 and 2017.
- Tunceli region has no design registration (file) for any year.
- There are no design applications (design) for any year in Bitlis region.
- Tunceli region has no design registration (design) for any year.
- In the detailed descriptive statistics analysis of the variables of intellectual assets, although there is a close to normal or normal distribution in some years or some periods very rare, it was observed that the data were not distributed normally and showed a severely right-skewed distribution in general.
- Markov Chains based on Methodology 2, which used to to investigate the changes of states in innovation performances of the regions in different time periods in this study, has revealed that there are regional disparities (at NUTS-3 level) in terms of innovation performances in Turkey. When the innovation performance groups obtained with Markov Chains are visualized with mapping, the following spatial inferences are made:
    i. There are regional disparities (at NUTS-3 level) in terms of innovation performances in Turkey.
    ii. The innovation leaders with the highest innovation performances in all time periods for all variables (as patent, utility model, trademark and design applications and registrations) are Ankara, Bursa, İstanbul, İzmir, Kayseri and Kocaeli regions.

iii. Regions with the lowest innovation performances (not only modest innovator regions, because modest innovator regions were sometimes not existed as the lowest categories in different time periods in different variables) in all time periods for all variables (as patent, utility model, trademark and design applications and registrations) are Ağrı, Artvin, Bingöl, Bitlis, Erzincan, Hakkari, Kars, Siirt, Tunceli, Bayburt, Bartın, Ardahan, Iğdır and Kilis regions.

iv. The maps (Figure 5.42 and Figure 5.51) show that there is a spatial segragation/ spatial polarization between the west and east of the country.

v. As can be seen from the maps (Figure 5.42 and Figure 5.51), it can be interpreted that metropolitan regions are generally more innovative.

- Five different panel data models reveal that different innovation indicators may differently affect the different types of the intellectual property rights. While one independent variable positively affects one dependent variable, it may affect the other dependent variable negatively. For example, when the results of five different panel data models are examined, 'total cash loans' and 'number of teaching staff within own unit for higher education institutions' variables have negative effects on the trademark applications, but have strikingly positive effect on the design applications (design). Likewise, 'life-long learning' variable positively affects utility models and design applications (design), it negatively affects patent applications (Table 5.106).

7. CONCLUSIONS

Turkey must deeply focus on and spent much more efforts on the afore-mentioned innovation dimensions. The reasons that Turkey being a large and diverse country and also an emerging country with a higher growth rate in terms of innovation performances and having some challenges on innovation increase the need for and importance of innovation-related research (Özen and Baycan, 2022b).

Policies and strategies for improving innovation systems of Turkey at international, national and regional levels are considered in this chapter that is structured by the supportive questions as follows:

- "What kind of process should be followed to improve Turkey's innovation performance at international, national and regional levels?" and
- "What kind of studies may be done for the future?"

7.1 Conclusions

Since a knowledge/science/technology/skills-intensive global competitive structure is changing, developing and transforming rapidly, challenges on innovation make the innovation systems and policies varied both in national and regional levels.

In today's conditions, also known as the knowledge society, every structure from micro to macro scale (firm, region, nation etc.) strives in this competitive structure with different responses and reactions in such a way that some try to create changes by pioneering, while others try to recognize, follow and adapt these changes. Therefore, countries and regions create policies, strategies and plans in order to establish and manage effective innovation systems (Özen and Baycan, 2015). Success in innovation performances is only possible by establishing and managing an effective innovation system.

As a conclusion of this thesis, the literature review and findings of the empirical studies of this thesis reveal that Turkey has some efforts and challenges in terms of

innovation components at national and regional scale in this knowledge/science/technology/skills-intensive global competitive structure.

In this section, the conclusions and recommendations of the thesis will be stated in the context of the research and explanatory questions of the thesis (Section 1.2).

Regional Institutional Structure, Descriptive Statistics and Markov Chains based on Methodology 2 which used to to investigate the changes of states in innovation performances of the regions in different time periods in this study, has revealed that there are regional disparities (at NUTS-3 level) (i. between regions located in the east and west of the country, ii. between metropolitan regions and non-metropolitan regions, iii. between high-developed regions and less-developed regions in terms of socio-economic development) in terms of innovation performances in Turkey.

The innovation leaders with the highest innovation performances in all time periods for all variables (as patent, utility model, trademark and design applications and registrations) are Ankara, Bursa, İstanbul, İzmir, Kayseri and Kocaeli regions.

Regions with the lowest innovation performances (not only modest innovator regions, because modest innovator regions were sometimes not existed as the lowest categories in different time periods in different variables) in all time periods for all variables (as patent, utility model, trademark and design applications and registrations) are Ağrı, Artvin, Bingöl, Bitlis, Erzincan, Hakkari, Kars, Siirt, Tunceli, Bayburt, Bartın, Ardahan, Iğdır and Kilis regions.

There is a spatial segragation / spatial polarization between the west and east of the country (Figure 5.42 – Figure 5.51).

It can be interpreted that metropolitan regions are generally more innovative (Figure 5.42 – Figure 5.51).

Innovation performances showed increases not only in the metropolitan regions but also in the regions next to them. The fact that the increase in innovation performance is not limited to the metropolitan regions but also in the regions adjacent to the metropolitan regions indicates the existence of spatial convergence in terms of innovation.

One of the reasons why many regions have increased their innovation performances in the last two time periods in Markov Chains may be the fact that these regions have

a university or increase the number of existing universities with the policy of “one university with each”. Because many state and mostly foundation universities have been rapidly established after "a university in each province" policy with the law no 5467 in 1st March 2006. 41 regions, which did not have a university before 2006, have gained universities in the following years with this policy. 15 of these 41 regions gained their first universities in 2006 (Adıyaman, Amasya, Burdur, Çorum, Erzincan, Giresun, Kastamonu, Kırşehir, Ordu, Rize, Tekirdağ, Uşak, Yozgat, Aksaray and Düzce); 17 in 2007 (Ağrı, Artvin, Bilecik, Bingöl, Bitlis, Çankırı, Kırklareli, Mardin, Muş, Nevşehir, Siirt, Sinop, Karaman, Batman, Karabük, Kilis, and Osmaniye) and finally 9 in 2008 (Gümüşhane, Hakkari, Tunceli, Bayburt, Şırnak, Bartın, Ardahan, Iğdır and Yalova). Another reason why the regions have recently increased their innovation performances in the last time period in Markov Chains may be that some regions have gained metropolitan region status with the Law No: 6360[25]. Because regions as Aydın, Balıkesir, Denizli, Hatay, Malatya, Manisa, Kahramanmaraş, Mardin, Muğla, Tekirdağ, Trabzon, Şanlıurfa and Van regions became metropolitan regions in 2012. This assumption can be supported by the rise of related regions from different groups to an upper group in the last time period in different variables as follows:

* patent applications (Şanlıurfa from moderate innovators to strong innovators; Aydın, Hatay, Trabzon from strong innovators to innovation leaders)

* patent grants (Malatya from moderate innovators to innovation leaders; Aydın, Hatay, Trabzon from strong innovators to innovation leaders)

* utility model applications (Van from modest to moderate innovators; Hatay, Kahramanmaraş, Muğla from strong innovators to innovation leaders)

* utility model grants (Hatay, Kahramanmaraş, Muğla from strong innovators to innovation leaders)

[25] ‘The Law on the Establishment of Metropolitan Municipalities and Twenty-Six Districts in Thirteen Provinces and Amendments on Some Laws and Decree Laws’ 2012., Law No: 6360, Date of Approval: 12 November 2012, Date of Publication on the National Gazette: 6 December 2012 No: 28489. 2012. Available online: https://www.resmigazete.gov.tr/eskiler/2012/12/20121206-1.htm (accessed on 12 August 2017). (In Turkish)

* trademark applications (Kahramanmaraş, Tekirdağ, Trabzon, Şanlıurfa from strong innovators to innovation leaders)

* trademark registrations (Kahramanmaraş, Trabzon, Şanlıurfa from strong innovators to innovation leaders)

* design applications (file) (Balıkesir, Tekirdağ, Trabzon from strong innovators to innovation leaders)

This assumption cannot be supported for design applications (file) for Mardin which moved from moderate innovators to modest innovators.

* design registrations (file) (Balıkesir, Tekirdağ, Trabzon from strong innovators to innovation leaders)

* design applications (design) (Balıkesir, Kahramanmaraş from strong innovators to innovation leaders)

This assumption cannot be supported for design applications (design) specific to some regions because the innovation performances of some regions that have metropolitan region status have recently decreased such as Malatya and Mardin declined from moderate innovators to modest innovators and Şanlıurfa from strong innovators to moderate innovators.

* design registrations (design) (Balıkesir, Kahramanmaraş, Trabzon from strong innovators to innovation leaders).

The increase in innovation performances may sometimes be related to shining through the collaboration and cooperation of the local administration, NGOs and public-private actors of the region. With such a collaborative governance approach, the region can accelerate its region compared to other regions.

So, what are the common features of these high innovation performance regions and low innovation performance regions within themselves?

Regions that are innovation leaders for all time periods of all variables, Ankara, Bursa, İstanbul, İzmir, Kayseri and Kocaeli regions, are all metropolitan regions.

Results of the analysis show that metropolitan regions have higher performance in innovation. Although the innovation leaders are generally the same metropolitan regions, there may be some changes in their positions in the system due to different

variables. Innovation leaders which are unique for all indicators and all time periods are Ankara, Bursa, İstanbul, İzmir, Kayseri and Kocaeli regions, are all metropolitan regions. There is a certain fact for each variable in all time periods that İstanbul takes the lead in the innovation performance.

These regions are at an advanced level of socio-economic development and center of attraction compared to other regions. In addition to creating innovation activities, these regions have the social and economic strengths to attract investments and specialized high-skilled innovation staff to their regions.

Considering the historical development process, the roles of the regions in the country within the scope of the settlement system and socio-economic development levels were also examined.

In this context, "State aids in investments and other supports provided to priority regions in development" in 2000 (SPO, 2000) shows that the regions in the first stage and defined as developed regions are İstanbul and Kocaeli provinces, and the areas within the boundaries of metropolitan municipality of Adana, Ankara, Antalya, Bursa and İzmir. There are two different issues in this list: (i). Although Adana and Antalya regions, which defined as developed regions in 2000, were innovation leaders or most variables in the Markov Chains, they do not have this feature for all variables in all time periods in terms of innovation performances. (ii) Another issue is the Kayseri region. Even though Kayseri is one of the regions defined as normally developing regions in 2000, it is a remarkable region that is the innovation leader for all variables in Markov Chains in terms of innovation performance.

In the "Research of Socio-Economic Development Ranking of Provinces and Regions (SEGE-2011)" study of the Ministry of Development (2013), İstanbul, Ankara, İzmir, Kocaeli, Antalya, Bursa, Eskişehir and Muğla were the regions within the scope of the First Stage Developed Regions. As can be seen, while İstanbul, Ankara, İzmir, Kocaeli and Bursa are innovation leaders in terms of innovation performance, Antalya, Eskişehir and Muğla have not been innovation leaders for all time periods of all variables. Kayseri region, which is the innovation leader for all time periods of all variables, was the Second Stage Development Region according to this study.

Again, the “Research of Socio-Economic Development Ranking of Provinces and Regions (SEGE-2017)" was carried out by the Ministry of Industry and Technology in 2019. First Stage Developed Regions were consisted of İstanbul, Ankara, İzmir, Kocaeli, Antalya, Bursa, Eskişehir, Muğla ve Tekirdağ regions. As can be seen, while İstanbul, Ankara, İzmir, Kocaeli and Bursa are innovation leaders in terms of innovation performance, Antalya, Eskişehir, Muğla and Tekirdağ regions have not been innovation leaders for all time periods of all variables. Kayseri region, which is the innovation leader for all time periods of all variables, was again located in the Second Stage Development Regions.

These innovation leaders are the regions where regional institutional structuring also stands out in terms of innovation.

Regions with the lowest innovation performances in all time periods for all variables (as patent, utility model, trademark and design applications and registrations), which are Ağrı, Artvin, Bingöl, Bitlis, Erzincan, Hakkari, Kars, Siirt, Tunceli, Bayburt, Bartın, Ardahan, Iğdır and Kilis regions, have lower socio-economic development levels compared to other regions. According to the SPO (2000), Ağrı, Ardahan, Artvin, Bartın, Bayburt, Bingöl, Bitlis, Erzincan, Iğdır, Kars and Kilis regions were the priority regions for development and Hakkari, Siirt and Tunceli were the regions within the scope of state of emergency regions. Similar to this, in the "Research Socio-Economic Development Ranking of Provinces and Regions (SEGE-2011)" study of the Ministry of Development (2013), (i) Artvin, Bartın and Erzincan regions were in the Fourth Stage Developed Regions, (ii) Tunceli, Kilis and Bayburt regions were in the Fifth Stage Developed Regions, and finally Ağrı, Bingöl, Bitlis, Hakkari, Kars, Siirt, Ardahan and Iğdır regions were in the last group as the Sixth Stage Developed Regions. The study (Ministry of Development, 2013) stated that all of the provinces in the 6th group are located in the East and Southeast Anatolia Regions.

According to the “Research of Socio-Economic Development Ranking of Provinces and Regions (SEGE-2017)" (Ministry of Industry and Technology, 2019), ranking was the same as in the previous study as (i) Artvin, Bartın and Erzincan regions were in the Fourth Stage Developed Regions, (ii) Tunceli, Kilis and Bayburt regions were in the Fifth Stage Developed Regions and finally Ağrı, Bingöl, Bitlis, Hakkari, Kars, Siirt, Ardahan and Iğdır regions were in the last group as the Sixth Stage Developed Regions.

This situation shows that innovation performance and socio-economic development may be parallel with some exceptions.

In short, the similar features of these regions are not only having low innovation performances but also being identified as 'priority regions in development' or 'state of emergency regions' in various national studies in different years.

Although some political decisions had already been taken for the development of these regions, identified as 'priority regions in development' or 'state of emergency regions', it is figured out from the performance measurements that the efforts to realize this have not been fully rewarded, especially in terms of innovation.

The reason for this can be shown that the investments and incentives made to the regions have not been realized properly for the purpose and on-site use (Sarı and Güven, 2007: p. 89; Çakır Sümer and Özcan, 2011: p. 110)[26].

In conclusion this study illustrates the innovation performances of Turkish regions/provinces both considering by their positions in the system and also their positions with each other.

Five different panel data models, which were performed to identify the determinants of the innovation performances, reveal that different innovation indicators may differently affect the different types of the intellectual property rights.

While one independent variable positively affects one dependent variable, it may affect the other dependent variable negatively. For example, when the results of five different panel data models are examined, 'total cash loans' and 'number of teaching staff within own unit for higher education institutions' variables have negative

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[26] Within the scope of the five-year development plans that started with the planned period in the 1960s, 'Priority Regions in Development (PRDs)' and incentive applications were carried out in order to resolve the disparities between the regions (Oskay and Kubar, cited in Keskin and Sungur, 2010: p. 282). In this context, development plans include objectives, principles and policies for the development of priority regions in economic, social and cultural aspects and thus reducing the disparities between these regions and other regions over time in terms of development (Düzakın and Kıran Bulğurcu, 2010: p. 2)". However, academic studies, that analyze policies for priority regions in development with various indicators, revealed that there is a problem in the policies implemented (Düzakın and Kıran Bulğurcu, 2010: p. 14) and that despite these policies, the desired success can not be achieved (Çakır Sümer and Özcan, 2011: p. 102; Sarı and Güven, 2007: p. 89) and the desired and expected development rate could not provided (Arslan, 2005: p. 1).
Reasons for the ineffectiveness of policies for priority regions in development can be summarized as follows from previous academic studies: "indirect and direct resources transferred to regions within the context of PRD cannot remain in these provinces (Sarı and Güven, 2007: p. 89; Çakır Sümer and Özcan, 2011: p. 110)". It was seen that "these resources could not be prevented from going out of the regions within the scope of the PRD (Sarı and Güven, 2007: p. 88)" and "especially in the planned period, although the public tried to steer the resource allocation directly and indirectly, the factors that shaped the development process were concentrated in the West. (Çakır Sümer and Özcan, 2011: p. 102)".

effects on the trademark applications, but have strikingly positive effect on the design applications (design). Likewise, 'life-long learning' variable positively affects utility models and design applications (design), it negatively affects patent applications (Table 5.106).

7.2 Recommendations

The fact that Turkey attached importance to the innovation systems later to developed countries caused Turkey to remain far behind the EU for most innovation variables. Even though Turkey's innovation index is far below the EU average, its innovation growth rate is much above the EU average (Özen and Baycan, 2014) and Turkey is trying to close the gap. Although Turkey has a resilient structure for some innovation variables (Section 5.3), it has been observed that intellectual assets except patent were affected by the global economic crisis in 2008. While the crisis is not managed well, recovery immediately afterwards can be seen as positive. In order to close the gap and catch up the EU, Turkey must be able to accelerate its increasing growth rate. Because its ability to catch the EU is not only dependent on its own performance, but also on the performance of the EU. If Turkey can achieve to accelerate its innovation systems in terms of the performances of various innovation indicators, Turkey can close the gap with the EU and be less affected by other possible crises and exhibit a resilient structure.

The fact that falling behind the innovation targets specified in the national development plans and not achieving the targets is not only a problem at the national level, but also affects the innovation performance of the country, national trends and also affects the innovation performance of the regions depending on the national trends. Failure to revise innovation strategies and action plans at the national level has spatial consequences on innovative actions. The lack of a holistic innovation-oriented strategy and a policy framework, and the fact that innovation is generally considered with partial approaches is an important problem. Although there are many institutions at national and regional level in Turkey, the absence of a holistic institutional framework for the realization of important goals for innovation reveals the importance of coordination and cooperation.

Although Turkey has efforts/plans/programmes to reach the vision in innovation, various special measures should be taken in terms of innovation performances in order to reduce the increasing regional differences/disparities in Turkey.

Interactions of "all important economic, social, political, organizational, institutional, and other factors etc." (Edquist, 1997b: p. 14), which are indispensable components of innovation systems, play a crucial role. Therefore, correct and effective political, legal, institutional and financial measures and solutions should be taken in all regions (not only for priority regions, but especially in all regions with lowest performances). Hence, the interaction and coordination of local actors (firms, universities, public research facilities and technology development zones/centers etc.) in the regions is a vital importance for the innovation process to be effective. Awareness of innovation culture among local actors needs to be increased.

Since the dynamics and characteristic features of regions such as local innovation assets, cultural norms, social rules, habits, history etc. differ, there should be no uniform vision, mission, policy and practices in the regions with lowest performances. It is necessary to implement, monitor and audit unique and place-based innovation policy designs in these regions (where local knowledge, dynamics stand out). Besides, the investment decisions must be made for the purpose and on-site. One of the most important factors in the innovation process is the provision of investment and financial support and the effective and efficient use of the financial resources created. Access to public and private funding sources (incentives, supports, programs, investments, etc.) should be facilitated.

On the other hand, these requirements also apply to the 'innovation leaders' regions with high innovation performances. In addition, these 'innovation leaders' regions especially need to keep their progressive efforts at the forefront of their priority goals rather than maintaining their status. Because maintaining the status marks the beginning of decline. Only in this way, can they sustain their successes in innovation. Thanks to these resilient structures, they can survive possible effects of unexpected situations arising from both internal and external (national or global) dynamics of the region. A way of ensuring sustainable regional development is to provide a sustainable regional innovation system with the local dynamics and interactions based on (i) the sectoral specializations of production, creativity, entrepreneurship and human capital; (ii) patterns of knowledge/science/technology/skills; and (iii) strong governance mechanisms with collaboration of various actors.

Success establishing and managing an effective regional innovation system is related to building an effective innovation process. As a first step of the innovation process, the problem identification of the region should be clearly defined in terms of the innovation systems and performances. Therefore, the reasons and determinants why the innovation performance of the region could not be better should be examined. Current situation analysis should be realistic. In the context of current situation analysis, the internal and external components of the region should be considered. All important physical/spatial, economic, social and cultural, and other characteristic features of regions constitute the internal dynamics. Physical and spatial features may be the size of the region, local products, geographical signs, geographical proximity to more innovative regions etc. Economic features may be the level of development, the market status, local pattern diversity of economic specialization, such as industrial, sectoral, scientific and technological specialisation in production, trade, knowledge and service, different sectoral trends and industrial clusters. Social and cultural features consist of the cultural norms, social rules, habits, history, amenities, high-quality of life, well-being, human capital etc. External dynamics includes global trends, national trends, investments and trade openness, etc.

A holistic innovation approach including a defined regional innovation vision, comprehensive innovation strategic goals, appropriate policy packages and action plans should be improved (Figure 7.1). In order to achieve the defined regional innovation vision, the creation of strategic goals, objectives and actions should be realistic by considering the current situation analysis and innovation capacity. The processes defined in the stages in the action plans should not be delayed due to various reasons such as lack of infrastructure, labor and financial insufficiencies. Therefore, monitoring and evaluation mechanisms, impact assessments, performance measurements gain importance after the implementation of the policies and action plans. Monitoring and evaluation mechanisms should also have a deadline definition.

Human capital is an important driving force that increases economic development and growth. Within the scope of human capital, individuals' knowledge, skills, abilities, education and experiences should not only be seen as an element that will increase production, but also should be considered as a requirement of the nature of the innovation process and the direction and speed of the diffusion of innovation. For this reason, it is necessary to increase the development and effective use of human

capital by employing high-skilled labor based on merit. The role of human capital in innovation is related to the factors as (i) their research and innovation culture, (ii) research and innovation systems, environment and infrastructure in the public and private sectors, (iii) the working conditions, (iv) incentive financial supports and (v) the amenities, high-quality of life and well-being in the region.

Raising high-qualified human capital with a research culture is indispensable for the innovation process and efficiency. Not only countries and regions, but also it is important to establish the ability of individuals to develop themselves, to create their skills and competence, and to increase the level of awareness on innovation. In this respect, concept of life-long learning and vocational education based on continuous learning, self-improvement and self-renewal are important. The open, attractive research and innovation systems should be strengthened in accordance with the requirements and priorities of today's knowledge/science/technology/skills-intensive global competitive structure. Innovation-friendly environments will be created and developed by widening and improving the effective use of information and communication technologies. Research and innovation infrastructure of public and private sector organizations should be established and developed. Working conditions of high-qualified staff (academics/researchers/innovators etc.) in R&D and innovation activities in the public-private sector should be improved. The research and innovation income of the universities, research and innovation centers etc. in the region should be increased and financially supported. Attractive financial mechanism such as supports, incentives, premiums, scholarship, project revenues, etc. should be created the staff beyond the fixed salary income.

A high level of amenities, quality of life, and well-being should be increased in the regions because amenities and their relationships to socioeconomic development and growth reflect the innovation performances. It is not possible to attract students, specialized staff and investments in a city without amenities and high-quality of life. These are factors that will enable high-skilled labor to stay in the city and create an attraction center effect. Lack of amenities is the one of the reason why the regions in the east of Ankara, except for a few metropolitan regions, have low performance in terms of innovation.

Unless these factors are not provided, human capital may go abroad. Prevention of brain drain should not be seen as sufficient, on the contrary, brain return and brain gain should be targeted.

Further the human capital, innovation culture needs to be settled and developed in society. Since innovation is a new concept for some parts of the society, it is necessary to build and increase the level of awareness on science, technology, research and innovation culture in the society.

Starting from primary school, children and young people should be raised with this innovation awareness, their motivation should be increased by bringing them together with inspiring successful role models, and sectoral competitions should be organized for encouragement. In order to raise awareness of innovation in society, effective innovation announcements should be done for existing Turkey Innovation Week to be known by all parts of society.

In order to be successful in innovation, not only qualified researchers in R&D and innovation activities are needed, but also the same quality of semi-skilled workers. For this, the qualifications of vocational and technical high-schools and vocational schools should be upgraded and their curriculums should be revised by giving priority to R&D and innovation. It is important to increase the quality of semi-skilled workers with continuous vocational training and increase their number quantitatively. In this context, domestic and international visits and trainings are important in terms of following global trends and practices.

Universities and higher education institutions play an effective role in innovation systems in terms of producing, using, diffusing, transfering and commercializing the knowledge, raising the high-skilled human capital and working towards the needs of the society. Effectiveness of quantity and quality of universities must be increased. Increasing the number of universities with 'one university with each' policy can be seen as a positive step for the innovative structure. Rather than the numerical size, the quality of universities is more important for Turkey, which was a moderate innovator and currently an emerging country, to catch up the innovation leaders. This policy would not be successful without ensuring the high-skilled human capital, open and attractive research and innovation environment and infrastructure, and also strong financial mechanism. In order for public and private universities to fulfill their

effective roles, their curriculums should give priority to R&D and innovation issues, especially in line with the needs of the priority sectors in their regions, their faculties and departments should be accredited, and they should have advanced research and innovation infrastructures. As previously mentioned, working conditions and attractive financial mechanisms should be improved for the high-qualified staff (academics/researchers/innovators etc.) of the university. The interactions of universities should be increased and intensed innovation collaborations should be established with both regional universities and the public sector and with the private sector. As a requirement of this, an inventory of academicians/researchers/companies etc. in the institutions at national and regional scale should be created before the innovation collaborations. It is essential to increase the level of awareness in producing, developing and cooperating joint projects for innovative goals.

It is necessary to increase the collaboration and interactions, not only among the organizations but also among the regions. In order to increase its innovation performance, an innovative region can provide an effort to make its neighboring regions innovative, or the other regions make efforts to create an innovative structure to reach these innovation leaders. Transforming competitive advantage into innovative activities by supporting collaboration and partnership ensures success in the innovation performance of regions.

These interactions and flows among the actors and the regions in the innovation system are important not only for the formation of human capital for the needs of the public and private sectors of the region, but also for the promotion of local production and the commercialization of local products.

Supporting value-added products by determining the priority sectors and sector trends in the regions and increasing the production of high-tech products in areas such as biotechnology, nanotechnology and material technology is only possible with ensuring smart specialization in region-specific creative industries, developing the clusters based on R&D and innovation, and encouraging entrepreneurship.

Firms, regions, nations differ depending on the pattern diversity of economic specialization such as industrial, sectoral, scientific and technological specialisation in production, trade, knowledge and services.

Market status gains importance in economic development&growth and beyond in innovation in terms of trade openness, exports and attracting the investments. For this reason, it is necessary to ensure that market researches can be carried out regularly and to improve the market conditions in order to access wide market opportunities. Expanding the market size and potential, increasing the market diversity, attractiveness and growth rate, ensuring the easy access to markets and building easy mobility in market are important. It is essential to create a strong structure and increase competitiveness in the market. It is necessary to increase companies' market entry, efficiency and cooperation-network development potential. In order to increase the share and success in the markets, foreign trade policies should be constantly reviewed and updated by considering global trends.

Support for licensing and commercialization of intellectual property rights (patent, utility model, brand, design, geographical signs) should be provided. Measures to protect intellectual property rights are important. Effective regulatory framework could be one of these measures. With the law numbered 6676 in 2016, the design gained a legal dimension. Then, with legal frameworks supporting R&D and design, such as "General Communiqué on the Law 5746 on the Support of the Research, Development and Design Activities", design centers began to be established after 2016 and the number of R&D centers increased. The reflections of the increase in patent in 2013 and the increase in R&D and design in 2016 may be positive and can contribute to the regions in terms of intellectual values in the future.

‘Innovation Systems’ is an effective tool for examining the national and regional economies and innovative performances and policy-making.

Success of establishing and managing an effective innovation structure is related to the institutional and organizational profile, the intensity of interactions and network of the actors in the innovation systems, the flows of knowledge, resources and human capital and to product the vision and policies. Because the system includes networks, the system's effectiveness and success can be provided with the effective participatory governance approach and accordingly with the collaboration, cooperation and coordination among the actors (institutions in the public and private sectors such as firms, universities, government agencies, technical agencies and R&D public infrastructure etc) in the innovation systems. Improving the coordination mechanisms and the flows of knowledge, technology and information among these

various actors strengthens innovation processes by promoting systematic and qualified interactions and dynamic networks between them. Creating and developing more effective networking, social capital, social networks, social relations should be ensured. It is important to develop institutional structuring and capacity in innovation. The governance mechanisms and the administrative and institutional structures and characteristics such as the role, power, distribution of duty, authority and responsibility within this structure, patterns of collaboration and cooperation of different units and actors within the organizational structure gain importance. Legal framework, that organize the "governance and coordination of research and innovation policies (Edquist, 2014)" and strategies for promoting innovation, should be implemented in a timely manner without delay.

To follow the development of innovation systems, global and national trends and regional dynamics, science, technology and innovation boards / advisory and technical boards / sector committees should be established on a regional basis. These boards should be formed with the participation of members from all actors in the innovation system in the region. These boards should also assume the role of monitoring and evaluation mechanisms, and should monitor the achievement of national and regional targets. Regional innovation strategies should be compatible with both the strategies, targets and priorities defined in the regional plan and all national plans, strategies and targets.

In addition to its strengths, it is obvious that Turkey has some challenges to innovation, as well as strong efforts to overcome them. Turkey will make a substantial progress both in innovation system and sustainable development by taking the above-mentioned policies into account not only at the national level, but also at the regional levels.

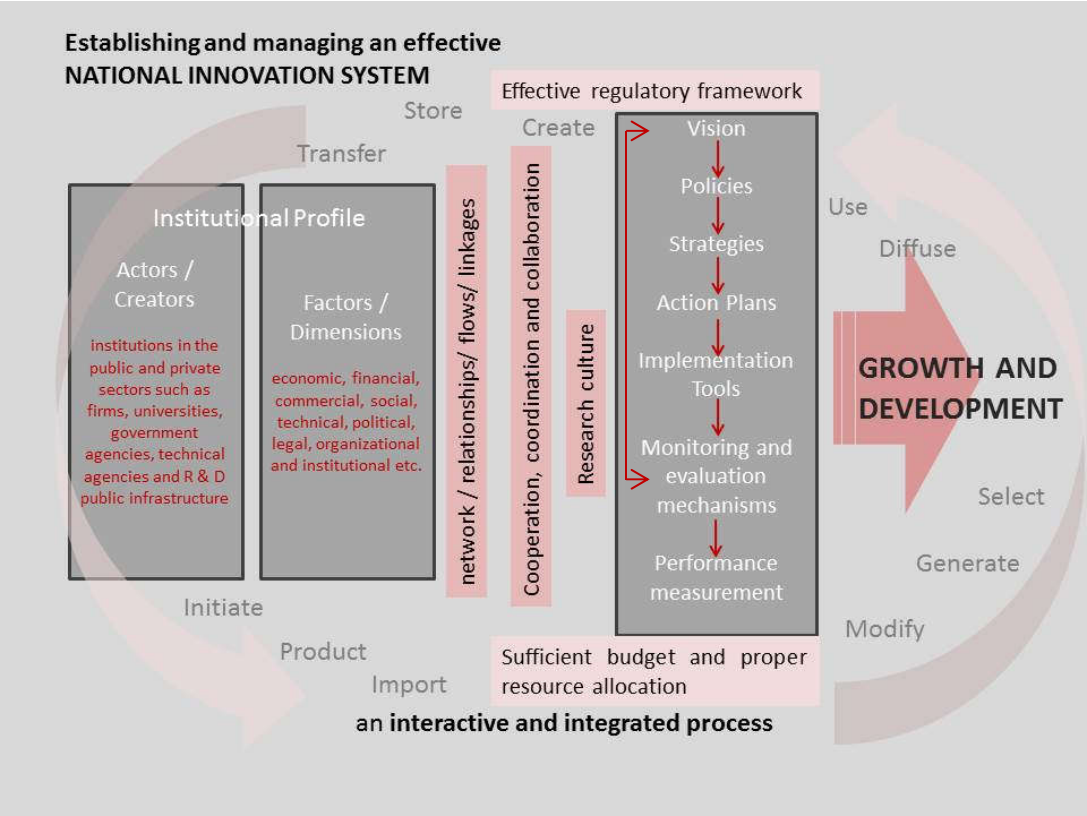


Figure 7.1 : Establishing and managing an effective national innovation system (Özen and Baycan, 2014).

For further researches, different econometric analysis and different scales can be used to measure innovation performances with different indicators in terms of different dimension of innovation. Especially after the presidential system, the reflection of the new structuring that will occur in innovation performance will take time. Further researches may examine these impacts.

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APPENDICES

APPENDIX A: Turkey's overall innovation performance profile at regional level.
APPENDIX B: Classification of regions in terms of innovation performances (Empirical results by Markov Chains of Methodology 1)
APPENDIX C: Summary table of the classification of regions in terms of innovation performances (Empirical results by Markov Chains of all tested methodologies)

APPENDIX A: Turkey's overall innovation performance profile at regional level

"Patent Applications"

Evaluation per each year (number):

Table A.1 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Year2000	81	100,0%	0	0,0%	81	100,0%
Year2001	81	100,0%	0	0,0%	81	100,0%
Year2002	81	100,0%	0	0,0%	81	100,0%
Year2003	81	100,0%	0	0,0%	81	100,0%
Year2004	81	100,0%	0	0,0%	81	100,0%
Year2005	81	100,0%	0	0,0%	81	100,0%
Year2006	81	100,0%	0	0,0%	81	100,0%
Year2007	81	100,0%	0	0,0%	81	100,0%
Year2008	81	100,0%	0	0,0%	81	100,0%
Year2009	81	100,0%	0	0,0%	81	100,0%
Year2010	81	100,0%	0	0,0%	81	100,0%
Year2011	81	100,0%	0	0,0%	81	100,0%
Year2012	81	100,0%	0	0,0%	81	100,0%
Year2013	81	100,0%	0	0,0%	81	100,0%
Year2014	81	100,0%	0	0,0%	81	100,0%
Year2015	81	100,0%	0	0,0%	81	100,0%
Year2016	81	100,0%	0	0,0%	81	100,0%
Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.2 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Year2000	0,417	81	0,000	0,199	81	0,000
Year2001	0,420	81	0,000	0,185	81	0,000
Year2002	0,410	81	0,000	0,212	81	0,000
Year2003	0,426	81	0,000	0,199	81	0,000
Year2004	0,420	81	0,000	0,187	81	0,000
Year2005	0,413	81	0,000	0,207	81	0,000
Year2006	0,419	81	0,000	0,185	81	0,000
Year2007	0,403	81	0,000	0,232	81	0,000
Year2008	0,409	81	0,000	0,210	81	0,000
Year2009	0,404	81	0,000	0,231	81	0,000
Year2010	0,402	81	0,000	0,240	81	0,000
Year2011	0,396	81	0,000	0,265	81	0,000
Year2012	0,402	81	0,000	0,234	81	0,000
Year2013	0,398	81	0,000	0,245	81	0,000
Year2014	0,403	81	0,000	0,228	81	0,000
Year2015	0,404	81	0,000	0,228	81	0,000
Year2016	0,411	81	0,000	0,204	81	0,000
Year2017	0,406	81	0,000	0,227	81	0,000

a. Lilliefors Significance Correction

Table A.3 : Descriptive statistics.

Descriptives

		Statistic	Std. Error
Year2000	Mean	3,95	2,092
	Median	0,00	
	Variance	354,598	
	Std. Deviation	18,831	
	Minimum	0	
	Maximum	161	
	Range	161	
	Skewness	7,628	0,267
	Kurtosis	62,492	0,529
Year2001	Mean	4,69	2,573
	Median	0,00	
	Variance	536,316	
	Std. Deviation	23,158	
	Minimum	0	
	Maximum	203	
	Range	203	
	Skewness	8,121	0,267
	Kurtosis	69,453	0,529
Year2002	Mean	5,74	2,816
	Median	1,00	
	Variance	642,419	
	Std. Deviation	25,346	
	Minimum	0	
	Maximum	219	
	Range	219	
	Skewness	7,760	0,267
	Kurtosis	64,652	0,529
Year2003	Mean	7,02	3,630
	Median	1,00	
	Variance	1067,274	
	Std. Deviation	32,669	
	Minimum	0	
	Maximum	282	
	Range	282	
	Skewness	7,788	0,267
	Kurtosis	64,809	0,529
Year2004	Mean	9,11	4,996
	Median	0,00	
	Variance	2021,925	
	Std. Deviation	44,966	
	Minimum	0	
	Maximum	393	
	Range	393	
	Skewness	8,069	0,267
	Kurtosis	68,647	0,529
Year2005	Mean	11,85	5,975
	Median	1,00	
	Variance	2891,403	
	Std. Deviation	53,772	
	Minimum	0	
	Maximum	461	
	Range	461	
	Skewness	7,664	0,267
	Kurtosis	62,944	0,529
Year2006	Mean	13,57	7,404
	Median	1,00	
	Variance	4439,973	
	Std. Deviation	66,633	
	Minimum	0	
	Maximum	587	
	Range	587	
	Skewness	8,221	0,267
	Kurtosis	70,871	0,529
Year2007	Mean	22,77	10,250
	Median	3,00	
	Variance	8510,057	
	Std. Deviation	92,250	
	Minimum	0	
	Maximum	787	
	Range	787	
	Skewness	7,493	0,267
	Kurtosis	60,861	0,529
Year2008	Mean	28,00	13,485
	Median	4,00	
	Variance	14728,700	
	Std. Deviation	121,362	
	Minimum	0	
	Maximum	1057	
	Range	1057	
	Skewness	7,918	0,267
	Kurtosis	66,739	0,529
Year2009	Mean	31,95	14,540
	Median	4,00	
	Variance	17123,448	
	Std. Deviation	130,857	
	Minimum	0	
	Maximum	1119	
	Range	1119	
	Skewness	7,510	0,267
	Kurtosis	61,400	0,529
Year2010	Mean	40,12	17,801
	Median	5,00	
	Variance	25667,160	
	Std. Deviation	160,210	
	Minimum	0	
	Maximum	1370	
	Range	1370	
	Skewness	7,458	0,267
	Kurtosis	61,076	0,529
Year2011	Mean	50,46	21,333
	Median	5,00	
	Variance	36861,376	
	Std. Deviation	191,993	
	Minimum	0	
	Maximum	1582	
	Range	1582	
	Skewness	6,813	0,267
	Kurtosis	52,177	0,529
Year2012	Mean	56,09	25,204
	Median	7,00	
	Variance	51454,305	
	Std. Deviation	226,835	
	Minimum	0	
	Maximum	1939	
	Range	1939	
	Skewness	7,500	0,267
	Kurtosis	61,236	0,529
Year2013	Mean	55,90	24,010
	Median	7,00	
	Variance	46695,590	
	Std. Deviation	216,092	
	Minimum	0	
	Maximum	1831	
	Range	1831	
	Skewness	7,308	0,267
	Kurtosis	58,698	0,529
Year2014	Mean	60,01	27,274
	Median	8,00	
	Variance	60251,462	
	Std. Deviation	245,462	
	Minimum	0	
	Maximum	2108	
	Range	2108	
	Skewness	7,596	0,267
	Kurtosis	62,511	0,529
Year2015	Mean	68,05	31,019
	Median	9,00	
	Variance	77934,798	
	Std. Deviation	279,168	
	Minimum	0	
	Maximum	2399	
	Range	2399	
	Skewness	7,600	0,267
	Kurtosis	62,654	0,529
Year2016	Mean	79,57	39,515
	Median	9,00	
	Variance	126475,273	
	Std. Deviation	355,634	
	Minimum	0	
	Maximum	3096	
	Range	3096	
	Skewness	7,919	0,267
	Kurtosis	66,806	0,529
Year2017	Mean	106,48	49,928
	Median	12,00	
	Variance	201917,753	
	Std. Deviation	449,353	
	Minimum	0	
	Maximum	3795	
	Range	3795	
	Skewness	7,328	0,267
	Kurtosis	58,633	0,529

Table A.4 : Outliers-Extreme values.

Extreme Values																					
			Case	Region	Value				Case	Region	Value				Case	Region	Value				Case	Region	Value
Year2000	Highest	1	34	İSTANBUL	161	Year2006	Highest	1	34	İSTANBUL	587	Year2012	Highest	1	34	İSTANBUL	1939	Year2018	Highest	1	34	İSTANBUL	1939
		2	6	ANKARA	44			2	6	ANKARA	116			2	6	ANKARA	569			2	6	ANKARA	569
		3	35	İZMİR	38			3	35	İZMİR	69			3	16	BURSA	288			3	16	BURSA	288
		4	41	KOCAELİ	9			4	16	BURSA	50			4	35	İZMİR	264			4	35	İZMİR	264
		5	45	MANİSA	8			5	41	KOCAELİ	47			5	41	KOCAELİ	225			5	41	KOCAELİ	225
	Lowest	1	80	OSMANİYE	0		Lowest	1	80	OSMANİYE	0		Lowest	1	76	IĞDIR	0		Lowest	1	76	IĞDIR	0
		2	79	KİLİS	0			2	79	KİLİS	0			2	75	ARDAHAN	0			2	75	ARDAHAN	0
		3	78	KARABÜK	0			3	78	KARABÜK	0			3	73	ŞIRNAK	0			3	73	ŞIRNAK	0
		4	77	YALOVA	0			4	76	IĞDIR	0			4	65	VAN	0			4	65	VAN	0
		5	76	IĞDIR	0[a]			5	75	ARDAHAN	0[a]			5	62	TUNCELİ	0[a]			5	62	TUNCELİ	0[a]
Year2001	Highest	1	34	İSTANBUL	203	Year2007	Highest	1	34	İSTANBUL	787	Year2013	Highest	1	34	İSTANBUL	1831	Year2019	Highest	1	34	İSTANBUL	1831
		2	6	ANKARA	42			2	6	ANKARA	248			2	6	ANKARA	562			2	6	ANKARA	562
		3	35	İZMİR	33			3	35	İZMİR	135			3	16	BURSA	316			3	16	BURSA	316
		4	16	BURSA	16			4	16	BURSA	71			4	41	KOCAELİ	275			4	41	KOCAELİ	275
		5	41	KOCAELİ	10			5	1	ADANA	70			5	35	İZMİR	265			5	35	İZMİR	265
	Lowest	1	80	OSMANİYE	0		Lowest	1	79	KİLİS	0		Lowest	1	76	IĞDIR	0		Lowest	1	76	IĞDIR	0
		2	79	KİLİS	0			2	78	KARABÜK	0			2	75	ARDAHAN	0			2	75	ARDAHAN	0
		3	78	KARABÜK	0			3	75	ARDAHAN	0			3	73	ŞIRNAK	0			3	73	ŞIRNAK	0
		4	76	IĞDIR	0			4	74	BARTIN	0			4	57	SİNOP	0			4	57	SİNOP	0
		5	75	ARDAHAN	0[a]			5	72	BATMAN	0[a]			5	56	SİİRT	0[a]			5	56	SİİRT	0[a]
Year2002	Highest	1	34	İSTANBUL	219	Year2008	Highest	1	34	İSTANBUL	1057	Year2014	Highest	1	34	İSTANBUL	2108	Year2020	Highest	1	34	İSTANBUL	2108
		2	6	ANKARA	55			2	6	ANKARA	269			2	6	ANKARA	596			2	6	ANKARA	596
		3	35	İZMİR	37			3	35	İZMİR	122			3	16	BURSA	316			3	16	BURSA	316
		4	16	BURSA	32			4	16	BURSA	119			4	35	İZMİR	275			4	35	İZMİR	275
		5	41	KOCAELİ	14			5	42	KONYA	69			5	42	KONYA	199			5	42	KONYA	199
	Lowest	1	80	OSMANİYE	0		Lowest	1	75	ARDAHAN	0		Lowest	1	76	IĞDIR	0		Lowest	1	76	IĞDIR	0
		2	79	KİLİS	0			2	74	BARTIN	0			2	74	BARTIN	0			2	74	BARTIN	0
		3	78	KARABÜK	0			3	73	ŞIRNAK	0			3	62	TUNCELİ	0			3	62	TUNCELİ	0
		4	76	IĞDIR	0			4	71	KIRIKKALE	0			4	12	BİNGÖL	0			4	12	BİNGÖL	0
		5	75	ARDAHAN	0[a]			5	70	KARAMAN	0[a]			5	4	AĞRI	0			5	4	AĞRI	0
Year2003	Highest	1	34	İSTANBUL	282	Year2009	Highest	1	34	İSTANBUL	1119	Year2015	Highest	1	34	İSTANBUL	2399	Year2021	Highest	1	34	İSTANBUL	2399
		2	6	ANKARA	74			2	6	ANKARA	318			2	6	ANKARA	636			2	6	ANKARA	636
		3	35	İZMİR	54			3	35	İZMİR	179			3	16	BURSA	440			3	16	BURSA	440
		4	16	BURSA	28			4	16	BURSA	170			4	35	İZMİR	289			4	35	İZMİR	289
		5	38	KAYSERİ	12			5	41	KOCAELİ	99			5	41	KOCAELİ	209			5	41	KOCAELİ	209
	Lowest	1	81	DÜZCE	0		Lowest	1	79	KİLİS	0		Lowest	1	76	IĞDIR	0		Lowest	1	76	IĞDIR	0
		2	80	OSMANİYE	0			2	76	IĞDIR	0			2	75	ARDAHAN	0			2	75	ARDAHAN	0
		3	79	KİLİS	0			3	75	ARDAHAN	0			3	57	SİNOP	0			3	57	SİNOP	0
		4	78	KARABÜK	0			4	73	ŞIRNAK	0			4	49	MUŞ	0			4	49	MUŞ	0
		5	75	ARDAHAN	0[a]			5	71	KIRIKKALE	0[a]			5	79	KİLİS	1[b]			5	79	KİLİS	1[b]
Year2004	Highest	1	34	İSTANBUL	393	Year2010	Highest	1	34	İSTANBUL	1370	Year2016	Highest	1	34	İSTANBUL	3096	Year2022	Highest	1	34	İSTANBUL	3096
		2	6	ANKARA	94			2	6	ANKARA	328			2	6	ANKARA	738			2	6	ANKARA	738
		3	35	İZMİR	52			3	45	MANİSA	246			3	16	BURSA	494			3	16	BURSA	494
		4	16	BURSA	34			4	16	BURSA	244			4	35	İZMİR	281			4	35	İZMİR	281
		5	41	KOCAELİ	16			5	35	İZMİR	158			5	41	KOCAELİ	233			5	41	KOCAELİ	233
	Lowest	1	80	OSMANİYE	0		Lowest	1	76	IĞDIR	0		Lowest	1	76	IĞDIR	0		Lowest	1	76	IĞDIR	0
		2	79	KİLİS	0			2	75	ARDAHAN	0			2	49	MUŞ	0			2	49	MUŞ	0
		3	78	KARABÜK	0			3	74	BARTIN	0			3	12	BİNGÖL	0			3	12	BİNGÖL	0
		4	76	IĞDIR	0			4	73	ŞIRNAK	0			4	75	ARDAHAN	1			4	75	ARDAHAN	1
		5	75	ARDAHAN	0[a]			5	72	BATMAN	0[a]			5	74	BARTIN	1[b]			5	74	BARTIN	1[b]
Year2005	Highest	1	34	İSTANBUL	461	Year2011	Highest	1	34	İSTANBUL	1582	Year2017	Highest	1	34	İSTANBUL	3795	Year2023	Highest	1	34	İSTANBUL	3795
		2	6	ANKARA	140			2	16	BURSA	530			2	45	MANİSA	1206			2	45	MANİSA	1206
		3	35	İZMİR	80			3	6	ANKARA	417			3	6	ANKARA	823			3	6	ANKARA	823
		4	16	BURSA	38			4	45	MANİSA	246			4	16	BURSA	440			4	16	BURSA	440
		5	59	TEKİRDAĞ	25			5	35	İZMİR	223			5	41	KOCAELİ	343			5	41	KOCAELİ	343
	Lowest	1	81	DÜZCE	0		Lowest	1	79	KİLİS	0		Lowest	1	75	ARDAHAN	0		Lowest	1	75	ARDAHAN	0
		2	80	OSMANİYE	0			2	76	IĞDIR	0			2	69	BAYBURT	0			2	69	BAYBURT	0
		3	79	KİLİS	0			3	75	ARDAHAN	0			3	36	KARS	0			3	36	KARS	0
		4	78	KARABÜK	0			4	74	BARTIN	0			4	30	HAKKARİ	0			4	30	HAKKARİ	0
		5	75	ARDAHAN	0[a]			5	69	BAYBURT	0[a]			5	12	BİNGÖL	0[a]			5	12	BİNGÖL	0[a]

a. Only a partial list of cases with the value 0 are shown in the table of lower extremes.
b. Only a partial list of cases with the value 1 are shown in the table of lower extremes.

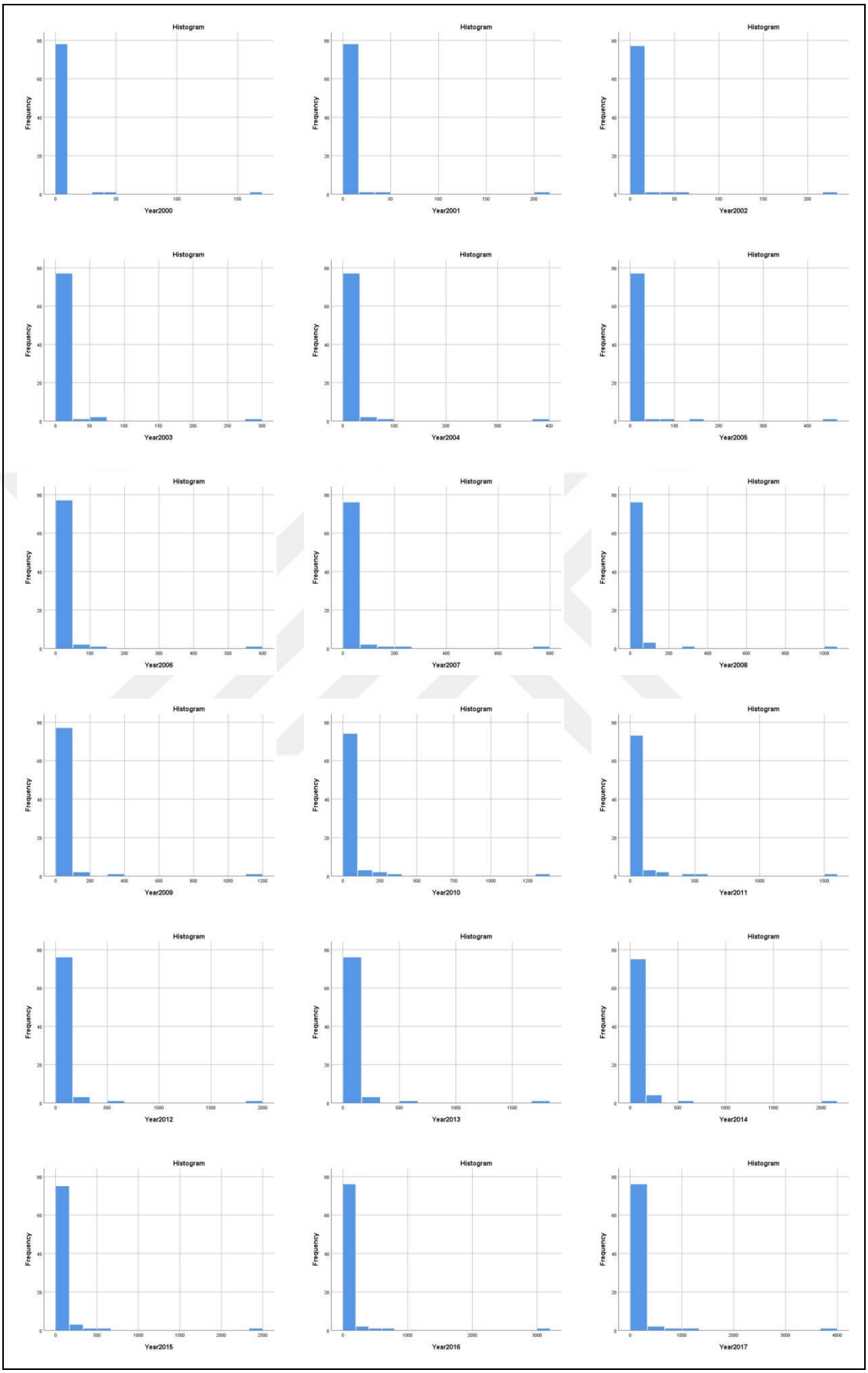


Figure A.1 : Histogram graphs.

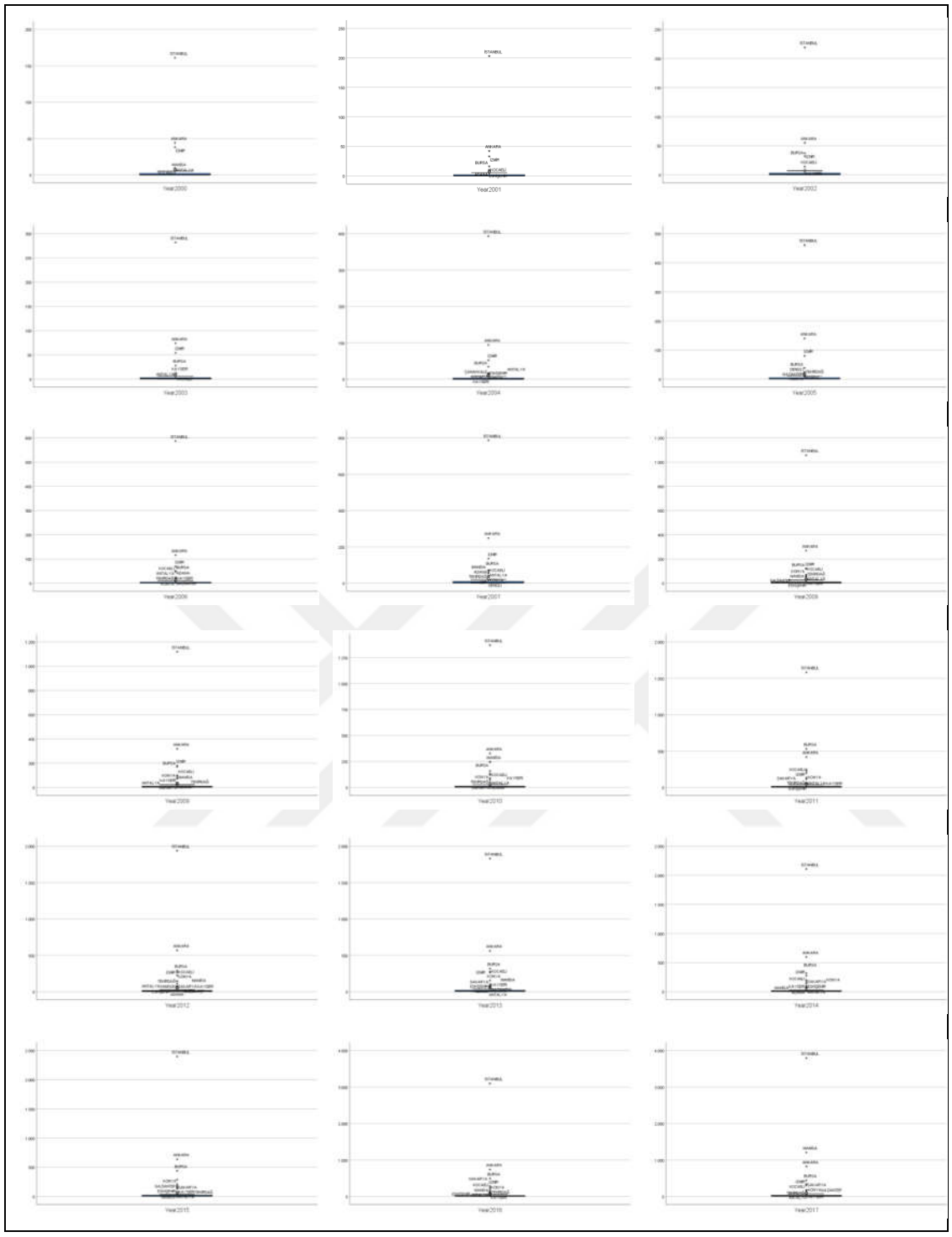


Figure A.2 : Boxplots.

Evaluation of time periods

Table A.5 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table A.6 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mean_2000_2005	0,425	81	0,000	0,194	81	0,000
Mean_2006_2010	0,405	81	0,000	0,222	81	0,000
Mean_2011_2017	0,403	81	0,000	0,229	81	0,000

a. Lilliefors Significance Correction

Table A.7 : Descriptive statistics.

Descriptives												
			Std.				Std.				Std.
		Statistic	Error			Statistic	Error			Statistic	Error
Mean_2000_2005	Mean	7,06	3,673	Mean_2006_2010	Mean	27,28	12,648	Mean_2011_2017	Mean	68,08	30,893
	Median	0,83			Median	4,00			Median	9,00	
	Variance	1092,601			Variance	12958,351			Variance	77302,429	
	Std. Deviation	33,055			Std. Deviation	113,835			Std. Deviation	278,033	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	287			Maximum	984			Maximum	2393	
	Range	287			Range	984			Range	2393	
	Skewness	7,876	0,267		Skewness	7,728	0,267		Skewness	7,619	0,267
	Kurtosis	65,978	0,529		Kurtosis	64,350	0,529		Kurtosis	62,994	0,529

Table A.8 : Outlier-Extreme values.

Extreme Values												
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Mean_2000_2005	Highest 1	34	İSTANBUL	287	Mean_2006_2010	34	İSTANBUL	984	Mean_2011_2017	34	İSTANBUL	2393
	2	6	ANKARA	75		6	ANKARA	256		6	ANKARA	620
	3	35	İZMİR	49		35	İZMİR	133		16	BURSA	403
	4	16	BURSA	26		16	BURSA	131		35	İZMİR	272
	5	41	KOCAELİ	13		45	MANİSA	90		45	MANİSA	266
	Lowest 1	80	OSMANİYE	0		75	ARDAHAN	0		76	IĞDIR	0
	2	79	KİLİS	0		69	BAYBURT	0		75	ARDAHAN	0
	3	78	KARABÜK	0		36	KARS	0		49	MUŞ	0
	4	75	ARDAHAN	0		24	ERZİNCAN	0		4	AĞRI	0
	5	73	ŞIRNAK	0[a]		8	ARTVİN	0		69	BAYBURT	1[b]

a. Only a partial list of cases with the value 0 are shown in the table of lower extremes.
b. Only a partial list of cases with the value 1 are shown in the table of lower extremes.

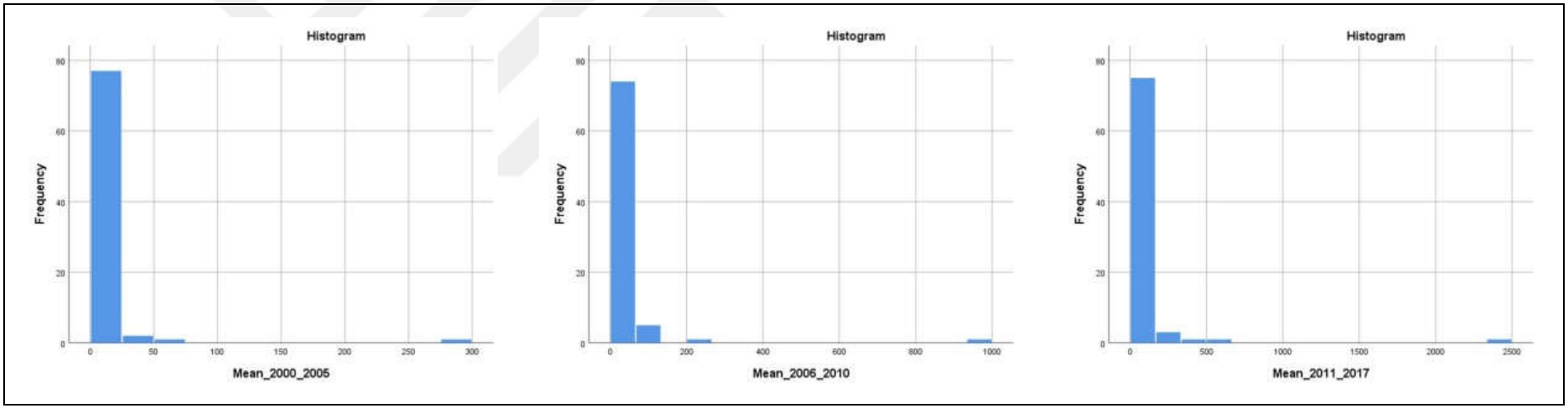


Figure A.3 : Histogram graphs.

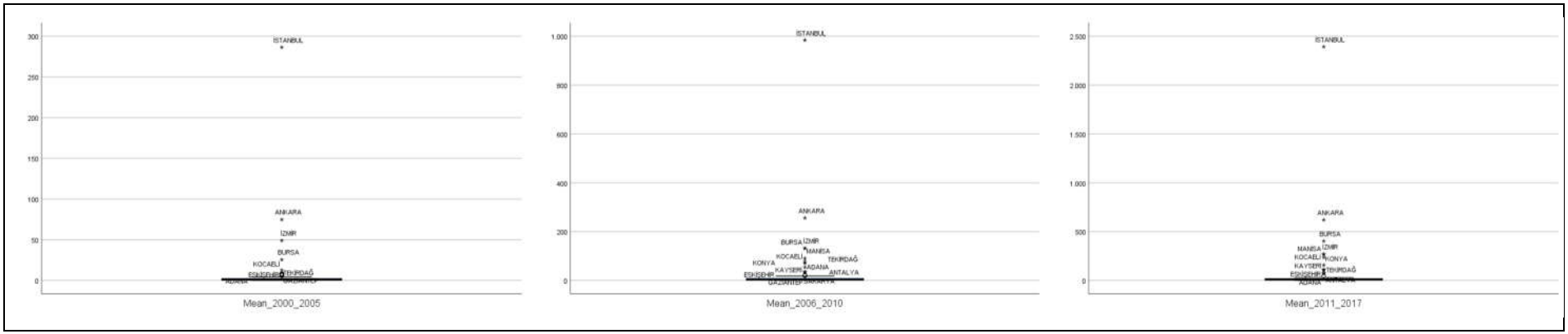


Figure A.4 : Boxplots.

Evaluation of each year (lg):

Table A.9 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
lg_Year2000	81	100,0%	0	0,0%	81	100,0%
lg_Year2001	81	100,0%	0	0,0%	81	100,0%
lg_Year2002	81	100,0%	0	0,0%	81	100,0%
lg_Year2003	81	100,0%	0	0,0%	81	100,0%
lg_Year2004	81	100,0%	0	0,0%	81	100,0%
lg_Year2005	81	100,0%	0	0,0%	81	100,0%
lg_Year2006	81	100,0%	0	0,0%	81	100,0%
lg_Year2007	81	100,0%	0	0,0%	81	100,0%
lg_Year2008	81	100,0%	0	0,0%	81	100,0%
lg_Year2009	81	100,0%	0	0,0%	81	100,0%
lg_Year2010	81	100,0%	0	0,0%	81	100,0%
lg_Year2011	81	100,0%	0	0,0%	81	100,0%
lg_Year2012	81	100,0%	0	0,0%	81	100,0%
lg_Year2013	81	100,0%	0	0,0%	81	100,0%
lg_Year2014	81	100,0%	0	0,0%	81	100,0%
lg_Year2015	81	100,0%	0	0,0%	81	100,0%
lg_Year2016	81	100,0%	0	0,0%	81	100,0%
lg_Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.10 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
lg_Year2000	0,320	81	0,000	0,658	81	0,000
lg_Year2001	0,269	81	0,000	0,705	81	0,000
lg_Year2002	0,253	81	0,000	0,757	81	0,000
lg_Year2003	0,218	81	0,000	0,771	81	0,000
lg_Year2004	0,273	81	0,000	0,755	81	0,000
lg_Year2005	0,195	81	0,000	0,819	81	0,000
lg_Year2006	0,205	81	0,000	0,812	81	0,000
lg_Year2007	0,134	81	0,001	0,905	81	0,000
lg_Year2008	0,138	81	0,001	0,909	81	0,000
lg_Year2009	0,117	81	0,008	0,913	81	0,000
lg_Year2010	0,120	81	0,005	0,914	81	0,000
lg_Year2011	0,118	81	0,007	0,915	81	0,000
lg_Year2012	0,111	81	0,016	0,937	81	0,001
lg_Year2013	0,124	81	0,003	0,949	81	0,003
lg_Year2014	0,122	81	0,004	0,939	81	0,001
lg_Year2015	0,093	81	0,081	0,943	81	0,001
lg_Year2016	0,101	81	0,040	0,943	81	0,001
lg_Year2017	0,089	81	0,178	0,955	81	0,007

a. Lilliefors Significance Correction

Table A.11 : Descriptive statistics.

Descriptives

			Std.				Std.				Std.
		Statistic	Error			Statistic	Error			Statistic	Error
lg_Year2000	Mean	0,2509	0,04600	lg_Year2006	Mean	0,4784	0,06374	lg_Year2012	Mean	0,9710	0,07901
	Median	0,0000			Median	0,3010			Median	0,9031	
	Variance	0,171			Variance	0,329			Variance	0,506	
	Std. Deviation	0,41403			Std. Deviation	0,57369			Std. Deviation	0,71107	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,21			Maximum	2,77			Maximum	3,29	
	Range	2,21			Range	2,77			Range	3,29	
	Skewness	2,448	0,267		Skewness	1,518	0,267		Skewness	0,800	0,267
	Kurtosis	7,420	0,529		Kurtosis	2,650	0,529		Kurtosis	0,717	0,529
lg_Year2001	Mean	0,2892	0,04763	lg_Year2007	Mean	0,7009	0,07025	lg_Year2013	Mean	1,0268	0,07583
	Median	0,0000			Median	0,6021			Median	0,9031	
	Variance	0,184			Variance	0,400			Variance	0,466	
	Std. Deviation	0,42865			Std. Deviation	0,63229			Std. Deviation	0,68246	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,31			Maximum	2,90			Maximum	3,26	
	Range	2,31			Range	2,90			Range	3,26	
	Skewness	2,260	0,267		Skewness	1,010	0,267		Skewness	0,776	0,267
	Kurtosis	6,554	0,529		Kurtosis	1,034	0,529		Kurtosis	0,843	0,529
lg_Year2002	Mean	0,3468	0,05174	lg_Year2008	Mean	0,7396	0,07395	lg_Year2014	Mean	1,0291	0,07532
	Median	0,3010			Median	0,6990			Median	0,9542	
	Variance	0,217			Variance	0,443			Variance	0,460	
	Std. Deviation	0,46570			Std. Deviation	0,66552			Std. Deviation	0,67790	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,34			Maximum	3,02			Maximum	3,32	
	Range	2,34			Range	3,02			Range	3,32	
	Skewness	1,850	0,267		Skewness	0,877	0,267		Skewness	0,942	0,267
	Kurtosis	4,241	0,529		Kurtosis	0,737	0,529		Kurtosis	1,027	0,529
lg_Year2003	Mean	0,3764	0,05285	lg_Year2009	Mean	0,7935	0,07231	lg_Year2015	Mean	1,0766	0,07560
	Median	0,3010			Median	0,6990			Median	1,0000	
	Variance	0,226			Variance	0,424			Variance	0,463	
	Std. Deviation	0,47564			Std. Deviation	0,65078			Std. Deviation	0,68042	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,45			Maximum	3,05			Maximum	3,38	
	Range	2,45			Range	3,05			Range	3,38	
	Skewness	1,897	0,267		Skewness	1,025	0,267		Skewness	0,925	0,267
	Kurtosis	4,798	0,529		Kurtosis	1,282	0,529		Kurtosis	1,066	0,529
lg_Year2004	Mean	0,3835	0,05853	lg_Year2010	Mean	0,8449	0,07603	lg_Year2016	Mean	1,1055	0,07612
	Median	0,0000			Median	0,7782			Median	1,0000	
	Variance	0,277			Variance	0,468			Variance	0,469	
	Std. Deviation	0,52678			Std. Deviation	0,68430			Std. Deviation	0,68509	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,60			Maximum	3,14			Maximum	3,49	
	Range	2,60			Range	3,14			Range	3,49	
	Skewness	1,745	0,267		Skewness	0,990	0,267		Skewness	0,963	0,267
	Kurtosis	3,633	0,529		Kurtosis	1,034	0,529		Kurtosis	1,191	0,529
lg_Year2005	Mean	0,4750	0,06150	lg_Year2011	Mean	0,8673	0,08146	lg_Year2017	Mean	1,1557	0,08342
	Median	0,3010			Median	0,7782			Median	1,1139	
	Variance	0,306			Variance	0,537			Variance	0,564	
	Std. Deviation	0,55354			Std. Deviation	0,73313			Std. Deviation	0,75075	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,66			Maximum	3,20			Maximum	3,58	
	Range	2,66			Range	3,20			Range	3,58	
	Skewness	1,527	0,267		Skewness	0,975	0,267		Skewness	0,756	0,267
	Kurtosis	2,796	0,529		Kurtosis	0,733	0,529		Kurtosis	0,767	0,529

Table A.12 : Outlier- Extreme values.

			Extreme Values												
			Case	Region	Value			Case	Region	Value			Case	Region	Value
lg_Year2000	Highest	1	34	İSTANBUL	2,21	lg_Year2006	Highest	1	34	İSTANBUL	2,77	lg_Year2012	1	34	İSTANBUL	3,29
		2	6	ANKARA	1,65			2	6	ANKARA	2,07		2	6	ANKARA	2,76
		3	35	İZMİR	1,59			3	35	İZMİR	1,85		3	16	BURSA	2,46
		4	41	KOCAELİ	1,00			4	16	BURSA	1,71		4	35	İZMİR	2,42
		5	45	MANİSA	0,95			5	41	KOCAELİ	1,68		5	41	KOCAELİ	2,35
	Lowest	1	80	OSMANİYE	0,00		Lowest	1	80	OSMANİYE	0,00		1	76	IĞDIR	0,00
		2	79	KİLİS	0,00			2	79	KİLİS	0,00		2	75	ARDAHAN	0,00
		3	78	KARABÜK	0,00			3	78	KARABÜK	0,00		3	73	ŞIRNAK	0,00
		4	77	YALOVA	0,00			4	76	IĞDIR	0,00		4	65	VAN	0,00
		5	76	IĞDIR	,00[a]			5	75	ARDAHAN	,00[a]		5	62	TUNCELİ	,00[a]
lg_Year2001	Highest	1	34	İSTANBUL	2,31	lg_Year2007	Highest	1	34	İSTANBUL	2,90	lg_Year2013	1	34	İSTANBUL	3,26
		2	6	ANKARA	1,63			2	6	ANKARA	2,40		2	6	ANKARA	2,75
		3	35	İZMİR	1,53			3	35	İZMİR	2,13		3	16	BURSA	2,50
		4	16	BURSA	1,23			4	16	BURSA	1,86		4	41	KOCAELİ	2,44
		5	41	KOCAELİ	1,04			5	1	ADANA	1,85		5	35	İZMİR	2,42
	Lowest	1	80	OSMANİYE	0,00		Lowest	1	79	KİLİS	0,00		1	76	IĞDIR	0,00
		2	79	KİLİS	0,00			2	78	KARABÜK	0,00		2	75	ARDAHAN	0,00
		3	78	KARABÜK	0,00			3	75	ARDAHAN	0,00		3	73	ŞIRNAK	0,00
		4	76	IĞDIR	0,00			4	74	BARTIN	0,00		4	57	SİNOP	0,00
		5	75	ARDAHAN	,00[a]			5	72	BATMAN	,00[a]		5	56	SİİRT	,00[a]
lg_Year2002	Highest	1	34	İSTANBUL	2,34	lg_Year2008	Highest	1	34	İSTANBUL	3,02	lg_Year2014	1	34	İSTANBUL	3,32
		2	6	ANKARA	1,75			2	6	ANKARA	2,43		2	6	ANKARA	2,78
		3	35	İZMİR	1,58			3	35	İZMİR	2,09		3	16	BURSA	2,50
		4	16	BURSA	1,52			4	16	BURSA	2,08		4	35	İZMİR	2,44
		5	41	KOCAELİ	1,18			5	42	KONYA	1,85		5	42	KONYA	2,30
	Lowest	1	80	OSMANİYE	0,00		Lowest	1	75	ARDAHAN	0,00		1	76	IĞDIR	0,00
		2	79	KİLİS	0,00			2	74	BARTIN	0,00		2	74	BARTIN	0,00
		3	78	KARABÜK	0,00			3	73	ŞIRNAK	0,00		3	62	TUNCELİ	0,00
		4	76	IĞDIR	0,00			4	71	KIRIKKALE	0,00		4	12	BİNGÖL	0,00
		5	75	ARDAHAN	,00[a]			5	70	KARAMAN	,00[a]		5	4	AĞRI	0,00
lg_Year2003	Highest	1	34	İSTANBUL	2,45	lg_Year2009	Highest	1	34	İSTANBUL	3,05	lg_Year2015	1	34	İSTANBUL	3,38
		2	6	ANKARA	1,88			2	6	ANKARA	2,50		2	6	ANKARA	2,80
		3	35	İZMİR	1,74			3	35	İZMİR	2,26		3	16	BURSA	2,64
		4	16	BURSA	1,46			4	16	BURSA	2,23		4	35	İZMİR	2,46
		5	38	KAYSERİ	1,11			5	41	KOCAELİ	2,00		5	41	KOCAELİ	2,32
	Lowest	1	81	DÜZCE	0,00		Lowest	1	79	KİLİS	0,00		1	76	IĞDIR	0,00
		2	80	OSMANİYE	0,00			2	76	IĞDIR	0,00		2	75	ARDAHAN	0,00
		3	79	KİLİS	0,00			3	75	ARDAHAN	0,00		3	57	SİNOP	0,00
		4	78	KARABÜK	0,00			4	73	ŞIRNAK	0,00		4	49	MUŞ	0,00
		5	75	ARDAHAN	,00[a]			5	71	KIRIKKALE	,00[a]		5	79	KİLİS	,30[b]
lg_Year2004	Highest	1	34	İSTANBUL	2,60	lg_Year2010	Highest	1	34	İSTANBUL	3,14	lg_Year2016	1	34	İSTANBUL	3,49
		2	6	ANKARA	1,98			2	6	ANKARA	2,52		2	6	ANKARA	2,87
		3	35	İZMİR	1,72			3	45	MANİSA	2,39		3	16	BURSA	2,69
		4	16	BURSA	1,54			4	16	BURSA	2,39		4	35	İZMİR	2,45
		5	41	KOCAELİ	1,23			5	35	İZMİR	2,20		5	41	KOCAELİ	2,37
	Lowest	1	80	OSMANİYE	0,00		Lowest	1	76	IĞDIR	0,00		1	76	IĞDIR	0,00
		2	79	KİLİS	0,00			2	75	ARDAHAN	0,00		2	49	MUŞ	0,00
		3	78	KARABÜK	0,00			3	74	BARTIN	0,00		3	12	BİNGÖL	0,00
		4	76	IĞDIR	0,00			4	73	ŞIRNAK	0,00		4	75	ARDAHAN	0,30
		5	75	ARDAHAN	,00[a]			5	72	BATMAN	,00[a]		5	74	BARTIN	,30[b]
lg_Year2005	Highest	1	34	İSTANBUL	2,66	lg_Year2011	Highest	1	34	İSTANBUL	3,20	lg_Year2017	1	34	İSTANBUL	3,58
		2	6	ANKARA	2,15			2	16	BURSA	2,73		2	45	MANİSA	3,08
		3	35	İZMİR	1,91			3	6	ANKARA	2,62		3	6	ANKARA	2,92
		4	16	BURSA	1,59			4	45	MANİSA	2,39		4	16	BURSA	2,64
		5	59	TEKİRDAĞ	1,41			5	35	İZMİR	2,35		5	41	KOCAELİ	2,54
	Lowest	1	81	DÜZCE	0,00		Lowest	1	79	KİLİS	0,00		1	75	ARDAHAN	0,00
		2	80	OSMANİYE	0,00			2	76	IĞDIR	0,00		2	69	BAYBURT	0,00
		3	79	KİLİS	0,00			3	75	ARDAHAN	0,00		3	36	KARS	0,00
		4	78	KARABÜK	0,00			4	74	BARTIN	0,00		4	30	HAKKARİ	0,00
		5	75	ARDAHAN	,00[a]			5	69	BAYBURT	,00[a]		5	12	BİNGÖL	,00[a]

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.
b. Only a partial list of cases with the value ,30 are shown in the table of lower extremes.

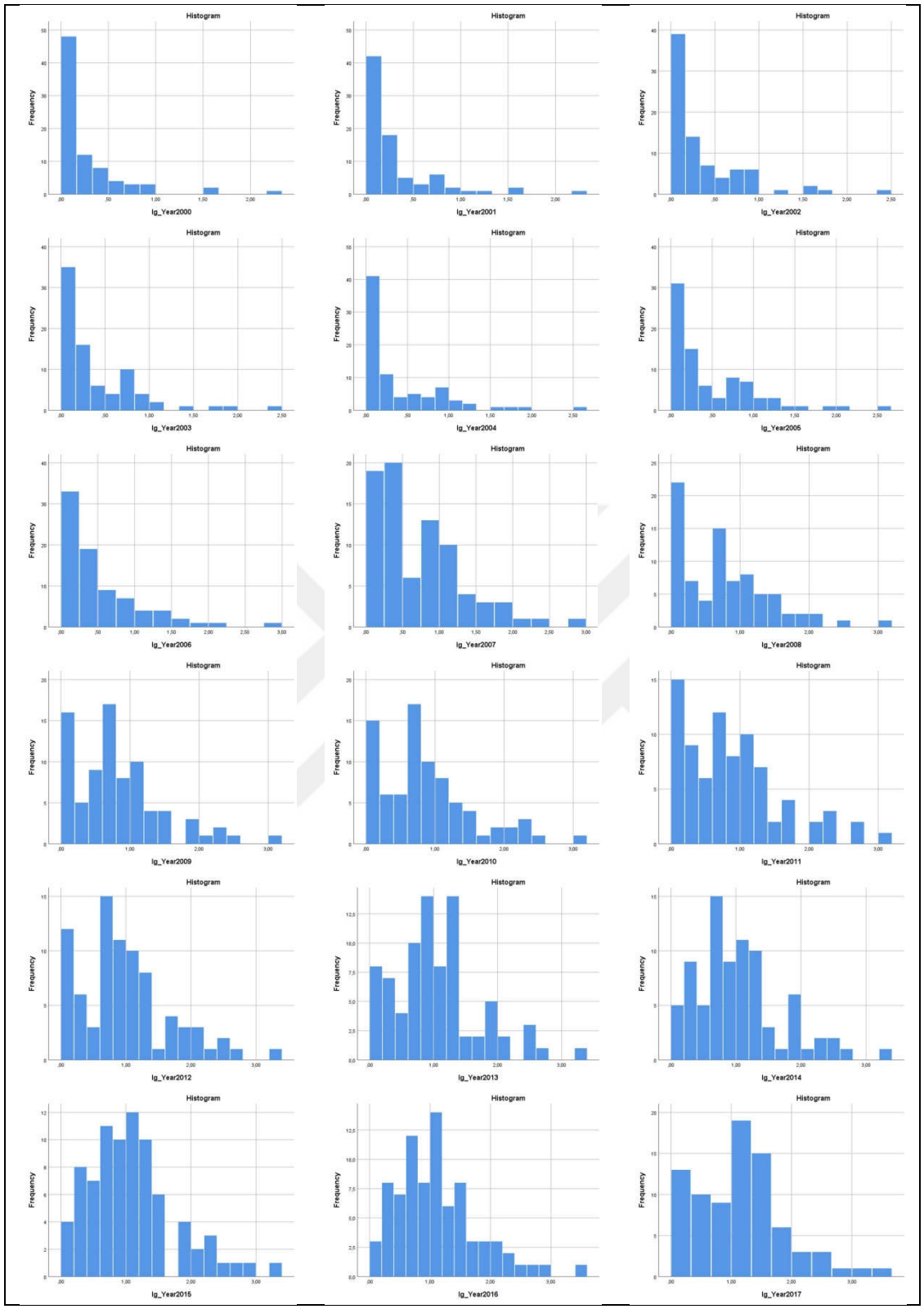


Figure A.5 : Histogram graphs.



Figure A.6 : Boxplots.

“Patent Grants”

Evaluation per each year (number):

Table A.13 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Year2000	81	100,0%	0	0,0%	81	100,0%
Year2001	81	100,0%	0	0,0%	81	100,0%
Year2002	81	100,0%	0	0,0%	81	100,0%
Year2003	81	100,0%	0	0,0%	81	100,0%
Year2004	81	100,0%	0	0,0%	81	100,0%
Year2005	81	100,0%	0	0,0%	81	100,0%
Year2006	81	100,0%	0	0,0%	81	100,0%
Year2007	81	100,0%	0	0,0%	81	100,0%
Year2008	81	100,0%	0	0,0%	81	100,0%
Year2009	81	100,0%	0	0,0%	81	100,0%
Year2010	81	100,0%	0	0,0%	81	100,0%
Year2011	81	100,0%	0	0,0%	81	100,0%
Year2012	81	100,0%	0	0,0%	81	100,0%
Year2013	81	100,0%	0	0,0%	81	100,0%
Year2014	81	100,0%	0	0,0%	81	100,0%
Year2015	81	100,0%	0	0,0%	81	100,0%
Year2016	81	100,0%	0	0,0%	81	100,0%
Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.14 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Year2000	0,507	81	0,000	0,212	81	0,000
Year2001	0,426	81	0,000	0,178	81	0,000
Year2002	0,451	81	0,000	0,186	81	0,000
Year2003	0,435	81	0,000	0,179	81	0,000
Year2004	0,418	81	0,000	0,203	81	0,000
Year2005	0,421	81	0,000	0,189	81	0,000
Year2006	0,418	81	0,000	0,194	81	0,000
Year2007	0,435	81	0,000	0,145	81	0,000
Year2008	0,422	81	0,000	0,182	81	0,000
Year2009	0,422	81	0,000	0,183	81	0,000
Year2010	0,413	81	0,000	0,207	81	0,000
Year2011	0,414	81	0,000	0,207	81	0,000
Year2012	0,412	81	0,000	0,214	81	0,000
Year2013	0,405	81	0,000	0,237	81	0,000
Year2014	0,417	81	0,000	0,198	81	0,000
Year2015	0,413	81	0,000	0,211	81	0,000
Year2016	0,419	81	0,000	0,184	81	0,000
Year2017	0,424	81	0,000	0,174	81	0,000
a. Lilliefors Significance Correction						

Table A.15 : Descriptive statistics.

Descriptives

		Statistic	Std. Error
Year2000	Mean	0,28	0,154
	Median	0,00	
	Variance	1,931	
	Std. Deviation	1,390	
	Minimum	0	
	Maximum	10	
	Range	10	
	Skewness	5,921	0,267
	Kurtosis	36,644	0,529
Year2001	Mean	0,70	0,417
	Median	0,00	
	Variance	14,111	
	Std. Deviation	3,756	
	Minimum	0	
	Maximum	33	
	Range	33	
	Skewness	8,190	0,267
	Kurtosis	70,567	0,529
Year2002	Mean	0,90	0,532
	Median	0,00	
	Variance	22,915	
	Std. Deviation	4,787	
	Minimum	0	
	Maximum	41	
	Range	41	
	Skewness	7,694	0,267
	Kurtosis	63,559	0,529
Year2003	Mean	1,14	0,690
	Median	0,00	
	Variance	38,544	
	Std. Deviation	6,208	
	Minimum	0	
	Maximum	53	
	Range	53	
	Skewness	7,680	0,267
	Kurtosis	63,006	0,529
Year2004	Mean	0,84	0,448
	Median	0,00	
	Variance	16,286	
	Std. Deviation	4,036	
	Minimum	0	
	Maximum	35	
	Range	35	
	Skewness	7,868	0,267
	Kurtosis	66,229	0,529
Year2005	Mean	1,16	0,648
	Median	0,00	
	Variance	34,011	
	Std. Deviation	5,832	
	Minimum	0	
	Maximum	51	
	Range	51	
	Skewness	8,082	0,267
	Kurtosis	68,917	0,529
Year2006	Mean	1,51	0,808
	Median	0,00	
	Variance	52,878	
	Std. Deviation	7,272	
	Minimum	0	
	Maximum	63	
	Range	63	
	Skewness	7,900	0,267
	Kurtosis	66,153	0,529
Year2007	Mean	3,91	2,657
	Median	0,00	
	Variance	571,630	
	Std. Deviation	23,909	
	Minimum	0	
	Maximum	213	
	Range	213	
	Skewness	8,595	0,267
	Kurtosis	75,725	0,529
Year2008	Mean	4,16	2,355
	Median	0,00	
	Variance	449,186	
	Std. Deviation	21,194	
	Minimum	0	
	Maximum	187	
	Range	187	
	Skewness	8,270	0,267
	Kurtosis	71,576	0,529
Year2009	Mean	5,63	3,169
	Median	0,00	
	Variance	813,611	
	Std. Deviation	28,524	
	Minimum	0	
	Maximum	251	
	Range	251	
	Skewness	8,215	0,267
	Kurtosis	70,764	0,529
Year2010	Mean	7,93	4,002
	Median	1,00	
	Variance	1297,094	
	Std. Deviation	36,015	
	Minimum	0	
	Maximum	314	
	Range	314	
	Skewness	7,946	0,267
	Kurtosis	67,309	0,529
Year2011	Mean	10,46	5,317
	Median	1,00	
	Variance	2289,551	
	Std. Deviation	47,849	
	Minimum	0	
	Maximum	417	
	Range	417	
	Skewness	7,930	0,267
	Kurtosis	67,201	0,529
Year2012	Mean	12,65	6,316
	Median	1,00	
	Variance	3231,404	
	Std. Deviation	56,845	
	Minimum	0	
	Maximum	490	
	Range	490	
	Skewness	7,703	0,267
	Kurtosis	64,077	0,529
Year2013	Mean	15,36	7,134
	Median	1,00	
	Variance	4122,658	
	Std. Deviation	64,208	
	Minimum	0	
	Maximum	540	
	Range	540	
	Skewness	7,229	0,267
	Kurtosis	57,511	0,529
Year2014	Mean	15,44	8,157
	Median	1,00	
	Variance	5389,075	
	Std. Deviation	73,410	
	Minimum	0	
	Maximum	639	
	Range	639	
	Skewness	7,942	0,267
	Kurtosis	67,172	0,529
Year2015	Mean	21,36	10,782
	Median	1,00	
	Variance	9417,083	
	Std. Deviation	97,042	
	Minimum	0	
	Maximum	842	
	Range	842	
	Skewness	7,838	0,267
	Kurtosis	65,938	0,529
Year2016	Mean	22,15	12,104
	Median	2,00	
	Variance	11867,603	
	Std. Deviation	108,939	
	Minimum	0	
	Maximum	956	
	Range	956	
	Skewness	8,147	0,267
	Kurtosis	69,777	0,529
Year2017	Mean	24,25	13,964
	Median	2,00	
	Variance	15793,638	
	Std. Deviation	125,673	
	Minimum	0	
	Maximum	1111	
	Range	1111	
	Skewness	8,327	0,267
	Kurtosis	72,287	0,529

Table A.16 : Outlier-Extreme values.

			Extreme Values											
			Case	Region	Value		Case	Region	Value		Case	Region	Value
Year2000	Highest	1	41	KOCAELİ	10	Year2006	34	İSTANBUL	63	Year2012	34	İSTANBUL	490
		2	34	İSTANBUL	7		6	ANKARA	18		16	BURSA	112
		3	6	ANKARA	3		16	BURSA	6		6	ANKARA	96
		4	7	ANTALYA	1		35	İZMİR	6		45	MANİSA	56
		5	16	BURSA	1[a]		41	KOCAELİ	3[d]		41	KOCAELİ	54
	Lowest	1	81	DÜZCE	0		81	DÜZCE	0		80	OSMANİYE	0
		2	80	OSMANİYE	0		80	OSMANİYE	0		79	KİLİS	0
		3	79	KİLİS	0		79	KİLİS	0		76	IĞDIR	0
		4	78	KARABÜK	0		78	KARABÜK	0		75	ARDAHAN	0
		5	77	YALOVA	0[b]		77	YALOVA	0[b]		74	BARTIN	0[b]
Year2001	Highest	1	34	İSTANBUL	33	Year2007	34	İSTANBUL	213	Year2013	34	İSTANBUL	540
		2	6	ANKARA	6		6	ANKARA	34		16	BURSA	173
		3	41	KOCAELİ	4		16	BURSA	12		6	ANKARA	109
		4	16	BURSA	3		35	İZMİR	12		41	KOCAELİ	74
		5	35	İZMİR	3		3	AFYONKARAHİSAR	5[e]		35	İZMİR	59
	Lowest	1	81	DÜZCE	0		81	DÜZCE	0		79	KİLİS	0
		2	80	OSMANİYE	0		80	OSMANİYE	0		78	KARABÜK	0
		3	79	KİLİS	0		79	KİLİS	0		76	IĞDIR	0
		4	78	KARABÜK	0		78	KARABÜK	0		75	ARDAHAN	0
		5	77	YALOVA	0[b]		77	YALOVA	0[b]		72	BATMAN	0[b]
Year2002	Highest	1	34	İSTANBUL	41	Year2008	34	İSTANBUL	187	Year2014	34	İSTANBUL	639
		2	6	ANKARA	11		6	ANKARA	33		16	BURSA	136
		3	41	KOCAELİ	8		35	İZMİR	25		6	ANKARA	116
		4	35	İZMİR	4		16	BURSA	16		35	İZMİR	52
		5	45	MANİSA	3		42	KONYA	8		41	KOCAELİ	50
	Lowest	1	81	DÜZCE	0		80	OSMANİYE	0		80	OSMANİYE	0
		2	80	OSMANİYE	0		79	KİLİS	0		79	KİLİS	0
		3	79	KİLİS	0		78	KARABÜK	0		78	KARABÜK	0
		4	78	KARABÜK	0		77	YALOVA	0		76	IĞDIR	0
		5	77	YALOVA	0[b]		76	IĞDIR	0[b]		75	ARDAHAN	0[b]
Year2003	Highest	1	34	İSTANBUL	53	Year2009	34	İSTANBUL	251	Year2015	34	İSTANBUL	842
		2	35	İZMİR	16		6	ANKARA	52		6	ANKARA	186
		3	6	ANKARA	10		16	BURSA	23		16	BURSA	131
		4	41	KOCAELİ	3		35	İZMİR	21		41	KOCAELİ	104
		5	16	BURSA	2[c]		45	MANİSA	21		35	İZMİR	86
	Lowest	1	81	DÜZCE	0		81	DÜZCE	0		80	OSMANİYE	0
		2	80	OSMANİYE	0		80	OSMANİYE	0		79	KİLİS	0
		3	79	KİLİS	0		79	KİLİS	0		78	KARABÜK	0
		4	78	KARABÜK	0		78	KARABÜK	0		77	YALOVA	0
		5	77	YALOVA	0[b]		75	ARDAHAN	0[b]		76	IĞDIR	0[b]
Year2004	Highest	1	34	İSTANBUL	35	Year2010	34	İSTANBUL	314	Year2016	34	İSTANBUL	956
		2	35	İZMİR	8		6	ANKARA	71		6	ANKARA	214
		3	6	ANKARA	6		16	BURSA	38		35	İZMİR	96
		4	41	KOCAELİ	3		35	İZMİR	34		16	BURSA	94
		5	1	ADANA	2[c]		45	MANİSA	31		41	KOCAELİ	66
	Lowest	1	81	DÜZCE	0		80	OSMANİYE	0		76	IĞDIR	0
		2	80	OSMANİYE	0		79	KİLİS	0		74	BARTIN	0
		3	79	KİLİS	0		78	KARABÜK	0		73	ŞIRNAK	0
		4	78	KARABÜK	0		77	YALOVA	0		69	BAYBURT	0
		5	77	YALOVA	0[b]		76	IĞDIR	0[b]		65	VAN	0[b]
Year2005	Highest	1	34	İSTANBUL	51	Year2011	34	İSTANBUL	417	Year2017	34	İSTANBUL	1111
		2	6	ANKARA	12		6	ANKARA	78		6	ANKARA	200
		3	35	İZMİR	5		16	BURSA	74		16	BURSA	129
		4	41	KOCAELİ	4		45	MANİSA	48		35	İZMİR	77
		5	16	BURSA	3[d]		42	KONYA	39		41	KOCAELİ	72
	Lowest	1	81	DÜZCE	0		81	DÜZCE	0		81	DÜZCE	0
		2	80	OSMANİYE	0		80	OSMANİYE	0		79	KİLİS	0
		3	79	KİLİS	0		79	KİLİS	0		76	IĞDIR	0
		4	78	KARABÜK	0		77	YALOVA	0		75	ARDAHAN	0
		5	77	YALOVA	0[b]		76	IĞDIR	0[b]		73	ŞIRNAK	0[b]

a. Only a partial list of cases with the value 1 are shown in the table of upper extremes.
b. Only a partial list of cases with the value 0 are shown in the table of lower extremes.
c. Only a partial list of cases with the value 2 are shown in the table of upper extremes.
d. Only a partial list of cases with the value 3 are shown in the table of upper extremes.
e. Only a partial list of cases with the value 5 are shown in the table of upper extremes.

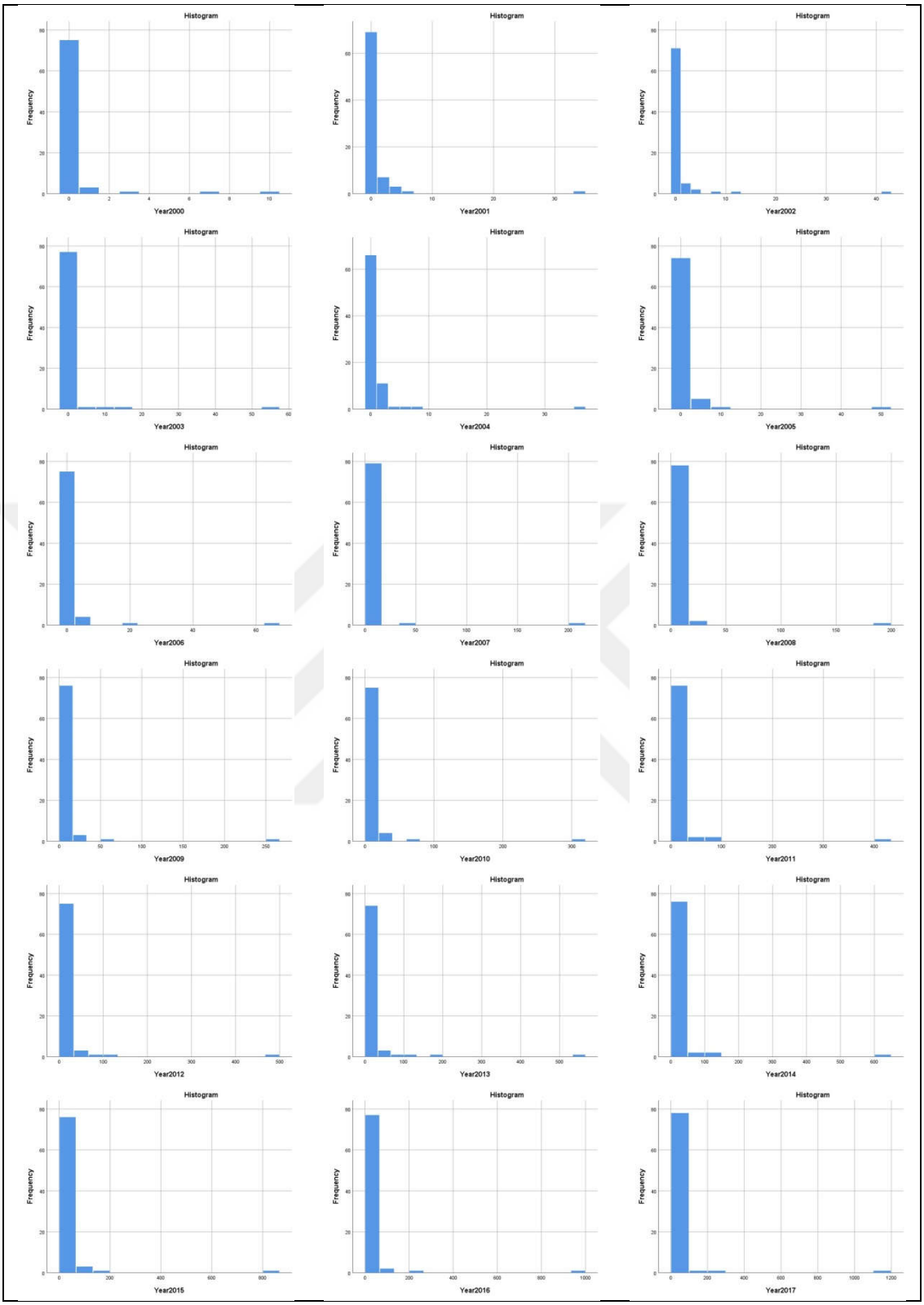


Figure A.7 : Histogram graphs.

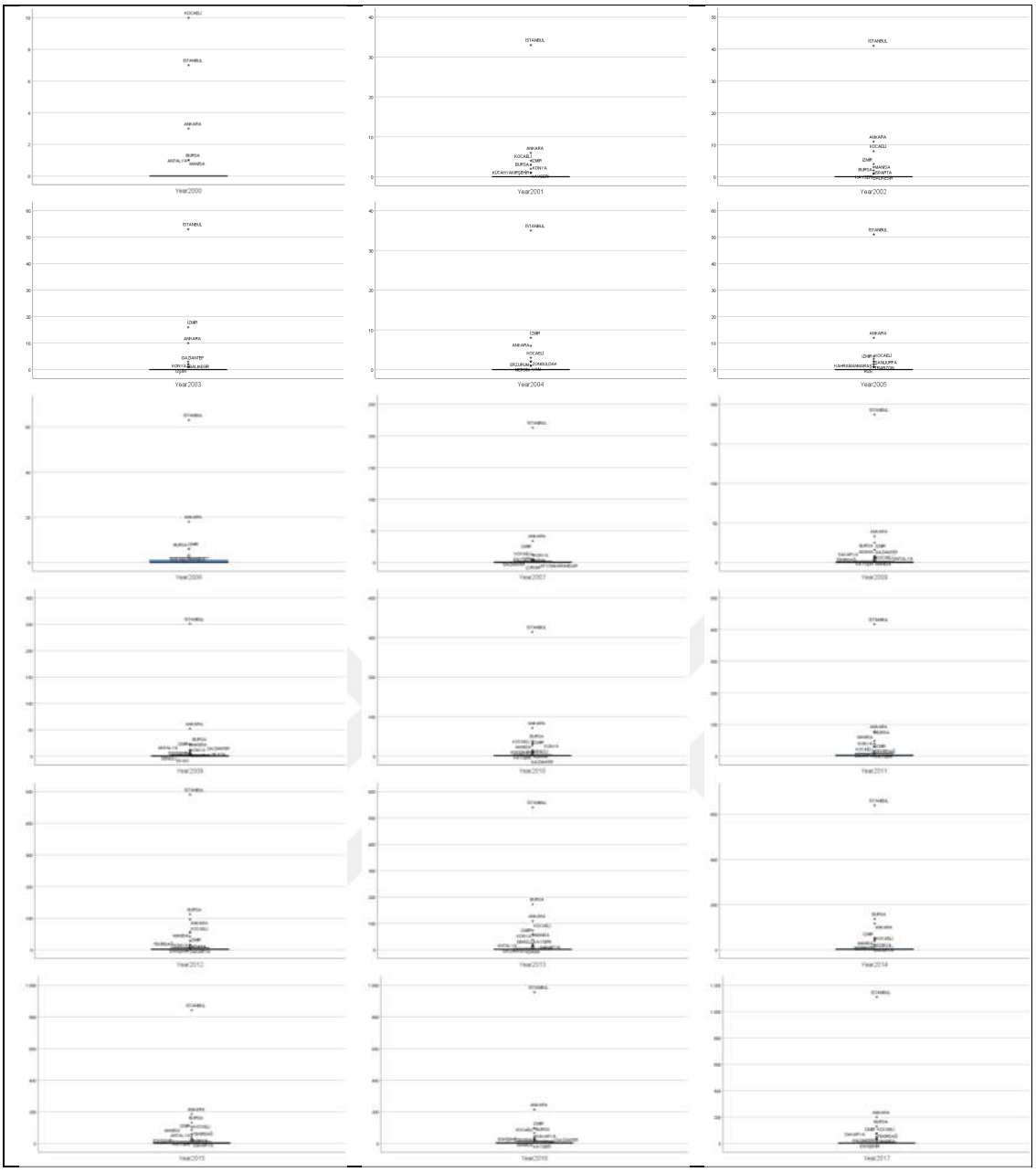


Figure A.8 : Boxplots.

Evaluation of time periods

Table A.17 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table A.18 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mean_2000_2005	0,421	81	0,000	0,190	81	0,000
Mean_2006_2010	0,421	81	0,000	0,180	81	0,000
Mean_2011_2017	0,416	81	0,000	0,197	81	0,000
a. Lilliefors Significance Correction						

Table A.19 : Descriptive statistics.

Descriptives									
		Statistic	Std. Error		Statistic	Std. Error		Statistic	Std. Error
Mean_2000_2005	Mean	0,84	0,469	Mean_2006_2010 Mean	4,63	2,591	Mean_2011_2017 Mean	17,38	9,078
	Median	0,00		Median	0,40		Median	1,57	
	Variance	17,850		Variance	543,635		Variance	6675,931	
	Std. Deviation	4,225		Std. Deviation	23,316		Std. Deviation	81,706	
	Minimum	0		Minimum	0		Minimum	0	
	Maximum	37		Maximum	206		Maximum	714	
	Range	37		Range	206		Range	714	
	Skewness	7,914	0,267	Skewness	8,260	0,267	Skewness	8,000	0,267
	Kurtosis	66,756	0,529	Kurtosis	71,349	0,529	Kurtosis	68,017	0,529

Table A.20 : Outlier-Extreme values.

Extreme Values												
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Mean_2000_2005 Highest	1	34	İSTANBUL	37	Mean_2006_2010 Highest	1	34	İSTANBUL	206	1	34	İSTANBUL	714
	2	6	ANKARA	8		2	6	ANKARA	42	2	6	ANKARA	143
	3	35	İZMİR	6		3	35	İZMİR	20	3	16	BURSA	121
	4	41	KOCAELİ	5		4	16	BURSA	19	4	41	KOCAELİ	64
	5	16	BURSA	2		5	45	MANİSA	12	5	35	İZMİR	63
Mean_2000_2005 Lowest	1	81	DÜZCE	0	Mean_2006_2010 Lowest	1	80	OSMANİYE	0	1	76	IĞDIR	0
	2	80	OSMANİYE	0		2	79	KİLİS	0	2	69	BAYBURT	0
	3	79	KİLİS	0		3	78	KARABÜK	0	3	62	TUNCELİ	0
	4	78	KARABÜK	0		4	75	ARDAHAN	0	4	30	HAKKARİ	0
	5	77	YALOVA	0[a]		5	73	ŞIRNAK	0[a]	5	24	ERZİNCAN	0[a]
a. Only a partial list of cases with the value 0 are shown in the table of lower extremes.													

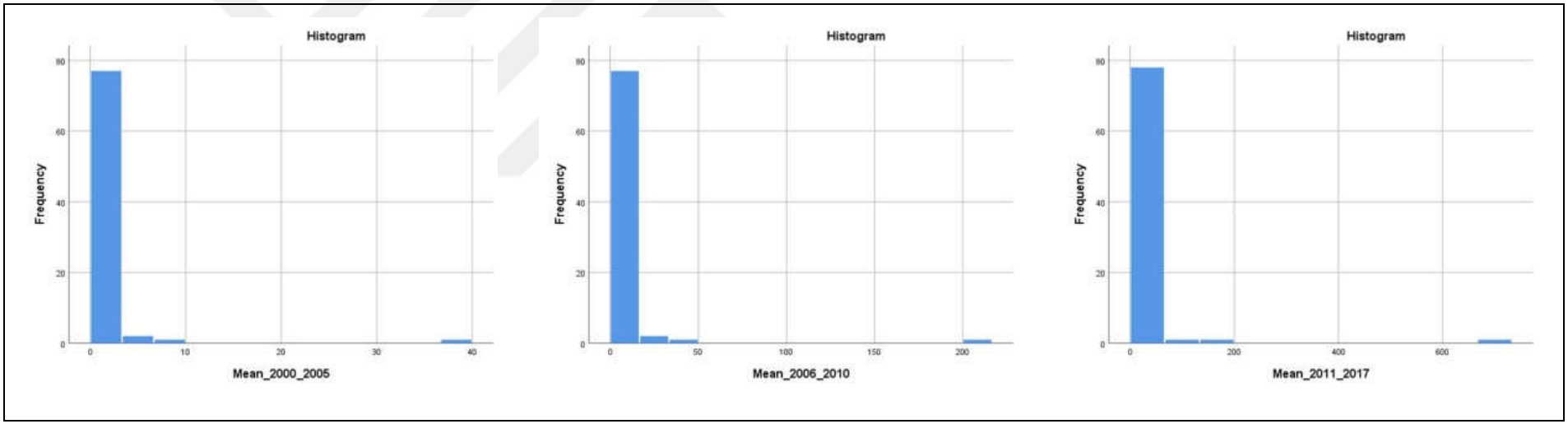


Figure A.9 : Histogram graphs.

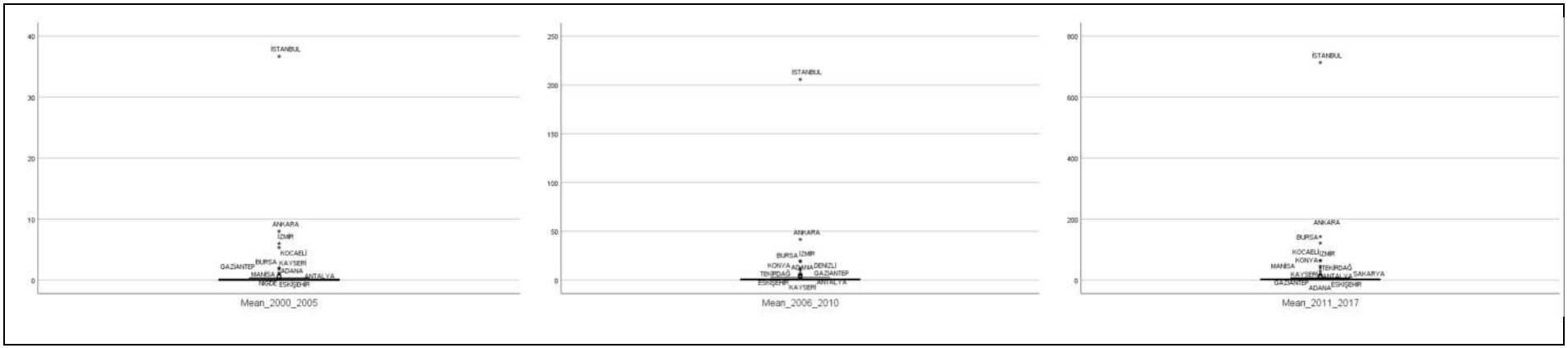


Figure A.10 : Boxplots.

Evaluation of Each Year (Lg of Numbers):

Table A.21 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Year2000	81	100,0%	0	0,0%	81	100,0%
Lg_Year2001	81	100,0%	0	0,0%	81	100,0%
Lg_Year2002	81	100,0%	0	0,0%	81	100,0%
Lg_Year2003	81	100,0%	0	0,0%	81	100,0%
Lg_Year2004	81	100,0%	0	0,0%	81	100,0%
Lg_Year2005	81	100,0%	0	0,0%	81	100,0%
Lg_Year2006	81	100,0%	0	0,0%	81	100,0%
Lg_Year2007	81	100,0%	0	0,0%	81	100,0%
Lg_Year2008	81	100,0%	0	0,0%	81	100,0%
Lg_Year2009	81	100,0%	0	0,0%	81	100,0%
Lg_Year2010	81	100,0%	0	0,0%	81	100,0%
Lg_Year2011	81	100,0%	0	0,0%	81	100,0%
Lg_Year2012	81	100,0%	0	0,0%	81	100,0%
Lg_Year2013	81	100,0%	0	0,0%	81	100,0%
Lg_Year2014	81	100,0%	0	0,0%	81	100,0%
Lg_Year2015	81	100,0%	0	0,0%	81	100,0%
Lg_Year2016	81	100,0%	0	0,0%	81	100,0%
Lg_Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.22 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Year2000	0,523	81	0,000	0,268	81	0,000
Lg_Year2001	0,485	81	0,000	0,396	81	0,000
Lg_Year2002	0,498	81	0,000	0,357	81	0,000
Lg_Year2003	0,479	81	0,000	0,374	81	0,000
Lg_Year2004	0,467	81	0,000	0,457	81	0,000
Lg_Year2005	0,442	81	0,000	0,494	81	0,000
Lg_Year2006	0,384	81	0,000	0,563	81	0,000
Lg_Year2007	0,400	81	0,000	0,552	81	0,000
Lg_Year2008	0,385	81	0,000	0,617	81	0,000
Lg_Year2009	0,321	81	0,000	0,671	81	0,000
Lg_Year2010	0,247	81	0,000	0,750	81	0,000
Lg_Year2011	0,249	81	0,000	0,757	81	0,000
Lg_Year2012	0,208	81	0,000	0,786	81	0,000
Lg_Year2013	0,222	81	0,000	0,796	81	0,000
Lg_Year2014	0,206	81	0,000	0,797	81	0,000
Lg_Year2015	0,217	81	0,000	0,811	81	0,000
Lg_Year2016	0,154	81	0,000	0,858	81	0,000
Lg_Year2017	0,177	81	0,000	0,838	81	0,000

a. Lilliefors Significance Correction

Table A.23 : Descriptive statistics.

Descriptives

		Statistic	Std. Error
Lg_Year2000	Mean	0,0426	0,01919
	Median	0,0000	
	Variance	0,030	
	Std. Deviation	0,17275	
	Minimum	0,00	
	Maximum	1,04	
	Range	1,04	
	Skewness	4,611	0,267
	Kurtosis	21,923	0,529
Lg_Year2001	Mean	0,0810	0,02639
	Median	0,0000	
	Variance	0,056	
	Std. Deviation	0,23751	
	Minimum	0,00	
	Maximum	1,53	
	Range	1,53	
	Skewness	3,928	0,267
	Kurtosis	18,487	0,529
Lg_Year2002	Mean	0,0820	0,02942
	Median	0,0000	
	Variance	0,070	
	Std. Deviation	0,26474	
	Minimum	0,00	
	Maximum	1,62	
	Range	1,62	
	Skewness	3,976	0,267
	Kurtosis	17,361	0,529
Lg_Year2003	Mean	0,0909	0,03116
	Median	0,0000	
	Variance	0,079	
	Std. Deviation	0,28043	
	Minimum	0,00	
	Maximum	1,73	
	Range	1,73	
	Skewness	4,076	0,267
	Kurtosis	18,433	0,529
Lg_Year2004	Mean	0,1006	0,02852
	Median	0,0000	
	Variance	0,066	
	Std. Deviation	0,25669	
	Minimum	0,00	
	Maximum	1,56	
	Range	1,56	
	Skewness	3,405	0,267
	Kurtosis	13,979	0,529
Lg_Year2005	Mean	0,1207	0,03157
	Median	0,0000	
	Variance	0,081	
	Std. Deviation	0,28412	
	Minimum	0,00	
	Maximum	1,72	
	Range	1,72	
	Skewness	3,288	0,267
	Kurtosis	13,354	0,529
Lg_Year2006	Mean	0,1531	0,03384
	Median	0,0000	
	Variance	0,093	
	Std. Deviation	0,30458	
	Minimum	0,00	
	Maximum	1,81	
	Range	1,81	
	Skewness	3,071	0,267
	Kurtosis	12,062	0,529
Lg_Year2007	Mean	0,1901	0,04418
	Median	0,0000	
	Variance	0,158	
	Std. Deviation	0,39759	
	Minimum	0,00	
	Maximum	2,33	
	Range	2,33	
	Skewness	2,991	0,267
	Kurtosis	11,177	0,529
Lg_Year2008	Mean	0,2363	0,04850
	Median	0,0000	
	Variance	0,191	
	Std. Deviation	0,43654	
	Minimum	0,00	
	Maximum	2,27	
	Range	2,27	
	Skewness	2,292	0,267
	Kurtosis	6,006	0,529
Lg_Year2009	Mean	0,2834	0,05190
	Median	0,0000	
	Variance	0,218	
	Std. Deviation	0,46707	
	Minimum	0,00	
	Maximum	2,40	
	Range	2,40	
	Skewness	2,181	0,267
	Kurtosis	5,445	0,529
Lg_Year2010	Mean	0,3739	0,05750
	Median	0,3010	
	Variance	0,268	
	Std. Deviation	0,51748	
	Minimum	0,00	
	Maximum	2,50	
	Range	2,50	
	Skewness	1,786	0,267
	Kurtosis	3,393	0,529
Lg_Year2011	Mean	0,4069	0,06194
	Median	0,3010	
	Variance	0,311	
	Std. Deviation	0,55748	
	Minimum	0,00	
	Maximum	2,62	
	Range	2,62	
	Skewness	1,709	0,267
	Kurtosis	2,956	0,529
Lg_Year2012	Mean	0,4583	0,06264
	Median	0,3010	
	Variance	0,318	
	Std. Deviation	0,56379	
	Minimum	0,00	
	Maximum	2,69	
	Range	2,69	
	Skewness	1,735	0,267
	Kurtosis	3,235	0,529
Lg_Year2013	Mean	0,5038	0,06615
	Median	0,3010	
	Variance	0,354	
	Std. Deviation	0,59539	
	Minimum	0,00	
	Maximum	2,73	
	Range	2,73	
	Skewness	1,642	0,267
	Kurtosis	2,583	0,529
Lg_Year2014	Mean	0,4837	0,06555
	Median	0,3010	
	Variance	0,348	
	Std. Deviation	0,58991	
	Minimum	0,00	
	Maximum	2,81	
	Range	2,81	
	Skewness	1,634	0,267
	Kurtosis	2,904	0,529
Lg_Year2015	Mean	0,5472	0,07156
	Median	0,3010	
	Variance	0,415	
	Std. Deviation	0,64401	
	Minimum	0,00	
	Maximum	2,93	
	Range	2,93	
	Skewness	1,504	0,267
	Kurtosis	2,060	0,529
Lg_Year2016	Mean	0,6148	0,06698
	Median	0,4771	
	Variance	0,363	
	Std. Deviation	0,60285	
	Minimum	0,00	
	Maximum	2,98	
	Range	2,98	
	Skewness	1,458	0,267
	Kurtosis	2,617	0,529
Lg_Year2017	Mean	0,5820	0,06981
	Median	0,4771	
	Variance	0,395	
	Std. Deviation	0,62826	
	Minimum	0,00	
	Maximum	3,05	
	Range	3,05	
	Skewness	1,498	0,267
	Kurtosis	2,560	0,529

Table A.24 : Outlier-Extreme values.

Extreme Values														
		Case	Region	Value		Case	Region	Value		Case	Region	Value		
Lg_Year2000	Highest	1	41	KOCAELİ	1,04	1	34	İSTANBUL	1,81	1	34	İSTANBUL	2,69	
		2	34	İSTANBUL	0,90	2	6	ANKARA	1,28	2	16	BURSA	2,05	
		3	6	ANKARA	0,60	3	16	BURSA	0,85	3	6	ANKARA	1,99	
		4	7	ANTALYA	0,30	4	35	İZMİR	0,85	4	45	MANİSA	1,76	
		5	16	BURSA	,30[a]	5	41	KOCAELİ	,60[d]	5	41	KOCAELİ	1,74	
	Lowest	1	81	DÜZCE	0,00	1	81	DÜZCE	0,00	1	80	OSMANİYE	0,00	
		2	80	OSMANİYE	0,00	2	80	OSMANİYE	0,00	2	79	KİLİS	0,00	
		3	79	KİLİS	0,00	3	79	KİLİS	0,00	3	76	IĞDIR	0,00	
		4	78	KARABÜK	0,00	4	78	KARABÜK	0,00	4	75	ARDAHAN	0,00	
		5	77	YALOVA	,00[b]	5	77	YALOVA	,00[b]	5	74	BARTIN	,00[b]	
Lg_Year2001	Highest	1	34	İSTANBUL	1,53	1	34	İSTANBUL	2,33	1	34	İSTANBUL	2,73	
		2	6	ANKARA	0,85	2	6	ANKARA	1,54	2	16	BURSA	2,24	
		3	41	KOCAELİ	0,70	3	16	BURSA	1,11	3	6	ANKARA	2,04	
		4	16	BURSA	0,60	4	35	İZMİR	1,11	4	41	KOCAELİ	1,88	
		5	35	İZMİR	0,60	5	3	AFYONKARAHİSAR	,78[e]	5	35	İZMİR	1,78	
	Lowest	1	81	DÜZCE	0,00	1	81	DÜZCE	0,00	1	79	KİLİS	0,00	
		2	80	OSMANİYE	0,00	2	80	OSMANİYE	0,00	2	78	KARABÜK	0,00	
		3	79	KİLİS	0,00	3	79	KİLİS	0,00	3	76	IĞDIR	0,00	
		4	78	KARABÜK	0,00	4	78	KARABÜK	0,00	4	75	ARDAHAN	0,00	
		5	77	YALOVA	,00[b]	5	77	YALOVA	,00[b]	5	72	BATMAN	,00[b]	
Lg_Year2002	Highest	1	34	İSTANBUL	1,62	1	34	İSTANBUL	2,27	1	34	İSTANBUL	2,81	
		2	6	ANKARA	1,08	2	6	ANKARA	1,53	2	16	BURSA	2,14	
		3	41	KOCAELİ	0,95	3	35	İZMİR	1,41	3	6	ANKARA	2,07	
		4	35	İZMİR	0,70	4	16	BURSA	1,23	4	35	İZMİR	1,72	
		5	45	MANİSA	0,60	5	42	KONYA	0,95	5	41	KOCAELİ	1,71	
	Lowest	1	81	DÜZCE	0,00	1	80	OSMANİYE	0,00	1	80	OSMANİYE	0,00	
		2	80	OSMANİYE	0,00	2	79	KİLİS	0,00	2	79	KİLİS	0,00	
		3	79	KİLİS	0,00	3	78	KARABÜK	0,00	3	78	KARABÜK	0,00	
		4	78	KARABÜK	0,00	4	77	YALOVA	0,00	4	76	IĞDIR	0,00	
		5	77	YALOVA	,00[b]	5	76	IĞDIR	,00[b]	5	75	ARDAHAN	,00[b]	
Lg_Year2003	Highest	1	34	İSTANBUL	1,73	1	34	İSTANBUL	2,40	1	34	İSTANBUL	2,93	
		2	35	İZMİR	1,23	2	6	ANKARA	1,72	2	6	ANKARA	2,27	
		3	6	ANKARA	1,04	3	16	BURSA	1,38	3	16	BURSA	2,12	
		4	41	KOCAELİ	0,60	4	35	İZMİR	1,34	4	41	KOCAELİ	2,02	
		5	16	BURSA	,48[c]	5	45	MANİSA	1,34	5	35	İZMİR	1,94	
	Lowest	1	81	DÜZCE	0,00	1	81	DÜZCE	0,00	1	80	OSMANİYE	0,00	
		2	80	OSMANİYE	0,00	2	80	OSMANİYE	0,00	2	79	KİLİS	0,00	
		3	79	KİLİS	0,00	3	79	KİLİS	0,00	3	78	KARABÜK	0,00	
		4	78	KARABÜK	0,00	4	78	KARABÜK	0,00	4	77	YALOVA	0,00	
		5	77	YALOVA	,00[b]	5	75	ARDAHAN	,00[b]	5	76	IĞDIR	,00[b]	
Lg_Year2004	Highest	1	34	İSTANBUL	1,56	1	34	İSTANBUL	2,50	1	34	İSTANBUL	2,98	
		2	35	İZMİR	0,95	2	6	ANKARA	1,86	2	6	ANKARA	2,33	
		3	6	ANKARA	0,85	3	16	BURSA	1,59	3	35	İZMİR	1,99	
		4	41	KOCAELİ	0,60	4	35	İZMİR	1,54	4	16	BURSA	1,98	
		5	1	ADANA	,48[c]	5	45	MANİSA	1,51	5	41	KOCAELİ	1,83	
	Lowest	1	81	DÜZCE	0,00	1	80	OSMANİYE	0,00	1	76	IĞDIR	0,00	
		2	80	OSMANİYE	0,00	2	79	KİLİS	0,00	2	74	BARTIN	0,00	
		3	79	KİLİS	0,00	3	78	KARABÜK	0,00	3	73	ŞIRNAK	0,00	
		4	78	KARABÜK	0,00	4	77	YALOVA	0,00	4	69	BAYBURT	0,00	
		5	77	YALOVA	,00[b]	5	76	IĞDIR	,00[b]	5	65	VAN	,00[b]	
Lg_Year2005	Highest	1	34	İSTANBUL	1,72	1	34	İSTANBUL	2,62	1	34	İSTANBUL	3,05	
		2	6	ANKARA	1,11	2	6	ANKARA	1,90	2	6	ANKARA	2,30	
		3	35	İZMİR	0,78	3	16	BURSA	1,88	3	16	BURSA	2,11	
		4	41	KOCAELİ	0,70	4	45	MANİSA	1,69	4	35	İZMİR	1,89	
		5	16	BURSA	,60[d]	5	42	KONYA	1,60	5	41	KOCAELİ	1,86	
	Lowest	1	81	DÜZCE	0,00	1	81	DÜZCE	0,00	1	81	DÜZCE	0,00	
		2	80	OSMANİYE	0,00	2	80	OSMANİYE	0,00	2	79	KİLİS	0,00	
		3	79	KİLİS	0,00	3	79	KİLİS	0,00	3	76	IĞDIR	0,00	
		4	78	KARABÜK	0,00	4	77	YALOVA	0,00	4	75	ARDAHAN	0,00	
		5	77	YALOVA	,00[b]	5	76	IĞDIR	,00[b]	5	73	ŞIRNAK	,00[b]	

a. Only a partial list of cases with the value ,30 are shown in the table of upper extremes.
b. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.
c. Only a partial list of cases with the value ,48 are shown in the table of upper extremes.
d. Only a partial list of cases with the value ,60 are shown in the table of upper extremes.
e. Only a partial list of cases with the value ,78 are shown in the table of upper extremes.

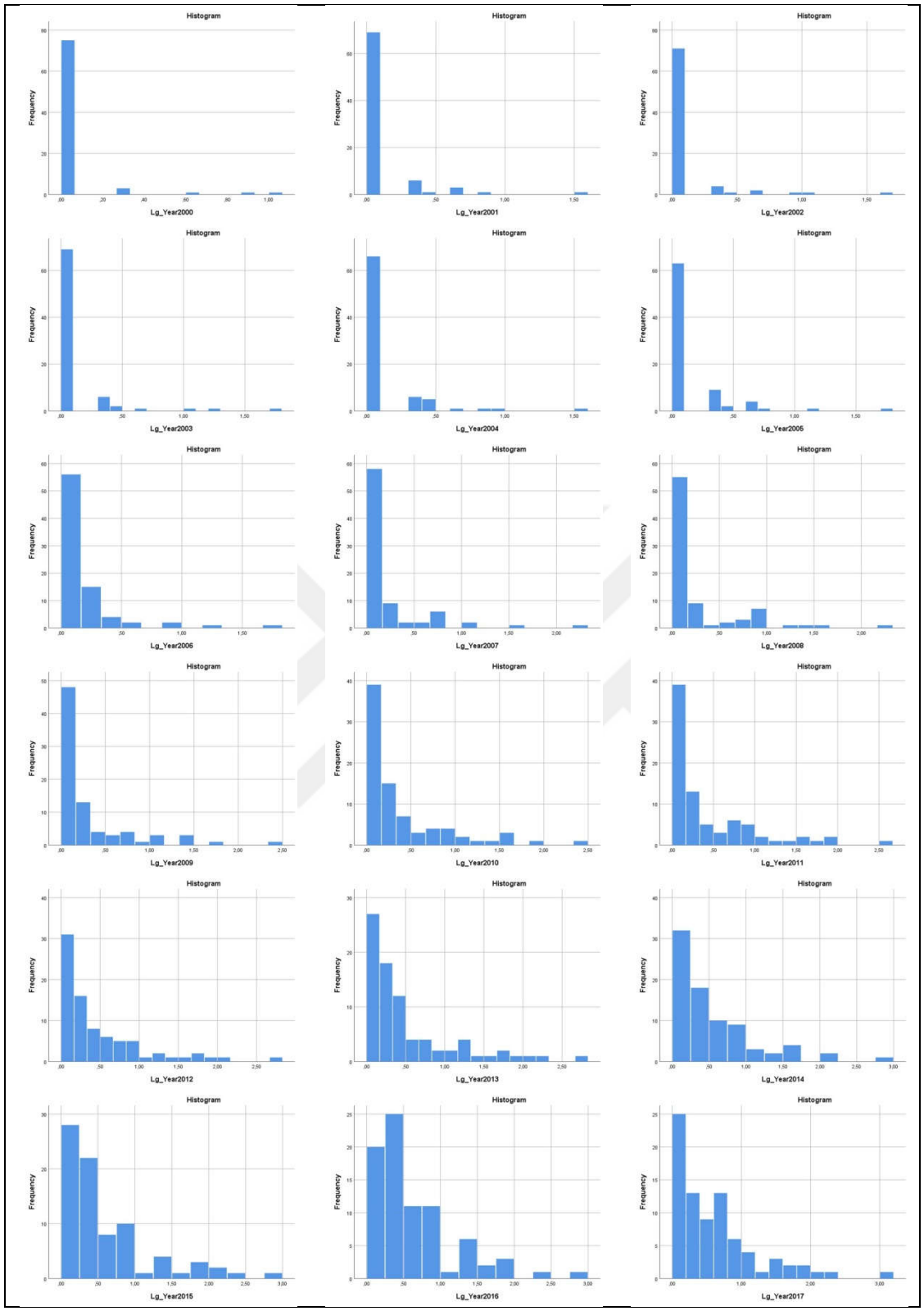


Figure A.11 : Histogram graphs.



Figure A.12 : Boxplots.

“Utility Model Applications”

Evaluation per each year (number)

Table A.25 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Year2000	81	100,0%	0	0,0%	81	100,0%
Year2001	81	100,0%	0	0,0%	81	100,0%
Year2002	81	100,0%	0	0,0%	81	100,0%
Year2003	81	100,0%	0	0,0%	81	100,0%
Year2004	81	100,0%	0	0,0%	81	100,0%
Year2005	81	100,0%	0	0,0%	81	100,0%
Year2006	81	100,0%	0	0,0%	81	100,0%
Year2007	81	100,0%	0	0,0%	81	100,0%
Year2008	81	100,0%	0	0,0%	81	100,0%
Year2009	81	100,0%	0	0,0%	81	100,0%
Year2010	81	100,0%	0	0,0%	81	100,0%
Year2011	81	100,0%	0	0,0%	81	100,0%
Year2012	81	100,0%	0	0,0%	81	100,0%
Year2013	81	100,0%	0	0,0%	81	100,0%
Year2014	81	100,0%	0	0,0%	81	100,0%
Year2015	81	100,0%	0	0,0%	81	100,0%
Year2016	81	100,0%	0	0,0%	81	100,0%
Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.26 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Year2000	0,395	81	0,000	0,286	81	0,000
Year2001	0,396	81	0,000	0,269	81	0,000
Year2002	0,405	81	0,000	0,240	81	0,000
Year2003	0,408	81	0,000	0,227	81	0,000
Year2004	0,406	81	0,000	0,236	81	0,000
Year2005	0,414	81	0,000	0,207	81	0,000
Year2006	0,412	81	0,000	0,208	81	0,000
Year2007	0,409	81	0,000	0,215	81	0,000
Year2008	0,403	81	0,000	0,231	81	0,000
Year2009	0,405	81	0,000	0,229	81	0,000
Year2010	0,408	81	0,000	0,216	81	0,000
Year2011	0,406	81	0,000	0,224	81	0,000
Year2012	0,399	81	0,000	0,249	81	0,000
Year2013	0,398	81	0,000	0,249	81	0,000
Year2014	0,395	81	0,000	0,260	81	0,000
Year2015	0,398	81	0,000	0,252	81	0,000
Year2016	0,394	81	0,000	0,257	81	0,000
Year2017	0,390	81	0,000	0,275	81	0,000

a. Lilliefors Significance Correction

Table A.27 : Descriptive statistics.

Descriptives											
			Std.				Std.				Std.
		Statistic	Error			Statistic	Error			Statistic	Error
Year2000	Mean	5,59	2,322	Year2006	Mean	29,91	14,992	Year2012	Mean	45,99	19,882
	Median	0,00			Median	2,00			Median	5,00	
	Variance	436,844			Variance	18206,505			Variance	32019,237	
	Std. Deviation	20,901			Std. Deviation	134,931			Std. Deviation	178,939	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	163			Maximum	1177			Maximum	1517	
	Range	163			Range	1177			Range	1517	
	Skewness	6,040	0,267		Skewness	7,934	0,267		Skewness	7,293	0,267
	Kurtosis	41,769	0,529		Kurtosis	67,338	0,529		Kurtosis	58,750	0,529
Year2001	Mean	7,77	3,283	Year2007	Mean	36,64	17,780	Year2013	Mean	42,64	18,373
	Median	1,00			Median	3,00			Median	5,00	
	Variance	872,907			Variance	25606,058			Variance	27343,333	
	Std. Deviation	29,545			Std. Deviation	160,019			Std. Deviation	165,358	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	240			Maximum	1394			Maximum	1400	
	Range	240			Range	1394			Range	1400	
	Skewness	6,584	0,267		Skewness	7,885	0,267		Skewness	7,266	0,267
	Kurtosis	49,145	0,529		Kurtosis	66,723	0,529		Kurtosis	58,398	0,529
Year2002	Mean	11,27	5,235	Year2008	Mean	36,32	16,442	Year2014	Mean	42,89	17,969
	Median	1,00			Median	4,00			Median	5,00	
	Variance	2220,050			Variance	21898,346			Variance	26154,725	
	Std. Deviation	47,117			Std. Deviation	147,981			Std. Deviation	161,724	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	394			Maximum	1278			Maximum	1343	
	Range	394			Range	1278			Range	1343	
	Skewness	7,091	0,267		Skewness	7,662	0,267		Skewness	6,930	0,267
	Kurtosis	55,973	0,529		Kurtosis	63,808	0,529		Kurtosis	53,766	0,529
Year2003	Mean	14,88	7,069	Year2009	Mean	35,09	16,188	Year2015	Mean	42,60	18,375
	Median	1,00			Median	4,00			Median	3,00	
	Variance	4047,560			Variance	21225,305			Variance	27350,242	
	Std. Deviation	63,620			Std. Deviation	145,689			Std. Deviation	165,379	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	544			Maximum	1257			Maximum	1395	
	Range	544			Range	1257			Range	1395	
	Skewness	7,514	0,267		Skewness	7,659	0,267		Skewness	7,214	0,267
	Kurtosis	61,607	0,529		Kurtosis	63,707	0,529		Kurtosis	57,584	0,529
Year2004	Mean	18,23	8,560	Year2010	Mean	36,96	17,673	Year2016	Mean	42,68	17,649
	Median	1,00			Median	3,00			Median	4,00	
	Variance	5935,582			Variance	25299,836			Variance	25231,146	
	Std. Deviation	77,043			Std. Deviation	159,059			Std. Deviation	158,843	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	652			Maximum	1384			Maximum	1353	
	Range	652			Range	1384			Range	1353	
	Skewness	7,297	0,267		Skewness	7,859	0,267		Skewness	7,334	0,267
	Kurtosis	58,867	0,529		Kurtosis	66,302	0,529		Kurtosis	59,514	0,529
Year2005	Mean	23,26	11,910	Year2011	Mean	39,20	18,250	Year2017	Mean	40,20	15,954
	Median	1,00			Median	4,00			Median	5,00	
	Variance	11489,919			Variance	26976,860			Variance	20616,060	
	Std. Deviation	107,191			Std. Deviation	164,246			Std. Deviation	143,583	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	932			Maximum	1421			Maximum	1195	
	Range	932			Range	1421			Range	1195	
	Skewness	7,882	0,267		Skewness	7,732	0,267		Skewness	6,902	0,267
	Kurtosis	66,588	0,529		Kurtosis	64,551	0,529		Kurtosis	53,730	0,529

Table A.28 : Outliers-Extreme values.

		Extreme Values											
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Year2000	Highest 1	34	İSTANBUL	163	Year2006 Highest 1	34	İSTANBUL	1177	Year2012 Highest 1	34	İSTANBUL	1517
	2	6	ANKARA	67	2	6	ANKARA	199	2	6	ANKARA	402
	3	35	İZMİR	50	3	35	İZMİR	187	3	35	İZMİR	317
	4	16	BURSA	48	4	16	BURSA	157	4	16	BURSA	271
	5	38	KAYSERİ	31	5	38	KAYSERİ	143	5	42	KONYA	216
	Lowest 1	81	DÜZCE	0	Lowest 1	80	OSMANİYE	0	Lowest 1	79	KİLİS	0
	2	80	OSMANİYE	0	2	79	KİLİS	0	2	76	IĞDIR	0
	3	79	KİLİS	0	3	76	IĞDIR	0	3	75	ARDAHAN	0
	4	78	KARABÜK	0	4	75	ARDAHAN	0	4	72	BATMAN	0
	5	77	YALOVA	0[a]	5	73	ŞIRNAK	0[a]	5	69	BAYBURT	0[a]
Year2001	Highest 1	34	İSTANBUL	240	Year2007 Highest 1	34	İSTANBUL	1394	Year2013 Highest 1	34	İSTANBUL	1400
	2	6	ANKARA	78	2	6	ANKARA	232	2	6	ANKARA	378
	3	35	İZMİR	68	3	35	İZMİR	230	3	16	BURSA	285
	4	16	BURSA	61	4	16	BURSA	203	4	35	İZMİR	252
	5	42	KONYA	39	5	42	KONYA	153	5	42	KONYA	204
	Lowest 1	81	DÜZCE	0	Lowest 1	79	KİLİS	0	Lowest 1	79	KİLİS	0
	2	80	OSMANİYE	0	2	77	YALOVA	0	2	76	IĞDIR	0
	3	78	KARABÜK	0	3	74	BARTIN	0	3	75	ARDAHAN	0
	4	76	IĞDIR	0	4	73	ŞIRNAK	0	4	73	ŞIRNAK	0
	5	75	ARDAHAN	0[a]	5	71	KIRIKKALE	0[a]	5	69	BAYBURT	0[a]
Year2002	Highest 1	34	İSTANBUL	394	Year2008 Highest 1	34	İSTANBUL	1278	Year2014 Highest 1	34	İSTANBUL	1343
	2	6	ANKARA	104	2	6	ANKARA	259	2	6	ANKARA	430
	3	16	BURSA	93	3	16	BURSA	216	3	35	İZMİR	300
	4	35	İZMİR	88	4	35	İZMİR	201	4	16	BURSA	279
	5	42	KONYA	54	5	42	KONYA	179	5	42	KONYA	205
	Lowest 1	80	OSMANİYE	0	Lowest 1	79	KİLİS	0	Lowest 1	79	KİLİS	0
	2	79	KİLİS	0	2	75	ARDAHAN	0	2	74	BARTIN	0
	3	78	KARABÜK	0	3	73	ŞIRNAK	0	3	73	ŞIRNAK	0
	4	76	IĞDIR	0	4	72	BATMAN	0	4	71	KIRIKKALE	0
	5	75	ARDAHAN	0[a]	5	62	TUNCELİ	0[a]	5	69	BAYBURT	0[a]
Year2003	Highest 1	34	İSTANBUL	544	Year2009 Highest 1	34	İSTANBUL	1257	Year2015 Highest 1	34	İSTANBUL	1395
	2	6	ANKARA	136	2	6	ANKARA	265	2	6	ANKARA	418
	3	16	BURSA	98	3	16	BURSA	221	3	16	BURSA	262
	4	35	İZMİR	96	4	35	İZMİR	199	4	35	İZMİR	256
	5	42	KONYA	53	5	42	KONYA	158	5	42	KONYA	182
	Lowest 1	80	OSMANİYE	0	Lowest 1	76	IĞDIR	0	Lowest 1	76	IĞDIR	0
	2	79	KİLİS	0	2	75	ARDAHAN	0	2	75	ARDAHAN	0
	3	78	KARABÜK	0	3	73	ŞIRNAK	0	3	73	ŞIRNAK	0
	4	75	ARDAHAN	0	4	69	BAYBURT	0	4	69	BAYBURT	0
	5	74	BARTIN	0[a]	5	68	AKSARAY	0[a]	5	57	SİNOP	0[a]
Year2004	Highest 1	34	İSTANBUL	652	Year2010 Highest 1	34	İSTANBUL	1384	Year2016 Highest 1	34	İSTANBUL	1353
	2	6	ANKARA	161	2	6	ANKARA	263	2	6	ANKARA	305
	3	16	BURSA	127	3	35	İZMİR	238	3	16	BURSA	277
	4	35	İZMİR	125	4	16	BURSA	208	4	35	İZMİR	273
	5	38	KAYSERİ	92	5	42	KONYA	130	5	42	KONYA	194
	Lowest 1	81	DÜZCE	0	Lowest 1	75	ARDAHAN	0	Lowest 1	79	KİLİS	0
	2	80	OSMANİYE	0	2	73	ŞIRNAK	0	2	76	IĞDIR	0
	3	79	KİLİS	0	3	69	BAYBURT	0	3	75	ARDAHAN	0
	4	78	KARABÜK	0	4	63	ŞANLIURFA	0	4	72	BATMAN	0
	5	76	IĞDIR	0[a]	5	62	TUNCELİ	0[a]	5	69	BAYBURT	0[a]
Year2005	Highest 1	34	İSTANBUL	932	Year2011 Highest 1	34	İSTANBUL	1421	Year2017 Highest 1	34	İSTANBUL	1195
	2	6	ANKARA	181	2	6	ANKARA	319	2	6	ANKARA	329
	3	16	BURSA	136	3	35	İZMİR	235	3	16	BURSA	304
	4	35	İZMİR	126	4	16	BURSA	231	4	35	İZMİR	257
	5	38	KAYSERİ	118	5	42	KONYA	125	5	42	KONYA	198
	Lowest 1	80	OSMANİYE	0	Lowest 1	76	IĞDIR	0	Lowest 1	79	KİLİS	0
	2	79	KİLİS	0	2	75	ARDAHAN	0	2	76	IĞDIR	0
	3	77	YALOVA	0	3	73	ŞIRNAK	0	3	74	BARTIN	0
	4	76	IĞDIR	0	4	72	BATMAN	0	4	72	BATMAN	0
	5	75	ARDAHAN	0[a]	5	65	VAN	0[a]	5	62	TUNCELİ	0[a]

a. Only a partial list of cases with the value 0 are shown in the table of lower extremes.

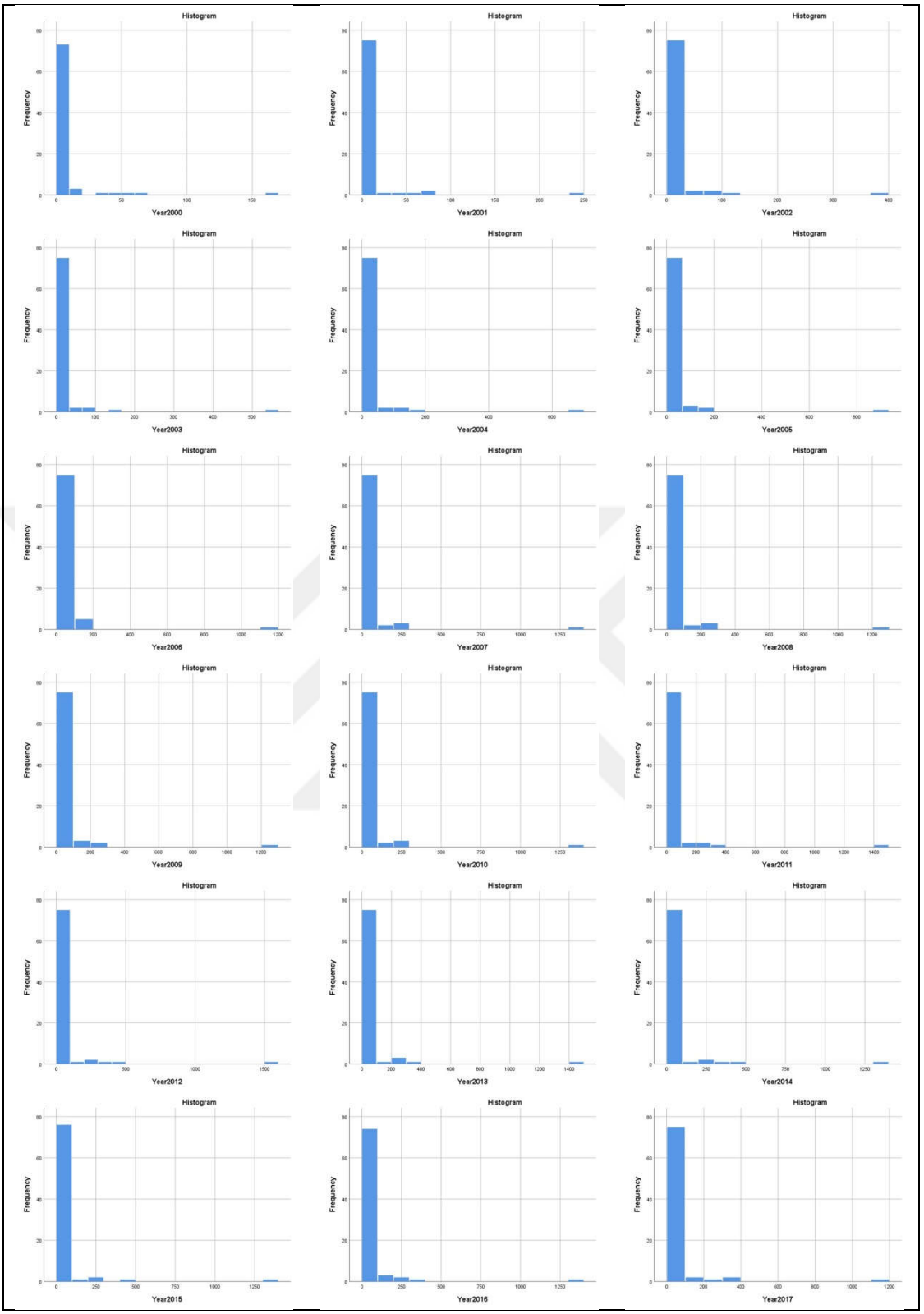


Figure A.13 : Histogram graphs.

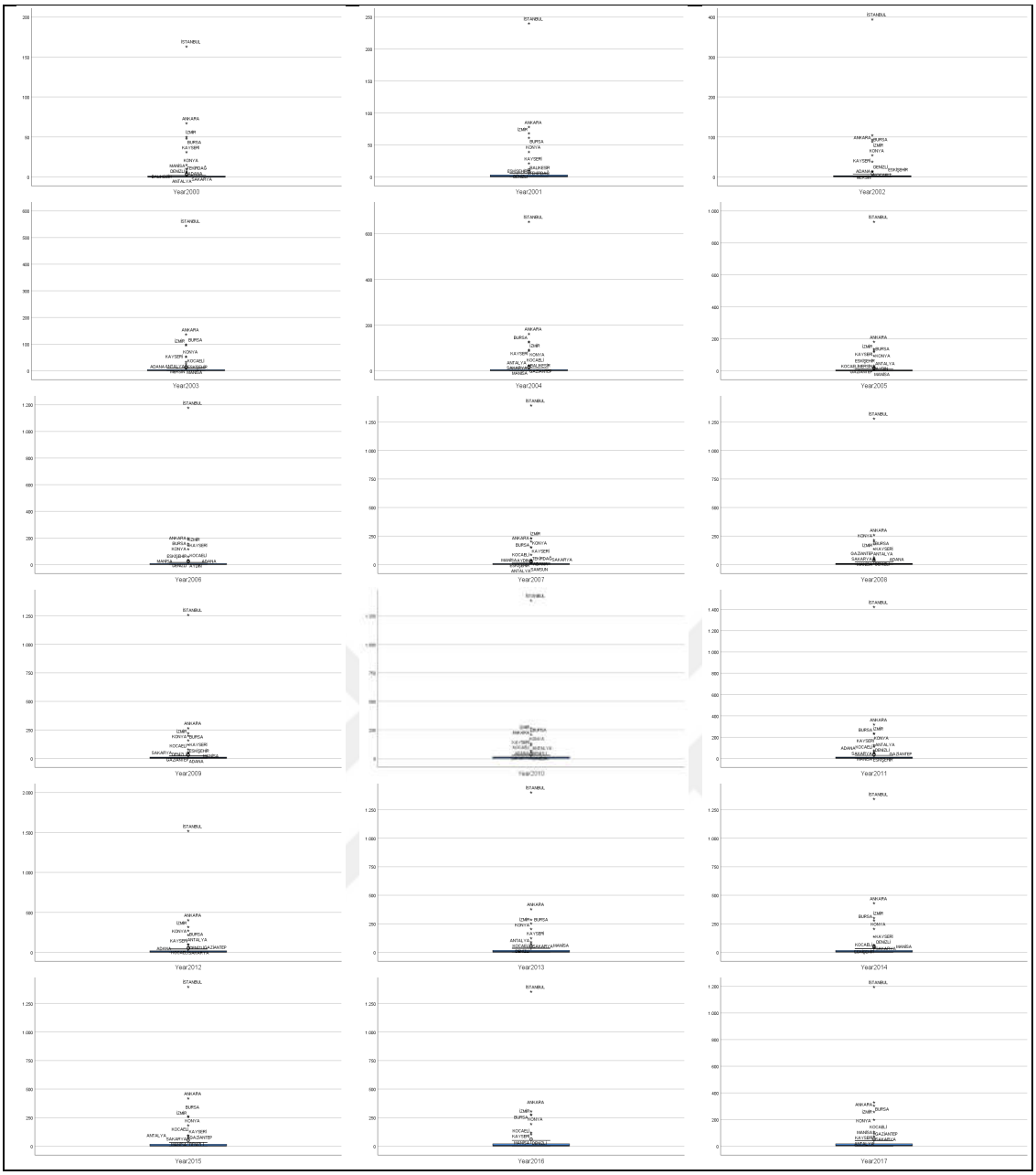


Figure A.14 : Boxplots.

Evaluation of the mean values of the regions within themselves within certain time periods

Table A.29 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table A.30 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mean_2000_2005	0,408	81	0,000	0,230	81	0,000
Mean_2006_2010	0,407	81	0,000	0,218	81	0,000
Mean_2011_2017	0,398	81	0,000	0,250	81	0,000
a. Lilliefors Significance Correction						

Table A.31 : Descriptive statistics.

Descriptives											
			Std.				Std.				Std.
		Statistic	Error			Statistic	Error			Statistic	Error
Mean_2000_2005	Mean	13,50	6,373	Mean_2006_2010	Mean	34,99	16,603	Mean_2011_2017	Mean	42,31	18,036
	Median	1,00			Median	3,40			Median	4,86	
	Variance	3289,619			Variance	22327,571			Variance	26350,109	
	Std. Deviation	57,355			Std. Deviation	149,424			Std. Deviation	162,327	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	488			Maximum	1298			Maximum	1375	
	Range	488			Range	1298			Range	1375	
	Skewness	7,390	0,267		Skewness	7,814	0,267		Skewness	7,266	0,267
	Kurtosis	60,013	0,529		Kurtosis	65,767	0,529		Kurtosis	58,409	0,529

Table A.32 : Outliers-Extreme values.

Extreme Values												
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Mean_2000_2005	Highest 1	34	İSTANBUL	488	Mean_2006_2010 Highest 1	34	İSTANBUL	1298	Mean_2011_2017 Highest 1	34	İSTANBUL	1375
	2	6	ANKARA	121	2	6	ANKARA	244	2	6	ANKARA	369
	3	16	BURSA	94	3	35	İZMİR	211	3	16	BURSA	273
	4	35	İZMİR	92	4	16	BURSA	201	4	35	İZMİR	270
	5	38	KAYSERİ	59	5	42	KONYA	147	5	42	KONYA	189
	Lowest 1	80	OSMANİYE	0	Lowest 1	73	ŞIRNAK	0	Lowest 1	56	SİİRT	0
	2	75	ARDAHAN	0	2	56	SİİRT	0	2	69	BAYBURT	0
	3	73	ŞIRNAK	0	3	30	HAKKARİ	0	3	62	TUNCELİ	0
	4	69	BAYBURT	0	4	13	BİTLİS	0	4	8	ARTVİN	0
	5	65	VAN	0[a]	5	12	BİNGÖL	0[a]	5	4	AĞRI	0
a. Only a partial list of cases with the value 0 are shown in the table of lower extremes.												

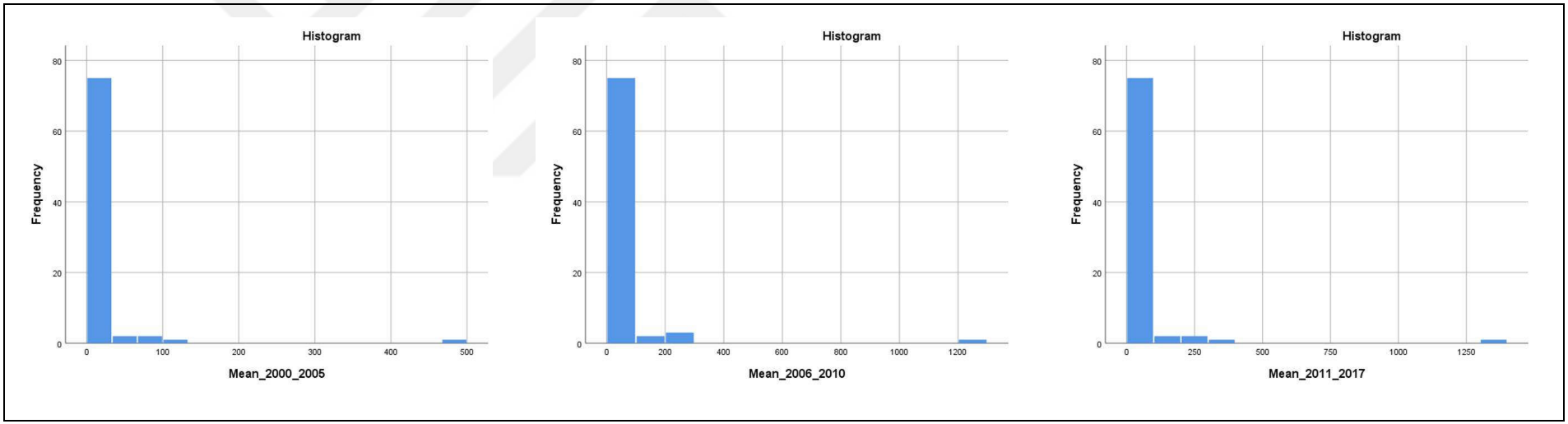


Figure A.15 : Histogram graphs.

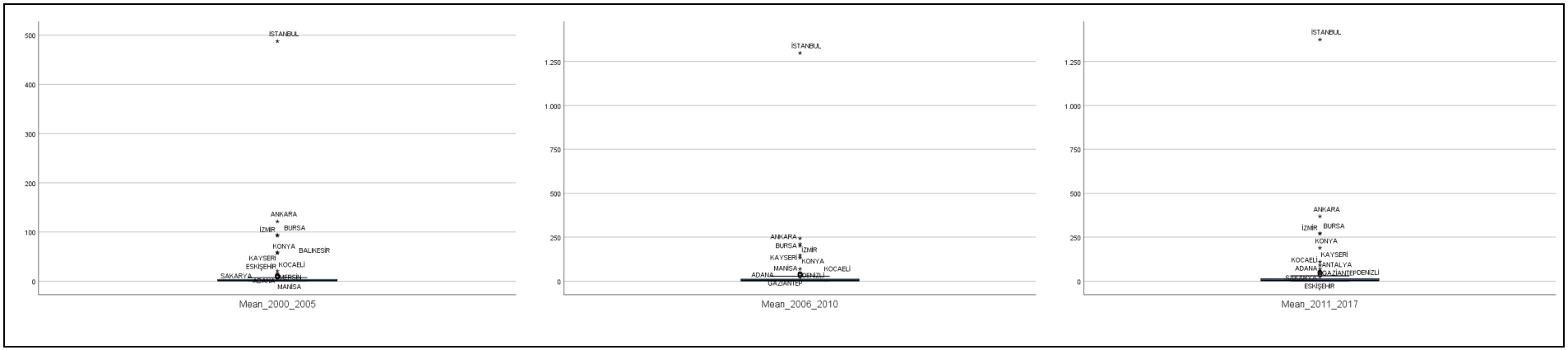


Figure A.16 : Boxplots.

Evaluation of Lg values per each year

Table A.33 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Year2000	81	100,0%	0	0,0%	81	100,0%
Lg_Year2001	81	100,0%	0	0,0%	81	100,0%
Lg_Year2002	81	100,0%	0	0,0%	81	100,0%
Lg_Year2003	81	100,0%	0	0,0%	81	100,0%
Lg_Year2004	81	100,0%	0	0,0%	81	100,0%
Lg_Year2005	81	100,0%	0	0,0%	81	100,0%
Lg_Year2006	81	100,0%	0	0,0%	81	100,0%
Lg_Year2007	81	100,0%	0	0,0%	81	100,0%
Lg_Year2008	81	100,0%	0	0,0%	81	100,0%
Lg_Year2009	81	100,0%	0	0,0%	81	100,0%
Lg_Year2010	81	100,0%	0	0,0%	81	100,0%
Lg_Year2011	81	100,0%	0	0,0%	81	100,0%
Lg_Year2012	81	100,0%	0	0,0%	81	100,0%
Lg_Year2013	81	100,0%	0	0,0%	81	100,0%
Lg_Year2014	81	100,0%	0	0,0%	81	100,0%
Lg_Year2015	81	100,0%	0	0,0%	81	100,0%
Lg_Year2016	81	100,0%	0	0,0%	81	100,0%
Lg_Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.34 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Year2000	0,318	81	0,000	0,663	81	0,000
Lg_Year2001	0,259	81	0,000	0,750	81	0,000
Lg_Year2002	0,237	81	0,000	0,749	81	0,000
Lg_Year2003	0,196	81	0,000	0,811	81	0,000
Lg_Year2004	0,220	81	0,000	0,780	81	0,000
Lg_Year2005	0,204	81	0,000	0,807	81	0,000
Lg_Year2006	0,172	81	0,000	0,857	81	0,000
Lg_Year2007	0,157	81	0,000	0,885	81	0,000
Lg_Year2008	0,117	81	0,008	0,914	81	0,000
Lg_Year2009	0,128	81	0,002	0,904	81	0,000
Lg_Year2010	0,164	81	0,000	0,905	81	0,000
Lg_Year2011	0,123	81	0,004	0,917	81	0,000
Lg_Year2012	0,110	81	0,018	0,929	81	0,000
Lg_Year2013	0,107	81	0,024	0,929	81	0,000
Lg_Year2014	0,108	81	0,021	0,930	81	0,000
Lg_Year2015	0,184	81	0,000	0,906	81	0,000
Lg_Year2016	0,147	81	0,000	0,929	81	0,000
Lg_Year2017	0,115	81	0,010	0,929	81	0,000

a. Lilliefors Significance Correction

Table A.35 : Descriptive statistics.

Descriptives											
		Statistic	Std. Error			Statistic	Std. Error			Statistic	Std. Error
Lg_Year2000	Mean	0,2954	0,05481	Lg_Year2006	Mean	0,6537	0,07638	Lg_Year2012	Mean	0,8828	0,07980
	Median	0,0000			Median	0,4771			Median	0,7782	
	Variance	0,243			Variance	0,473			Variance	0,516	
	Std. Deviation	0,49328			Std. Deviation	0,68740			Std. Deviation	0,71819	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,21			Maximum	3,07			Maximum	3,18	
	Range	2,21			Range	3,07			Range	3,18	
	Skewness	2,058	0,267		Skewness	1,234	0,267		Skewness	0,858	0,267
	Kurtosis	3,987	0,529		Kurtosis	1,286	0,529		Kurtosis	0,503	0,529
Lg_Year2001	Mean	0,3808	0,05856	Lg_Year2007	Mean	0,7468	0,07762	Lg_Year2013	Mean	0,8725	0,07785
	Median	0,3010			Median	0,6021			Median	0,7782	
	Variance	0,278			Variance	0,488			Variance	0,491	
	Std. Deviation	0,52707			Std. Deviation	0,69855			Std. Deviation	0,70062	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,38			Maximum	3,14			Maximum	3,15	
	Range	2,38			Range	3,14			Range	3,15	
	Skewness	1,732	0,267		Skewness	1,134	0,267		Skewness	0,878	0,267
	Kurtosis	2,963	0,529		Kurtosis	1,037	0,529		Kurtosis	0,676	0,529
Lg_Year2002	Mean	0,4143	0,06292	Lg_Year2008	Mean	0,8231	0,07455	Lg_Year2014	Mean	0,8870	0,07660
	Median	0,3010			Median	0,6990			Median	0,7782	
	Variance	0,321			Variance	0,450			Variance	0,475	
	Std. Deviation	0,56624			Std. Deviation	0,67099			Std. Deviation	0,68937	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,60			Maximum	3,11			Maximum	3,13	
	Range	2,60			Range	3,11			Range	3,13	
	Skewness	1,795	0,267		Skewness	1,024	0,267		Skewness	0,910	0,267
	Kurtosis	3,235	0,529		Kurtosis	1,020	0,529		Kurtosis	0,838	0,529
Lg_Year2003	Mean	0,5055	0,06573	Lg_Year2009	Mean	0,7803	0,07549	Lg_Year2015	Mean	0,8526	0,07773
	Median	0,3010			Median	0,6990			Median	0,6021	
	Variance	0,350			Variance	0,462			Variance	0,489	
	Std. Deviation	0,59154			Std. Deviation	0,67943			Std. Deviation	0,69959	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,74			Maximum	3,10			Maximum	3,14	
	Range	2,74			Range	3,10			Range	3,14	
	Skewness	1,562	0,267		Skewness	1,079	0,267		Skewness	1,035	0,267
	Kurtosis	2,465	0,529		Kurtosis	1,050	0,529		Kurtosis	0,775	0,529
Lg_Year2004	Mean	0,4947	0,07120	Lg_Year2010	Mean	0,7917	0,07625	Lg_Year2016	Mean	0,8882	0,07971
	Median	0,3010			Median	0,6021			Median	0,6990	
	Variance	0,411			Variance	0,471			Variance	0,515	
	Std. Deviation	0,64079			Std. Deviation	0,68626			Std. Deviation	0,71735	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,81			Maximum	3,14			Maximum	3,13	
	Range	2,81			Range	3,14			Range	3,13	
	Skewness	1,556	0,267		Skewness	1,047	0,267		Skewness	0,785	0,267
	Kurtosis	2,108	0,529		Kurtosis	0,930	0,529		Kurtosis	0,219	0,529
Lg_Year2005	Mean	0,5491	0,07364	Lg_Year2011	Mean	0,8153	0,07818	Lg_Year2017	Mean	0,8872	0,07661
	Median	0,3010			Median	0,6990			Median	0,7782	
	Variance	0,439			Variance	0,495			Variance	0,475	
	Std. Deviation	0,66280			Std. Deviation	0,70362			Std. Deviation	0,68953	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,97			Maximum	3,15			Maximum	3,08	
	Range	2,97			Range	3,15			Range	3,08	
	Skewness	1,453	0,267		Skewness	0,918	0,267		Skewness	0,898	0,267
	Kurtosis	1,864	0,529		Kurtosis	0,654	0,529		Kurtosis	0,544	0,529

Table A.36 : Outliers-Extreme values.

Extreme Values													
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Lg_Year2000	Highest 1	34	İSTANBUL	2,21	Lg_Year2006 Highest 1	34	İSTANBUL	3,07	Lg_Year2012 Highest 1	34	İSTANBUL	3,18
	2	6	ANKARA	1,83	2	6	ANKARA	2,30	2	6	ANKARA	2,61
	3	35	İZMİR	1,71	3	35	İZMİR	2,27	3	35	İZMİR	2,50
	4	16	BURSA	1,69	4	16	BURSA	2,20	4	16	BURSA	2,43
	5	38	KAYSERİ	1,51	5	38	KAYSERİ	2,16	5	42	KONYA	2,34
	Lowest 1	81	DÜZCE	0,00	Lowest 1	80	OSMANİYE	0,00	Lowest 1	79	KİLİS	0,00
	2	80	OSMANİYE	0,00	2	79	KİLİS	0,00	2	76	IĞDIR	0,00
	3	79	KİLİS	0,00	3	76	IĞDIR	0,00	3	75	ARDAHAN	0,00
	4	78	KARABÜK	0,00	4	75	ARDAHAN	0,00	4	72	BATMAN	0,00
	5	77	YALOVA	,00[a]	5	73	ŞIRNAK	,00[a]	5	69	BAYBURT	,00[a]
Lg_Year2001	Highest 1	34	İSTANBUL	2,38	Lg_Year2007 Highest 1	34	İSTANBUL	3,14	Lg_Year2013 Highest 1	34	İSTANBUL	3,15
	2	6	ANKARA	1,90	2	6	ANKARA	2,37	2	6	ANKARA	2,58
	3	35	İZMİR	1,84	3	35	İZMİR	2,36	3	16	BURSA	2,46
	4	16	BURSA	1,79	4	16	BURSA	2,31	4	35	İZMİR	2,40
	5	42	KONYA	1,60	5	42	KONYA	2,19	5	42	KONYA	2,31
	Lowest 1	81	DÜZCE	0,00	Lowest 1	79	KİLİS	0,00	Lowest 1	79	KİLİS	0,00
	2	80	OSMANİYE	0,00	2	77	YALOVA	0,00	2	76	IĞDIR	0,00
	3	78	KARABÜK	0,00	3	74	BARTIN	0,00	3	75	ARDAHAN	0,00
	4	76	IĞDIR	0,00	4	73	ŞIRNAK	0,00	4	73	ŞIRNAK	0,00
	5	75	ARDAHAN	,00[a]	5	71	KIRIKKALE	,00[a]	5	69	BAYBURT	,00[a]
Lg_Year2002	Highest 1	34	İSTANBUL	2,60	Lg_Year2008 Highest 1	34	İSTANBUL	3,11	Lg_Year2014 Highest 1	34	İSTANBUL	3,13
	2	6	ANKARA	2,02	2	6	ANKARA	2,41	2	6	ANKARA	2,63
	3	16	BURSA	1,97	3	16	BURSA	2,34	3	35	İZMİR	2,48
	4	35	İZMİR	1,95	4	35	İZMİR	2,31	4	16	BURSA	2,45
	5	42	KONYA	1,74	5	42	KONYA	2,26	5	42	KONYA	2,31
	Lowest 1	80	OSMANİYE	0,00	Lowest 1	79	KİLİS	0,00	Lowest 1	79	KİLİS	0,00
	2	79	KİLİS	0,00	2	75	ARDAHAN	0,00	2	74	BARTIN	0,00
	3	78	KARABÜK	0,00	3	73	ŞIRNAK	0,00	3	73	ŞIRNAK	0,00
	4	76	IĞDIR	0,00	4	72	BATMAN	0,00	4	71	KIRIKKALE	0,00
	5	75	ARDAHAN	,00[a]	5	62	TUNCELİ	,00[a]	5	69	BAYBURT	,00[a]
Lg_Year2003	Highest 1	34	İSTANBUL	2,74	Lg_Year2009 Highest 1	34	İSTANBUL	3,10	Lg_Year2015 Highest 1	34	İSTANBUL	3,14
	2	6	ANKARA	2,14	2	6	ANKARA	2,42	2	6	ANKARA	2,62
	3	16	BURSA	2,00	3	16	BURSA	2,35	3	16	BURSA	2,42
	4	35	İZMİR	1,99	4	35	İZMİR	2,30	4	35	İZMİR	2,41
	5	42	KONYA	1,73	5	42	KONYA	2,20	5	42	KONYA	2,26
	Lowest 1	80	OSMANİYE	0,00	Lowest 1	76	IĞDIR	0,00	Lowest 1	76	IĞDIR	0,00
	2	79	KİLİS	0,00	2	75	ARDAHAN	0,00	2	75	ARDAHAN	0,00
	3	78	KARABÜK	0,00	3	73	ŞIRNAK	0,00	3	73	ŞIRNAK	0,00
	4	75	ARDAHAN	0,00	4	69	BAYBURT	0,00	4	69	BAYBURT	0,00
	5	74	BARTIN	,00[a]	5	68	AKSARAY	,00[a]	5	57	SİNOP	,00[a]
Lg_Year2004	Highest 1	34	İSTANBUL	2,81	Lg_Year2010 Highest 1	34	İSTANBUL	3,14	Lg_Year2016 Highest 1	34	İSTANBUL	3,13
	2	6	ANKARA	2,21	2	6	ANKARA	2,42	2	6	ANKARA	2,49
	3	16	BURSA	2,11	3	35	İZMİR	2,38	3	16	BURSA	2,44
	4	35	İZMİR	2,10	4	16	BURSA	2,32	4	35	İZMİR	2,44
	5	38	KAYSERİ	1,97	5	42	KONYA	2,12	5	42	KONYA	2,29
	Lowest 1	81	DÜZCE	0,00	Lowest 1	75	ARDAHAN	0,00	Lowest 1	79	KİLİS	0,00
	2	80	OSMANİYE	0,00	2	73	ŞIRNAK	0,00	2	76	IĞDIR	0,00
	3	79	KİLİS	0,00	3	69	BAYBURT	0,00	3	75	ARDAHAN	0,00
	4	78	KARABÜK	0,00	4	63	ŞANLIURFA	0,00	4	72	BATMAN	0,00
	5	76	IĞDIR	,00[a]	5	62	TUNCELİ	,00[a]	5	69	BAYBURT	,00[a]
Lg_Year2005	Highest 1	34	İSTANBUL	2,97	Lg_Year2011 Highest 1	34	İSTANBUL	3,15	Lg_Year2017 Highest 1	34	İSTANBUL	3,08
	2	6	ANKARA	2,26	2	6	ANKARA	2,51	2	6	ANKARA	2,52
	3	16	BURSA	2,14	3	35	İZMİR	2,37	3	16	BURSA	2,48
	4	35	İZMİR	2,10	4	16	BURSA	2,37	4	35	İZMİR	2,41
	5	38	KAYSERİ	2,08	5	42	KONYA	2,10	5	42	KONYA	2,30
	Lowest 1	80	OSMANİYE	0,00	Lowest 1	76	IĞDIR	0,00	Lowest 1	79	KİLİS	0,00
	2	79	KİLİS	0,00	2	75	ARDAHAN	0,00	2	76	IĞDIR	0,00
	3	77	YALOVA	0,00	3	73	ŞIRNAK	0,00	3	74	BARTIN	0,00
	4	76	IĞDIR	0,00	4	72	BATMAN	0,00	4	72	BATMAN	0,00
	5	75	ARDAHAN	,00[a]	5	65	VAN	,00[a]	5	62	TUNCELİ	,00[a]

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.

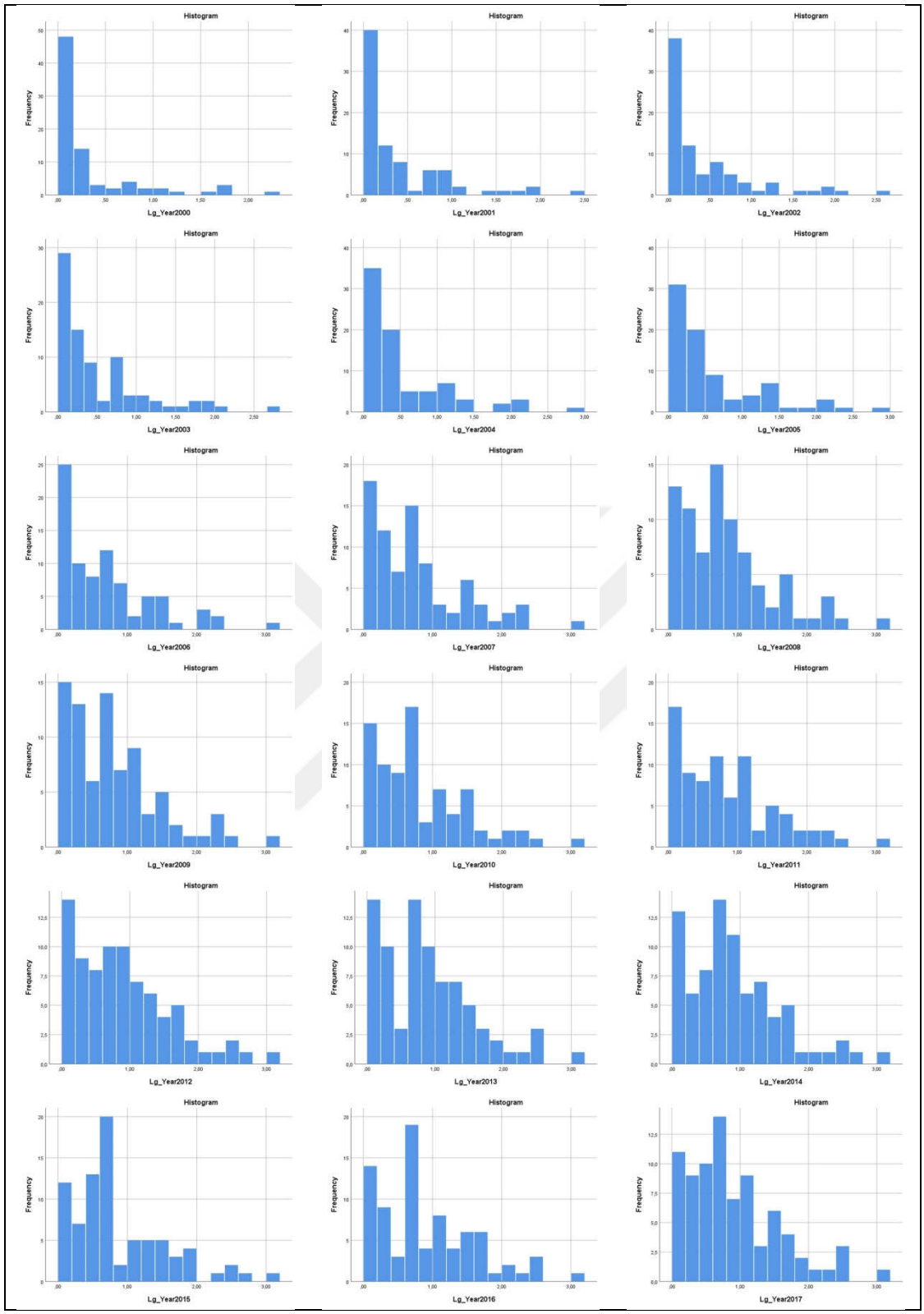


Figure A.17 : Histogram graphs.

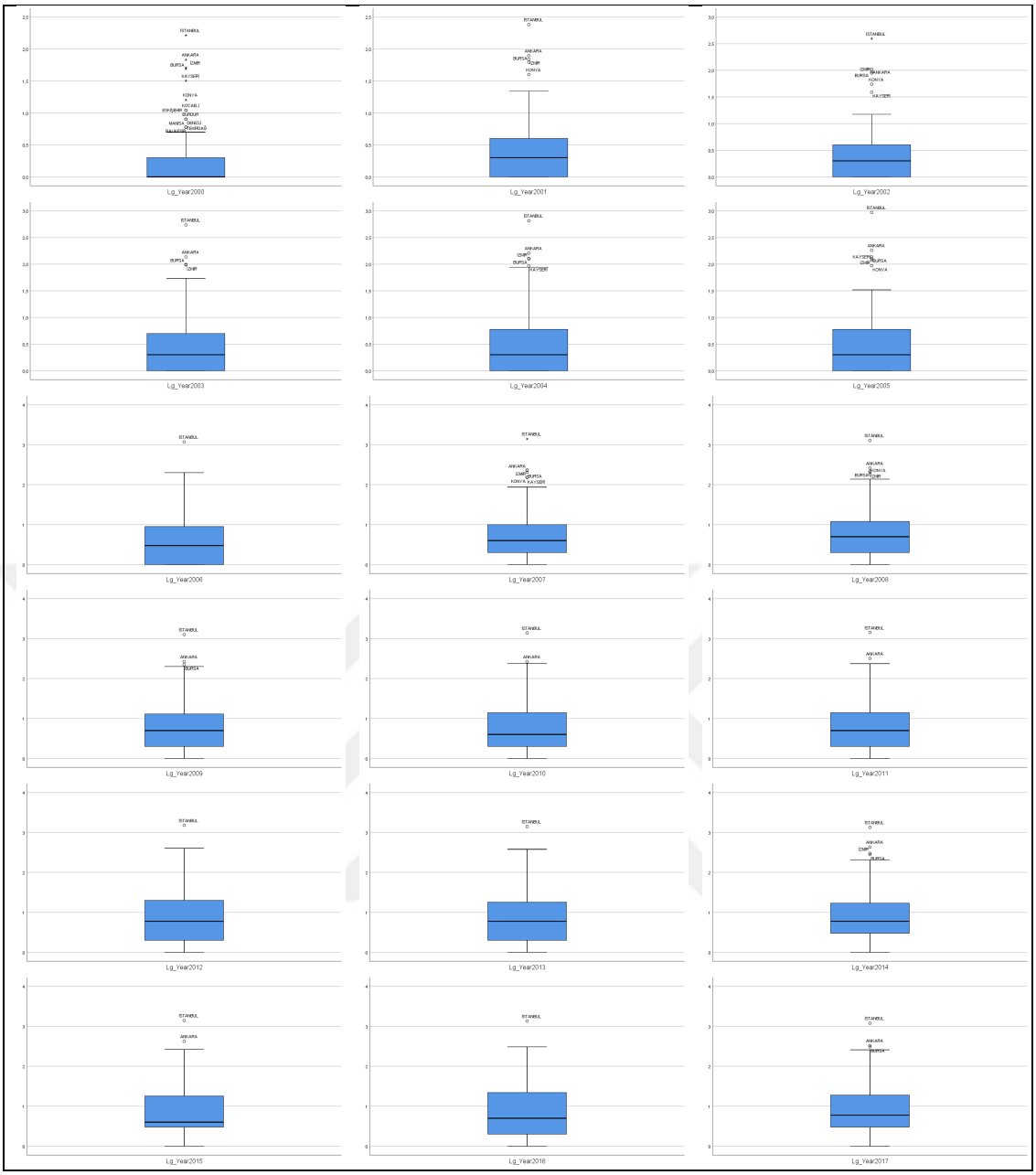


Figure A.18 : Boxplots.

“Utility Model Grants”

Evaluation per each year (number)

Table A.37 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Year2000	81	100,0%	0	0,0%	81	100,0%
Year2001	81	100,0%	0	0,0%	81	100,0%
Year2002	81	100,0%	0	0,0%	81	100,0%
Year2003	81	100,0%	0	0,0%	81	100,0%
Year2004	81	100,0%	0	0,0%	81	100,0%
Year2005	81	100,0%	0	0,0%	81	100,0%
Year2006	81	100,0%	0	0,0%	81	100,0%
Year2007	81	100,0%	0	0,0%	81	100,0%
Year2008	81	100,0%	0	0,0%	81	100,0%
Year2009	81	100,0%	0	0,0%	81	100,0%
Year2010	81	100,0%	0	0,0%	81	100,0%
Year2011	81	100,0%	0	0,0%	81	100,0%
Year2012	81	100,0%	0	0,0%	81	100,0%
Year2013	81	100,0%	0	0,0%	81	100,0%
Year2014	81	100,0%	0	0,0%	81	100,0%
Year2015	81	100,0%	0	0,0%	81	100,0%
Year2016	81	100,0%	0	0,0%	81	100,0%
Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.38 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Year2000	0,407	81	0,000	0,244	81	0,000
Year2001	0,399	81	0,000	0,265	81	0,000
Year2002	0,393	81	0,000	0,285	81	0,000
Year2003	0,409	81	0,000	0,235	81	0,000
Year2004	0,408	81	0,000	0,223	81	0,000
Year2005	0,409	81	0,000	0,227	81	0,000
Year2006	0,416	81	0,000	0,203	81	0,000
Year2007	0,414	81	0,000	0,202	81	0,000
Year2008	0,412	81	0,000	0,208	81	0,000
Year2009	0,406	81	0,000	0,224	81	0,000
Year2010	0,398	81	0,000	0,245	81	0,000
Year2011	0,410	81	0,000	0,215	81	0,000
Year2012	0,406	81	0,000	0,223	81	0,000
Year2013	0,403	81	0,000	0,241	81	0,000
Year2014	0,398	81	0,000	0,254	81	0,000
Year2015	0,398	81	0,000	0,257	81	0,000
Year2016	0,402	81	0,000	0,246	81	0,000
Year2017	0,397	81	0,000	0,253	81	0,000

a. Lilliefors Significance Correction

Table A.39 : Descriptive statistics.

Descriptives									
			Std.			Std.			Std.
		Statistic	Error		Statistic	Error		Statistic	Error
Year2000	Mean	1.79	.846	Year2006	20.48	10.702	Year2012	27.72	12.980
	Median	0.00			1.00			3.00	
	Variance	57.943			9277.703			13647.081	
	Std. Deviation	7.612			96.321			116.821	
	Minimum	0			0			0	
	Maximum	63			838			1010	
	Range	63			838			1010	
	Skewness	6.985	.267		7.906	.267		7.716	.267
	Kurtosis	54.097	.529		66.902	.529		64.388	.529
Year2001	Mean	3.17	1.379	Year2007	26.49	13.564	Year2013	24.65	11.149
	Median	0.00			1.00			2.00	
	Variance	153.970			14902.428			10068.704	
	Std. Deviation	12.408			122.076			100.343	
	Minimum	0			0			0	
	Maximum	103			1069			855	
	Range	103			1069			855	
	Skewness	6.918	.267		8.033	.267		7.413	.267
	Kurtosis	53.860	.529		68.611	.529		60.340	.529
Year2002	Mean	4.60	1.890	Year2008	22.63	11.268	Year2014	30.51	13.122
	Median	0.00			2.00			3.00	
	Variance	289.192			10285.161			13947.403	
	Std. Deviation	17.006			101.416			118.099	
	Minimum	0			0			0	
	Maximum	134			886			996	
	Range	134			886			996	
	Skewness	6.165	.267		7.969	.267		7.175	.267
	Kurtosis	43.428	.529		67.742	.529		57.378	.529
Year2003	Mean	8.69	4.178	Year2009	26.56	12.376	Year2015	33.10	14.222
	Median	0.00			2.00			3.00	
	Variance	1413.791			12406.700			16383.565	
	Std. Deviation	37.600			111.385			127.998	
	Minimum	0			0			0	
	Maximum	315			967			1070	
	Range	315			967			1070	
	Skewness	7.144	.267		7.787	.267		7.039	.267
	Kurtosis	56.646	.529		65.457	.529		55.377	.529
Year2004	Mean	8.36	3.992	Year2010	24.96	10.771	Year2016	28.98	12.965
	Median	1.00			2.00			2.00	
	Variance	1290.533			9397.836			13616.374	
	Std. Deviation	35.924			96.942			116.689	
	Minimum	0			0			0	
	Maximum	310			835			985	
	Range	310			835			985	
	Skewness	7.689	.267		7.571	.267		7.237	.267
	Kurtosis	64.021	.529		62.711	.529		57.963	.529
Year2005	Mean	11.89	5.771	Year2011	24.05	11.683	Year2017	24.86	10.560
	Median	0.00			2.00			3.00	
	Variance	2698.100			11055.973			9031.894	
	Std. Deviation	51.943			105.147			95.036	
	Minimum	0			0			0	
	Maximum	442			914			807	
	Range	442			914			807	
	Skewness	7.420	.267		7.847	.267		7.293	.267
	Kurtosis	60.466	.529		66.142	.529		58.945	.529

Table A.40 : Outliers-Extreme values.

Extreme Values																	
			Case	Region	Value			Case	Region	Value			Case	Region	Value		
Year2000	Highest	1	34	İSTANBUL	63	Year2006	Highest	1	34	İSTANBUL	838	Year2012	Highest	1	34	İSTANBUL	1010
		2	16	BURSA	23			2	6	ANKARA	147			2	6	ANKARA	203
		3	35	İZMİR	12			3	16	BURSA	139			3	16	BURSA	183
		4	26	ESKİŞEHİR	9			4	35	İZMİR	129			4	35	İZMİR	177
		5	42	KONYA	8			5	42	KONYA	87			5	42	KONYA	105
	Lowest	1	81	DÜZCE	0		Lowest	1	81	DÜZCE	0		Lowest	1	78	KARABÜK	0
		2	80	OSMANİYE	0			2	80	OSMANİYE	0			2	76	IĞDIR	0
		3	79	KİLİS	0			3	79	KİLİS	0			3	75	ARDAHAN	0
		4	78	KARABÜK	0			4	77	YALOVA	0			4	73	ŞIRNAK	0
		5	76	IĞDIR	0[a]			5	76	IĞDIR	0[a]			5	72	BATMAN	0[a]
Year2001	Highest	1	34	İSTANBUL	103	Year2007	Highest	1	34	İSTANBUL	1069	Year2013	Highest	1	34	İSTANBUL	855
		2	16	BURSA	31			2	35	İZMİR	167			2	6	ANKARA	216
		3	6	ANKARA	26			3	6	ANKARA	164			3	35	İZMİR	171
		4	35	İZMİR	18			4	16	BURSA	152			4	16	BURSA	141
		5	38	KAYSERİ	12			5	38	KAYSERİ	105			5	42	KONYA	119
	Lowest	1	81	DÜZCE	0		Lowest	1	80	OSMANİYE	0		Lowest	1	79	KİLİS	0
		2	80	OSMANİYE	0			2	79	KİLİS	0			2	78	KARABÜK	0
		3	79	KİLİS	0			3	77	YALOVA	0			3	76	IĞDIR	0
		4	78	KARABÜK	0			4	75	ARDAHAN	0			4	75	ARDAHAN	0
		5	77	YALOVA	0[a]			5	74	BARTIN	0[a]			5	74	BARTIN	0[a]
Year2002	Highest	1	34	İSTANBUL	134	Year2008	Highest	1	34	İSTANBUL	886	Year2014	Highest	1	34	İSTANBUL	996
		2	35	İZMİR	50			2	35	İZMİR	156			2	6	ANKARA	251
		3	6	ANKARA	48			3	16	BURSA	147			3	16	BURSA	199
		4	16	BURSA	33			4	6	ANKARA	121			4	35	İZMİR	198
		5	42	KONYA	22			5	42	KONYA	88			5	42	KONYA	173
	Lowest	1	81	DÜZCE	0		Lowest	1	79	KİLİS	0		Lowest	1	79	KİLİS	0
		2	80	OSMANİYE	0			2	77	YALOVA	0			2	76	IĞDIR	0
		3	78	KARABÜK	0			3	75	ARDAHAN	0			3	75	ARDAHAN	0
		4	77	YALOVA	0			4	73	ŞIRNAK	0			4	73	ŞIRNAK	0
		5	76	IĞDIR	0[a]			5	71	KIRIKKALE	0[a]			5	69	BAYBURT	0[a]
Year2003	Highest	1	34	İSTANBUL	315	Year2009	Highest	1	34	İSTANBUL	967	Year2015	Highest	1	34	İSTANBUL	1070
		2	6	ANKARA	86			2	6	ANKARA	176			2	6	ANKARA	316
		3	35	İZMİR	69			3	35	İZMİR	157			3	35	İZMİR	235
		4	16	BURSA	67			4	16	BURSA	150			4	16	BURSA	191
		5	42	KONYA	44			5	42	KONYA	128			5	42	KONYA	185
	Lowest	1	80	OSMANİYE	0		Lowest	1	79	KİLİS	0		Lowest	1	79	KİLİS	0
		2	79	KİLİS	0			2	78	KARABÜK	0			2	78	KARABÜK	0
		3	78	KARABÜK	0			3	74	BARTIN	0			3	75	ARDAHAN	0
		4	76	IĞDIR	0			4	72	BATMAN	0			4	73	ŞIRNAK	0
		5	75	ARDAHAN	0[a]			5	71	KIRIKKALE	0[a]			5	69	BAYBURT	0[a]
Year2004	Highest	1	34	İSTANBUL	310	Year2010	Highest	1	34	İSTANBUL	835	Year2016	Highest	1	34	İSTANBUL	985
		2	6	ANKARA	62			2	6	ANKARA	159			2	6	ANKARA	271
		3	35	İZMİR	61			3	35	İZMİR	158			3	16	BURSA	208
		4	16	BURSA	51			4	16	BURSA	151			4	35	İZMİR	173
		5	42	KONYA	32			5	17	ÇANAKKALE	90			5	42	KONYA	146
	Lowest	1	80	OSMANİYE	0		Lowest	1	76	IĞDIR	0		Lowest	1	79	KİLİS	0
		2	79	KİLİS	0			2	74	BARTIN	0			2	76	IĞDIR	0
		3	78	KARABÜK	0			3	73	ŞIRNAK	0			3	75	ARDAHAN	0
		4	76	IĞDIR	0			4	72	BATMAN	0			4	74	BARTIN	0
		5	75	ARDAHAN	0[a]			5	71	KIRIKKALE	0[a]			5	73	ŞIRNAK	0[a]
Year2005	Highest	1	34	İSTANBUL	442	Year2011	Highest	1	34	İSTANBUL	914	Year2017	Highest	1	34	İSTANBUL	807
		2	6	ANKARA	94			2	6	ANKARA	177			2	16	BURSA	182
		3	35	İZMİR	94			3	35	İZMİR	147			3	6	ANKARA	163
		4	16	BURSA	87			4	16	BURSA	145			4	35	İZMİR	162
		5	42	KONYA	58			5	42	KONYA	93			5	42	KONYA	139
	Lowest	1	81	DÜZCE	0		Lowest	1	80	OSMANİYE	0		Lowest	1	79	KİLİS	0
		2	80	OSMANİYE	0			2	79	KİLİS	0			2	77	YALOVA	0
		3	79	KİLİS	0			3	78	KARABÜK	0			3	76	IĞDIR	0
		4	78	KARABÜK	0			4	76	IĞDIR	0			4	75	ARDAHAN	0
		5	77	YALOVA	0[a]			5	75	ARDAHAN	0[a]			5	72	BATMAN	0[a]

a. Only a partial list of cases with the value 0 are shown in the table of lower extremes.

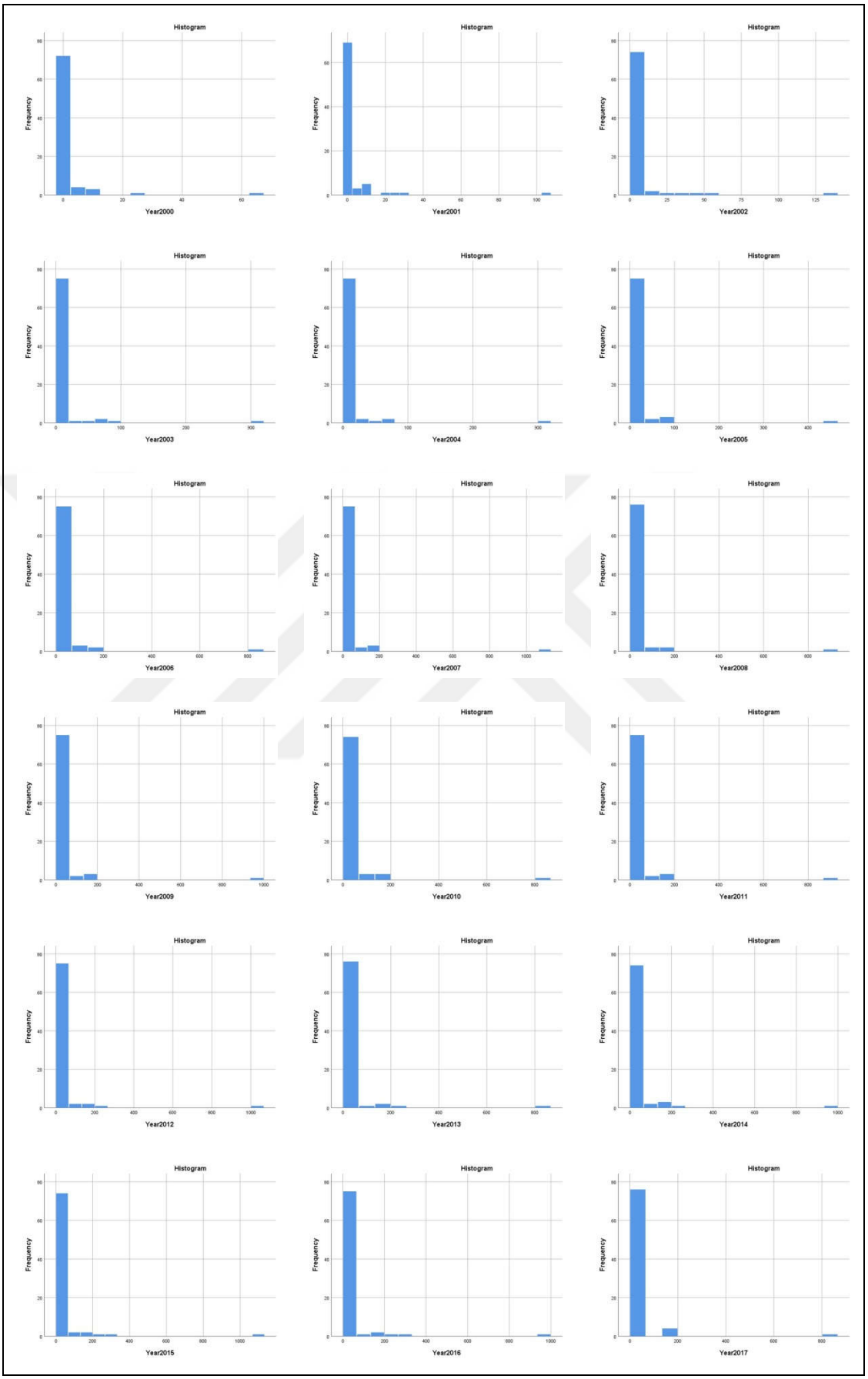


Figure A.19 : Histogram graphs.

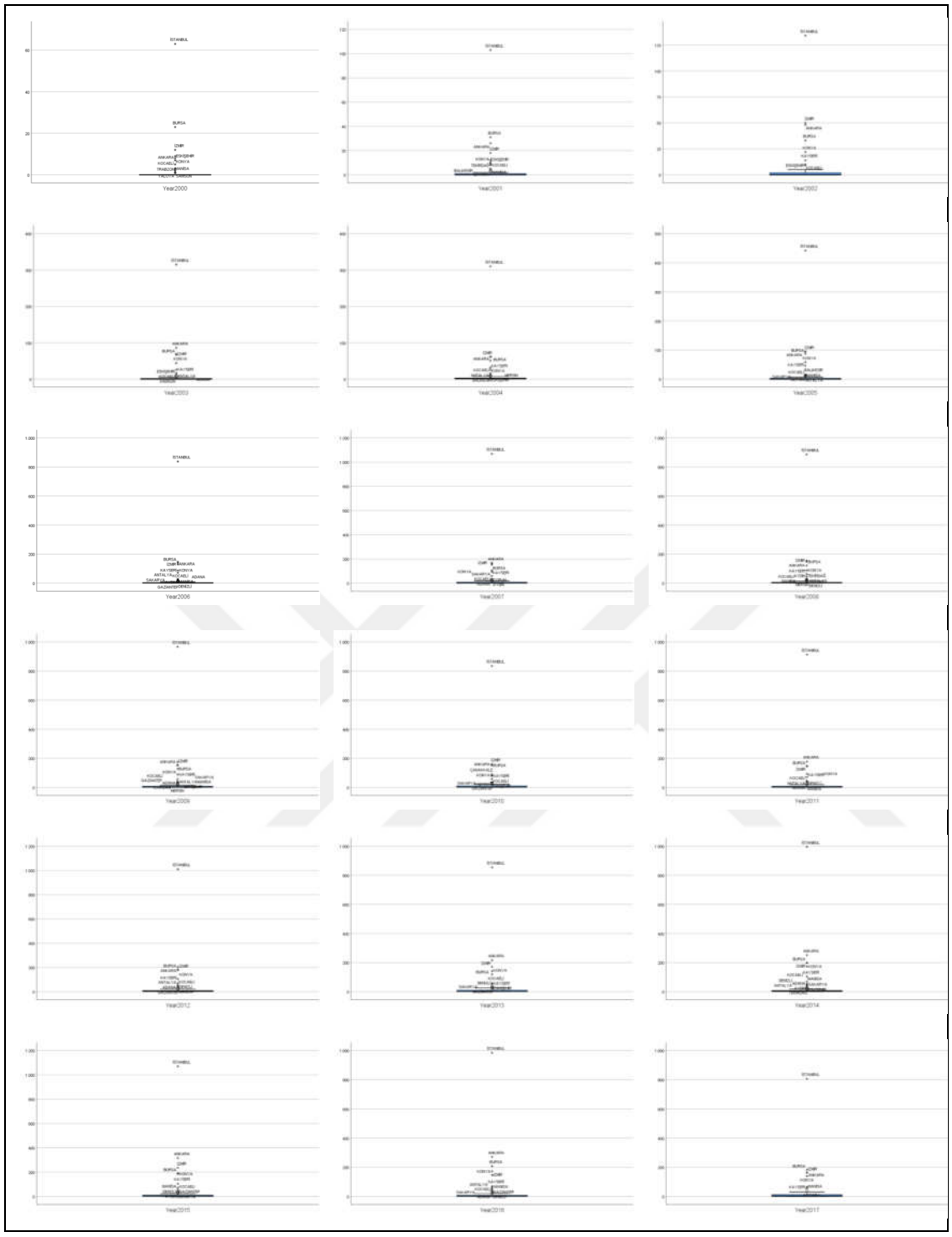


Figure A.20 : Boxplots.

Evaluation of time periods:

Table A.41 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table A.42 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mean_2000_2005	0,406	81	0,000	0,235	81	0,000
Mean_2006_2010	0,409	81	0,000	0,213	81	0,000
Mean_2011_2017	0,402	81	0,000	0,240	81	0,000

a. Lilliefors Significance Correction

Table A.43 : Descriptive statistics.

Descriptives									
			Std.			Std.			Std.
		Statistic	Error		Statistic	Error		Statistic	Error
Mean_2000_2005	Mean	6,42	2,995	Mean_2006_2010	24,22	11,718	Mean_2011_2017	27,69	12,362
	Median	0,33			1,80			2,57	
	Variance	726,600			11122,738			12378,296	
	Std. Deviation	26,956			105,464			111,258	
	Minimum	0			0			0	
	Maximum	228			919			948	
	Range	228			919			948	
	Skewness	7,279	0,267		7,893	0,267		7,401	0,267
	Kurtosis	58,536	0,529		66,786	0,529		60,254	0,529

Table A.44 : Outlier-Extreme values.

Extreme Values										
		Case	Region	Value		Case	Region	Value	Case	Region	Value
Mean_2000_2005	Highest 1	34	İSTANBUL	228	Mean_2006_2010 Highest 1	34	İSTANBUL	919	Mean_2011_2017 Highest 1	34	İSTANBUL	948
	2	6	ANKARA	54	2	6	ANKARA	153	2	6	ANKARA	228
	3	35	İZMİR	51	3	35	İZMİR	153	3	35	İZMİR	180
	4	16	BURSA	49	4	16	BURSA	148	4	16	BURSA	178
	5	42	KONYA	29	5	42	KONYA	96	5	42	KONYA	137
	Lowest 1	80	OSMANİYE	0	Lowest 1	56	SİİRT	0	Lowest 1	75	ARDAHAN	0
	2	78	KARABÜK	0	2	30	HAKKARİ	0	2	69	BAYBURT	0
	3	76	IĞDIR	0	3	29	GÜMÜŞHANE	0	3	4	AĞRI	0
	4	75	ARDAHAN	0	4	13	BİTLİS	0	4	62	TUNCELİ	0
	5	73	ŞIRNAK	0[a]	5	12	BİNGÖL	0[a]	5	56	SİİRT	0[b]

a. Only a partial list of cases with the value 0 are shown in the table of lower extremes.
b. Only a partial list of cases with the value 0 are shown in the table of lower extremes.

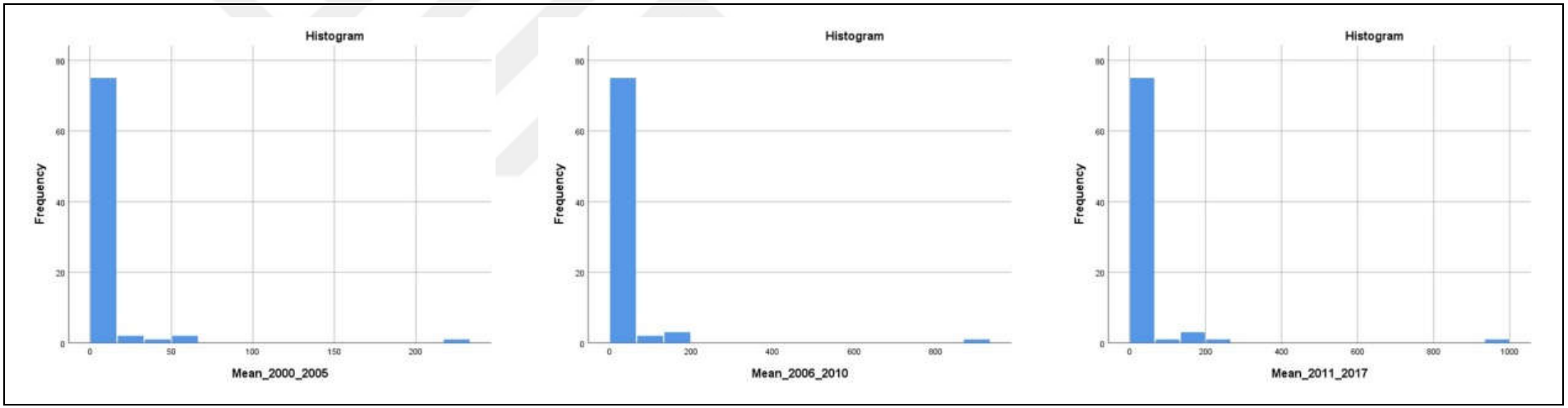


Figure A.21 : Histogram graphs.

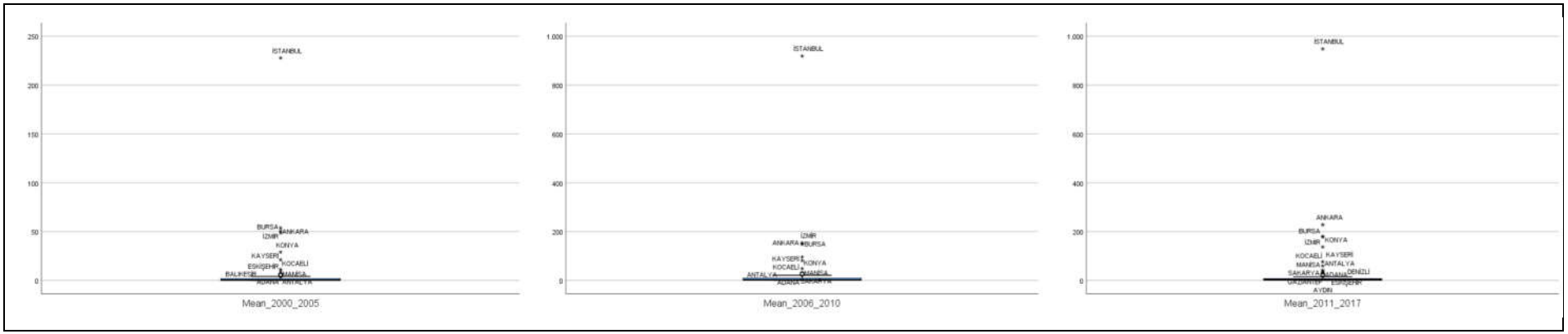


Figure A.22 : Boxplots.

Evaluation of Each Year (Lg):

Table A.45 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Year2000	81	100,0%	0	0,0%	81	100,0%
Lg_Year2001	81	100,0%	0	0,0%	81	100,0%
Lg_Year2002	81	100,0%	0	0,0%	81	100,0%
Lg_Year2003	81	100,0%	0	0,0%	81	100,0%
Lg_Year2004	81	100,0%	0	0,0%	81	100,0%
Lg_Year2005	81	100,0%	0	0,0%	81	100,0%
Lg_Year2006	81	100,0%	0	0,0%	81	100,0%
Lg_Year2007	81	100,0%	0	0,0%	81	100,0%
Lg_Year2008	81	100,0%	0	0,0%	81	100,0%
Lg_Year2009	81	100,0%	0	0,0%	81	100,0%
Lg_Year2010	81	100,0%	0	0,0%	81	100,0%
Lg_Year2011	81	100,0%	0	0,0%	81	100,0%
Lg_Year2012	81	100,0%	0	0,0%	81	100,0%
Lg_Year2013	81	100,0%	0	0,0%	81	100,0%
Lg_Year2014	81	100,0%	0	0,0%	81	100,0%
Lg_Year2015	81	100,0%	0	0,0%	81	100,0%
Lg_Year2016	81	100,0%	0	0,0%	81	100,0%
Lg_Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.46 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Year2000	0,437	81	0,000	0,519	81	0,000
Lg_Year2001	0,372	81	0,000	0,614	81	0,000
Lg_Year2002	0,293	81	0,000	0,685	81	0,000
Lg_Year2003	0,297	81	0,000	0,671	81	0,000
Lg_Year2004	0,232	81	0,000	0,768	81	0,000
Lg_Year2005	0,270	81	0,000	0,723	81	0,000
Lg_Year2006	0,260	81	0,000	0,770	81	0,000
Lg_Year2007	0,187	81	0,000	0,847	81	0,000
Lg_Year2008	0,167	81	0,000	0,856	81	0,000
Lg_Year2009	0,182	81	0,000	0,872	81	0,000
Lg_Year2010	0,149	81	0,000	0,888	81	0,000
Lg_Year2011	0,163	81	0,000	0,867	81	0,000
Lg_Year2012	0,137	81	0,001	0,893	81	0,000
Lg_Year2013	0,217	81	0,000	0,838	81	0,000
Lg_Year2014	0,141	81	0,000	0,887	81	0,000
Lg_Year2015	0,161	81	0,000	0,887	81	0,000
Lg_Year2016	0,166	81	0,000	0,865	81	0,000
Lg_Year2017	0,162	81	0,000	0,884	81	0,000

a. Lilliefors Significance Correction

Table A.47 : Descriptive statistics.

Descriptives											
			Std.				Std.				Std.
		Statistic	Error			Statistic	Error			Statistic	Error
Lg_Year2000	Mean	0,1544	0,03872	Lg_Year2006	Mean	0,4945	0,07181	Lg_Year2012	Mean	0,7152	0,07255
	Median	0,0000			Median	0,3010			Median	0,6021	
	Variance	0,121			Variance	0,418			Variance	0,426	
	Std. Deviation	0,34848			Std. Deviation	0,64625			Std. Deviation	0,65291	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	1,81			Maximum	2,92			Maximum	3,00	
	Range	1,81			Range	2,92			Range	3,00	
	Skewness	2,743	0,267		Skewness	1,627	0,267		Skewness	1,148	0,267
	Kurtosis	7,919	0,529		Kurtosis	2,364	0,529		Kurtosis	1,256	0,529
Lg_Year2001	Mean	0,2285	0,04704	Lg_Year2007	Mean	0,6185	0,07483	Lg_Year2013	Mean	0,6107	0,07738
	Median	0,0000			Median	0,3010			Median	0,4771	
	Variance	0,179			Variance	0,454			Variance	0,485	
	Std. Deviation	0,42334			Std. Deviation	0,67347			Std. Deviation	0,69644	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,02			Maximum	3,03			Maximum	2,93	
	Range	2,02			Range	3,03			Range	2,93	
	Skewness	2,203	0,267		Skewness	1,276	0,267		Skewness	1,132	0,267
	Kurtosis	4,703	0,529		Kurtosis	1,403	0,529		Kurtosis	0,771	0,529
Lg_Year2002	Mean	0,2920	0,05113	Lg_Year2008	Mean	0,6204	0,07094	Lg_Year2014	Mean	0,7312	0,07541
	Median	0,0000			Median	0,4771			Median	0,6021	
	Variance	0,212			Variance	0,408			Variance	0,461	
	Std. Deviation	0,46013			Std. Deviation	0,63847			Std. Deviation	0,67869	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,13			Maximum	2,95			Maximum	3,00	
	Range	2,13			Range	2,95			Range	3,00	
	Skewness	2,069	0,267		Skewness	1,312	0,267		Skewness	1,109	0,267
	Kurtosis	4,286	0,529		Kurtosis	1,620	0,529		Kurtosis	1,060	0,529
Lg_Year2003	Mean	0,3289	0,05984	Lg_Year2009	Mean	0,7066	0,07105	Lg_Year2015	Mean	0,7529	0,07568
	Median	0,0000			Median	0,4771			Median	0,6021	
	Variance	0,290			Variance	0,409			Variance	0,464	
	Std. Deviation	0,53858			Std. Deviation	0,63947			Std. Deviation	0,68108	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,50			Maximum	2,99			Maximum	3,03	
	Range	2,50			Range	2,99			Range	3,03	
	Skewness	2,097	0,267		Skewness	1,283	0,267		Skewness	1,142	0,267
	Kurtosis	4,264	0,529		Kurtosis	1,485	0,529		Kurtosis	1,132	0,529
Lg_Year2004	Mean	0,3972	0,05829	Lg_Year2010	Mean	0,6988	0,07410	Lg_Year2016	Mean	0,6690	0,07667
	Median	0,3010			Median	0,4771			Median	0,4771	
	Variance	0,275			Variance	0,445			Variance	0,476	
	Std. Deviation	0,52457			Std. Deviation	0,66689			Std. Deviation	0,69001	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,49			Maximum	2,92			Maximum	2,99	
	Range	2,49			Range	2,92			Range	2,99	
	Skewness	1,715	0,267		Skewness	1,041	0,267		Skewness	1,194	0,267
	Kurtosis	3,110	0,529		Kurtosis	0,673	0,529		Kurtosis	1,086	0,529
Lg_Year2005	Mean	0,3954	0,06471	Lg_Year2011	Mean	0,6396	0,07233	Lg_Year2017	Mean	0,6910	0,07428
	Median	0,0000			Median	0,4771			Median	0,6021	
	Variance	0,339			Variance	0,424			Variance	0,447	
	Std. Deviation	0,58238			Std. Deviation	0,65098			Std. Deviation	0,66852	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,65			Maximum	2,96			Maximum	2,91	
	Range	2,65			Range	2,96			Range	2,91	
	Skewness	1,816	0,267		Skewness	1,230	0,267		Skewness	1,040	0,267
	Kurtosis	3,117	0,529		Kurtosis	1,414	0,529		Kurtosis	0,730	0,529

Table A.48 : Outlier-Extreme values.

		Extreme Values											
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Lg_Year2000	Highest 1	34	İSTANBUL	1,81	Lg_Year2006	34	İSTANBUL	2,92	Lg_Year2012	34	İSTANBUL	3,00
	2	16	BURSA	1,38		6	ANKARA	2,17		6	ANKARA	2,31
	3	35	İZMİR	1,11		16	BURSA	2,15		16	BURSA	2,26
	4	26	ESKİŞEHİR	1,00		35	İZMİR	2,11		35	İZMİR	2,25
	5	42	KONYA	0,95		42	KONYA	1,94		42	KONYA	2,03
	Lowest 1	81	DÜZCE	0,00		81	DÜZCE	0,00		78	KARABÜK	0,00
	2	80	OSMANİYE	0,00		80	OSMANİYE	0,00		76	IĞDIR	0,00
	3	79	KİLİS	0,00		79	KİLİS	0,00		75	ARDAHAN	0,00
	4	78	KARABÜK	0,00		77	YALOVA	0,00		73	ŞIRNAK	0,00
	5	76	IĞDIR	,00[a]		76	IĞDIR	,00[a]		72	BATMAN	,00[a]
Lg_Year2001	Highest 1	34	İSTANBUL	2,02	Lg_Year2007	34	İSTANBUL	3,03	Lg_Year2013	34	İSTANBUL	2,93
	2	16	BURSA	1,51		35	İZMİR	2,23		6	ANKARA	2,34
	3	6	ANKARA	1,43		6	ANKARA	2,22		35	İZMİR	2,24
	4	35	İZMİR	1,28		16	BURSA	2,18		16	BURSA	2,15
	5	38	KAYSERİ	1,11		38	KAYSERİ	2,03		42	KONYA	2,08
	Lowest 1	81	DÜZCE	0,00		80	OSMANİYE	0,00		79	KİLİS	0,00
	2	80	OSMANİYE	0,00		79	KİLİS	0,00		78	KARABÜK	0,00
	3	79	KİLİS	0,00		77	YALOVA	0,00		76	IĞDIR	0,00
	4	78	KARABÜK	0,00		75	ARDAHAN	0,00		75	ARDAHAN	0,00
	5	77	YALOVA	,00[a]		74	BARTIN	,00[a]		74	BARTIN	,00[a]
Lg_Year2002	Highest 1	34	İSTANBUL	2,13	Lg_Year2008	34	İSTANBUL	2,95	Lg_Year2014	34	İSTANBUL	3,00
	2	35	İZMİR	1,71		35	İZMİR	2,20		6	ANKARA	2,40
	3	6	ANKARA	1,69		16	BURSA	2,17		16	BURSA	2,30
	4	16	BURSA	1,53		6	ANKARA	2,09		35	İZMİR	2,30
	5	42	KONYA	1,36		42	KONYA	1,95		42	KONYA	2,24
	Lowest 1	81	DÜZCE	0,00		79	KİLİS	0,00		79	KİLİS	0,00
	2	80	OSMANİYE	0,00		77	YALOVA	0,00		76	IĞDIR	0,00
	3	78	KARABÜK	0,00		75	ARDAHAN	0,00		75	ARDAHAN	0,00
	4	77	YALOVA	0,00		73	ŞIRNAK	0,00		73	ŞIRNAK	0,00
	5	76	IĞDIR	,00[a]		71	KIRIKKALE	,00[a]		69	BAYBURT	,00[a]
Lg_Year2003	Highest 1	34	İSTANBUL	2,50	Lg_Year2009	34	İSTANBUL	2,99	Lg_Year2015	34	İSTANBUL	3,03
	2	6	ANKARA	1,94		6	ANKARA	2,25		6	ANKARA	2,50
	3	35	İZMİR	1,85		35	İZMİR	2,20		35	İZMİR	2,37
	4	16	BURSA	1,83		16	BURSA	2,18		16	BURSA	2,28
	5	42	KONYA	1,65		42	KONYA	2,11		42	KONYA	2,27
	Lowest 1	80	OSMANİYE	0,00		79	KİLİS	0,00		79	KİLİS	0,00
	2	79	KİLİS	0,00		78	KARABÜK	0,00		78	KARABÜK	0,00
	3	78	KARABÜK	0,00		74	BARTIN	0,00		75	ARDAHAN	0,00
	4	76	IĞDIR	0,00		72	BATMAN	0,00		73	ŞIRNAK	0,00
	5	75	ARDAHAN	,00[a]		71	KIRIKKALE	,00[a]		69	BAYBURT	,00[a]
Lg_Year2004	Highest 1	34	İSTANBUL	2,49	Lg_Year2010	34	İSTANBUL	2,92	Lg_Year2016	34	İSTANBUL	2,99
	2	6	ANKARA	1,80		6	ANKARA	2,20		6	ANKARA	2,43
	3	35	İZMİR	1,79		35	İZMİR	2,20		16	BURSA	2,32
	4	16	BURSA	1,72		16	BURSA	2,18		35	İZMİR	2,24
	5	42	KONYA	1,52		17	ÇANAKKALE	1,96		42	KONYA	2,17
	Lowest 1	80	OSMANİYE	0,00		76	IĞDIR	0,00		79	KİLİS	0,00
	2	79	KİLİS	0,00		74	BARTIN	0,00		76	IĞDIR	0,00
	3	78	KARABÜK	0,00		73	ŞIRNAK	0,00		75	ARDAHAN	0,00
	4	76	IĞDIR	0,00		72	BATMAN	0,00		74	BARTIN	0,00
	5	75	ARDAHAN	,00[a]		71	KIRIKKALE	,00[a]		73	ŞIRNAK	,00[a]
Lg_Year2005	Highest 1	34	İSTANBUL	2,65	Lg_Year2011	34	İSTANBUL	2,96	Lg_Year2017	34	İSTANBUL	2,91
	2	6	ANKARA	1,98		6	ANKARA	2,25		16	BURSA	2,26
	3	35	İZMİR	1,98		35	İZMİR	2,17		6	ANKARA	2,21
	4	16	BURSA	1,94		16	BURSA	2,16		35	İZMİR	2,21
	5	42	KONYA	1,77		42	KONYA	1,97		42	KONYA	2,15
	Lowest 1	81	DÜZCE	0,00		80	OSMANİYE	0,00		79	KİLİS	0,00
	2	80	OSMANİYE	0,00		79	KİLİS	0,00		77	YALOVA	0,00
	3	79	KİLİS	0,00		78	KARABÜK	0,00		76	IĞDIR	0,00
	4	78	KARABÜK	0,00		76	IĞDIR	0,00		75	ARDAHAN	0,00
	5	77	YALOVA	,00[a]		75	ARDAHAN	,00[a]		72	BATMAN	,00[a]

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.

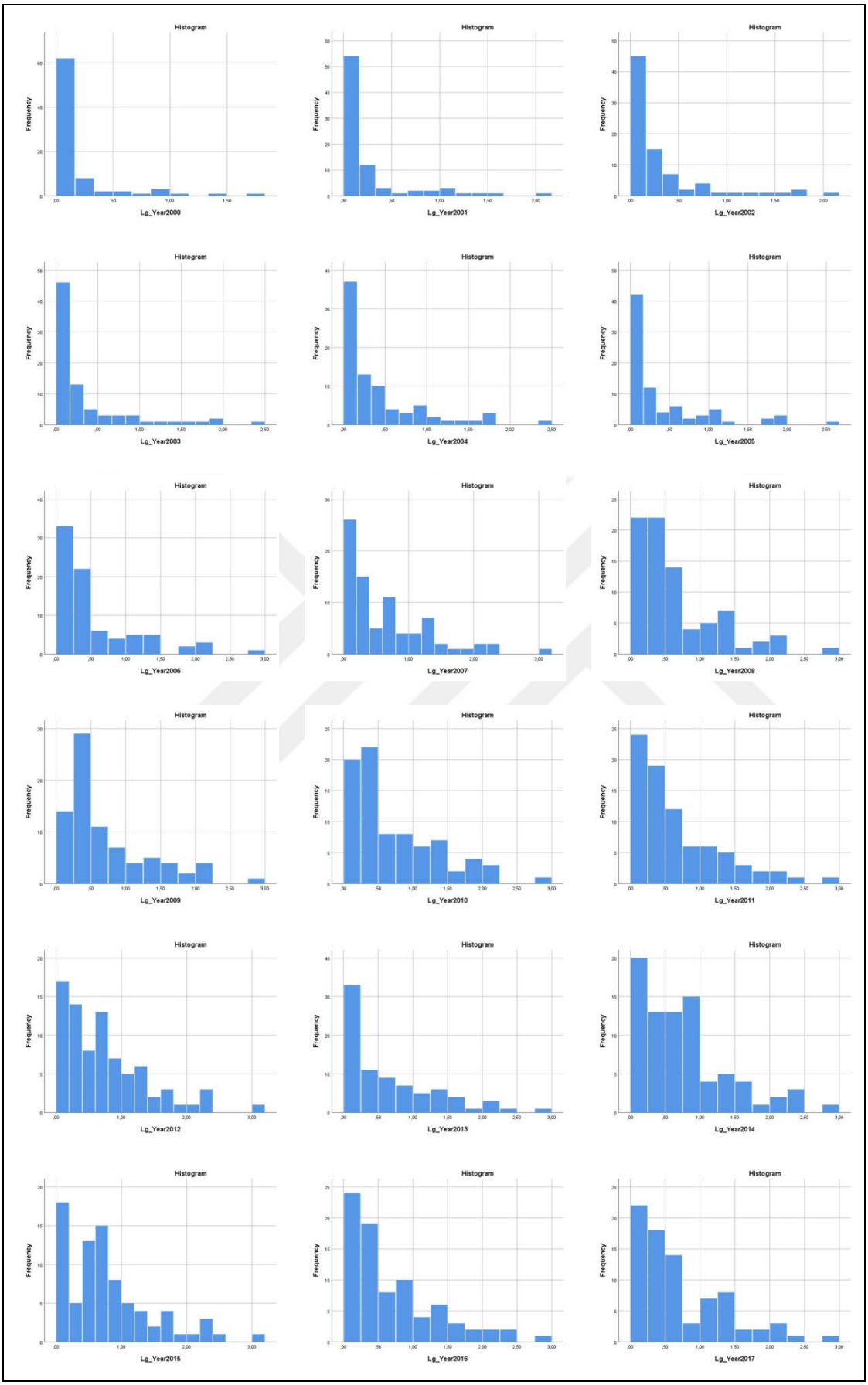


Figure A.23 : Histogram graphs.



Figure A.24 : Boxplots.

"Trademark Applications":

Evaluation of Each Year

Table A.49 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Year2000	81	100,0%	0	0,0%	81	100,0%
Year2001	81	100,0%	0	0,0%	81	100,0%
Year2002	81	100,0%	0	0,0%	81	100,0%
Year2003	81	100,0%	0	0,0%	81	100,0%
Year2004	81	100,0%	0	0,0%	81	100,0%
Year2005	81	100,0%	0	0,0%	81	100,0%
Year2006	81	100,0%	0	0,0%	81	100,0%
Year2007	81	100,0%	0	0,0%	81	100,0%
Year2008	81	100,0%	0	0,0%	81	100,0%
Year2009	81	100,0%	0	0,0%	81	100,0%
Year2010	81	100,0%	0	0,0%	81	100,0%
Year2011	81	100,0%	0	0,0%	81	100,0%
Year2012	81	100,0%	0	0,0%	81	100,0%
Year2013	81	100,0%	0	0,0%	81	100,0%
Year2014	81	100,0%	0	0,0%	81	100,0%
Year2015	81	100,0%	0	0,0%	81	100,0%
Year2016	81	100,0%	0	0,0%	81	100,0%
Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.50 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Year2000	0,415	81	0,000	0,188	81	0,000
Year2001	0,423	81	0,000	0,164	81	0,000
Year2002	0,423	81	0,000	0,166	81	0,000
Year2003	0,423	81	0,000	0,163	81	0,000
Year2004	0,418	81	0,000	0,178	81	0,000
Year2005	0,412	81	0,000	0,190	81	0,000
Year2006	0,413	81	0,000	0,189	81	0,000
Year2007	0,417	81	0,000	0,180	81	0,000
Year2008	0,416	81	0,000	0,179	81	0,000
Year2009	0,416	81	0,000	0,179	81	0,000
Year2010	0,415	81	0,000	0,183	81	0,000
Year2011	0,416	81	0,000	0,182	81	0,000
Year2012	0,416	81	0,000	0,181	81	0,000
Year2013	0,414	81	0,000	0,185	81	0,000
Year2014	0,415	81	0,000	0,186	81	0,000
Year2015	0,411	81	0,000	0,196	81	0,000
Year2016	0,409	81	0,000	0,201	81	0,000
Year2017	0,409	81	0,000	0,202	81	0,000

a. Lilliefors Significance Correction

Table A.51 : Descriptive statistics.

Descriptives

			Std.				Std.				
		Statistic	Error			Statistic	Error			Statistic	Std. Error
Year2000	Mean	261,19	134,515	Year2006	Mean	675,46	339,353	Year2012	Mean	1201,37	624,596
	Median	32,00			Median	88,00			Median	167,00	
	Variance	1465644,528			Variance	9328010,101			Variance	31599736,361	
	Std. Deviation	1210,638			Std. Deviation	3054,179			Std. Deviation	5621,364	
	Minimum	0			Minimum	4			Minimum	4	
	Maximum	10677			Maximum	27140			Maximum	50030	
	Range	10677			Range	27136			Range	50026	
	Skewness	8,212	0,267		Skewness	8,360	0,267		Skewness	8,420	0,267
	Kurtosis	70,785	0,529		Kurtosis	72,869	0,529		Kurtosis	73,615	0,529
Year2001	Mean	250,07	142,637	Year2007	Mean	723,41	378,134	Year2013	Mean	1151,91	588,301
	Median	30,00			Median	96,00			Median	178,00	
	Variance	1647966,544			Variance	11581793,369			Variance	28033971,505	
	Std. Deviation	1283,731			Std. Deviation	3403,203			Std. Deviation	5294,712	
	Minimum	0			Minimum	6			Minimum	6	
	Maximum	11459			Maximum	30286			Maximum	47021	
	Range	11459			Range	30280			Range	47015	
	Skewness	8,547	0,267		Skewness	8,422	0,267		Skewness	8,358	0,267
	Kurtosis	75,218	0,529		Kurtosis	73,632	0,529		Kurtosis	72,811	0,529
Year2002	Mean	351,58	200,956	Year2008	Mean	748,11	392,954	Year2014	Mean	1199,28	613,585
	Median	38,00			Median	113,00			Median	168,00	
	Variance	3271057,847			Variance	12507463,500			Variance	30495443,931	
	Std. Deviation	1808,607			Std. Deviation	3536,589			Std. Deviation	5522,268	
	Minimum	0			Minimum	2			Minimum	10	
	Maximum	16131			Maximum	31500			Maximum	49028	
	Range	16131			Range	31498			Range	49018	
	Skewness	8,527	0,267		Skewness	8,444	0,267		Skewness	8,353	0,267
	Kurtosis	74,971	0,529		Kurtosis	73,934	0,529		Kurtosis	72,738	0,529
Year2003	Mean	376,16	215,865	Year2009	Mean	738,74	384,548	Year2015	Mean	1184,72	580,106
	Median	38,00			Median	123,00			Median	168,00	
	Variance	3774416,436			Variance	11978058,894			Variance	27258401,606	
	Std. Deviation	1942,786			Std. Deviation	3460,933			Std. Deviation	5220,958	
	Minimum	0			Minimum	2			Minimum	8	
	Maximum	17365			Maximum	30832			Maximum	46187	
	Range	17365			Range	30830			Range	46179	
	Skewness	8,581	0,267		Skewness	8,445	0,267		Skewness	8,243	0,267
	Kurtosis	75,683	0,529		Kurtosis	73,927	0,529		Kurtosis	71,308	0,529
Year2004	Mean	475,20	254,384	Year2010	Mean	902,99	464,160	Year2016	Mean	1167,59	563,543
	Median	47,00			Median	130,00			Median	164,00	
	Variance	5241623,985			Variance	17450989,887			Variance	25724021,544	
	Std. Deviation	2289,459			Std. Deviation	4177,438			Std. Deviation	5071,885	
	Minimum	2			Minimum	4			Minimum	5	
	Maximum	20382			Maximum	37150			Maximum	44782	
	Range	20380			Range	37146			Range	44777	
	Skewness	8,443	0,267		Skewness	8,395	0,267		Skewness	8,188	0,267
	Kurtosis	73,919	0,529		Kurtosis	73,286	0,529		Kurtosis	70,614	0,529
Year2005	Mean	603,91	300,590	Year2011	Mean	1280,83	664,847	Year2017	Mean	1309,86	625,196
	Median	91,00			Median	178,00			Median	197,00	
	Variance	7318684,730			Variance	35803690,420			Variance	31660443,069	
	Std. Deviation	2705,307			Std. Deviation	5983,619			Std. Deviation	5626,761	
	Minimum	2			Minimum	6			Minimum	13	
	Maximum	24011			Maximum	53161			Maximum	49683	
	Range	24009			Range	53155			Range	49670	
	Skewness	8,327	0,267		Skewness	8,381	0,267		Skewness	8,182	0,267
	Kurtosis	72,427	0,529		Kurtosis	73,067	0,529		Kurtosis	70,538	0,529

Table A.52 : Outlier-Extreme values.

		Extreme Values											
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Year2000	Highest 1	34	İSTANBUL	10677	Year2006 Highest 1	34	İSTANBUL	27140	Year2012 Highest 1	34	İSTANBUL	50030
	2	6	ANKARA	2010	2	6	ANKARA	3979	2	6	ANKARA	7261
	3	35	İZMİR	1473	3	35	İZMİR	3200	3	35	İZMİR	5868
	4	16	BURSA	1063	4	16	BURSA	2591	4	16	BURSA	4031
	5	42	KONYA	681	5	42	KONYA	1900	5	27	GAZİANTEP	2897
	Lowest 1	56	SİİRT	0	Lowest 1	75	ARDAHAN	4	Lowest 1	75	ARDAHAN	4
	2	13	BİTLİS	0	2	73	ŞIRNAK	4	2	69	BAYBURT	10
	3	49	MUŞ	1	3	30	HAKKARİ	8	3	62	TUNCELİ	11
	4	30	HAKKARİ	1	4	62	TUNCELİ	9	4	29	GÜMÜŞHANE	18
	5	62	TUNCELİ	2[a]	5	69	BAYBURT	10	5	30	HAKKARİ	22
Year2001	Highest 1	34	İSTANBUL	11459	Year2007 Highest 1	34	İSTANBUL	30286	Year2013 Highest 1	34	İSTANBUL	47021
	2	6	ANKARA	1531	2	6	ANKARA	4536	2	6	ANKARA	7370
	3	35	İZMİR	1139	3	35	İZMİR	3383	3	35	İZMİR	5541
	4	16	BURSA	969	4	16	BURSA	2562	4	16	BURSA	3940
	5	42	KONYA	441	5	7	ANTALYA	1550	5	27	GAZİANTEP	2971
	Lowest 1	75	ARDAHAN	0	Lowest 1	62	TUNCELİ	6	Lowest 1	75	ARDAHAN	6
	2	69	BAYBURT	0	2	69	BAYBURT	7	2	69	BAYBURT	11
	3	30	HAKKARİ	0	3	13	BİTLİS	8	3	62	TUNCELİ	12
	4	12	BİNGÖL	0	4	79	KİLİS	10	4	29	GÜMÜŞHANE	13
	5	73	ŞIRNAK	1	5	75	ARDAHAN	12	5	49	MUŞ	17
Year2002	Highest 1	34	İSTANBUL	16131	Year2008 Highest 1	34	İSTANBUL	31500	Year2014 Highest 1	34	İSTANBUL	49028
	2	6	ANKARA	2075	2	6	ANKARA	4585	2	6	ANKARA	7682
	3	35	İZMİR	1769	3	35	İZMİR	3295	3	35	İZMİR	5938
	4	16	BURSA	1369	4	16	BURSA	2383	4	16	BURSA	4185
	5	42	KONYA	696	5	7	ANTALYA	1885	5	7	ANTALYA	3057
	Lowest 1	73	ŞIRNAK	0	Lowest 1	62	TUNCELİ	2	Lowest 1	69	BAYBURT	10
	2	62	TUNCELİ	0	2	75	ARDAHAN	9	2	75	ARDAHAN	12
	3	30	HAKKARİ	0	3	69	BAYBURT	10	3	62	TUNCELİ	17
	4	75	ARDAHAN	1	4	13	BİTLİS	11	4	29	GÜMÜŞHANE	20
	5	69	BAYBURT	1[b]	5	12	BİNGÖL	12	5	12	BİNGÖL	20
Year2003	Highest 1	34	İSTANBUL	17365	Year2009 Highest 1	34	İSTANBUL	30832	Year2015 Highest 1	34	İSTANBUL	46187
	2	6	ANKARA	2142	2	6	ANKARA	4472	2	6	ANKARA	7579
	3	35	İZMİR	1761	3	35	İZMİR	3508	3	35	İZMİR	6638
	4	16	BURSA	1248	4	16	BURSA	2159	4	16	BURSA	4179
	5	27	GAZİANTEP	768	5	27	GAZİANTEP	1780	5	7	ANTALYA	3071
	Lowest 1	30	HAKKARİ	0	Lowest 1	69	BAYBURT	2	Lowest 1	69	BAYBURT	8
	2	69	BAYBURT	1	2	75	ARDAHAN	7	2	75	ARDAHAN	10
	3	29	GÜMÜŞHANE	1	3	62	TUNCELİ	8	3	13	BİTLİS	20
	4	75	ARDAHAN	3	4	13	BİTLİS	9	4	12	BİNGÖL	21
	5	13	BİTLİS	3	5	8	ARTVİN	12	5	62	TUNCELİ	22[c]
Year2004	Highest 1	34	İSTANBUL	20382	Year2010 Highest 1	34	İSTANBUL	37150	Year2016 Highest 1	34	İSTANBUL	44782
	2	35	İZMİR	2613	2	6	ANKARA	5588	2	6	ANKARA	7440
	3	6	ANKARA	2584	3	35	İZMİR	4339	3	35	İZMİR	6546
	4	16	BURSA	1646	4	16	BURSA	3051	4	16	BURSA	4348
	5	27	GAZİANTEP	1155	5	7	ANTALYA	2363	5	27	GAZİANTEP	3439
	Lowest 1	75	ARDAHAN	2	Lowest 1	62	TUNCELİ	4	Lowest 1	69	BAYBURT	5
	2	30	HAKKARİ	2	2	69	BAYBURT	5	2	62	TUNCELİ	5
	3	29	GÜMÜŞHANE	2	3	75	ARDAHAN	11	3	30	HAKKARİ	18
	4	13	BİTLİS	3	4	30	HAKKARİ	19	4	49	MUŞ	20
	5	76	IĞDIR	4	5	29	GÜMÜŞHANE	19	5	13	BİTLİS	21
Year2005	Highest 1	34	İSTANBUL	24011	Year2011 Highest 1	34	İSTANBUL	53161	Year2017 Highest 1	34	İSTANBUL	49683
	2	6	ANKARA	3552	2	6	ANKARA	8630	2	6	ANKARA	8536
	3	35	İZMİR	2996	3	35	İZMİR	6088	3	35	İZMİR	7060
	4	16	BURSA	2502	4	16	BURSA	4174	4	16	BURSA	4847
	5	42	KONYA	1567	5	7	ANTALYA	2838	5	27	GAZİANTEP	3496
	Lowest 1	8	ARTVİN	2	Lowest 1	75	ARDAHAN	6	Lowest 1	69	BAYBURT	13
	2	69	BAYBURT	4	2	69	BAYBURT	14	2	75	ARDAHAN	14
	3	62	TUNCELİ	5	3	62	TUNCELİ	15	3	62	TUNCELİ	15
	4	73	ŞIRNAK	7	4	13	BİTLİS	16	4	49	MUŞ	22
	5	75	ARDAHAN	8	5	30	HAKKARİ	22[c]	5	30	HAKKARİ	22

a. Only a partial list of cases with the value 2 are shown in the table of lower extremes.
b. Only a partial list of cases with the value 1 are shown in the table of lower extremes.
c. Only a partial list of cases with the value 22 are shown in the table of lower extremes.

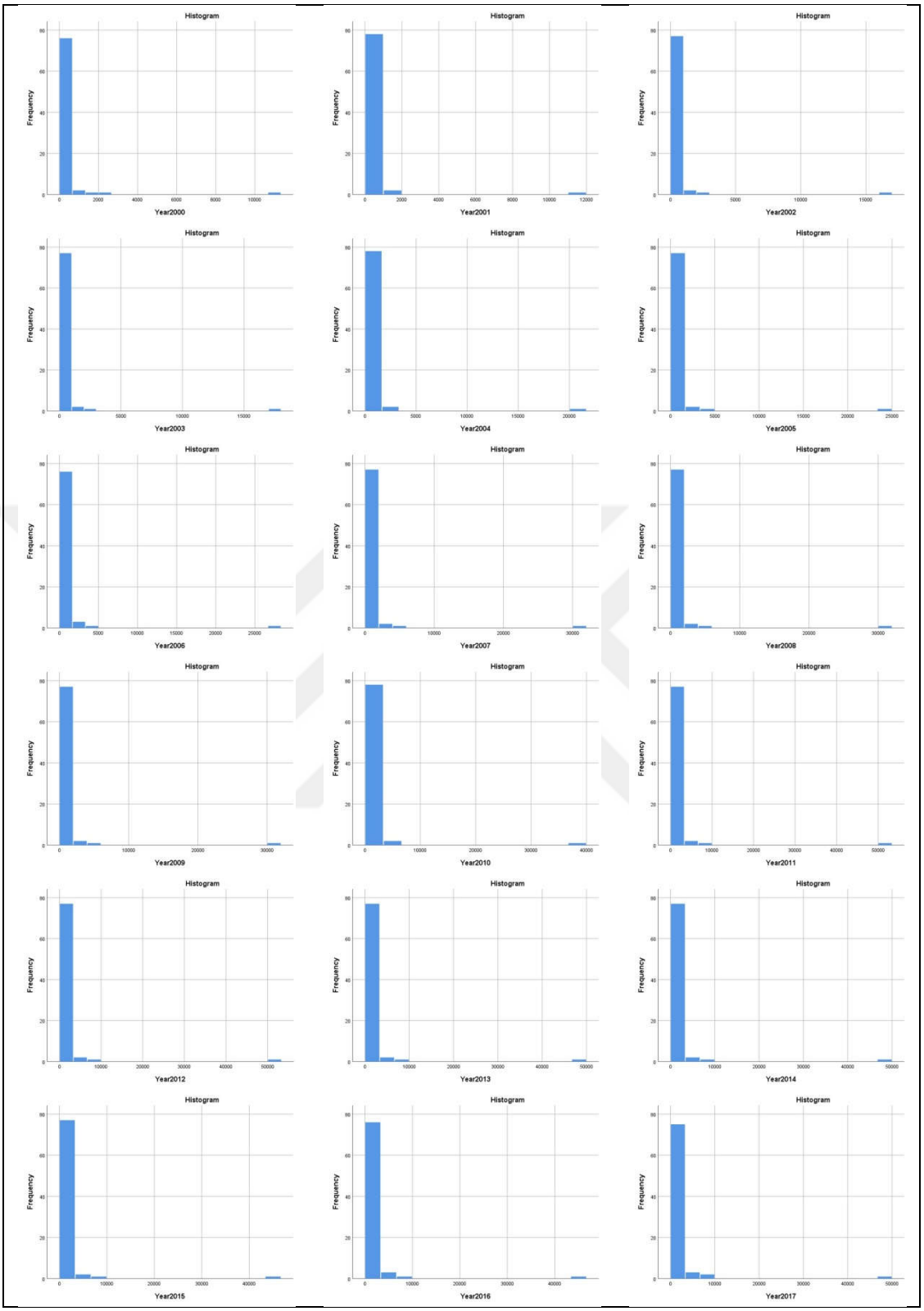


Figure A.25 : Histogram graphs.

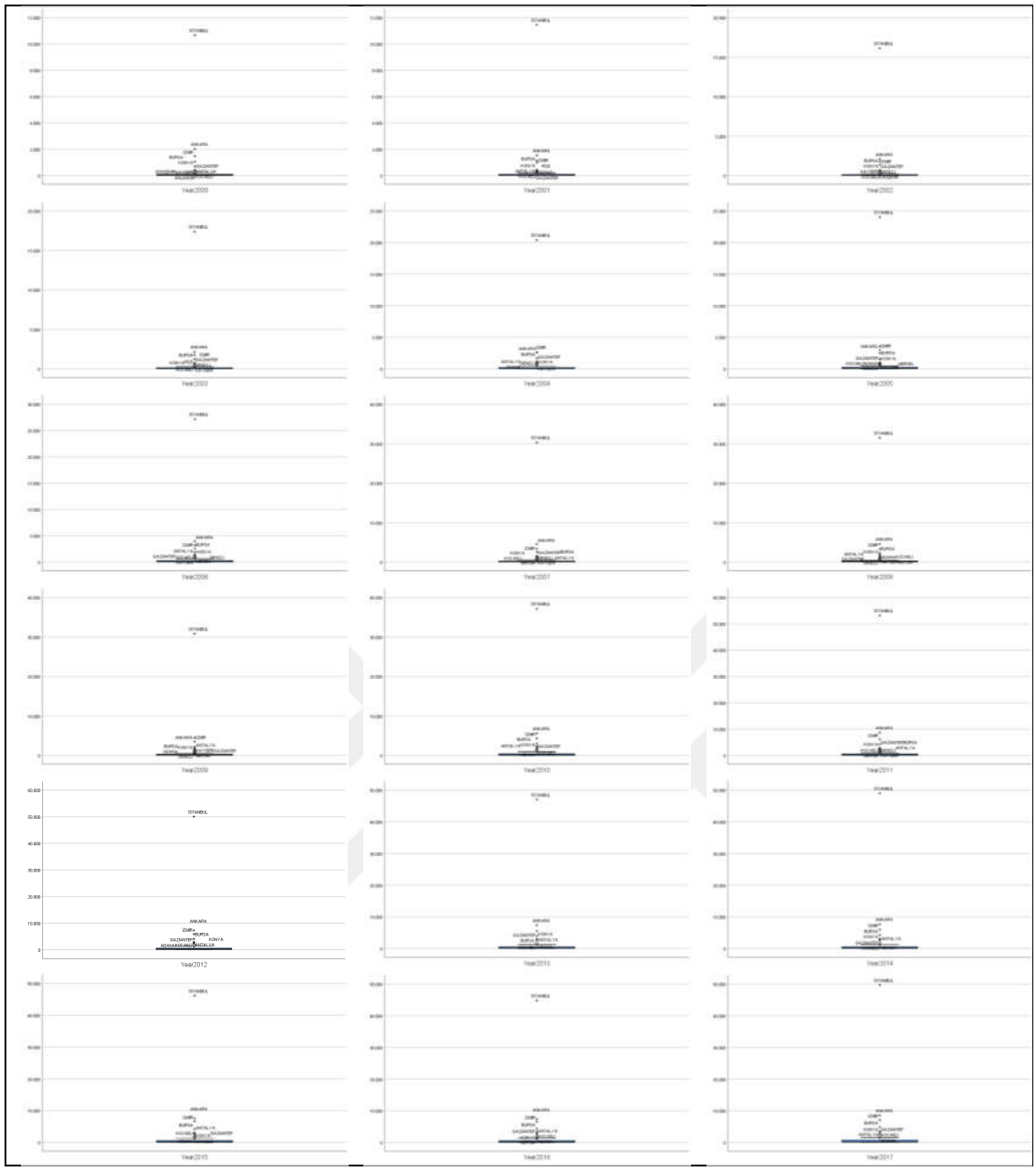


Figure A.26 : Boxplots.

Evaluation of time periods:

Table A.53 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table A.54 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mean_2000_2005	0,419	81	0,000	0,175	81	0,000
Mean_2006_2010	0,416	81	0,000	0,182	81	0,000
Mean_2011_2017	0,413	81	0,000	0,190	81	0,000

a. Lilliefors Significance Correction

Table A.55 : Descriptive statistics.

Descriptives												
				Std.				Std.				Std.
		Statistic		Error		Statistic		Error		Statistic		Error
Mean 2000 2005	Mean	386,35		208,036	Mean 2006 2010	757,74		391,775	Mean 2011 2017	1213,65		608,462
	Median	50,67				122,40				177,00		
	Variance	3505609,353				12432491,501				29988339,526		
	Std. Deviation	1872,327				3525,974				5476,161		
	Minimum	2				6				10		
	Maximum	16671				31382				48556		
	Range	16669				31376				48546		
	Skewness	8,452		0,267		8,417		0,267		8,310		0,267
	Kurtosis	74,009		0,529		73,579		0,529		72,188		0,529

Table A.56 : Outlier- Extreme values.

Extreme Values												
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Mean 2000 2005	Highest 1	34	İSTANBUL	16671	Mean 2006 2010 Highest 1	34	İSTANBUL	31382	Mean 2011 2017 Highest 1	34	İSTANBUL	48556
	2	6	ANKARA	2316	2	6	ANKARA	4632	2	6	ANKARA	7785
	3	35	İZMİR	1959	3	35	İZMİR	3545	3	35	İZMİR	6240
	4	16	BURSA	1466	4	16	BURSA	2549	4	16	BURSA	4243
	5	42	KONYA	871	5	7	ANTALYA	1776	5	27	GAZİANTEP	3017
	Lowest 1	69	BAYBURT	2	Lowest 1	62	TUNCELİ	6	Lowest 1	69	BAYBURT	10
	2	30	HAKKARİ	3	2	69	BAYBURT	7	2	75	ARDAHAN	11
	3	75	ARDAHAN	3	3	75	ARDAHAN	9	3	62	TUNCELİ	14
	4	62	TUNCELİ	4	4	13	BİTLİS	12	4	29	GÜMÜŞHANE	22
	5	56	SİİRT	5[a]	5	76	IĞDIR	17	5	30	HAKKARİ	24

a. Only a partial list of cases with the value 5 are shown in the table of lower extremes.

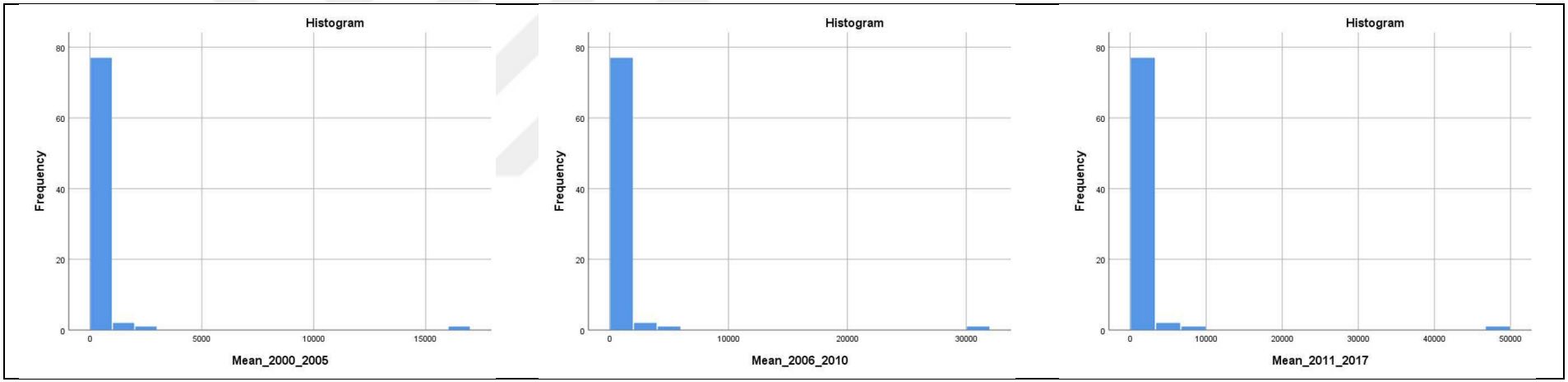


Figure A.27 : Histogram graphs.

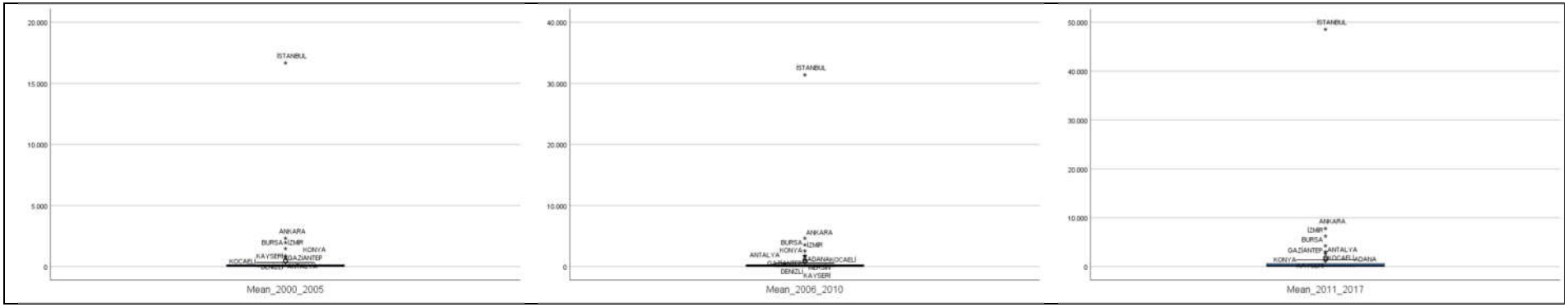


Figure A.28 : Boxplots.

Evaluation of Each Year (Lg):

Table A.57 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Year2000	81	100,0%	0	0,0%	81	100,0%
Lg_Year2001	81	100,0%	0	0,0%	81	100,0%
Lg_Year2002	81	100,0%	0	0,0%	81	100,0%
Lg_Year2003	81	100,0%	0	0,0%	81	100,0%
Lg_Year2004	81	100,0%	0	0,0%	81	100,0%
Lg_Year2005	81	100,0%	0	0,0%	81	100,0%
Lg_Year2006	81	100,0%	0	0,0%	81	100,0%
Lg_Year2007	81	100,0%	0	0,0%	81	100,0%
Lg_Year2008	81	100,0%	0	0,0%	81	100,0%
Lg_Year2009	81	100,0%	0	0,0%	81	100,0%
Lg_Year2010	81	100,0%	0	0,0%	81	100,0%
Lg_Year2011	81	100,0%	0	0,0%	81	100,0%
Lg_Year2012	81	100,0%	0	0,0%	81	100,0%
Lg_Year2013	81	100,0%	0	0,0%	81	100,0%
Lg_Year2014	81	100,0%	0	0,0%	81	100,0%
Lg_Year2015	81	100,0%	0	0,0%	81	100,0%
Lg_Year2016	81	100,0%	0	0,0%	81	100,0%
Lg_Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.58 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Year2000	0,065	81	,200*	0,985	81	0,456
Lg_Year2001	0,081	81	,200*	0,980	81	0,238
Lg_Year2002	0,071	81	,200*	0,984	81	0,395
Lg_Year2003	0,070	81	,200*	0,983	81	0,342
Lg_Year2004	0,088	81	0,181	0,981	81	0,258
Lg_Year2005	0,075	81	,200*	0,987	81	0,613
Lg_Year2006	0,064	81	,200*	0,981	81	0,262
Lg_Year2007	0,071	81	,200*	0,973	81	0,089
Lg_Year2008	0,079	81	,200*	0,978	81	0,185
Lg_Year2009	0,057	81	,200*	0,987	81	0,564
Lg_Year2010	0,073	81	,200*	0,978	81	0,180
Lg_Year2011	0,061	81	,200*	0,979	81	0,204
Lg_Year2012	0,083	81	,200*	0,979	81	0,193
Lg_Year2013	0,080	81	,200*	0,980	81	0,238
Lg_Year2014	0,096	81	0,065	0,969	81	0,047
Lg_Year2015	0,088	81	0,181	0,975	81	0,114
Lg_Year2016	0,085	81	,200*	0,978	81	0,183
Lg_Year2017	0,080	81	,200*	0,973	81	0,079

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table A.59 : Descriptive statistics.

Descriptives											
			Std.			Std.				Std.
		Statistic	Error		Statistic	Error			Statistic	Error
Lg_Year2000	Mean	1,5967	0,08327	Lg_Year2006	Mean	2,0484	0,08039	Lg_Year2012	Mean	2,2982	0,07883
	Median	1,5185			Median	1,9445			Median	2,2227	
	Variance	0,562			Variance	0,523			Variance	0,503	
	Std. Deviation	0,74939			Std. Deviation	0,72348			Std. Deviation	0,70948	
	Minimum	0,00			Minimum	0,60			Minimum	0,60	
	Maximum	4,03			Maximum	4,43			Maximum	4,70	
	Range	4,03			Range	3,83			Range	4,10	
	Skewness	0,379	0,267		Skewness	0,525	0,267		Skewness	0,544	0,267
	Kurtosis	0,714	0,529		Kurtosis	0,568	0,529		Kurtosis	0,886	0,529
Lg_Year2001	Mean	1,5318	0,08481	Lg_Year2007	Mean	2,0655	0,07918	Lg_Year2013	Mean	2,2859	0,07850
	Median	1,4914			Median	1,9823			Median	2,2504	
	Variance	0,583			Variance	0,508			Variance	0,499	
	Std. Deviation	0,76332			Std. Deviation	0,71262			Std. Deviation	0,70647	
	Minimum	0,00			Minimum	0,78			Minimum	0,78	
	Maximum	4,06			Maximum	4,48			Maximum	4,67	
	Range	4,06			Range	3,70			Range	3,89	
	Skewness	0,328	0,267		Skewness	0,631	0,267		Skewness	0,577	0,267
	Kurtosis	0,791	0,529		Kurtosis	0,643	0,529		Kurtosis	0,803	0,529
Lg_Year2002	Mean	1,6268	0,08860	Lg_Year2008	Mean	2,0837	0,07881	Lg_Year2014	Mean	2,2979	0,07779
	Median	1,5911			Median	2,0531			Median	2,2253	
	Variance	0,636			Variance	0,503			Variance	0,490	
	Std. Deviation	0,79737			Std. Deviation	0,70929			Std. Deviation	0,70007	
	Minimum	0,00			Minimum	0,30			Minimum	1,00	
	Maximum	4,21			Maximum	4,50			Maximum	4,69	
	Range	4,21			Range	4,20			Range	3,69	
	Skewness	0,327	0,267		Skewness	0,572	0,267		Skewness	0,707	0,267
	Kurtosis	0,648	0,529		Kurtosis	0,965	0,529		Kurtosis	0,751	0,529
Lg_Year2003	Mean	1,7099	0,08260	Lg_Year2009	Mean	2,0922	0,07968	Lg_Year2015	Mean	2,3028	0,07916
	Median	1,5911			Median	2,0899			Median	2,2253	
	Variance	0,553			Variance	0,514			Variance	0,508	
	Std. Deviation	0,74339			Std. Deviation	0,71711			Std. Deviation	0,71247	
	Minimum	0,00			Minimum	0,30			Minimum	0,90	
	Maximum	4,24			Maximum	4,49			Maximum	4,66	
	Range	4,24			Range	4,19			Range	3,76	
	Skewness	0,510	0,267		Skewness	0,443	0,267		Skewness	0,622	0,267
	Kurtosis	0,883	0,529		Kurtosis	0,802	0,529		Kurtosis	0,542	0,529
Lg_Year2004	Mean	1,7964	0,08645	Lg_Year2010	Mean	2,1882	0,07786	Lg_Year2016	Mean	2,2904	0,08036
	Median	1,6721			Median	2,1139			Median	2,2148	
	Variance	0,605			Variance	0,491			Variance	0,523	
	Std. Deviation	0,77801			Std. Deviation	0,70073			Std. Deviation	0,72325	
	Minimum	0,30			Minimum	0,60			Minimum	0,70	
	Maximum	4,31			Maximum	4,57			Maximum	4,65	
	Range	4,01			Range	3,97			Range	3,95	
	Skewness	0,478	0,267		Skewness	0,567	0,267		Skewness	0,534	0,267
	Kurtosis	0,475	0,529		Kurtosis	0,900	0,529		Kurtosis	0,683	0,529
Lg_Year2005	Mean	2,0107	0,08074	Lg_Year2011	Mean	2,3107	0,07992	Lg_Year2017	Mean	2,3676	0,07776
	Median	1,9590			Median	2,2504			Median	2,2945	
	Variance	0,528			Variance	0,517			Variance	0,490	
	Std. Deviation	0,72668			Std. Deviation	0,71930			Std. Deviation	0,69987	
	Minimum	0,30			Minimum	0,78			Minimum	1,11	
	Maximum	4,38			Maximum	4,73			Maximum	4,70	
	Range	4,08			Range	3,95			Range	3,58	
	Skewness	0,394	0,267		Skewness	0,577	0,267		Skewness	0,654	0,267
	Kurtosis	0,712	0,529		Kurtosis	0,662	0,529		Kurtosis	0,590	0,529

Table A.60 : Outlier-Extreme values.

			Extreme Values												
			Case	Region	Value			Case	Region	Value			Case	Region	Value
Lg_Year2000	Highest	1	34	İSTANBUL	4,03	Lg_Year2006	Highest	1	34	İSTANBUL	4,43	Lg_Year2012	Highest	1	34	İSTANBUL	4,70
		2	6	ANKARA	3,30			2	6	ANKARA	3,60			2	6	ANKARA	3,86
		3	35	İZMİR	3,17			3	35	İZMİR	3,51			3	35	İZMİR	3,77
		4	16	BURSA	3,03			4	16	BURSA	3,41			4	16	BURSA	3,61
		5	42	KONYA	2,83			5	42	KONYA	3,28			5	27	GAZİANTEP	3,46
	Lowest	1	56	SİİRT	0,00		Lowest	1	75	ARDAHAN	0,60		Lowest	1	75	ARDAHAN	0,60
		2	13	BİTLİS	0,00			2	73	ŞIRNAK	0,60			2	69	BAYBURT	1,00
		3	49	MUŞ	0,30			3	30	HAKKARİ	0,90			3	62	TUNCELİ	1,04
		4	30	HAKKARİ	0,30			4	62	TUNCELİ	0,95			4	29	GÜMÜŞHANE	1,26
		5	62	TUNCELİ	,48[a]			5	69	BAYBURT	1,00			5	30	HAKKARİ	1,34
Lg_Year2001	Highest	1	34	İSTANBUL	4,06	Lg_Year2007	Highest	1	34	İSTANBUL	4,48	Lg_Year2013	Highest	1	34	İSTANBUL	4,67
		2	6	ANKARA	3,19			2	6	ANKARA	3,66			2	6	ANKARA	3,87
		3	35	İZMİR	3,06			3	35	İZMİR	3,53			3	35	İZMİR	3,74
		4	16	BURSA	2,99			4	16	BURSA	3,41			4	16	BURSA	3,60
		5	42	KONYA	2,65			5	7	ANTALYA	3,19			5	27	GAZİANTEP	3,47
	Lowest	1	75	ARDAHAN	0,00		Lowest	1	62	TUNCELİ	0,78		Lowest	1	75	ARDAHAN	0,78
		2	69	BAYBURT	0,00			2	69	BAYBURT	0,85			2	69	BAYBURT	1,04
		3	30	HAKKARİ	0,00			3	13	BİTLİS	0,90			3	62	TUNCELİ	1,08
		4	12	BİNGÖL	0,00			4	79	KİLİS	1,00			4	29	GÜMÜŞHANE	1,11
		5	73	ŞIRNAK	0,30			5	75	ARDAHAN	1,08			5	49	MUŞ	1,23
Lg_Year2002	Highest	1	34	İSTANBUL	4,21	Lg_Year2008	Highest	1	34	İSTANBUL	4,50	Lg_Year2014	Highest	1	34	İSTANBUL	4,69
		2	6	ANKARA	3,32			2	6	ANKARA	3,66			2	6	ANKARA	3,89
		3	35	İZMİR	3,25			3	35	İZMİR	3,52			3	35	İZMİR	3,77
		4	16	BURSA	3,14			4	16	BURSA	3,38			4	16	BURSA	3,62
		5	42	KONYA	2,84			5	7	ANTALYA	3,28			5	7	ANTALYA	3,49
	Lowest	1	73	ŞIRNAK	0,00		Lowest	1	62	TUNCELİ	0,30		Lowest	1	69	BAYBURT	1,00
		2	62	TUNCELİ	0,00			2	75	ARDAHAN	0,95			2	75	ARDAHAN	1,08
		3	30	HAKKARİ	0,00			3	69	BAYBURT	1,00			3	62	TUNCELİ	1,23
		4	75	ARDAHAN	0,30			4	13	BİTLİS	1,04			4	29	GÜMÜŞHANE	1,30
		5	69	BAYBURT	,30[b]			5	12	BİNGÖL	1,08			5	12	BİNGÖL	1,30
Lg_Year2003	Highest	1	34	İSTANBUL	4,24	Lg_Year2009	Highest	1	34	İSTANBUL	4,49	Lg_Year2015	Highest	1	34	İSTANBUL	4,66
		2	6	ANKARA	3,33			2	6	ANKARA	3,65			2	6	ANKARA	3,88
		3	35	İZMİR	3,25			3	35	İZMİR	3,55			3	35	İZMİR	3,82
		4	16	BURSA	3,10			4	16	BURSA	3,33			4	16	BURSA	3,62
		5	27	GAZİANTEP	2,89			5	27	GAZİANTEP	3,25			5	7	ANTALYA	3,49
	Lowest	1	30	HAKKARİ	0,00		Lowest	1	69	BAYBURT	0,30		Lowest	1	69	BAYBURT	0,90
		2	69	BAYBURT	0,30			2	75	ARDAHAN	0,85			2	75	ARDAHAN	1,00
		3	29	GÜMÜŞHANE	0,30			3	62	TUNCELİ	0,90			3	13	BİTLİS	1,30
		4	75	ARDAHAN	0,60			4	13	BİTLİS	0,95			4	12	BİNGÖL	1,32
		5	13	BİTLİS	0,60			5	8	ARTVİN	1,08			5	62	TUNCELİ	1,34[c]
Lg_Year2004	Highest	1	34	İSTANBUL	4,31	Lg_Year2010	Highest	1	34	İSTANBUL	4,57	Lg_Year2016	Highest	1	34	İSTANBUL	4,65
		2	35	İZMİR	3,42			2	6	ANKARA	3,75			2	6	ANKARA	3,87
		3	6	ANKARA	3,41			3	35	İZMİR	3,64			3	35	İZMİR	3,82
		4	16	BURSA	3,22			4	16	BURSA	3,48			4	16	BURSA	3,64
		5	27	GAZİANTEP	3,06			5	7	ANTALYA	3,37			5	27	GAZİANTEP	3,54
	Lowest	1	75	ARDAHAN	0,30		Lowest	1	62	TUNCELİ	0,60		Lowest	1	69	BAYBURT	0,70
		2	30	HAKKARİ	0,30			2	69	BAYBURT	0,70			2	62	TUNCELİ	0,70
		3	29	GÜMÜŞHANE	0,30			3	75	ARDAHAN	1,04			3	30	HAKKARİ	1,26
		4	13	BİTLİS	0,48			4	30	HAKKARİ	1,28			4	49	MUŞ	1,30
		5	76	IĞDIR	0,60			5	29	GÜMÜŞHANE	1,28			5	13	BİTLİS	1,32
Lg_Year2005	Highest	1	34	İSTANBUL	4,38	Lg_Year2011	Highest	1	34	İSTANBUL	4,73	Lg_Year2017	Highest	1	34	İSTANBUL	4,70
		2	6	ANKARA	3,55			2	6	ANKARA	3,94			2	6	ANKARA	3,93
		3	35	İZMİR	3,48			3	35	İZMİR	3,78			3	35	İZMİR	3,85
		4	16	BURSA	3,40			4	16	BURSA	3,62			4	16	BURSA	3,69
		5	42	KONYA	3,20			5	7	ANTALYA	3,45			5	27	GAZİANTEP	3,54
	Lowest	1	8	ARTVİN	0,30		Lowest	1	75	ARDAHAN	0,78		Lowest	1	69	BAYBURT	1,11
		2	69	BAYBURT	0,60			2	69	BAYBURT	1,15			2	75	ARDAHAN	1,15
		3	62	TUNCELİ	0,70			3	62	TUNCELİ	1,18			3	62	TUNCELİ	1,18
		4	73	ŞIRNAK	0,85			4	13	BİTLİS	1,20			4	49	MUŞ	1,34
		5	75	ARDAHAN	0,90			5	30	HAKKARİ	1,34[c]			5	30	HAKKARİ	1,34

a. Only a partial list of cases with the value ,48 are shown in the table of lower extremes.
b. Only a partial list of cases with the value ,30 are shown in the table of lower extremes.
c. Only a partial list of cases with the value 1,34 are shown in the table of lower extremes.

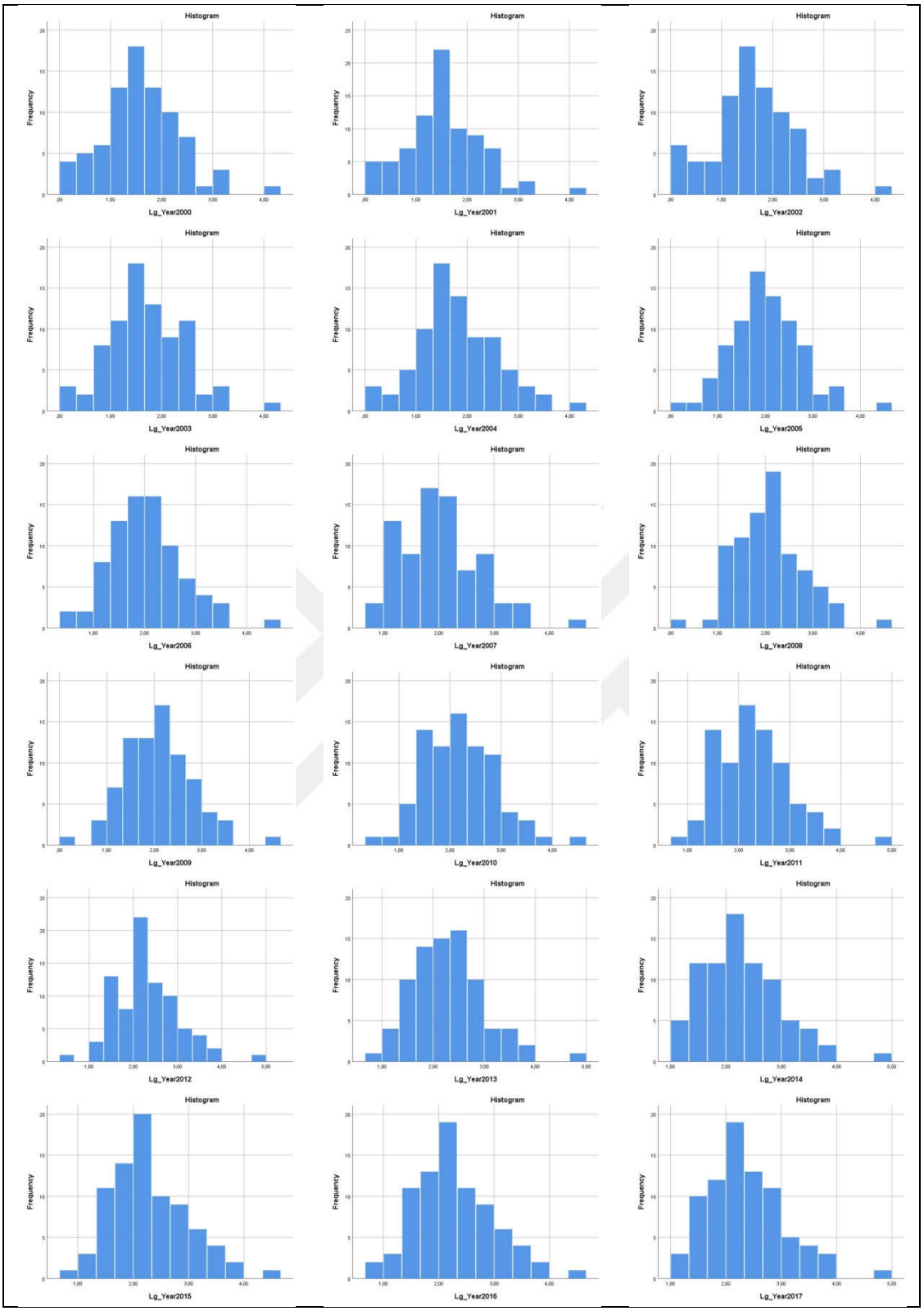


Figure A.29 : Histogram graphs.



Figure A.30 : Boxplots.

“Trademark Registrations”

Evaluation per each year:

Table A.61 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Year2000	81	100,0%	0	0,0%	81	100,0%
Year2001	81	100,0%	0	0,0%	81	100,0%
Year2002	81	100,0%	0	0,0%	81	100,0%
Year2003	81	100,0%	0	0,0%	81	100,0%
Year2004	81	100,0%	0	0,0%	81	100,0%
Year2005	81	100,0%	0	0,0%	81	100,0%
Year2006	81	100,0%	0	0,0%	81	100,0%
Year2007	81	100,0%	0	0,0%	81	100,0%
Year2008	81	100,0%	0	0,0%	81	100,0%
Year2009	81	100,0%	0	0,0%	81	100,0%
Year2010	81	100,0%	0	0,0%	81	100,0%
Year2011	81	100,0%	0	0,0%	81	100,0%
Year2012	81	100,0%	0	0,0%	81	100,0%
Year2013	81	100,0%	0	0,0%	81	100,0%
Year2014	81	100,0%	0	0,0%	81	100,0%
Year2015	81	100,0%	0	0,0%	81	100,0%
Year2016	81	100,0%	0	0,0%	81	100,0%
Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.62 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Year2000	0,406	81	0,000	0,205	81	0,000
Year2001	0,412	81	0,000	0,195	81	0,000
Year2002	0,421	81	0,000	0,172	81	0,000
Year2003	0,424	81	0,000	0,163	81	0,000
Year2004	0,423	81	0,000	0,165	81	0,000
Year2005	0,420	81	0,000	0,173	81	0,000
Year2006	0,415	81	0,000	0,185	81	0,000
Year2007	0,415	81	0,000	0,183	81	0,000
Year2008	0,416	81	0,000	0,183	81	0,000
Year2009	0,417	81	0,000	0,178	81	0,000
Year2010	0,417	81	0,000	0,178	81	0,000
Year2011	0,416	81	0,000	0,180	81	0,000
Year2012	0,415	81	0,000	0,185	81	0,000
Year2013	0,417	81	0,000	0,179	81	0,000
Year2014	0,417	81	0,000	0,179	81	0,000
Year2015	0,415	81	0,000	0,183	81	0,000
Year2016	0,411	81	0,000	0,197	81	0,000
Year2017	0,409	81	0,000	0,201	81	0,000

a. Lilliefors Significance Correction

Table A.63 : Descriptive statistics.

Descriptives									
			Std.			Std.			Std.
		Statistic	Error		Statistic	Error		Statistic	Error
Year2000	Mean	131,36	61,566	Year2006 Mean	426,04	219,093	Year2012 Mean	646,74	331,655
	Median	24,00		Median	53,00		Median	94,00	
	Variance	307022,233		Variance	3888125,311		Variance	8909574,119	
	Std. Deviation	554,096		Std. Deviation	1971,833		Std. Deviation	2984,891	
	Minimum	0		Minimum	2		Minimum	4	
	Maximum	4881		Maximum	17531		Maximum	26516	
	Range	4881		Range	17529		Range	26512	
	Skewness	8,120	0,267	Skewness	8,386	0,267	Skewness	8,368	0,267
	Kurtosis	69,695	0,529	Kurtosis	73,203	0,529	Kurtosis	72,935	0,529
Year2001	Mean	125,05	62,532	Year2007 Mean	502,53	260,332	Year2013 Mean	844,33	447,804
	Median	16,00		Median	68,00		Median	114,00	
	Variance	316734,473		Variance	5489591,052		Variance	16242808,400	
	Std. Deviation	562,792		Std. Deviation	2342,988		Std. Deviation	4030,237	
	Minimum	0		Minimum	1		Minimum	1	
	Maximum	4962		Maximum	20845		Maximum	35857	
	Range	4962		Range	20844		Range	35856	
	Skewness	8,182	0,267	Skewness	8,408	0,267	Skewness	8,425	0,267
	Kurtosis	70,463	0,529	Kurtosis	73,473	0,529	Kurtosis	73,662	0,529
Year2002	Mean	166,41	92,376	Year2008 Mean	438,80	228,625	Year2014 Mean	892,91	469,730
	Median	19,00		Median	54,00		Median	110,00	
	Variance	691202,494		Variance	4233813,285		Variance	17872334,880	
	Std. Deviation	831,386		Std. Deviation	2057,623		Std. Deviation	4227,568	
	Minimum	0		Minimum	3		Minimum	4	
	Maximum	7392		Maximum	18307		Maximum	37639	
	Range	7392		Range	18304		Range	37635	
	Skewness	8,437	0,267	Skewness	8,411	0,267	Skewness	8,435	0,267
	Kurtosis	73,786	0,529	Kurtosis	73,529	0,529	Kurtosis	73,816	0,529
Year2003	Mean	179,19	103,315	Year2009 Mean	511,28	271,780	Year2015 Mean	865,57	447,476
	Median	19,00		Median	77,00		Median	125,00	
	Variance	864588,128		Variance	5983031,406		Variance	16219026,323	
	Std. Deviation	929,832		Std. Deviation	2446,024		Std. Deviation	4027,285	
	Minimum	0		Minimum	1		Minimum	4	
	Maximum	8309		Maximum	21770		Maximum	35798	
	Range	8309		Range	21769		Range	35794	
	Skewness	8,577	0,267	Skewness	8,435	0,267	Skewness	8,387	0,267
	Kurtosis	75,636	0,529	Kurtosis	73,790	0,529	Kurtosis	73,184	0,529
Year2004	Mean	232,90	132,774	Year2010 Mean	399,96	210,892	Year2016 Mean	1032,90	505,146
	Median	23,00		Median	62,00		Median	144,00	
	Variance	1427937,240		Variance	3602503,786		Variance	20668968,965	
	Std. Deviation	1194,963		Std. Deviation	1898,026		Std. Deviation	4546,314	
	Minimum	0		Minimum	1		Minimum	5	
	Maximum	10676		Maximum	16906		Maximum	40212	
	Range	10676		Range	16905		Range	40207	
	Skewness	8,565	0,267	Skewness	8,448	0,267	Skewness	8,237	0,267
	Kurtosis	75,491	0,529	Kurtosis	73,974	0,529	Kurtosis	71,246	0,529
Year2005	Mean	332,51	182,684	Year2011 Mean	442,69	231,419	Year2017 Mean	955,48	460,332
	Median	35,00		Median	71,00		Median	130,00	
	Variance	2703242,203		Variance	4337936,191		Variance	17164364,503	
	Std. Deviation	1644,154		Std. Deviation	2082,771		Std. Deviation	4142,990	
	Minimum	1		Minimum	2		Minimum	5	
	Maximum	14668		Maximum	18532		Maximum	36570	
	Range	14667		Range	18530		Range	36565	
	Skewness	8,508	0,267	Skewness	8,418	0,267	Skewness	8,180	0,267
	Kurtosis	74,769	0,529	Kurtosis	73,580	0,529	Kurtosis	70,515	0,529

Table A.64 : Outlier-Extreme values.

		Extreme Values											
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Year2000	Highest 1	34	İSTANBUL	4881	Year2006 Highest 1	34	İSTANBUL	17531	Year2012 Highest 1	34	İSTANBUL	26516
	2	35	İZMİR	853	2	6	ANKARA	2363	2	6	ANKARA	4114
	3	6	ANKARA	739	3	35	İZMİR	2124	3	35	İZMİR	3234
	4	16	BURSA	607	4	16	BURSA	1782	4	16	BURSA	2113
	5	42	KONYA	409	5	42	KONYA	1184	5	42	KONYA	1554
	Lowest 1	76	IĞDIR	0	Lowest 1	75	ARDAHAN	2	Lowest 1	69	BAYBURT	4
	2	75	ARDAHAN	0	2	8	ARTVİN	2	2	62	TUNCELİ	4
	3	73	ŞIRNAK	0	3	73	ŞIRNAK	4	3	76	IĞDIR	7
	4	69	BAYBURT	0	4	69	BAYBURT	4	4	75	ARDAHAN	8
	5	62	TUNCELİ	0[a]	5	56	SİİRT	4	5	56	SİİRT	8[c]
Year2001	Highest 1	34	İSTANBUL	4962	Year2007 Highest 1	34	İSTANBUL	20845	Year2013 Highest 1	34	İSTANBUL	35857
	2	6	ANKARA	840	2	6	ANKARA	2924	2	6	ANKARA	5403
	3	35	İZMİR	747	3	35	İZMİR	2493	3	35	İZMİR	4102
	4	16	BURSA	583	4	16	BURSA	1873	4	16	BURSA	2749
	5	42	KONYA	336	5	42	KONYA	1309	5	7	ANTALYA	1776
	Lowest 1	62	TUNCELİ	0	Lowest 1	75	ARDAHAN	1	Lowest 1	75	ARDAHAN	1
	2	56	SİİRT	0	2	73	ŞIRNAK	1	2	69	BAYBURT	6
	3	49	MUŞ	0	3	69	BAYBURT	2	3	29	GÜMÜŞHANE	8
	4	29	GÜMÜŞHANE	0	4	76	IĞDIR	3	4	62	TUNCELİ	9
	5	13	BİTLİS	0[a]	5	30	HAKKARİ	5	5	30	HAKKARİ	11
Year2002	Highest 1	34	İSTANBUL	7392	Year2008 Highest 1	34	İSTANBUL	18307	Year2014 Highest 1	34	İSTANBUL	37639
	2	6	ANKARA	1069	2	6	ANKARA	2608	2	6	ANKARA	5316
	3	35	İZMİR	874	3	35	İZMİR	1983	3	35	İZMİR	4361
	4	16	BURSA	712	4	16	BURSA	1565	4	16	BURSA	2902
	5	42	KONYA	346	5	42	KONYA	1313	5	27	GAZİANTEP	2236
	Lowest 1	74	BARTIN	0	Lowest 1	62	TUNCELİ	3	Lowest 1	75	ARDAHAN	4
	2	69	BAYBURT	0	2	76	IĞDIR	4	2	62	TUNCELİ	10
	3	30	HAKKARİ	0	3	69	BAYBURT	4	3	29	GÜMÜŞHANE	10
	4	8	ARTVİN	0	4	79	KİLİS	5	4	69	BAYBURT	11
	5	76	IĞDIR	1[b]	5	49	MUŞ	5	5	76	IĞDIR	16
Year2003	Highest 1	34	İSTANBUL	8309	Year2009 Highest 1	34	İSTANBUL	21770	Year2015 Highest 1	34	İSTANBUL	35798
	2	6	ANKARA	964	2	6	ANKARA	3339	2	6	ANKARA	5358
	3	35	İZMİR	838	3	35	İZMİR	2302	3	35	İZMİR	4323
	4	16	BURSA	712	4	16	BURSA	1506	4	16	BURSA	2925
	5	42	KONYA	430	5	7	ANTALYA	1235	5	7	ANTALYA	2019
	Lowest 1	75	ARDAHAN	0	Lowest 1	62	TUNCELİ	1	Lowest 1	69	BAYBURT	4
	2	62	TUNCELİ	0	2	76	IĞDIR	6	2	75	ARDAHAN	9
	3	30	HAKKARİ	0	3	75	ARDAHAN	7	3	62	TUNCELİ	10
	4	12	BİNGÖL	0	4	69	BAYBURT	7	4	49	MUŞ	14
	5	4	AĞRI	0	5	36	KARS	8	5	12	BİNGÖL	16
Year2004	Highest 1	34	İSTANBUL	10676	Year2010 Highest 1	34	İSTANBUL	16906	Year2016 Highest 1	34	İSTANBUL	40212
	2	6	ANKARA	1253	2	6	ANKARA	2460	2	6	ANKARA	6411
	3	35	İZMİR	1119	3	35	İZMİR	1931	3	35	İZMİR	5928
	4	16	BURSA	881	4	16	BURSA	1111	4	16	BURSA	3722
	5	42	KONYA	476	5	42	KONYA	950	5	27	GAZİANTEP	2512
	Lowest 1	69	BAYBURT	0	Lowest 1	69	BAYBURT	1	Lowest 1	69	BAYBURT	5
	2	30	HAKKARİ	0	2	13	BİTLİS	3	2	75	ARDAHAN	8
	3	76	IĞDIR	1	3	75	ARDAHAN	4	3	62	TUNCELİ	14
	4	73	ŞIRNAK	1	4	56	SİİRT	4	4	12	BİNGÖL	14
	5	13	BİTLİS	1[b]	5	62	TUNCELİ	6	5	29	GÜMÜŞHANE	15
Year2005	Highest 1	34	İSTANBUL	14668	Year2011 Highest 1	34	İSTANBUL	18532	Year2017 Highest 1	34	İSTANBUL	36570
	2	35	İZMİR	1740	2	6	ANKARA	2782	2	6	ANKARA	6087
	3	6	ANKARA	1673	3	35	İZMİR	2146	3	35	İZMİR	5398
	4	16	BURSA	1216	4	16	BURSA	1329	4	16	BURSA	3546
	5	42	KONYA	866	5	7	ANTALYA	1191	5	27	GAZİANTEP	2631
	Lowest 1	75	ARDAHAN	1	Lowest 1	69	BAYBURT	2	Lowest 1	62	TUNCELİ	5
	2	29	GÜMÜŞHANE	1	2	62	TUNCELİ	2	2	69	BAYBURT	8
	3	69	BAYBURT	2	3	75	ARDAHAN	5	3	36	KARS	11
	4	36	KARS	2	4	29	GÜMÜŞHANE	5	4	75	ARDAHAN	14
	5	30	HAKKARİ	2	5	49	MUŞ	8[c]	5	49	MUŞ	17

a. Only a partial list of cases with the value 0 are shown in the table of lower extremes.
b. Only a partial list of cases with the value 1 are shown in the table of lower extremes.
c. Only a partial list of cases with the value 8 are shown in the table of lower extremes.

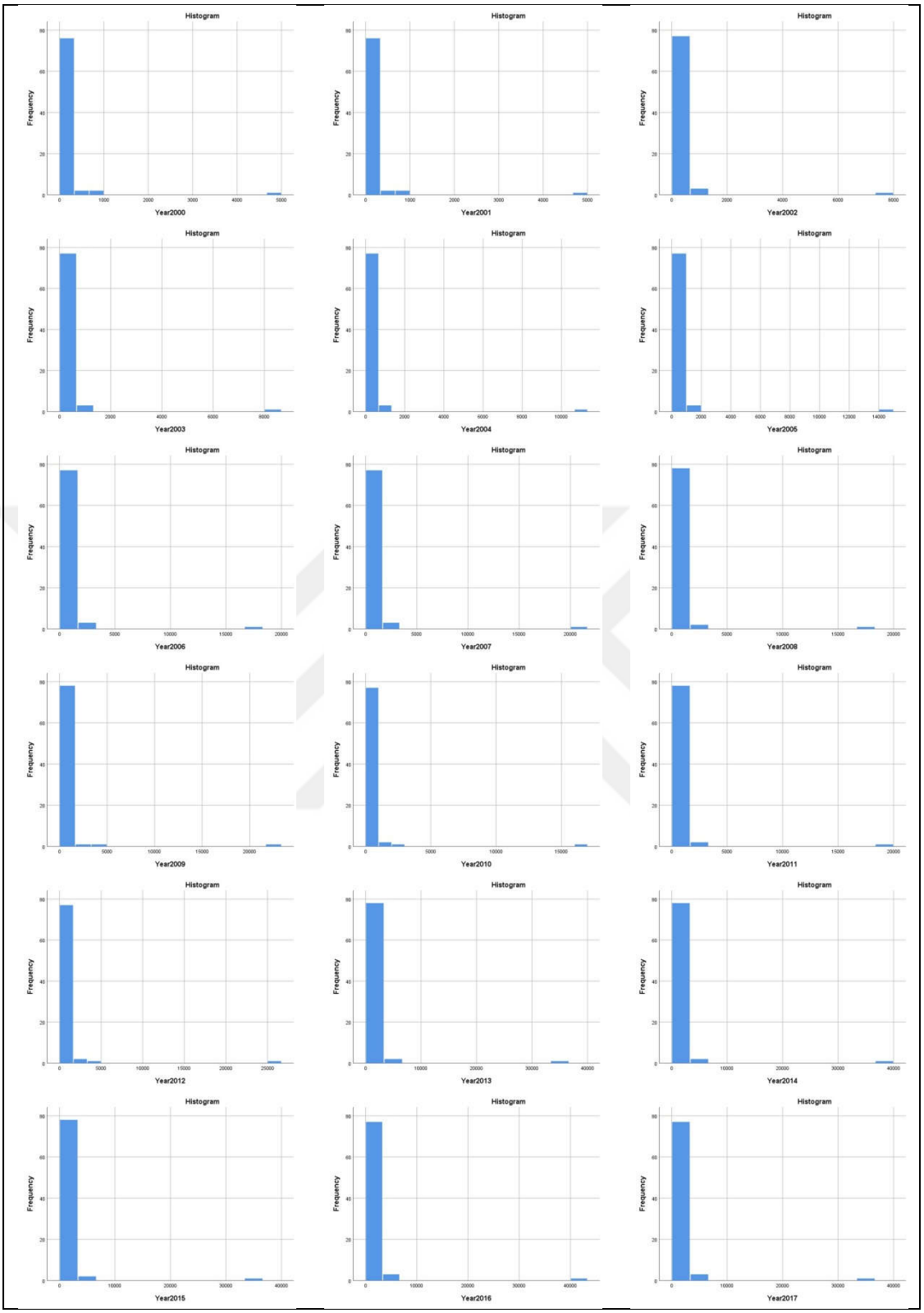


Figure A.31 : Histogram graphs.

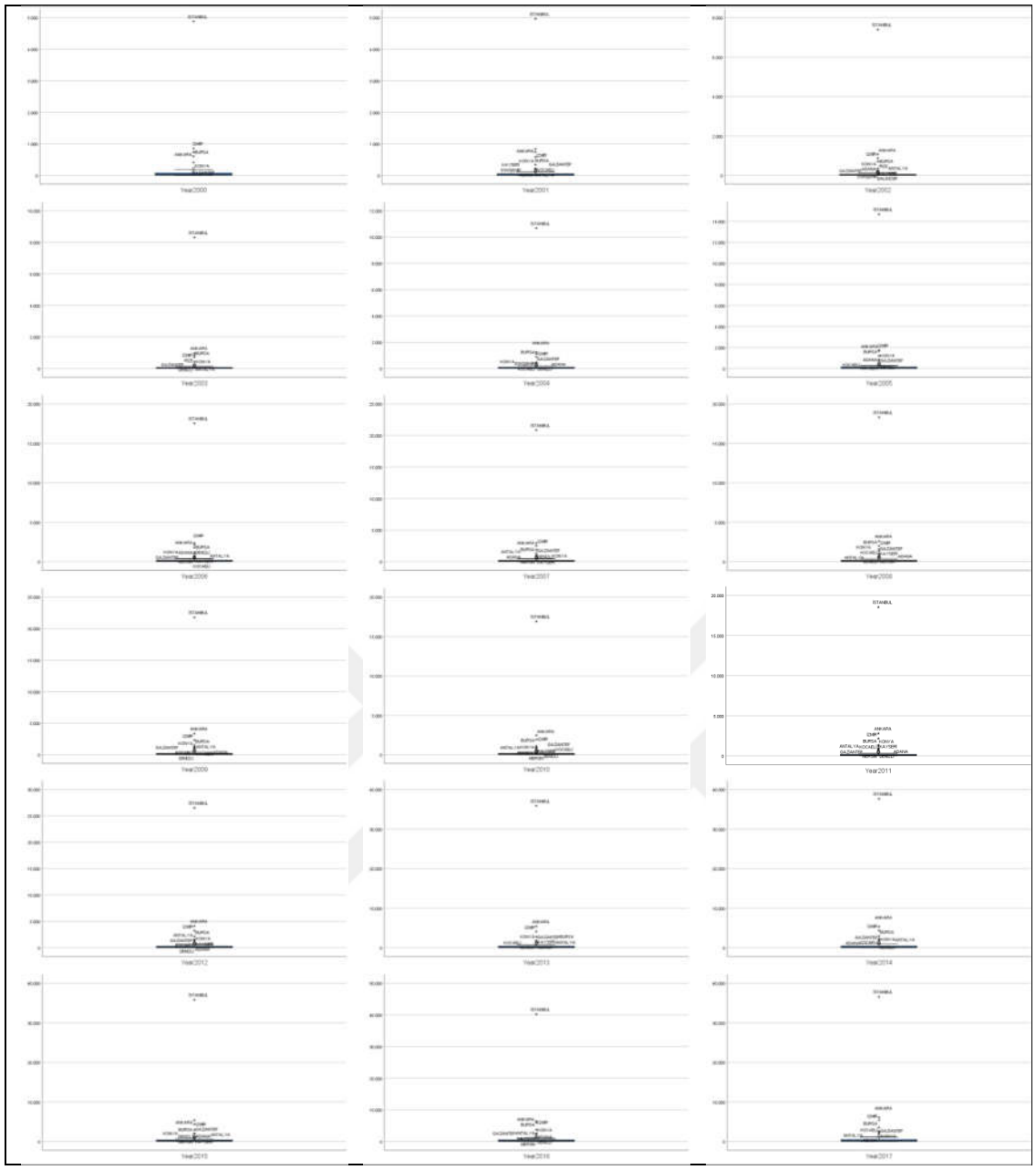


Figure A.32 : Boxplots.

Evalution of Time Periods

Table A.65 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table A.66 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mean_2000_2005	0,419	81	0,000	0,174	81	0,000
Mean_2006_2010	0,416	81	0,000	0,181	81	0,000
Mean_2011_2017	0,414	81	0,000	0,187	81	0,000

a. Lilliefors Significance Correction

Table A.67 : Descriptive statistics.

Descriptives									
		Statistic	Std. Error		Statistic	Std. Error		Statistic	Std. Error
Mean_2000_2005	Mean	194,57	105,799	Mean_2006_2010 Mean	455,72	238,090	Mean_2011_2017 Mean	811,52	413,267
	Median	21,00		Median	62,20		Median	109,43	
	Variance	906670,851		Variance	4591636,504		Variance	13833941,818	
	Std. Deviation	952,193		Std. Deviation	2142,810		Std. Deviation	3719,401	
	Minimum	1		Minimum	4		Minimum	6	
	Maximum	8481		Maximum	19072		Maximum	33018	
	Range	8481		Range	19068		Range	33012	
	Skewness	8,466	0,267	Skewness	8,423	0,267	Skewness	8,347	0,267
	Kurtosis	74,196	0,529	Kurtosis	73,664	0,529	Kurtosis	72,664	0,529

Table A.68 : Outlier-Extreme values.

Extreme Values										
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Mean_2000_2005 Highest	1	34	İSTANBUL	8481	Mean_2006_2010 Highest	1	34	İSTANBUL	19072	1	34	İSTANBUL	33018
	2	6	ANKARA	1090		2	6	ANKARA	2739	2	6	ANKARA	5067
	3	35	İZMİR	1029		3	35	İZMİR	2167	3	35	İZMİR	4213
	4	16	BURSA	785		4	16	BURSA	1567	4	16	BURSA	2755
	5	42	KONYA	477		5	42	KONYA	1185	5	7	ANTALYA	1907
Lowest	1	69	BAYBURT	1	Lowest	1	69	BAYBURT	4	1	69	BAYBURT	6
	2	30	HAKKARİ	1		2	62	TUNCELİ	4	2	75	ARDAHAN	7
	3	62	TUNCELİ	1		3	75	ARDAHAN	5	3	62	TUNCELİ	8
	4	75	ARDAHAN	1		4	76	IĞDIR	6	4	29	GÜMÜŞHANE	12
	5	13	BİTLİS	1		5	13	BİTLİS	8[a]	5	13	BİTLİS	16

a. Only a partial list of cases with the value 8 are shown in the table of lower extremes.

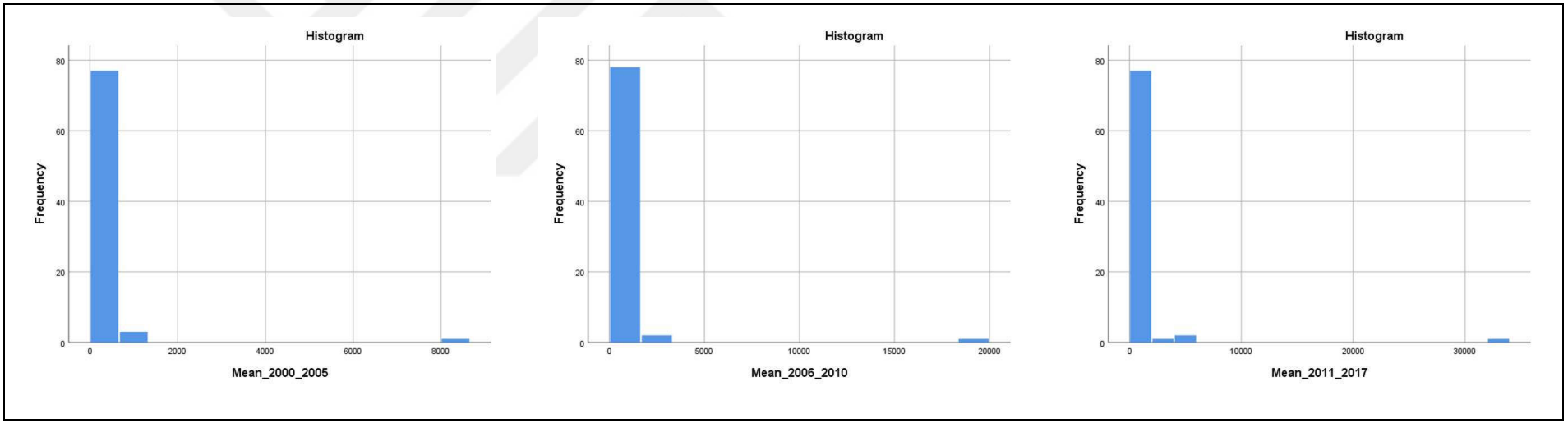


Figure A.33 : Histogram graphs.

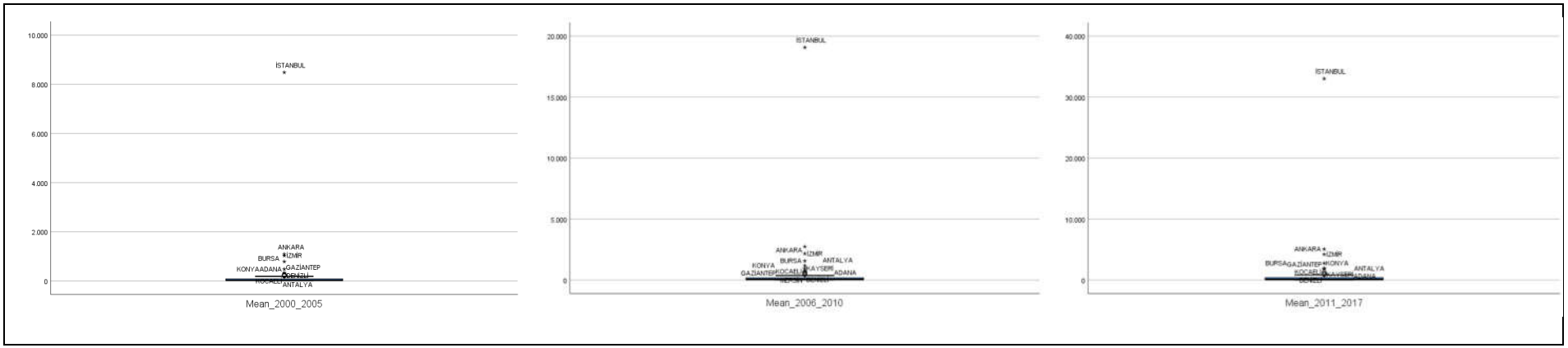


Figure A.34 : Boxplots.

Evaluation of Each Year (Lg):

Table A.69 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Year2000	81	100,0%	0	0,0%	81	100,0%
Lg_Year2001	81	100,0%	0	0,0%	81	100,0%
Lg_Year2002	81	100,0%	0	0,0%	81	100,0%
Lg_Year2003	81	100,0%	0	0,0%	81	100,0%
Lg_Year2004	81	100,0%	0	0,0%	81	100,0%
Lg_Year2005	81	100,0%	0	0,0%	81	100,0%
Lg_Year2006	81	100,0%	0	0,0%	81	100,0%
Lg_Year2007	81	100,0%	0	0,0%	81	100,0%
Lg_Year2008	81	100,0%	0	0,0%	81	100,0%
Lg_Year2009	81	100,0%	0	0,0%	81	100,0%
Lg_Year2010	81	100,0%	0	0,0%	81	100,0%
Lg_Year2011	81	100,0%	0	0,0%	81	100,0%
Lg_Year2012	81	100,0%	0	0,0%	81	100,0%
Lg_Year2013	81	100,0%	0	0,0%	81	100,0%
Lg_Year2014	81	100,0%	0	0,0%	81	100,0%
Lg_Year2015	81	100,0%	0	0,0%	81	100,0%
Lg_Year2016	81	100,0%	0	0,0%	81	100,0%
Lg_Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.70 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Year2000	0,044	81	,200*	0,982	81	0,300
Lg_Year2001	0,061	81	,200*	0,977	81	0,144
Lg_Year2002	0,071	81	,200*	0,973	81	0,090
Lg_Year2003	0,094	81	0,074	0,974	81	0,095
Lg_Year2004	0,080	81	,200*	0,978	81	0,190
Lg_Year2005	0,085	81	,200*	0,985	81	0,465
Lg_Year2006	0,048	81	,200*	0,985	81	0,439
Lg_Year2007	0,062	81	,200*	0,989	81	0,756
Lg_Year2008	0,068	81	,200*	0,975	81	0,121
Lg_Year2009	0,077	81	,200*	0,978	81	0,173
Lg_Year2010	0,070	81	,200*	0,985	81	0,465
Lg_Year2011	0,067	81	,200*	0,983	81	0,346
Lg_Year2012	0,058	81	,200*	0,982	81	0,305
Lg_Year2013	0,079	81	,200*	0,984	81	0,407
Lg_Year2014	0,083	81	,200*	0,976	81	0,138
Lg_Year2015	0,086	81	,200*	0,974	81	0,099
Lg_Year2016	0,099	81	0,049	0,980	81	0,239
Lg_Year2017	0,079	81	,200*	0,978	81	0,178

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table A.71 : Descriptive statistics.

Descriptives											
			Std.				Std.				Std.
		Statistic	Error			Statistic	Error			Statistic	Error
Lg_Year2000	Mean	1,3647	0,08441	Lg_Year2006	Mean	1,8038	0,08437	Lg_Year2012	Mean	2,0068	0,08199
	Median	1,3979			Median	1,7243			Median	1,9731	
	Variance	0,577			Variance	0,577			Variance	0,544	
	Std. Deviation	0,75965			Std. Deviation	0,75931			Std. Deviation	0,73787	
	Minimum	0,00			Minimum	0,30			Minimum	0,60	
	Maximum	3,69			Maximum	4,24			Maximum	4,42	
	Range	3,69			Range	3,94			Range	3,82	
	Skewness	0,217	0,267		Skewness	0,413	0,267		Skewness	0,487	0,267
	Kurtosis	0,163	0,529		Kurtosis	0,435	0,529		Kurtosis	0,480	0,529
Lg_Year2001	Mean	1,2956	0,08277	Lg_Year2007	Mean	1,8659	0,08729	Lg_Year2013	Mean	2,0887	0,08404
	Median	1,2304			Median	1,8325			Median	2,0569	
	Variance	0,555			Variance	0,617			Variance	0,572	
	Std. Deviation	0,74497			Std. Deviation	0,78558			Std. Deviation	0,75634	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,70			Maximum	4,32			Maximum	4,55	
	Range	3,70			Range	4,32			Range	4,55	
	Skewness	0,445	0,267		Skewness	0,176	0,267		Skewness	0,378	0,267
	Kurtosis	0,494	0,529		Kurtosis	0,659	0,529		Kurtosis	0,862	0,529
Lg_Year2002	Mean	1,3571	0,08355	Lg_Year2008	Mean	1,8145	0,08210	Lg_Year2014	Mean	2,1510	0,07924
	Median	1,3010			Median	1,7324			Median	2,0414	
	Variance	0,565			Variance	0,546			Variance	0,509	
	Std. Deviation	0,75193			Std. Deviation	0,73894			Std. Deviation	0,71315	
	Minimum	0,00			Minimum	0,48			Minimum	0,60	
	Maximum	3,87			Maximum	4,26			Maximum	4,58	
	Range	3,87			Range	3,79			Range	3,97	
	Skewness	0,488	0,267		Skewness	0,598	0,267		Skewness	0,621	0,267
	Kurtosis	0,737	0,529		Kurtosis	0,513	0,529		Kurtosis	0,784	0,529
Lg_Year2003	Mean	1,3705	0,08444	Lg_Year2009	Mean	1,8903	0,08100	Lg_Year2015	Mean	2,1425	0,07922
	Median	1,3010			Median	1,8865			Median	2,0969	
	Variance	0,578			Variance	0,531			Variance	0,508	
	Std. Deviation	0,75994			Std. Deviation	0,72903			Std. Deviation	0,71302	
	Minimum	0,00			Minimum	0,00			Minimum	0,60	
	Maximum	3,92			Maximum	4,34			Maximum	4,55	
	Range	3,92			Range	4,34			Range	3,95	
	Skewness	0,468	0,267		Skewness	0,526	0,267		Skewness	0,637	0,267
	Kurtosis	0,722	0,529		Kurtosis	0,877	0,529		Kurtosis	0,732	0,529
Lg_Year2004	Mean	1,4625	0,08609	Lg_Year2010	Mean	1,7967	0,08123	Lg_Year2016	Mean	2,2237	0,08149
	Median	1,3802			Median	1,7924			Median	2,1584	
	Variance	0,600			Variance	0,534			Variance	0,538	
	Std. Deviation	0,77480			Std. Deviation	0,73107			Std. Deviation	0,73342	
	Minimum	0,00			Minimum	0,00			Minimum	0,70	
	Maximum	4,03			Maximum	4,23			Maximum	4,60	
	Range	4,03			Range	4,23			Range	3,91	
	Skewness	0,548	0,267		Skewness	0,465	0,267		Skewness	0,548	0,267
	Kurtosis	0,468	0,529		Kurtosis	0,768	0,529		Kurtosis	0,445	0,529
Lg_Year2005	Mean	1,6127	0,08903	Lg_Year2011	Mean	1,8550	0,07993	Lg_Year2017	Mean	2,2013	0,08001
	Median	1,5441			Median	1,8513			Median	2,1139	
	Variance	0,642			Variance	0,517			Variance	0,519	
	Std. Deviation	0,80125			Std. Deviation	0,71934			Std. Deviation	0,72012	
	Minimum	0,00			Minimum	0,30			Minimum	0,70	
	Maximum	4,17			Maximum	4,27			Maximum	4,56	
	Range	4,17			Range	3,97			Range	3,86	
	Skewness	0,399	0,267		Skewness	0,496	0,267		Skewness	0,609	0,267
	Kurtosis	0,373	0,529		Kurtosis	0,798	0,529		Kurtosis	0,568	0,529

Table A.72 : Outlier-Extreme values.

		Extreme Values											
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Lg Year2000	Highest 1	34	İSTANBUL	3,69	Lg Year2006 Highest 1	34	İSTANBUL	4,24	Lg Year2012 Highest 1	34	İSTANBUL	4,42
	2	35	İZMİR	2,93	2	6	ANKARA	3,37	2	6	ANKARA	3,61
	3	6	ANKARA	2,87	3	35	İZMİR	3,33	3	35	İZMİR	3,51
	4	16	BURSA	2,78	4	16	BURSA	3,25	4	16	BURSA	3,32
	5	42	KONYA	2,61	5	42	KONYA	3,07	5	42	KONYA	3,19
	Lowest 1	76	IĞDIR	0,00	Lowest 1	75	ARDAHAN	0,30	Lowest 1	69	BAYBURT	0,60
	2	75	ARDAHAN	0,00	2	8	ARTVİN	0,30	2	62	TUNCELİ	0,60
	3	73	ŞIRNAK	0,00	3	73	ŞIRNAK	0,60	3	76	IĞDIR	0,85
	4	69	BAYBURT	0,00	4	69	BAYBURT	0,60	4	75	ARDAHAN	0,90
	5	62	TUNCELİ	,00[a]	5	56	SİİRT	0,60	5	56	SİİRT	,90[c]
Lg Year2001	Highest 1	34	İSTANBUL	3,70	Lg Year2007 Highest 1	34	İSTANBUL	4,32	Lg Year2013 Highest 1	34	İSTANBUL	4,55
	2	6	ANKARA	2,92	2	6	ANKARA	3,47	2	6	ANKARA	3,73
	3	35	İZMİR	2,87	3	35	İZMİR	3,40	3	35	İZMİR	3,61
	4	16	BURSA	2,77	4	16	BURSA	3,27	4	16	BURSA	3,44
	5	42	KONYA	2,53	5	42	KONYA	3,12	5	7	ANTALYA	3,25
	Lowest 1	62	TUNCELİ	0,00	Lowest 1	75	ARDAHAN	0,00	Lowest 1	75	ARDAHAN	0,00
	2	56	SİİRT	0,00	2	73	ŞIRNAK	0,00	2	69	BAYBURT	0,78
	3	49	MUŞ	0,00	3	69	BAYBURT	0,30	3	29	GÜMÜŞHANE	0,90
	4	29	GÜMÜŞHANE	0,00	4	76	IĞDIR	0,48	4	62	TUNCELİ	0,95
	5	13	BİTLİS	,00[a]	5	30	HAKKARİ	0,70	5	30	HAKKARİ	1,04
Lg Year2002	Highest 1	34	İSTANBUL	3,87	Lg Year2008 Highest 1	34	İSTANBUL	4,26	Lg Year2014 Highest 1	34	İSTANBUL	4,58
	2	6	ANKARA	3,03	2	6	ANKARA	3,42	2	6	ANKARA	3,73
	3	35	İZMİR	2,94	3	35	İZMİR	3,30	3	35	İZMİR	3,64
	4	16	BURSA	2,85	4	16	BURSA	3,19	4	16	BURSA	3,46
	5	42	KONYA	2,54	5	42	KONYA	3,12	5	27	GAZİANTEP	3,35
	Lowest 1	74	BARTIN	0,00	Lowest 1	62	TUNCELİ	0,48	Lowest 1	75	ARDAHAN	0,60
	2	69	BAYBURT	0,00	2	76	IĞDIR	0,60	2	62	TUNCELİ	1,00
	3	30	HAKKARİ	0,00	3	69	BAYBURT	0,60	3	29	GÜMÜŞHANE	1,00
	4	8	ARTVİN	0,00	4	79	KİLİS	0,70	4	69	BAYBURT	1,04
	5	76	IĞDIR	,30[b]	5	49	MUŞ	0,70	5	76	IĞDIR	1,20
Lg Year2003	Highest 1	34	İSTANBUL	3,92	Lg Year2009 Highest 1	34	İSTANBUL	4,34	Lg Year2015 Highest 1	34	İSTANBUL	4,55
	2	6	ANKARA	2,98	2	6	ANKARA	3,52	2	6	ANKARA	3,73
	3	35	İZMİR	2,92	3	35	İZMİR	3,36	3	35	İZMİR	3,64
	4	16	BURSA	2,85	4	16	BURSA	3,18	4	16	BURSA	3,47
	5	42	KONYA	2,63	5	7	ANTALYA	3,09	5	7	ANTALYA	3,31
	Lowest 1	75	ARDAHAN	0,00	Lowest 1	62	TUNCELİ	0,00	Lowest 1	69	BAYBURT	0,60
	2	62	TUNCELİ	0,00	2	76	IĞDIR	0,78	2	75	ARDAHAN	0,95
	3	30	HAKKARİ	0,00	3	75	ARDAHAN	0,85	3	62	TUNCELİ	1,00
	4	12	BİNGÖL	0,00	4	69	BAYBURT	0,85	4	49	MUŞ	1,15
	5	4	AĞRI	0,00	5	36	KARS	0,90	5	12	BİNGÖL	1,20
Lg Year2004	Highest 1	34	İSTANBUL	4,03	Lg Year2010 Highest 1	34	İSTANBUL	4,23	Lg Year2016 Highest 1	34	İSTANBUL	4,60
	2	6	ANKARA	3,10	2	6	ANKARA	3,39	2	6	ANKARA	3,81
	3	35	İZMİR	3,05	3	35	İZMİR	3,29	3	35	İZMİR	3,77
	4	16	BURSA	2,95	4	16	BURSA	3,05	4	16	BURSA	3,57
	5	42	KONYA	2,68	5	42	KONYA	2,98	5	27	GAZİANTEP	3,40
	Lowest 1	69	BAYBURT	0,00	Lowest 1	69	BAYBURT	0,00	Lowest 1	69	BAYBURT	0,70
	2	30	HAKKARİ	0,00	2	13	BİTLİS	0,48	2	75	ARDAHAN	0,90
	3	76	IĞDIR	0,30	3	75	ARDAHAN	0,60	3	62	TUNCELİ	1,15
	4	73	ŞIRNAK	0,30	4	56	SİİRT	0,60	4	12	BİNGÖL	1,15
	5	13	BİTLİS	,30[b]	5	62	TUNCELİ	0,78	5	29	GÜMÜŞHANE	1,18
Lg Year2005	Highest 1	34	İSTANBUL	4,17	Lg Year2011 Highest 1	34	İSTANBUL	4,27	Lg Year2017 Highest 1	34	İSTANBUL	4,56
	2	35	İZMİR	3,24	2	6	ANKARA	3,44	2	6	ANKARA	3,78
	3	6	ANKARA	3,22	3	35	İZMİR	3,33	3	35	İZMİR	3,73
	4	16	BURSA	3,08	4	16	BURSA	3,12	4	16	BURSA	3,55
	5	42	KONYA	2,94	5	7	ANTALYA	3,08	5	27	GAZİANTEP	3,42
	Lowest 1	75	ARDAHAN	0,00	Lowest 1	69	BAYBURT	0,30	Lowest 1	62	TUNCELİ	0,70
	2	29	GÜMÜŞHANE	0,00	2	62	TUNCELİ	0,30	2	69	BAYBURT	0,90
	3	69	BAYBURT	0,30	3	75	ARDAHAN	0,70	3	36	KARS	1,04
	4	36	KARS	0,30	4	29	GÜMÜŞHANE	0,70	4	75	ARDAHAN	1,15
	5	30	HAKKARİ	0,30	5	49	MUŞ	,90[c]	5	49	MUŞ	1,23

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.
b. Only a partial list of cases with the value ,30 are shown in the table of lower extremes.
c. Only a partial list of cases with the value ,90 are shown in the table of lower extremes.

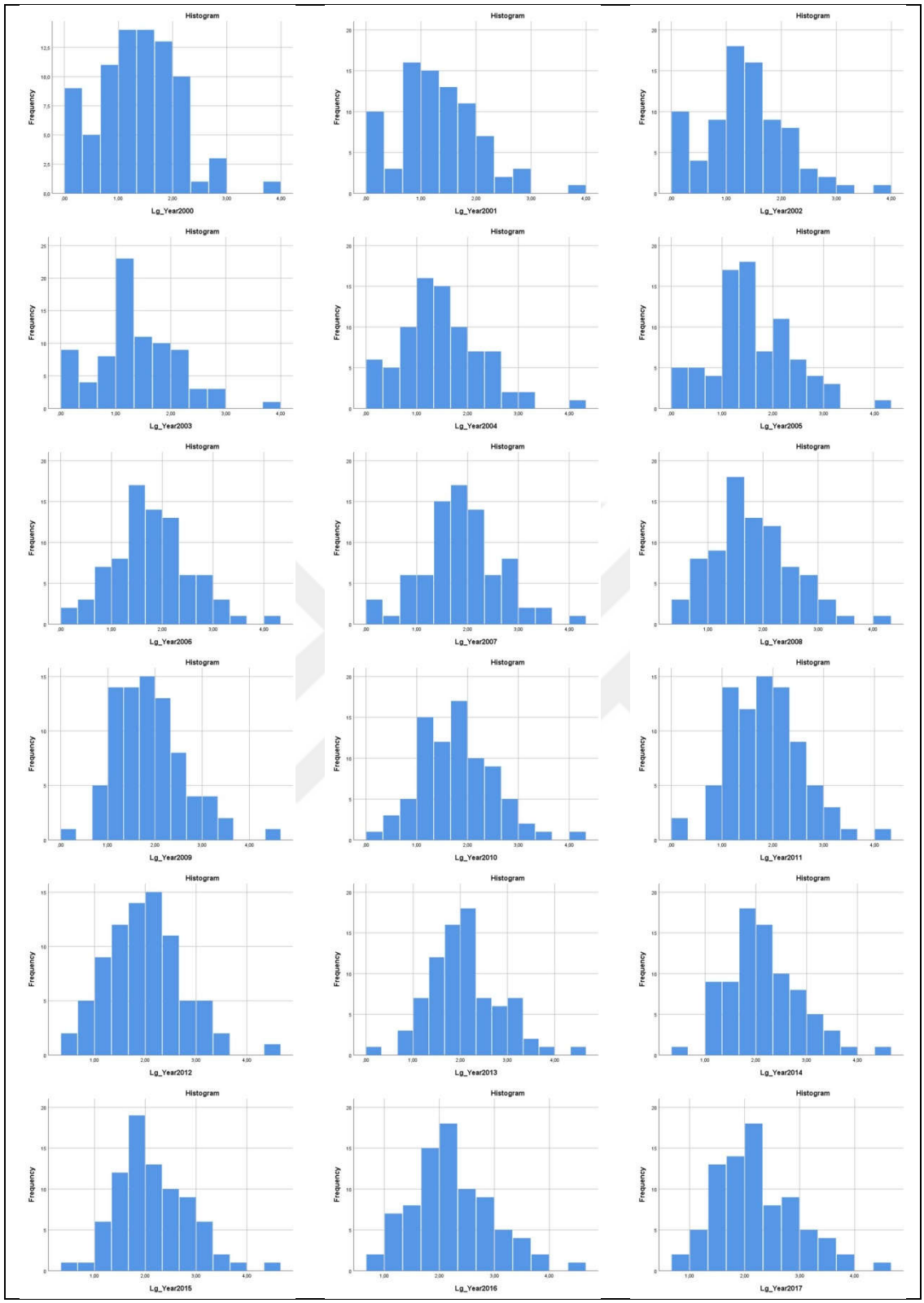


Figure A.35 : Histogram graphs.



Figure A.36 : Boxplots.

“Design Applications (File)”

Evaluation per Each Year:

Table A.73 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Year2000	81	100,0%	0	0,0%	81	100,0%
Year2001	81	100,0%	0	0,0%	81	100,0%
Year2002	81	100,0%	0	0,0%	81	100,0%
Year2003	81	100,0%	0	0,0%	81	100,0%
Year2004	81	100,0%	0	0,0%	81	100,0%
Year2005	81	100,0%	0	0,0%	81	100,0%
Year2006	81	100,0%	0	0,0%	81	100,0%
Year2007	81	100,0%	0	0,0%	81	100,0%
Year2008	81	100,0%	0	0,0%	81	100,0%
Year2009	81	100,0%	0	0,0%	81	100,0%
Year2010	81	100,0%	0	0,0%	81	100,0%
Year2011	81	100,0%	0	0,0%	81	100,0%
Year2012	81	100,0%	0	0,0%	81	100,0%
Year2013	81	100,0%	0	0,0%	81	100,0%
Year2014	81	100,0%	0	0,0%	81	100,0%
Year2015	81	100,0%	0	0,0%	81	100,0%
Year2016	81	100,0%	0	0,0%	81	100,0%
Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.74 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Year2000	0,414	81	0,000	0,228	81	0,000
Year2001	0,410	81	0,000	0,228	81	0,000
Year2002	0,418	81	0,000	0,199	81	0,000
Year2003	0,421	81	0,000	0,184	81	0,000
Year2004	0,422	81	0,000	0,182	81	0,000
Year2005	0,417	81	0,000	0,197	81	0,000
Year2006	0,416	81	0,000	0,201	81	0,000
Year2007	0,418	81	0,000	0,192	81	0,000
Year2008	0,415	81	0,000	0,199	81	0,000
Year2009	0,420	81	0,000	0,187	81	0,000
Year2010	0,418	81	0,000	0,190	81	0,000
Year2011	0,416	81	0,000	0,195	81	0,000
Year2012	0,415	81	0,000	0,197	81	0,000
Year2013	0,410	81	0,000	0,213	81	0,000
Year2014	0,416	81	0,000	0,227	81	0,000
Year2015	0,412	81	0,000	0,239	81	0,000
Year2016	0,400	81	0,000	0,251	81	0,000
Year2017	0,410	81	0,000	0,238	81	0,000

a. Lilliefors Significance Correction

Table A.75 : Descriptive statistics.

Descriptives									
			Std.			Std.			Std.
		Statistic	Error		Statistic	Error		Statistic	Error
Year2000	Mean	27,09	13,223	Year2006 Mean	68,02	35,635	Year2012 Mean	97,09	50,196
	Median	1,00		Median	3,00		Median	7,00	
	Variance	14163,680		Variance	102859,499		Variance	204093,330	
	Std. Deviation	119,011		Std. Deviation	320,717		Std. Deviation	451,767	
	Minimum	0		Minimum	0		Minimum	0	
	Maximum	997		Maximum	2794		Maximum	3974	
	Range	997		Range	2794		Range	3974	
	Skewness	7,194	0,267	Skewness	7,947	0,267	Skewness	8,138	0,267
	Kurtosis	56,918	0,529	Kurtosis	67,327	0,529	Kurtosis	70,007	0,529
Year2001	Mean	31,47	15,363	Year2007 Mean	73,88	39,887	Year2013 Mean	101,43	49,487
	Median	1,00		Median	3,00		Median	7,00	
	Variance	19118,552		Variance	128869,135		Variance	198363,523	
	Std. Deviation	138,270		Std. Deviation	358,983		Std. Deviation	445,380	
	Minimum	0		Minimum	0		Minimum	0	
	Maximum	1166		Maximum	3154		Maximum	3880	
	Range	1166		Range	3154		Range	3880	
	Skewness	7,302	0,267	Skewness	8,140	0,267	Skewness	7,888	0,267
	Kurtosis	58,478	0,529	Kurtosis	69,965	0,529	Kurtosis	66,770	0,529
Year2002	Mean	44,54	23,864	Year2008 Mean	75,22	39,061	Year2014 Mean	103,64	49,201
	Median	1,00		Median	4,00		Median	7,00	
	Variance	46127,201		Variance	123584,750		Variance	196079,033	
	Std. Deviation	214,772		Std. Deviation	351,546		Std. Deviation	442,808	
	Minimum	0		Minimum	0		Minimum	0	
	Maximum	1865		Maximum	3082		Maximum	3790	
	Range	1865		Range	3082		Range	3790	
	Skewness	7,894	0,267	Skewness	8,068	0,267	Skewness	7,521	0,267
	Kurtosis	66,583	0,529	Kurtosis	69,053	0,529	Kurtosis	61,822	0,529
Year2003	Mean	49,10	27,430	Year2009 Mean	73,17	40,100	Year2015 Mean	102,36	46,863
	Median	2,00		Median	3,00		Median	5,00	
	Variance	60944,640		Variance	130247,495		Variance	177883,608	
	Std. Deviation	246,870		Std. Deviation	360,898		Std. Deviation	421,763	
	Minimum	0		Minimum	0		Minimum	0	
	Maximum	2170		Maximum	3182		Maximum	3584	
	Range	2170		Range	3182		Range	3584	
	Skewness	8,177	0,267	Skewness	8,226	0,267	Skewness	7,358	0,267
	Kurtosis	70,354	0,529	Kurtosis	71,112	0,529	Kurtosis	59,710	0,529
Year2004	Mean	55,86	31,517	Year2010 Mean	81,07	43,327	Year2016 Mean	103,35	45,246
	Median	2,00		Median	5,00		Median	8,00	
	Variance	80456,794		Variance	152054,694		Variance	165819,779	
	Std. Deviation	283,649		Std. Deviation	389,942		Std. Deviation	407,210	
	Minimum	0		Minimum	0		Minimum	0	
	Maximum	2499		Maximum	3444		Maximum	3429	
	Range	2499		Range	3444		Range	3429	
	Skewness	8,231	0,267	Skewness	8,250	0,267	Skewness	7,160	0,267
	Kurtosis	71,096	0,529	Kurtosis	71,453	0,529	Kurtosis	57,150	0,529
Year2005	Mean	60,80	32,042	Year2011 Mean	92,90	48,696	Year2017 Mean	105,35	47,636
	Median	3,00		Median	6,00		Median	9,00	
	Variance	83159,635		Variance	192074,815		Variance	183801,554	
	Std. Deviation	288,374		Std. Deviation	438,263		Std. Deviation	428,721	
	Minimum	0		Minimum	0		Minimum	0	
	Maximum	2529		Maximum	3861		Maximum	3664	
	Range	2529		Range	3861		Range	3664	
	Skewness	8,086	0,267	Skewness	8,182	0,267	Skewness	7,449	0,267
	Kurtosis	69,260	0,529	Kurtosis	70,558	0,529	Kurtosis	61,033	0,529

Table A.76 : Outlier-Extreme values.

Extreme Values														
		Case	Region	Value		Case	Region	Value		Case	Region	Value		
Year2000	Highest 1	34	İSTANBUL	997	Year2006	34	İSTANBUL	2794	Year2012	34	İSTANBUL	3974		
	2	16	BURSA	317		6	ANKARA	570		16	BURSA	614		
	3	35	İZMİR	205		16	BURSA	465		6	ANKARA	509		
	4	6	ANKARA	193		35	İZMİR	334		35	İZMİR	495		
	5	42	KONYA	73		38	KAYSERİ	247		38	KAYSERİ	440		
	Lowest 1	80	OSMANİYE	0		80	OSMANİYE	0		76	IĞDIR	0		
	2	79	KİLİS	0		79	KİLİS	0		75	ARDAHAN	0		
	3	78	KARABÜK	0		76	IĞDIR	0		73	ŞIRNAK	0		
	4	77	YALOVA	0		74	BARTIN	0		69	BAYBURT	0		
	5	76	IĞDIR	0[a]		73	ŞIRNAK	0[a]		66	YOZGAT	0[a]		
Year2001	Highest 1	34	İSTANBUL	1166	Year2007	34	İSTANBUL	3154	Year2013	34	İSTANBUL	3880		
	2	16	BURSA	367		6	ANKARA	509		16	BURSA	698		
	3	35	İZMİR	190		16	BURSA	459		6	ANKARA	575		
	4	6	ANKARA	177		35	İZMİR	359		35	İZMİR	516		
	5	38	KAYSERİ	164		38	KAYSERİ	331		38	KAYSERİ	485		
	Lowest 1	80	OSMANİYE	0		78	KARABÜK	0		76	IĞDIR	0		
	2	79	KİLİS	0		76	IĞDIR	0		75	ARDAHAN	0		
	3	78	KARABÜK	0		75	ARDAHAN	0		73	ŞIRNAK	0		
	4	77	YALOVA	0		74	BARTIN	0		69	BAYBURT	0		
	5	76	IĞDIR	0[a]		73	ŞIRNAK	0[a]		66	YOZGAT	0[a]		
Year2002	Highest 1	34	İSTANBUL	1865	Year2008	34	İSTANBUL	3082	Year2014	34	İSTANBUL	3790		
	2	16	BURSA	405		6	ANKARA	517		16	BURSA	928		
	3	6	ANKARA	307		16	BURSA	450		6	ANKARA	611		
	4	35	İZMİR	241		38	KAYSERİ	372		38	KAYSERİ	594		
	5	38	KAYSERİ	158		35	İZMİR	350		35	İZMİR	531		
	Lowest 1	80	OSMANİYE	0		79	KİLİS	0		79	KİLİS	0		
	2	78	KARABÜK	0		77	YALOVA	0		75	ARDAHAN	0		
	3	77	YALOVA	0		76	IĞDIR	0		73	ŞIRNAK	0		
	4	76	IĞDIR	0		75	ARDAHAN	0		69	BAYBURT	0		
	5	75	ARDAHAN	0[a]		74	BARTIN	0[a]		66	YOZGAT	0[a]		
Year2003	Highest 1	34	İSTANBUL	2170	Year2009	34	İSTANBUL	3182	Year2015	34	İSTANBUL	3584		
	2	16	BURSA	383		6	ANKARA	454		16	BURSA	867		
	3	6	ANKARA	291		16	BURSA	424		6	ANKARA	746		
	4	35	İZMİR	282		35	İZMİR	358		38	KAYSERİ	580		
	5	38	KAYSERİ	129		38	KAYSERİ	352		35	İZMİR	507		
	Lowest 1	78	KARABÜK	0		79	KİLİS	0		78	KARABÜK	0		
	2	76	IĞDIR	0		76	IĞDIR	0		75	ARDAHAN	0		
	3	75	ARDAHAN	0		75	ARDAHAN	0		71	KIRIKKALE	0		
	4	74	BARTIN	0		73	ŞIRNAK	0		66	YOZGAT	0		
	5	73	ŞIRNAK	0[a]		72	BATMAN	0[a]		62	TUNCELİ	0[a]		
Year2004	Highest 1	34	İSTANBUL	2499	Year2010	34	İSTANBUL	3444	Year2016	34	İSTANBUL	3429		
	2	6	ANKARA	405		16	BURSA	491		16	BURSA	875		
	3	16	BURSA	352		6	ANKARA	416		6	ANKARA	747		
	4	35	İZMİR	287		35	İZMİR	400		38	KAYSERİ	662		
	5	38	KAYSERİ	172		38	KAYSERİ	348		35	İZMİR	494		
	Lowest 1	79	KİLİS	0		76	IĞDIR	0		76	IĞDIR	0		
	2	76	IĞDIR	0		74	BARTIN	0		75	ARDAHAN	0		
	3	75	ARDAHAN	0		73	ŞIRNAK	0		73	ŞIRNAK	0		
	4	74	BARTIN	0		69	BAYBURT	0		71	KIRIKKALE	0		
	5	73	ŞIRNAK	0[a]		66	YOZGAT	0[a]		69	BAYBURT	0[a]		
Year2005	Highest 1	34	İSTANBUL	2529	Year2011	34	İSTANBUL	3861	Year2017	34	İSTANBUL	3664		
	2	16	BURSA	420		16	BURSA	616		16	BURSA	776		
	3	6	ANKARA	394		6	ANKARA	519		6	ANKARA	735		
	4	35	İZMİR	329		35	İZMİR	416		38	KAYSERİ	587		
	5	38	KAYSERİ	201		38	KAYSERİ	379		35	İZMİR	517		
	Lowest 1	79	KİLİS	0		76	IĞDIR	0		75	ARDAHAN	0		
	2	76	IĞDIR	0		73	ŞIRNAK	0		69	BAYBURT	0		
	3	75	ARDAHAN	0		69	BAYBURT	0		65	VAN	0		
	4	73	ŞIRNAK	0		66	YOZGAT	0		29	GÜMÜŞHANE	0		
	5	69	BAYBURT	0[a]		62	TUNCELİ	0[a]		23	ELAZIĞ	0[a]		

a. Only a partial list of cases with the value 0 are shown in the table of lower extremes.

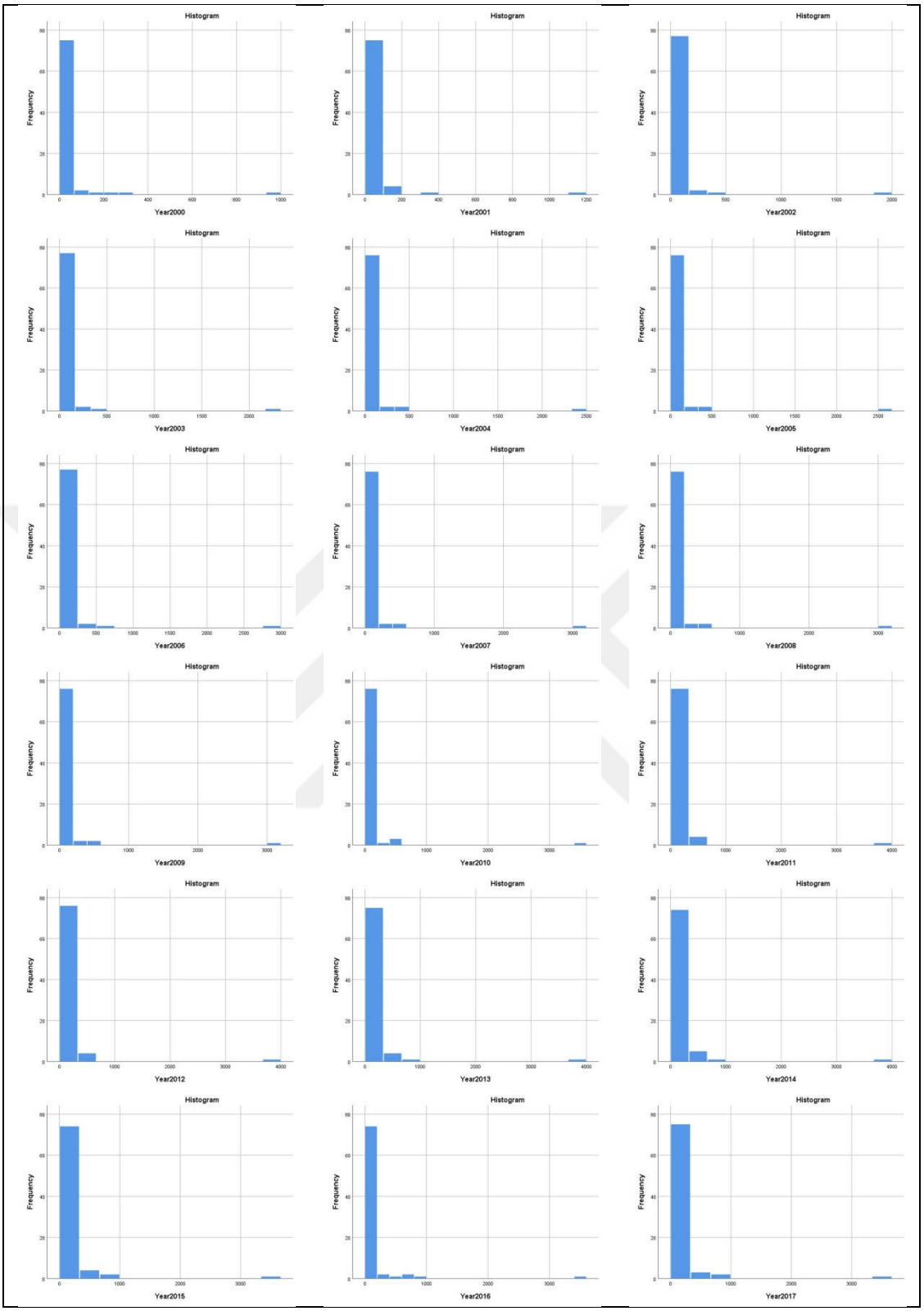


Figure A.37 : Histogram graphs.

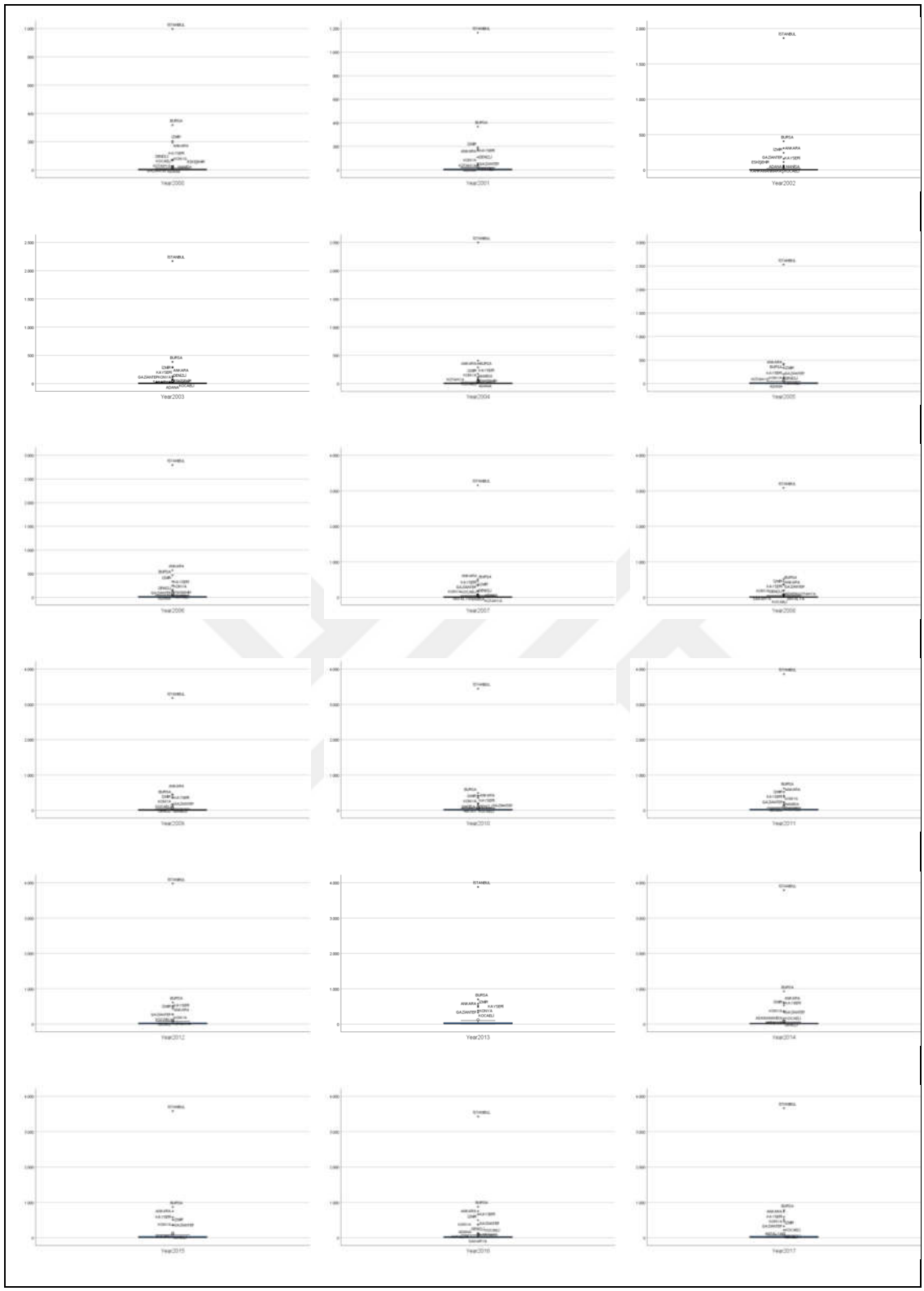


Figure A.38 : Boxplots.

Evaluation of Time Periods:

Table A.77 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table A.78 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mean_2000_2005	0,417	81	0,000	0,198	81	0,000
Mean_2006_2010	0,417	81	0,000	0,193	81	0,000
Mean_2011_2017	0,408	81	0,000	0,222	81	0,000
a. Lilliefors Significance Correction						

Table A.79 : Descriptive statistics.

Descriptives											
		Statistic	Std. Error			Statistic	Std. Error			Statistic	Std. Error
Mean_2000_2005	Mean	44,81	23,844	Mean_2006_2010	Mean	74,27	39,574	Mean_2011_2017	Mean	100,87	48,093
	Median	2,00			Median	3,80			Median	8,00	
	Variance	46049,691			Variance	126857,414			Variance	187344,350	
	Std. Deviation	214,592			Std. Deviation	356,170			Std. Deviation	432,833	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	1871			Maximum	3131			Maximum	3740	
	Range	1871			Range	3131			Range	3740	
	Skewness	7,973	0,267		Skewness	8,146	0,267		Skewness	7,708	0,267
	Kurtosis	67,665	0,529		Kurtosis	70,052	0,529		Kurtosis	64,367	0,529

Table A.80 : Outlier-Extreme values.

Extreme Values															
			Case	Region	Value			Case	Region	Value			Case	Region	Value
Mean_2000_2005	Highest	1	34	İSTANBUL	1871	Mean_2006_2010	Highest	1	34	İSTANBUL	3131	Mean_2011_2017	Highest	1	34	İSTANBUL	3740
		2	16	BURSA	374			2	6	ANKARA	493			2	16	BURSA	768
		3	6	ANKARA	295			3	16	BURSA	458			3	6	ANKARA	635
		4	35	İZMİR	256			4	35	İZMİR	360			4	38	KAYSERİ	532
		5	38	KAYSERİ	149			5	38	KAYSERİ	330			5	35	İZMİR	497
	Lowest	1	76	IĞDIR	0		Lowest	1	76	IĞDIR	0		Lowest	1	13	BİTLİS	0
		2	73	ŞIRNAK	0			2	73	ŞIRNAK	0			2	12	BİNGÖL	0
		3	69	BAYBURT	0			3	65	VAN	0			3	75	ARDAHAN	0
		4	65	VAN	0			4	62	TUNCELİ	0			4	66	YOZGAT	0
		5	62	TUNCELİ	0[a]			5	56	SİİRT	0[a]			5	36	KARS	0
a. Only a partial list of cases with the value 0 are shown in the table of lower extremes.															

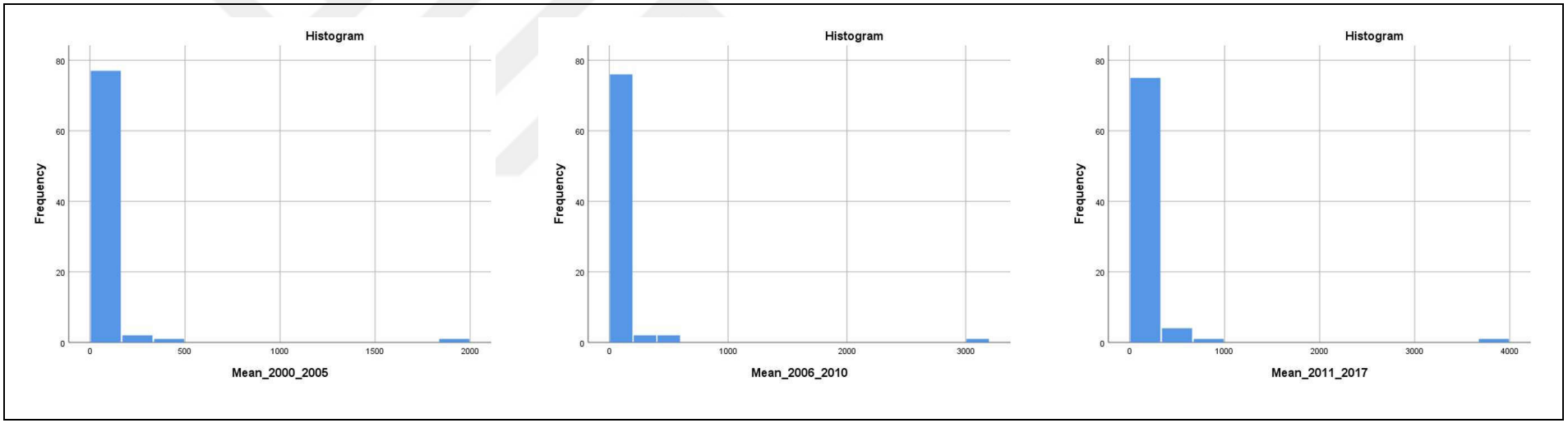


Figure A.39 : Histogram graphs.

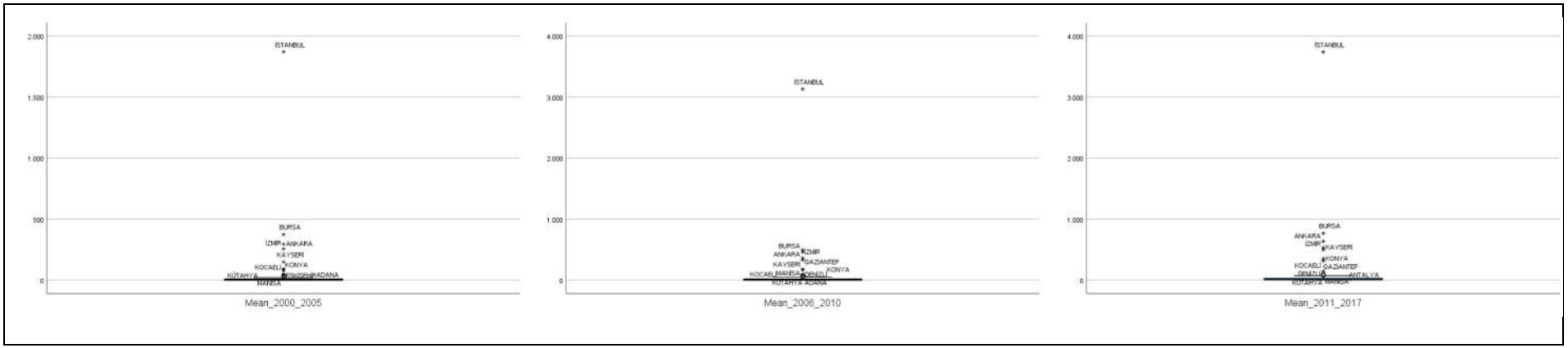


Figure A.40 : Boxplots.

Evaluation per each year (Lg)

Table A.81 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Year2000	81	100,0%	0	0,0%	81	100,0%
Lg_Year2001	81	100,0%	0	0,0%	81	100,0%
Lg_Year2002	81	100,0%	0	0,0%	81	100,0%
Lg_Year2003	81	100,0%	0	0,0%	81	100,0%
Lg_Year2004	81	100,0%	0	0,0%	81	100,0%
Lg_Year2005	81	100,0%	0	0,0%	81	100,0%
Lg_Year2006	81	100,0%	0	0,0%	81	100,0%
Lg_Year2007	81	100,0%	0	0,0%	81	100,0%
Lg_Year2008	81	100,0%	0	0,0%	81	100,0%
Lg_Year2009	81	100,0%	0	0,0%	81	100,0%
Lg_Year2010	81	100,0%	0	0,0%	81	100,0%
Lg_Year2011	81	100,0%	0	0,0%	81	100,0%
Lg_Year2012	81	100,0%	0	0,0%	81	100,0%
Lg_Year2013	81	100,0%	0	0,0%	81	100,0%
Lg_Year2014	81	100,0%	0	0,0%	81	100,0%
Lg_Year2015	81	100,0%	0	0,0%	81	100,0%
Lg_Year2016	81	100,0%	0	0,0%	81	100,0%
Lg_Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.82 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Year2000	0,205	81	0,000	0,806	81	0,000
Lg_Year2001	0,231	81	0,000	0,796	81	0,000
Lg_Year2002	0,203	81	0,000	0,814	81	0,000
Lg_Year2003	0,183	81	0,000	0,853	81	0,000
Lg_Year2004	0,172	81	0,000	0,860	81	0,000
Lg_Year2005	0,165	81	0,000	0,873	81	0,000
Lg_Year2006	0,151	81	0,000	0,891	81	0,000
Lg_Year2007	0,158	81	0,000	0,882	81	0,000
Lg_Year2008	0,141	81	0,000	0,903	81	0,000
Lg_Year2009	0,150	81	0,000	0,887	81	0,000
Lg_Year2010	0,137	81	0,001	0,912	81	0,000
Lg_Year2011	0,151	81	0,000	0,924	81	0,000
Lg_Year2012	0,121	81	0,005	0,929	81	0,000
Lg_Year2013	0,120	81	0,006	0,934	81	0,000
Lg_Year2014	0,104	81	0,031	0,931	81	0,000
Lg_Year2015	0,125	81	0,003	0,927	81	0,000
Lg_Year2016	0,104	81	0,029	0,941	81	0,001
Lg_Year2017	0,091	81	0,092	0,943	81	0,001

a. Lilliefors Significance Correction

Table A.83 : Descriptive statistics.

Descriptives												
			Std.				Std.				Std.
		Statistic	Error			Statistic	Error			Statistic	Error
Lg_Year2000	Mean	0,5611	0,07570	Lg_Year2006	Mean	0,8247	0,08810	Lg_Year2012	Mean	0,9983	0,09130
	Median	0,3010			Median	0,6021			Median	0,9031	
	Variance	0,464			Variance	0,629			Variance	0,675	
	Std. Deviation	0,68131			Std. Deviation	0,79290			Std. Deviation	0,82168	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,00			Maximum	3,45			Maximum	3,60	
	Range	3,00			Range	3,45			Range	3,60	
	Skewness	1,500	0,267		Skewness	1,028	0,267		Skewness	0,781	0,267
	Kurtosis	2,031	0,529		Kurtosis	0,683	0,529		Kurtosis	0,234	0,529
Lg_Year2001	Mean	0,5712	0,07996	Lg_Year2007	Mean	0,8195	0,09069	Lg_Year2013	Mean	1,0561	0,09046
	Median	0,3010			Median	0,6021			Median	0,9031	
	Variance	0,518			Variance	0,666			Variance	0,663	
	Std. Deviation	0,71962			Std. Deviation	0,81624			Std. Deviation	0,81414	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,07			Maximum	3,50			Maximum	3,59	
	Range	3,07			Range	3,50			Range	3,59	
	Skewness	1,409	0,267		Skewness	1,012	0,267		Skewness	0,689	0,267
	Kurtosis	1,582	0,529		Kurtosis	0,533	0,529		Kurtosis	0,267	0,529
Lg_Year2002	Mean	0,6283	0,08403	Lg_Year2008	Mean	0,8753	0,09044	Lg_Year2014	Mean	1,0260	0,09045
	Median	0,3010			Median	0,6990			Median	0,9031	
	Variance	0,572			Variance	0,663			Variance	0,663	
	Std. Deviation	0,75630			Std. Deviation	0,81396			Std. Deviation	0,81403	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,27			Maximum	3,49			Maximum	3,58	
	Range	3,27			Range	3,49			Range	3,58	
	Skewness	1,373	0,267		Skewness	0,888	0,267		Skewness	0,840	0,267
	Kurtosis	1,435	0,529		Kurtosis	0,346	0,529		Kurtosis	0,491	0,529
Lg_Year2003	Mean	0,6981	0,08400	Lg_Year2009	Mean	0,8305	0,08913	Lg_Year2015	Mean	1,0255	0,09108
	Median	0,4771			Median	0,6021			Median	0,7782	
	Variance	0,571			Variance	0,643			Variance	0,672	
	Std. Deviation	0,75597			Std. Deviation	0,80216			Std. Deviation	0,81974	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,34			Maximum	3,50			Maximum	3,55	
	Range	3,34			Range	3,50			Range	3,55	
	Skewness	1,201	0,267		Skewness	1,035	0,267		Skewness	0,861	0,267
	Kurtosis	1,107	0,529		Kurtosis	0,648	0,529		Kurtosis	0,356	0,529
Lg_Year2004	Mean	0,7258	0,08511	Lg_Year2010	Mean	0,9131	0,09008	Lg_Year2016	Mean	1,0782	0,08965
	Median	0,4771			Median	0,7782			Median	0,9542	
	Variance	0,587			Variance	0,657			Variance	0,651	
	Std. Deviation	0,76596			Std. Deviation	0,81071			Std. Deviation	0,80687	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,40			Maximum	3,54			Maximum	3,54	
	Range	3,40			Range	3,54			Range	3,54	
	Skewness	1,211	0,267		Skewness	0,873	0,267		Skewness	0,775	0,267
	Kurtosis	1,161	0,529		Kurtosis	0,321	0,529		Kurtosis	0,353	0,529
Lg_Year2005	Mean	0,7764	0,08865	Lg_Year2011	Mean	0,9879	0,08902	Lg_Year2017	Mean	1,1035	0,08754
	Median	0,6021			Median	0,8451			Median	1,0000	
	Variance	0,637			Variance	0,642			Variance	0,621	
	Std. Deviation	0,79782			Std. Deviation	0,80122			Std. Deviation	0,78788	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,40			Maximum	3,59			Maximum	3,56	
	Range	3,40			Range	3,59			Range	3,56	
	Skewness	1,043	0,267		Skewness	0,879	0,267		Skewness	0,815	0,267
	Kurtosis	0,573	0,529		Kurtosis	0,437	0,529		Kurtosis	0,474	0,529

Table A.84 : Outlier-Extreme values.

Extreme Values															
			Case	Region	Value			Case	Region	Value			Case	Region	Value
Lg_Year2000	Highest	1	34	İSTANBUL	3,00	Lg_Year2006	Highest	1	34	İSTANBUL	3,45	Lg_Year2012	1	34	İSTANBUL	3,60
		2	16	BURSA	2,50			2	6	ANKARA	2,76		2	16	BURSA	2,79
		3	35	İZMİR	2,31			3	16	BURSA	2,67		3	6	ANKARA	2,71
		4	6	ANKARA	2,29			4	35	İZMİR	2,53		4	35	İZMİR	2,70
		5	42	KONYA	1,87			5	38	KAYSERİ	2,39		5	38	KAYSERİ	2,64
	Lowest	1	80	OSMANİYE	0,00		Lowest	1	80	OSMANİYE	0,00		1	76	IĞDIR	0,00
		2	79	KİLİS	0,00			2	79	KİLİS	0,00		2	75	ARDAHAN	0,00
		3	78	KARABÜK	0,00			3	76	IĞDIR	0,00		3	73	ŞIRNAK	0,00
		4	77	YALOVA	0,00			4	74	BARTIN	0,00		4	69	BAYBURT	0,00
		5	76	IĞDIR	,00[a]			5	73	ŞIRNAK	,00[a]		5	66	YOZGAT	,00[a]
Lg_Year2001	Highest	1	34	İSTANBUL	3,07	Lg_Year2007	Highest	1	34	İSTANBUL	3,50	Lg_Year2013	1	34	İSTANBUL	3,59
		2	16	BURSA	2,57			2	6	ANKARA	2,71		2	16	BURSA	2,84
		3	35	İZMİR	2,28			3	16	BURSA	2,66		3	6	ANKARA	2,76
		4	6	ANKARA	2,25			4	35	İZMİR	2,56		4	35	İZMİR	2,71
		5	38	KAYSERİ	2,22			5	38	KAYSERİ	2,52		5	38	KAYSERİ	2,69
	Lowest	1	80	OSMANİYE	0,00		Lowest	1	78	KARABÜK	0,00		1	76	IĞDIR	0,00
		2	79	KİLİS	0,00			2	76	IĞDIR	0,00		2	75	ARDAHAN	0,00
		3	78	KARABÜK	0,00			3	75	ARDAHAN	0,00		3	73	ŞIRNAK	0,00
		4	77	YALOVA	0,00			4	74	BARTIN	0,00		4	69	BAYBURT	0,00
		5	76	IĞDIR	,00[a]			5	73	ŞIRNAK	,00[a]		5	66	YOZGAT	,00[a]
Lg_Year2002	Highest	1	34	İSTANBUL	3,27	Lg_Year2008	Highest	1	34	İSTANBUL	3,49	Lg_Year2014	1	34	İSTANBUL	3,58
		2	16	BURSA	2,61			2	6	ANKARA	2,71		2	16	BURSA	2,97
		3	6	ANKARA	2,49			3	16	BURSA	2,65		3	6	ANKARA	2,79
		4	35	İZMİR	2,38			4	38	KAYSERİ	2,57		4	38	KAYSERİ	2,77
		5	38	KAYSERİ	2,20			5	35	İZMİR	2,55		5	35	İZMİR	2,73
	Lowest	1	80	OSMANİYE	0,00		Lowest	1	79	KİLİS	0,00		1	79	KİLİS	0,00
		2	78	KARABÜK	0,00			2	77	YALOVA	0,00		2	75	ARDAHAN	0,00
		3	77	YALOVA	0,00			3	76	IĞDIR	0,00		3	73	ŞIRNAK	0,00
		4	76	IĞDIR	0,00			4	75	ARDAHAN	0,00		4	69	BAYBURT	0,00
		5	75	ARDAHAN	,00[a]			5	74	BARTIN	,00[a]		5	66	YOZGAT	,00[a]
Lg_Year2003	Highest	1	34	İSTANBUL	3,34	Lg_Year2009	Highest	1	34	İSTANBUL	3,50	Lg_Year2015	1	34	İSTANBUL	3,55
		2	16	BURSA	2,58			2	6	ANKARA	2,66		2	16	BURSA	2,94
		3	6	ANKARA	2,47			3	16	BURSA	2,63		3	6	ANKARA	2,87
		4	35	İZMİR	2,45			4	35	İZMİR	2,56		4	38	KAYSERİ	2,76
		5	38	KAYSERİ	2,11			5	38	KAYSERİ	2,55		5	35	İZMİR	2,71
	Lowest	1	78	KARABÜK	0,00		Lowest	1	79	KİLİS	0,00		1	78	KARABÜK	0,00
		2	76	IĞDIR	0,00			2	76	IĞDIR	0,00		2	75	ARDAHAN	0,00
		3	75	ARDAHAN	0,00			3	75	ARDAHAN	0,00		3	71	KIRIKKALE	0,00
		4	74	BARTIN	0,00			4	73	ŞIRNAK	0,00		4	66	YOZGAT	0,00
		5	73	ŞIRNAK	,00[a]			5	72	BATMAN	,00[a]		5	62	TUNCELİ	,00[a]
Lg_Year2004	Highest	1	34	İSTANBUL	3,40	Lg_Year2010	Highest	1	34	İSTANBUL	3,54	Lg_Year2016	1	34	İSTANBUL	3,54
		2	6	ANKARA	2,61			2	16	BURSA	2,69		2	16	BURSA	2,94
		3	16	BURSA	2,55			3	6	ANKARA	2,62		3	6	ANKARA	2,87
		4	35	İZMİR	2,46			4	35	İZMİR	2,60		4	38	KAYSERİ	2,82
		5	38	KAYSERİ	2,24			5	38	KAYSERİ	2,54		5	35	İZMİR	2,69
	Lowest	1	79	KİLİS	0,00		Lowest	1	76	IĞDIR	0,00		1	76	IĞDIR	0,00
		2	76	IĞDIR	0,00			2	74	BARTIN	0,00		2	75	ARDAHAN	0,00
		3	75	ARDAHAN	0,00			3	73	ŞIRNAK	0,00		3	73	ŞIRNAK	0,00
		4	74	BARTIN	0,00			4	69	BAYBURT	0,00		4	71	KIRIKKALE	0,00
		5	73	ŞIRNAK	,00[a]			5	66	YOZGAT	,00[a]		5	69	BAYBURT	,00[a]
Lg_Year2005	Highest	1	34	İSTANBUL	3,40	Lg_Year2011	Highest	1	34	İSTANBUL	3,59	Lg_Year2017	1	34	İSTANBUL	3,56
		2	16	BURSA	2,62			2	16	BURSA	2,79		2	16	BURSA	2,89
		3	6	ANKARA	2,60			3	6	ANKARA	2,72		3	6	ANKARA	2,87
		4	35	İZMİR	2,52			4	35	İZMİR	2,62		4	38	KAYSERİ	2,77
		5	38	KAYSERİ	2,31			5	38	KAYSERİ	2,58		5	35	İZMİR	2,71
	Lowest	1	79	KİLİS	0,00		Lowest	1	76	IĞDIR	0,00		1	75	ARDAHAN	0,00
		2	76	IĞDIR	0,00			2	73	ŞIRNAK	0,00		2	69	BAYBURT	0,00
		3	75	ARDAHAN	0,00			3	69	BAYBURT	0,00		3	65	VAN	0,00
		4	73	ŞIRNAK	0,00			4	66	YOZGAT	0,00		4	29	GÜMÜŞHANE	0,00
		5	69	BAYBURT	,00[a]			5	62	TUNCELİ	,00[a]		5	23	ELAZIĞ	,00[a]

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.

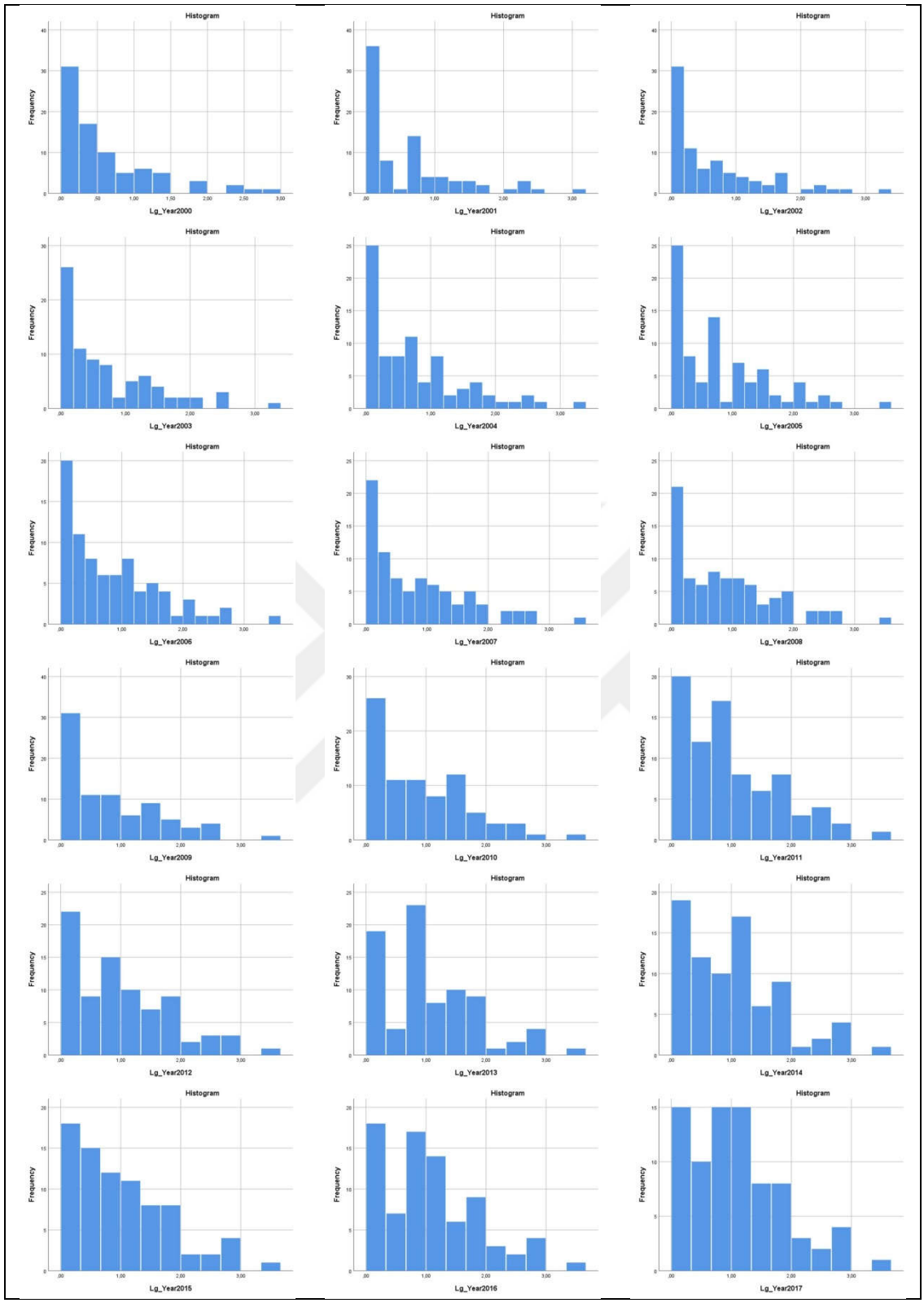


Figure A.41 : Histogram graphs.



Figure A.42 : Boxplots.

“Design Registrations (File)”

Evaluation per each year

Table A.85 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Year2000	81	100,0%	0	0,0%	81	100,0%
Year2001	81	100,0%	0	0,0%	81	100,0%
Year2002	81	100,0%	0	0,0%	81	100,0%
Year2003	81	100,0%	0	0,0%	81	100,0%
Year2004	81	100,0%	0	0,0%	81	100,0%
Year2005	81	100,0%	0	0,0%	81	100,0%
Year2006	81	100,0%	0	0,0%	81	100,0%
Year2007	81	100,0%	0	0,0%	81	100,0%
Year2008	81	100,0%	0	0,0%	81	100,0%
Year2009	81	100,0%	0	0,0%	81	100,0%
Year2010	81	100,0%	0	0,0%	81	100,0%
Year2011	81	100,0%	0	0,0%	81	100,0%
Year2012	81	100,0%	0	0,0%	81	100,0%
Year2013	81	100,0%	0	0,0%	81	100,0%
Year2014	81	100,0%	0	0,0%	81	100,0%
Year2015	81	100,0%	0	0,0%	81	100,0%
Year2016	81	100,0%	0	0,0%	81	100,0%
Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.86 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Year2000	0,412	81	0,000	0,222	81	0,000
Year2001	0,409	81	0,000	0,232	81	0,000
Year2002	0,416	81	0,000	0,205	81	0,000
Year2003	0,422	81	0,000	0,183	81	0,000
Year2004	0,421	81	0,000	0,184	81	0,000
Year2005	0,419	81	0,000	0,193	81	0,000
Year2006	0,417	81	0,000	0,200	81	0,000
Year2007	0,419	81	0,000	0,189	81	0,000
Year2008	0,416	81	0,000	0,199	81	0,000
Year2009	0,419	81	0,000	0,188	81	0,000
Year2010	0,419	81	0,000	0,187	81	0,000
Year2011	0,418	81	0,000	0,188	81	0,000
Year2012	0,415	81	0,000	0,198	81	0,000
Year2013	0,412	81	0,000	0,206	81	0,000
Year2014	0,413	81	0,000	0,222	81	0,000
Year2015	0,412	81	0,000	0,237	81	0,000
Year2016	0,400	81	0,000	0,251	81	0,000
Year2017	0,410	81	0,000	0,239	81	0,000

a. Lilliefors Significance Correction

Table A.87 : Descriptive statistics.

Descriptives											
			Std.				Std.				Std.
		Statistic	Error			Statistic	Error			Statistic	Error
Year2000	Mean	20,72	10,352	Year2006	Mean	70,47	37,140	Year2012	Mean	89,80	46,658
	Median	1,00			Median	2,00			Median	5,00	
	Variance	8681,081			Variance	111728,577			Variance	176334,710	
	Std. Deviation	93,172			Std. Deviation	334,258			Std. Deviation	419,922	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	782			Maximum	2917			Maximum	3693	
	Range	782			Range	2917			Range	3693	
	Skewness	7,252	0,267		Skewness	7,985	0,267		Skewness	8,136	0,267
	Kurtosis	57,572	0,529		Kurtosis	67,855	0,529		Kurtosis	69,976	0,529
Year2001	Mean	28,88	13,920	Year2007	Mean	72,30	39,397	Year2013	Mean	96,49	48,059
	Median	1,00			Median	3,00			Median	8,00	
	Variance	15695,760			Variance	125719,461			Variance	187086,203	
	Std. Deviation	125,283			Std. Deviation	354,569			Std. Deviation	432,535	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	1052			Maximum	3117			Maximum	3788	
	Range	1052			Range	3117			Range	3788	
	Skewness	7,221	0,267		Skewness	8,158	0,267		Skewness	8,014	0,267
	Kurtosis	57,380	0,529		Kurtosis	70,199	0,529		Kurtosis	68,426	0,529
Year2002	Mean	33,25	17,499	Year2008	Mean	71,40	37,363	Year2014	Mean	94,00	45,378
	Median	1,00			Median	4,00			Median	6,00	
	Variance	24802,713			Variance	113073,692			Variance	166791,850	
	Std. Deviation	157,489			Std. Deviation	336,264			Std. Deviation	408,402	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	1362			Maximum	2947			Maximum	3513	
	Range	1362			Range	2947			Range	3513	
	Skewness	7,806	0,267		Skewness	8,064	0,267		Skewness	7,629	0,267
	Kurtosis	65,363	0,529		Kurtosis	69,006	0,529		Kurtosis	63,251	0,529
Year2003	Mean	39,81	22,570	Year2009	Mean	66,40	36,304	Year2015	Mean	105,85	48,871
	Median	1,00			Median	3,00			Median	7,00	
	Variance	41263,478			Variance	106756,917			Variance	193455,828	
	Std. Deviation	203,134			Std. Deviation	326,737			Std. Deviation	439,836	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	1784			Maximum	2877			Maximum	3736	
	Range	1784			Range	2877			Range	3736	
	Skewness	8,168	0,267		Skewness	8,196	0,267		Skewness	7,359	0,267
	Kurtosis	70,204	0,529		Kurtosis	70,703	0,529		Kurtosis	59,681	0,529
Year2004	Mean	52,14	29,241	Year2010	Mean	78,52	42,500	Year2016	Mean	108,65	47,672
	Median	2,00			Median	4,00			Median	8,00	
	Variance	69258,944			Variance	146304,428			Variance	184083,854	
	Std. Deviation	263,171			Std. Deviation	382,498			Std. Deviation	429,050	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	2315			Maximum	3380			Maximum	3616	
	Range	2315			Range	3380			Range	3616	
	Skewness	8,192	0,267		Skewness	8,269	0,267		Skewness	7,176	0,267
	Kurtosis	70,593	0,529		Kurtosis	71,700	0,529		Kurtosis	57,368	0,529
Year2005	Mean	54,17	29,314	Year2011	Mean	85,37	45,875	Year2017	Mean	99,88	45,243
	Median	2,00			Median	5,00			Median	8,00	
	Variance	69605,720			Variance	170467,311			Variance	165798,660	
	Std. Deviation	263,829			Std. Deviation	412,877			Std. Deviation	407,184	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	2313			Maximum	3644			Maximum	3472	
	Range	2313			Range	3644			Range	3472	
	Skewness	8,095	0,267		Skewness	8,239	0,267		Skewness	7,407	0,267
	Kurtosis	69,352	0,529		Kurtosis	71,283	0,529		Kurtosis	60,469	0,529

Table A.88 : Outlier-Extreme values.

		Extreme Values											
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Year2000	Highest 1	34	İSTANBUL	782	Year2006	34	İSTANBUL	2917	Year2012	34	İSTANBUL	3693
	2	16	BURSA	256		6	ANKARA	568		16	BURSA	603
	3	35	İZMİR	151		16	BURSA	491		35	İZMİR	461
	4	6	ANKARA	138		35	İZMİR	330		6	ANKARA	457
	5	38	KAYSERİ	64		38	KAYSERİ	262		38	KAYSERİ	377
	Lowest 1	80	OSMANİYE	0		80	OSMANİYE	0		80	OSMANİYE	0
	2	79	KİLİS	0		79	KİLİS	0		76	IĞDIR	0
	3	78	KARABÜK	0		76	IĞDIR	0		75	ARDAHAN	0
	4	77	YALOVA	0		75	ARDAHAN	0		73	ŞIRNAK	0
	5	76	IĞDIR	0[a]		74	BARTIN	0[a]		69	BAYBURT	0[a]
Year2001	Highest 1	34	İSTANBUL	1052	Year2007	34	İSTANBUL	3117	Year2013	34	İSTANBUL	3788
	2	16	BURSA	337		6	ANKARA	485		16	BURSA	577
	3	35	İZMİR	190		16	BURSA	472		6	ANKARA	528
	4	6	ANKARA	181		35	İZMİR	359		35	İZMİR	505
	5	38	KAYSERİ	126		38	KAYSERİ	300		38	KAYSERİ	469
	Lowest 1	80	OSMANİYE	0		78	KARABÜK	0		76	IĞDIR	0
	2	79	KİLİS	0		76	IĞDIR	0		75	ARDAHAN	0
	3	78	KARABÜK	0		75	ARDAHAN	0		73	ŞIRNAK	0
	4	77	YALOVA	0		74	BARTIN	0		69	BAYBURT	0
	5	76	IĞDIR	0[a]		73	ŞIRNAK	0[a]		66	YOZGAT	0[a]
Year2002	Highest 1	34	İSTANBUL	1362	Year2008	34	İSTANBUL	2947	Year2014	34	İSTANBUL	3513
	2	16	BURSA	331		6	ANKARA	480		16	BURSA	827
	3	6	ANKARA	206		16	BURSA	444		38	KAYSERİ	537
	4	35	İZMİR	174		38	KAYSERİ	350		6	ANKARA	493
	5	38	KAYSERİ	125		35	İZMİR	348		35	İZMİR	477
	Lowest 1	80	OSMANİYE	0		80	OSMANİYE	0		75	ARDAHAN	0
	2	79	KİLİS	0		79	KİLİS	0		73	ŞIRNAK	0
	3	78	KARABÜK	0		77	YALOVA	0		69	BAYBURT	0
	4	77	YALOVA	0		76	IĞDIR	0		62	TUNCELİ	0
	5	76	IĞDIR	0[a]		75	ARDAHAN	0[a]		56	SİİRT	0[a]
Year2003	Highest 1	34	İSTANBUL	1784	Year2009	34	İSTANBUL	2877	Year2015	34	İSTANBUL	3736
	2	16	BURSA	342		6	ANKARA	443		16	BURSA	946
	3	35	İZMİR	223		16	BURSA	375		6	ANKARA	736
	4	6	ANKARA	211		35	İZMİR	327		38	KAYSERİ	610
	5	38	KAYSERİ	124		38	KAYSERİ	325		35	İZMİR	534
	Lowest 1	80	OSMANİYE	0		79	KİLİS	0		80	OSMANİYE	0
	2	78	KARABÜK	0		76	IĞDIR	0		75	ARDAHAN	0
	3	76	IĞDIR	0		75	ARDAHAN	0		71	KIRIKKALE	0
	4	75	ARDAHAN	0		74	BARTIN	0		69	BAYBURT	0
	5	74	BARTIN	0[a]		73	ŞIRNAK	0[a]		66	YOZGAT	0[a]
Year2004	Highest 1	34	İSTANBUL	2315	Year2010	34	İSTANBUL	3380	Year2016	34	İSTANBUL	3616
	2	16	BURSA	374		16	BURSA	475		16	BURSA	923
	3	6	ANKARA	335		6	ANKARA	407		6	ANKARA	773
	4	35	İZMİR	296		35	İZMİR	386		38	KAYSERİ	681
	5	38	KAYSERİ	148		38	KAYSERİ	329		35	İZMİR	530
	Lowest 1	79	KİLİS	0		80	OSMANİYE	0		76	IĞDIR	0
	2	76	IĞDIR	0		76	IĞDIR	0		75	ARDAHAN	0
	3	75	ARDAHAN	0		74	BARTIN	0		73	ŞIRNAK	0
	4	74	BARTIN	0		73	ŞIRNAK	0		71	KIRIKKALE	0
	5	73	ŞIRNAK	0[a]		71	KIRIKKALE	0[a]		66	YOZGAT	0[a]
Year2005	Highest 1	34	İSTANBUL	2313	Year2011	34	İSTANBUL	3644	Year2017	34	İSTANBUL	3472
	2	16	BURSA	381		16	BURSA	546		16	BURSA	788
	3	6	ANKARA	356		6	ANKARA	471		6	ANKARA	658
	4	35	İZMİR	310		38	KAYSERİ	392		38	KAYSERİ	595
	5	38	KAYSERİ	194		35	İZMİR	370		35	İZMİR	488
	Lowest 1	79	KİLİS	0		76	IĞDIR	0		75	ARDAHAN	0
	2	78	KARABÜK	0		73	ŞIRNAK	0		69	BAYBURT	0
	3	76	IĞDIR	0		69	BAYBURT	0		66	YOZGAT	0
	4	75	ARDAHAN	0		66	YOZGAT	0		65	VAN	0
	5	73	ŞIRNAK	0[a]		65	VAN	0[a]		62	TUNCELİ	0[a]

a. Only a partial list of cases with the value 0 are shown in the table of lower extremes.

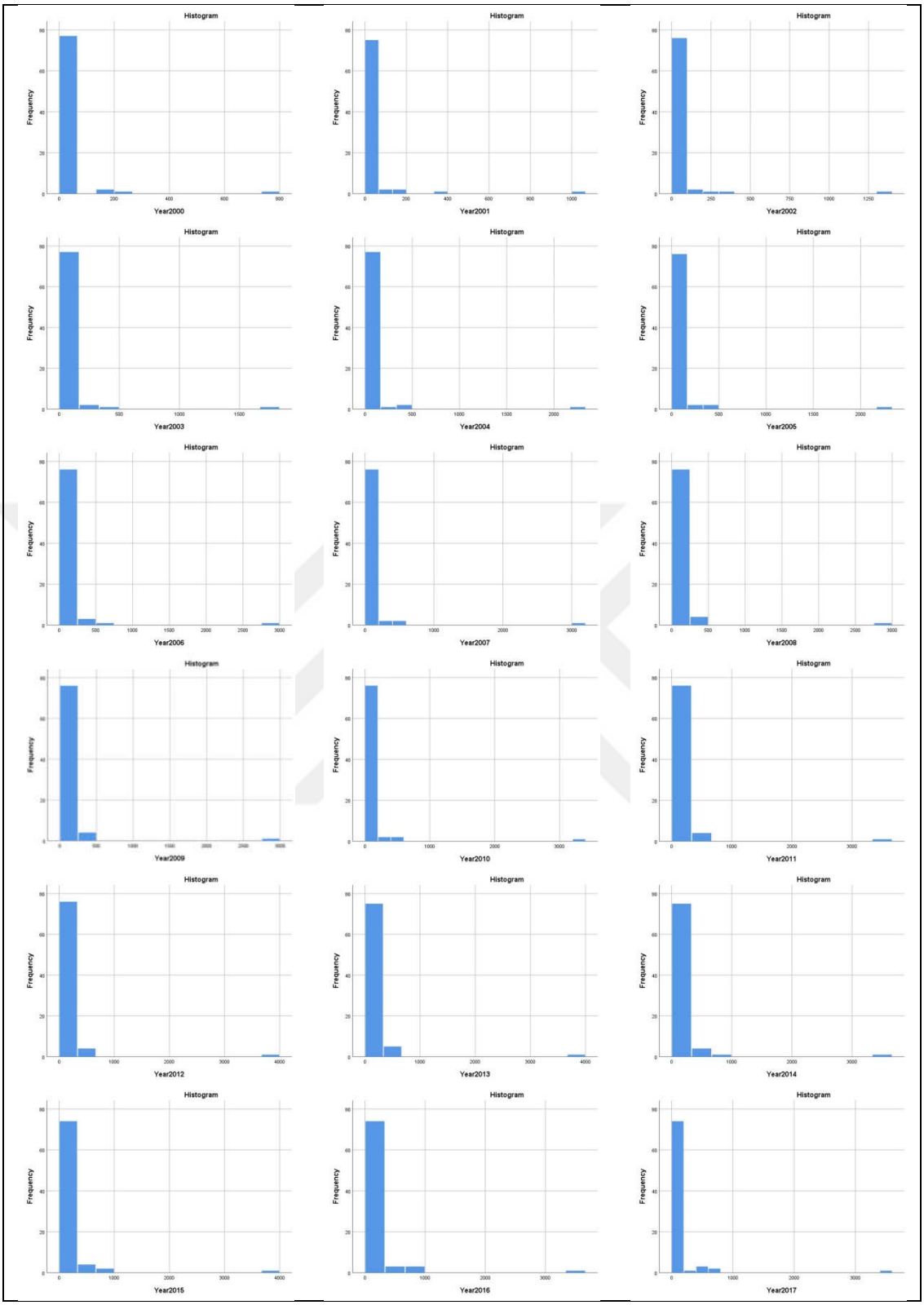


Figure A.43 : Histogram graphs.

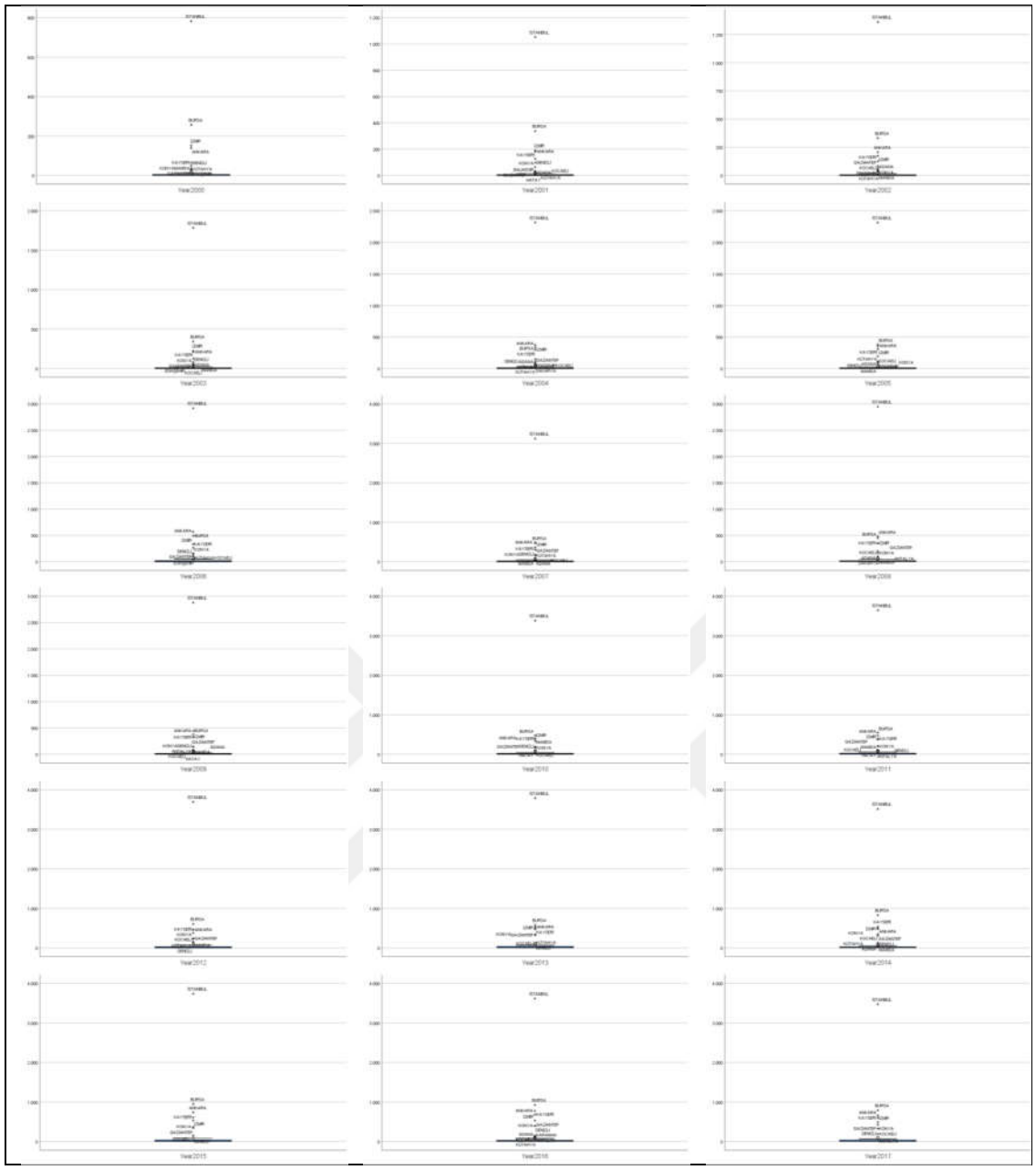


Figure A.44 : Boxplots.

Evaluation of Time Periods:

Table A.89 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table A.90 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mean_2000_2005	0,418	81	0,000	0,197	81	0,000
Mean_2006_2010	0,418	81	0,000	0,192	81	0,000
Mean_2011_2017	0,409	81	0,000	0,220	81	0,000

a. Lilliefors Significance Correction

Table A.91 : Descriptive statistics.

Descriptives												
			Std.				Std.				Std.
		Statistic	Error			Statistic	Error			Statistic	Error
Mean_2000_2005	Mean	38,1607	20,43265	Mean_2006_2010	Mean	71,8148	38,51496	Mean_2011_2017	Mean	97,1500	46,71856
	Median	1,5000			Median	3,4000			Median	7,7100	
	Variance	33816,957			Variance	120155,579			Variance	176792,550	
	Std. Deviation	183,89387			Std. Deviation	346,63465			Std. Deviation	420,46706	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	1601,33			Maximum	3047,60			Maximum	3637,43	
	Range	1601,33			Range	3047,60			Range	3637,43	
	Skewness	7,952	0,267		Skewness	8,151	0,267		Skewness	7,736	0,267
	Kurtosis	67,359	0,529		Kurtosis	70,121	0,529		Kurtosis	64,731	0,529

Table A.92 : Outlier-Extreme values.

Extreme Values												
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Mean_2000_2005	Highest 1	34	İSTANBUL	1601,33	Mean_2006_2010 Highest 1	34	İSTANBUL	3047,60	Mean_2011_2017 Highest 1	34	İSTANBUL	3637,43
	2	16	BURSA	336,83	2	6	ANKARA	476,60	2	16	BURSA	744,29
	3	6	ANKARA	237,83	3	16	BURSA	451,40	3	6	ANKARA	588,00
	4	35	İZMİR	224,00	4	35	İZMİR	350,00	4	38	KAYSERİ	523,00
	5	38	KAYSERİ	130,17	5	38	KAYSERİ	313,20	5	35	İZMİR	480,71
	Lowest 1	76	IĞDIR	0,00	Lowest 1	76	IĞDIR	0,00	Lowest 1	62	TUNCELİ	0,00
	2	73	ŞIRNAK	0,00	2	74	BARTIN	0,00	2	36	KARS	0,00
	3	69	BAYBURT	0,00	3	73	ŞIRNAK	0,00	3	12	BİNGÖL	0,00
	4	65	VAN	0,00	4	65	VAN	0,00	4	75	ARDAHAN	0,14
	5	62	TUNCELİ	,00[a]	5	62	TUNCELİ	,00[a]	5	66	YOZGAT	,14[b]

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.
b. Only a partial list of cases with the value ,14 are shown in the table of lower extremes.

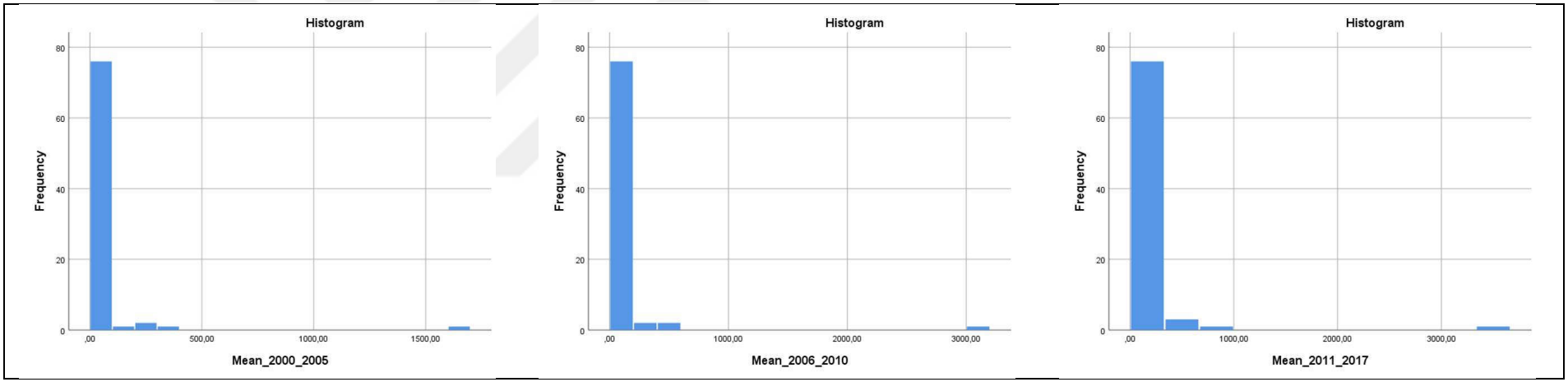


Figure A.45 : Histogram graphs.

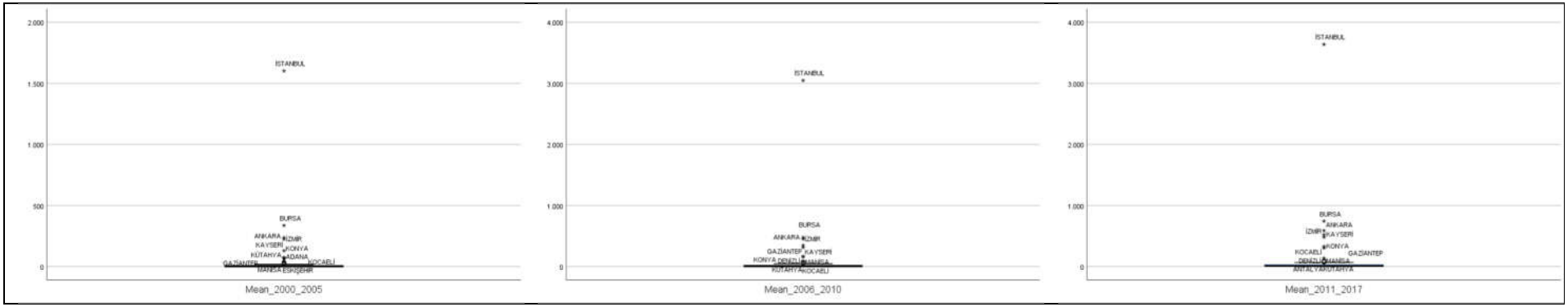


Figure A.46 : Boxplots.

Evaluation per each year (Lg):

Table A.93 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Year2000	81	100,0%	0	0,0%	81	100,0%
Lg_Year2001	81	100,0%	0	0,0%	81	100,0%
Lg_Year2002	81	100,0%	0	0,0%	81	100,0%
Lg_Year2003	81	100,0%	0	0,0%	81	100,0%
Lg_Year2004	81	100,0%	0	0,0%	81	100,0%
Lg_Year2005	81	100,0%	0	0,0%	81	100,0%
Lg_Year2006	81	100,0%	0	0,0%	81	100,0%
Lg_Year2007	81	100,0%	0	0,0%	81	100,0%
Lg_Year2008	81	100,0%	0	0,0%	81	100,0%
Lg_Year2009	81	100,0%	0	0,0%	81	100,0%
Lg_Year2010	81	100,0%	0	0,0%	81	100,0%
Lg_Year2011	81	100,0%	0	0,0%	81	100,0%
Lg_Year2012	81	100,0%	0	0,0%	81	100,0%
Lg_Year2013	81	100,0%	0	0,0%	81	100,0%
Lg_Year2014	81	100,0%	0	0,0%	81	100,0%
Lg_Year2015	81	100,0%	0	0,0%	81	100,0%
Lg_Year2016	81	100,0%	0	0,0%	81	100,0%
Lg_Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.94 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Year2000	0,225	81	0,000	0,772	81	0,000
Lg_Year2001	0,263	81	0,000	0,787	81	0,000
Lg_Year2002	0,245	81	0,000	0,779	81	0,000
Lg_Year2003	0,208	81	0,000	0,808	81	0,000
Lg_Year2004	0,190	81	0,000	0,837	81	0,000
Lg_Year2005	0,180	81	0,000	0,852	81	0,000
Lg_Year2006	0,178	81	0,000	0,867	81	0,000
Lg_Year2007	0,157	81	0,000	0,883	81	0,000
Lg_Year2008	0,164	81	0,000	0,876	81	0,000
Lg_Year2009	0,156	81	0,000	0,883	81	0,000
Lg_Year2010	0,135	81	0,001	0,907	81	0,000
Lg_Year2011	0,136	81	0,001	0,922	81	0,000
Lg_Year2012	0,129	81	0,002	0,914	81	0,000
Lg_Year2013	0,099	81	0,049	0,937	81	0,001
Lg_Year2014	0,109	81	0,018	0,924	81	0,000
Lg_Year2015	0,110	81	0,016	0,929	81	0,000
Lg_Year2016	0,095	81	0,070	0,941	81	0,001
Lg_Year2017	0,091	81	0,096	0,939	81	0,001

a. Lilliefors Significance Correction

Table A.95 : Descriptive statistics.

Descriptives												
			Std.				Std.				Std.
		Statistic	Error			Statistic	Error			Statistic	Error
Lg_Year2000	Mean	0,4887	0,07174	Lg_Year2006	Mean	0,7882	0,09150	Lg_Year2012	Mean	0,9459	0,09091
	Median	0,3010			Median	0,4771			Median	0,7782	
	Variance	0,417			Variance	0,678			Variance	0,669	
	Std. Deviation	0,64565			Std. Deviation	0,82348			Std. Deviation	0,81820	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	2,89			Maximum	3,47			Maximum	3,57	
	Range	2,89			Range	3,47			Range	3,57	
	Skewness	1,656	0,267		Skewness	1,049	0,267		Skewness	0,895	0,267
	Kurtosis	2,623	0,529		Kurtosis	0,497	0,529		Kurtosis	0,351	0,529
Lg_Year2001	Mean	0,5552	0,07921	Lg_Year2007	Mean	0,8145	0,09005	Lg_Year2013	Mean	1,0415	0,08974
	Median	0,3010			Median	0,6021			Median	0,9542	
	Variance	0,508			Variance	0,657			Variance	0,652	
	Std. Deviation	0,71289			Std. Deviation	0,81047			Std. Deviation	0,80764	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,02			Maximum	3,49			Maximum	3,58	
	Range	3,02			Range	3,49			Range	3,58	
	Skewness	1,399	0,267		Skewness	1,010	0,267		Skewness	0,690	0,267
	Kurtosis	1,552	0,529		Kurtosis	0,590	0,529		Kurtosis	0,280	0,529
Lg_Year2002	Mean	0,5520	0,08078	Lg_Year2008	Mean	0,8131	0,09229	Lg_Year2014	Mean	0,9881	0,08919
	Median	0,3010			Median	0,6990			Median	0,8451	
	Variance	0,529			Variance	0,690			Variance	0,644	
	Std. Deviation	0,72705			Std. Deviation	0,83061			Std. Deviation	0,80274	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,13			Maximum	3,47			Maximum	3,55	
	Range	3,13			Range	3,47			Range	3,55	
	Skewness	1,475	0,267		Skewness	0,941	0,267		Skewness	0,907	0,267
	Kurtosis	1,701	0,529		Kurtosis	0,301	0,529		Kurtosis	0,574	0,529
Lg_Year2003	Mean	0,6011	0,08215	Lg_Year2009	Mean	0,8010	0,08819	Lg_Year2015	Mean	1,0218	0,09272
	Median	0,3010			Median	0,6021			Median	0,9031	
	Variance	0,547			Variance	0,630			Variance	0,696	
	Std. Deviation	0,73935			Std. Deviation	0,79367			Std. Deviation	0,83450	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,25			Maximum	3,46			Maximum	3,57	
	Range	3,25			Range	3,46			Range	3,57	
	Skewness	1,371	0,267		Skewness	1,035	0,267		Skewness	0,798	0,267
	Kurtosis	1,491	0,529		Kurtosis	0,720	0,529		Kurtosis	0,299	0,529
Lg_Year2004	Mean	0,6812	0,08615	Lg_Year2010	Mean	0,8896	0,08963	Lg_Year2016	Mean	1,0816	0,09157
	Median	0,4771			Median	0,6990			Median	0,9542	
	Variance	0,601			Variance	0,651			Variance	0,679	
	Std. Deviation	0,77531			Std. Deviation	0,80668			Std. Deviation	0,82414	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,36			Maximum	3,53			Maximum	3,56	
	Range	3,36			Range	3,53			Range	3,56	
	Skewness	1,229	0,267		Skewness	0,910	0,267		Skewness	0,726	0,267
	Kurtosis	1,069	0,529		Kurtosis	0,439	0,529		Kurtosis	0,246	0,529
Lg_Year2005	Mean	0,7134	0,08653	Lg_Year2011	Mean	0,9551	0,08763	Lg_Year2017	Mean	1,0759	0,08717
	Median	0,4771			Median	0,7782			Median	0,9542	
	Variance	0,606			Variance	0,622			Variance	0,616	
	Std. Deviation	0,77875			Std. Deviation	0,78869			Std. Deviation	0,78454	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,36			Maximum	3,56			Maximum	3,54	
	Range	3,36			Range	3,56			Range	3,54	
	Skewness	1,179	0,267		Skewness	0,908	0,267		Skewness	0,848	0,267
	Kurtosis	0,971	0,529		Kurtosis	0,562	0,529		Kurtosis	0,553	0,529

Table A.96 : Outlier-Extreme values.

		Extreme Values											
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Lg Year2000	Highest 1	34	İSTANBUL	2,89	Lg Year2006 Highest 1	34	İSTANBUL	3,47	Lg Year2012 Highest 1	34	İSTANBUL	3,57
	2	16	BURSA	2,41	2	6	ANKARA	2,76	2	16	BURSA	2,78
	3	35	İZMİR	2,18	3	16	BURSA	2,69	3	35	İZMİR	2,66
	4	6	ANKARA	2,14	4	35	İZMİR	2,52	4	6	ANKARA	2,66
	5	38	KAYSERİ	1,81	5	38	KAYSERİ	2,42	5	38	KAYSERİ	2,58
	Lowest 1	80	OSMANİYE	0,00	Lowest 1	80	OSMANİYE	0,00	Lowest 1	80	OSMANİYE	0,00
	2	79	KİLİS	0,00	2	79	KİLİS	0,00	2	76	IĞDIR	0,00
	3	78	KARABÜK	0,00	3	76	IĞDIR	0,00	3	75	ARDAHAN	0,00
	4	77	YALOVA	0,00	4	75	ARDAHAN	0,00	4	73	ŞIRNAK	0,00
	5	76	IĞDIR	,00[a]	5	74	BARTIN	,00[a]	5	69	BAYBURT	,00[a]
Lg Year2001	Highest 1	34	İSTANBUL	3,02	Lg Year2007 Highest 1	34	İSTANBUL	3,49	Lg Year2013 Highest 1	34	İSTANBUL	3,58
	2	16	BURSA	2,53	2	6	ANKARA	2,69	2	16	BURSA	2,76
	3	35	İZMİR	2,28	3	16	BURSA	2,67	3	6	ANKARA	2,72
	4	6	ANKARA	2,26	4	35	İZMİR	2,56	4	35	İZMİR	2,70
	5	38	KAYSERİ	2,10	5	38	KAYSERİ	2,48	5	38	KAYSERİ	2,67
	Lowest 1	80	OSMANİYE	0,00	Lowest 1	78	KARABÜK	0,00	Lowest 1	76	IĞDIR	0,00
	2	79	KİLİS	0,00	2	76	IĞDIR	0,00	2	75	ARDAHAN	0,00
	3	78	KARABÜK	0,00	3	75	ARDAHAN	0,00	3	73	ŞIRNAK	0,00
	4	77	YALOVA	0,00	4	74	BARTIN	0,00	4	69	BAYBURT	0,00
	5	76	IĞDIR	,00[a]	5	73	ŞIRNAK	,00[a]	5	66	YOZGAT	,00[a]
Lg Year2002	Highest 1	34	İSTANBUL	3,13	Lg Year2008 Highest 1	34	İSTANBUL	3,47	Lg Year2014 Highest 1	34	İSTANBUL	3,55
	2	16	BURSA	2,52	2	6	ANKARA	2,68	2	16	BURSA	2,92
	3	6	ANKARA	2,32	3	16	BURSA	2,65	3	38	KAYSERİ	2,73
	4	35	İZMİR	2,24	4	38	KAYSERİ	2,55	4	6	ANKARA	2,69
	5	38	KAYSERİ	2,10	5	35	İZMİR	2,54	5	35	İZMİR	2,68
	Lowest 1	80	OSMANİYE	0,00	Lowest 1	80	OSMANİYE	0,00	Lowest 1	75	ARDAHAN	0,00
	2	79	KİLİS	0,00	2	79	KİLİS	0,00	2	73	ŞIRNAK	0,00
	3	78	KARABÜK	0,00	3	77	YALOVA	0,00	3	69	BAYBURT	0,00
	4	77	YALOVA	0,00	4	76	IĞDIR	0,00	4	62	TUNCELİ	0,00
	5	76	IĞDIR	,00[a]	5	75	ARDAHAN	,00[a]	5	56	SİİRT	,00[a]
Lg Year2003	Highest 1	34	İSTANBUL	3,25	Lg Year2009 Highest 1	34	İSTANBUL	3,46	Lg Year2015 Highest 1	34	İSTANBUL	3,57
	2	16	BURSA	2,54	2	6	ANKARA	2,65	2	16	BURSA	2,98
	3	35	İZMİR	2,35	3	16	BURSA	2,58	3	6	ANKARA	2,87
	4	6	ANKARA	2,33	4	35	İZMİR	2,52	4	38	KAYSERİ	2,79
	5	38	KAYSERİ	2,10	5	38	KAYSERİ	2,51	5	35	İZMİR	2,73
	Lowest 1	80	OSMANİYE	0,00	Lowest 1	79	KİLİS	0,00	Lowest 1	80	OSMANİYE	0,00
	2	78	KARABÜK	0,00	2	76	IĞDIR	0,00	2	75	ARDAHAN	0,00
	3	76	IĞDIR	0,00	3	75	ARDAHAN	0,00	3	71	KIRIKKALE	0,00
	4	75	ARDAHAN	0,00	4	74	BARTIN	0,00	4	69	BAYBURT	0,00
	5	74	BARTIN	,00[a]	5	73	ŞIRNAK	,00[a]	5	66	YOZGAT	,00[a]
Lg Year2004	Highest 1	34	İSTANBUL	3,36	Lg Year2010 Highest 1	34	İSTANBUL	3,53	Lg Year2016 Highest 1	34	İSTANBUL	3,56
	2	16	BURSA	2,57	2	16	BURSA	2,68	2	16	BURSA	2,97
	3	6	ANKARA	2,53	3	6	ANKARA	2,61	3	6	ANKARA	2,89
	4	35	İZMİR	2,47	4	35	İZMİR	2,59	4	38	KAYSERİ	2,83
	5	38	KAYSERİ	2,17	5	38	KAYSERİ	2,52	5	35	İZMİR	2,73
	Lowest 1	79	KİLİS	0,00	Lowest 1	80	OSMANİYE	0,00	Lowest 1	76	IĞDIR	0,00
	2	76	IĞDIR	0,00	2	76	IĞDIR	0,00	2	75	ARDAHAN	0,00
	3	75	ARDAHAN	0,00	3	74	BARTIN	0,00	3	73	ŞIRNAK	0,00
	4	74	BARTIN	0,00	4	73	ŞIRNAK	0,00	4	71	KIRIKKALE	0,00
	5	73	ŞIRNAK	,00[a]	5	71	KIRIKKALE	,00[a]	5	66	YOZGAT	,00[a]
Lg Year2005	Highest 1	34	İSTANBUL	3,36	Lg Year2011 Highest 1	34	İSTANBUL	3,56	Lg Year2017 Highest 1	34	İSTANBUL	3,54
	2	16	BURSA	2,58	2	16	BURSA	2,74	2	16	BURSA	2,90
	3	6	ANKARA	2,55	3	6	ANKARA	2,67	3	6	ANKARA	2,82
	4	35	İZMİR	2,49	4	38	KAYSERİ	2,59	4	38	KAYSERİ	2,78
	5	38	KAYSERİ	2,29	5	35	İZMİR	2,57	5	35	İZMİR	2,69
	Lowest 1	79	KİLİS	0,00	Lowest 1	76	IĞDIR	0,00	Lowest 1	75	ARDAHAN	0,00
	2	78	KARABÜK	0,00	2	73	ŞIRNAK	0,00	2	69	BAYBURT	0,00
	3	76	IĞDIR	0,00	3	69	BAYBURT	0,00	3	66	YOZGAT	0,00
	4	75	ARDAHAN	0,00	4	66	YOZGAT	0,00	4	65	VAN	0,00
	5	73	ŞIRNAK	,00[a]	5	65	VAN	,00[a]	5	62	TUNCELİ	,00[a]

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.

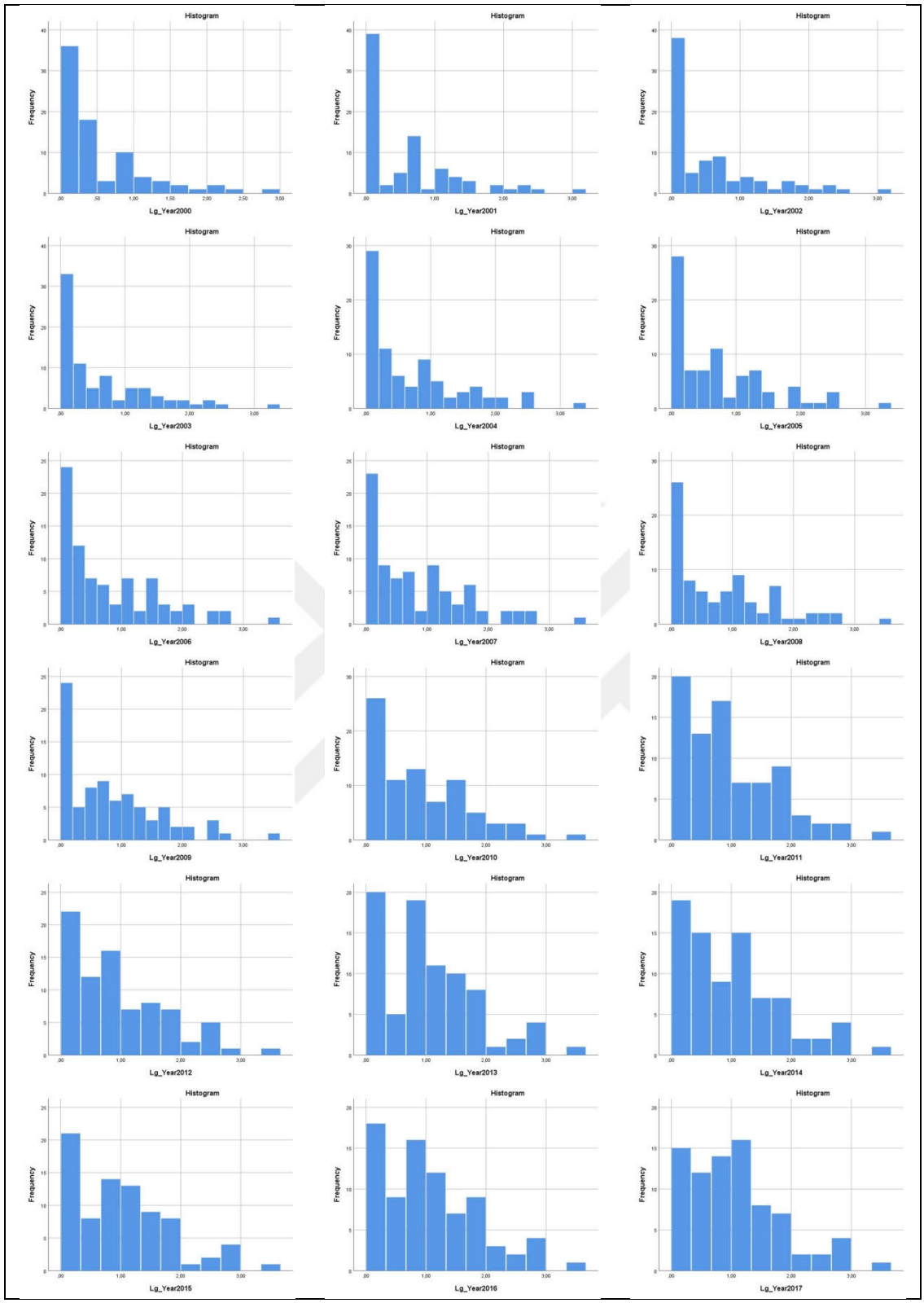


Figure A.47 : Histogram graphs.



Figure A.48 : Boxplots.

“Design Applications (Design)”:

Evaluation per each year:

Table A.97 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Year2000	81	100,0%	0	0,0%	81	100,0%
Year2001	81	100,0%	0	0,0%	81	100,0%
Year2002	81	100,0%	0	0,0%	81	100,0%
Year2003	81	100,0%	0	0,0%	81	100,0%
Year2004	81	100,0%	0	0,0%	81	100,0%
Year2005	81	100,0%	0	0,0%	81	100,0%
Year2006	81	100,0%	0	0,0%	81	100,0%
Year2007	81	100,0%	0	0,0%	81	100,0%
Year2008	81	100,0%	0	0,0%	81	100,0%
Year2009	81	100,0%	0	0,0%	81	100,0%
Year2010	81	100,0%	0	0,0%	81	100,0%
Year2011	81	100,0%	0	0,0%	81	100,0%
Year2012	81	100,0%	0	0,0%	81	100,0%
Year2013	81	100,0%	0	0,0%	81	100,0%
Year2014	81	100,0%	0	0,0%	81	100,0%
Year2015	81	100,0%	0	0,0%	81	100,0%
Year2016	81	100,0%	0	0,0%	81	100,0%
Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.98 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Year2000	0,409	81	0,000	0,237	81	0,000
Year2001	0,409	81	0,000	0,239	81	0,000
Year2002	0,415	81	0,000	0,215	81	0,000
Year2003	0,418	81	0,000	0,203	81	0,000
Year2004	0,419	81	0,000	0,195	81	0,000
Year2005	0,415	81	0,000	0,208	81	0,000
Year2006	0,413	81	0,000	0,208	81	0,000
Year2007	0,420	81	0,000	0,188	81	0,000
Year2008	0,413	81	0,000	0,208	81	0,000
Year2009	0,418	81	0,000	0,193	81	0,000
Year2010	0,419	81	0,000	0,188	81	0,000
Year2011	0,415	81	0,000	0,200	81	0,000
Year2012	0,411	81	0,000	0,216	81	0,000
Year2013	0,408	81	0,000	0,257	81	0,000
Year2014	0,406	81	0,000	0,249	81	0,000
Year2015	0,401	81	0,000	0,263	81	0,000
Year2016	0,405	81	0,000	0,258	81	0,000
Year2017	0,399	81	0,000	0,257	81	0,000

a. Lilliefors Significance Correction

Table A.99 : Descriptive statistics.

Descriptives											
			Std.				Std.				Std.
		Statistic	Error			Statistic	Error			Statistic	Error
Year2000	Mean	124,91	60,261	Year2006	Mean	355,84	180,595	Year2012	Mean	492,47	243,001
	Median	3,00			Median	12,00			Median	22,00	
	Variance	294147,180			Variance	2641772,086			Variance	4783011,302	
	Std. Deviation	542,353			Std. Deviation	1625,353			Std. Deviation	2187,010	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	4268			Maximum	14176			Maximum	18965	
	Range	4268			Range	14176			Range	18965	
	Skewness	6,513	0,267		Skewness	7,946	0,267		Skewness	7,807	0,267
	Kurtosis	45,985	0,529		Kurtosis	67,413	0,529		Kurtosis	65,596	0,529
Year2001	Mean	164,98	79,589	Year2007	Mean	359,07	198,104	Year2013	Mean	538,94	237,357
	Median	1,00			Median	11,00			Median	19,00	
	Variance	513093,224			Variance	3178867,869			Variance	4563413,559	
	Std. Deviation	716,305			Std. Deviation	1782,938			Std. Deviation	2136,215	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	5615			Maximum	15656			Maximum	17703	
	Range	5615			Range	15656			Range	17703	
	Skewness	6,470	0,267		Skewness	8,153	0,267		Skewness	6,893	0,267
	Kurtosis	45,386	0,529		Kurtosis	69,991	0,529		Kurtosis	53,530	0,529
Year2002	Mean	245,75	127,179	Year2008	Mean	355,83	180,595	Year2014	Mean	508,38	229,666
	Median	3,00			Median	12,00			Median	26,00	
	Variance	1310126,263			Variance	2641780,970			Variance	4272466,789	
	Std. Deviation	1144,607			Std. Deviation	1625,356			Std. Deviation	2066,995	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	9587			Maximum	14176			Maximum	17290	
	Range	9587			Range	14176			Range	17290	
	Skewness	7,282	0,267		Skewness	7,946	0,267		Skewness	7,062	0,267
	Kurtosis	57,558	0,529		Kurtosis	67,413	0,529		Kurtosis	55,806	0,529
Year2003	Mean	268,27	143,741	Year2009	Mean	324,41	174,838	Year2015	Mean	477,35	205,471
	Median	2,00			Median	8,00			Median	19,00	
	Variance	1673576,650			Variance	2476025,694			Variance	3419685,379	
	Std. Deviation	1293,668			Std. Deviation	1573,539			Std. Deviation	1849,239	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	10951			Maximum	13848			Maximum	15296	
	Range	10951			Range	13848			Range	15296	
	Skewness	7,501	0,267		Skewness	8,171	0,267		Skewness	6,841	0,267
	Kurtosis	60,367	0,529		Kurtosis	70,436	0,529		Kurtosis	52,936	0,529
Year2004	Mean	286,85	155,925	Year2010	Mean	363,79	198,045	Year2016	Mean	485,11	213,878
	Median	4,00			Median	15,00			Median	20,00	
	Variance	1969320,753			Variance	3176953,518			Variance	3705259,450	
	Std. Deviation	1403,325			Std. Deviation	1782,401			Std. Deviation	1924,905	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	12180			Maximum	15726			Maximum	15849	
	Range	12180			Range	15726			Range	15849	
	Skewness	7,922	0,267		Skewness	8,237	0,267		Skewness	6,796	0,267
	Kurtosis	66,658	0,529		Kurtosis	71,273	0,529		Kurtosis	52,150	0,529
Year2005	Mean	329,56	170,525	Year2011	Mean	437,69	227,196	Year2017	Mean	483,60	210,201
	Median	5,00			Median	14,00			Median	25,00	
	Variance	2355372,925			Variance	4181072,591			Variance	3578955,992	
	Std. Deviation	1534,722			Std. Deviation	2044,767			Std. Deviation	1891,813	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	13238			Maximum	17949			Maximum	15790	
	Range	13238			Range	17949			Range	15790	
	Skewness	7,761	0,267		Skewness	8,095	0,267		Skewness	6,976	0,267
	Kurtosis	64,612	0,529		Kurtosis	69,417	0,529		Kurtosis	54,937	0,529

Table A.100 : Outlier-Extreme values.

		Extreme Values											
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Year2000	Highest 1	34	İSTANBUL	4268	Year2006 Highest 1	34	İSTANBUL	14176	Year2012 Highest 1	34	İSTANBUL	18965
	2	16	BURSA	2250	2	16	BURSA	2703	2	27	GAZİANTEP	4017
	3	35	İZMİR	699	3	6	ANKARA	2357	3	16	BURSA	3014
	4	20	DENİZLİ	643	4	27	GAZİANTEP	1769	4	6	ANKARA	2614
	5	6	ANKARA	641	5	38	KAYSERİ	1206	5	35	İZMİR	2098
	Lowest 1	80	OSMANİYE	0	Lowest 1	79	KİLİS	0	Lowest 1	76	IĞDIR	0
	2	79	KİLİS	0	2	77	YALOVA	0	2	75	ARDAHAN	0
	3	78	KARABÜK	0	3	76	IĞDIR	0	3	73	ŞIRNAK	0
	4	77	YALOVA	0	4	75	ARDAHAN	0	4	69	BAYBURT	0
	5	76	IĞDIR	0[a]	5	74	BARTIN	0[a]	5	66	YOZGAT	0[a]
Year2001	Highest 1	34	İSTANBUL	5615	Year2007 Highest 1	34	İSTANBUL	15656	Year2013 Highest 1	34	İSTANBUL	17703
	2	16	BURSA	2997	2	16	BURSA	3238	2	27	GAZİANTEP	5079
	3	20	DENİZLİ	1150	3	27	GAZİANTEP	1641	3	38	KAYSERİ	4287
	4	35	İZMİR	627	4	6	ANKARA	1602	4	16	BURSA	3648
	5	27	GAZİANTEP	619	5	38	KAYSERİ	1172	5	6	ANKARA	2770
	Lowest 1	80	OSMANİYE	0	Lowest 1	76	IĞDIR	0	Lowest 1	76	IĞDIR	0
	2	79	KİLİS	0	2	75	ARDAHAN	0	2	75	ARDAHAN	0
	3	78	KARABÜK	0	3	74	BARTIN	0	3	73	ŞIRNAK	0
	4	77	YALOVA	0	4	69	BAYBURT	0	4	69	BAYBURT	0
	5	76	IĞDIR	0[a]	5	66	YOZGAT	0[a]	5	66	YOZGAT	0[a]
Year2002	Highest 1	34	İSTANBUL	9587	Year2008 Highest 1	34	İSTANBUL	14176	Year2014 Highest 1	34	İSTANBUL	17290
	2	16	BURSA	3483	2	16	BURSA	2703	2	16	BURSA	4396
	3	27	GAZİANTEP	1718	3	6	ANKARA	2357	3	27	GAZİANTEP	4320
	4	6	ANKARA	1018	4	27	GAZİANTEP	1769	4	38	KAYSERİ	2986
	5	35	İZMİR	827	5	38	KAYSERİ	1206	5	6	ANKARA	2654
	Lowest 1	80	OSMANİYE	0	Lowest 1	79	KİLİS	0	Lowest 1	79	KİLİS	0
	2	78	KARABÜK	0	2	77	YALOVA	0	2	75	ARDAHAN	0
	3	77	YALOVA	0	3	76	IĞDIR	0	3	73	ŞIRNAK	0
	4	76	IĞDIR	0	4	75	ARDAHAN	0	4	69	BAYBURT	0
	5	75	ARDAHAN	0[a]	5	74	BARTIN	0[a]	5	66	YOZGAT	0[a]
Year2003	Highest 1	34	İSTANBUL	10951	Year2009 Highest 1	34	İSTANBUL	13848	Year2015 Highest 1	34	İSTANBUL	15296
	2	16	BURSA	3884	2	16	BURSA	2148	2	27	GAZİANTEP	4534
	3	27	GAZİANTEP	1297	3	6	ANKARA	1666	3	16	BURSA	3387
	4	6	ANKARA	1061	4	27	GAZİANTEP	1538	4	38	KAYSERİ	2938
	5	35	İZMİR	939	5	38	KAYSERİ	1380	5	6	ANKARA	2921
	Lowest 1	78	KARABÜK	0	Lowest 1	79	KİLİS	0	Lowest 1	78	KARABÜK	0
	2	76	IĞDIR	0	2	76	IĞDIR	0	2	75	ARDAHAN	0
	3	75	ARDAHAN	0	3	75	ARDAHAN	0	3	71	KIRIKKALE	0
	4	74	BARTIN	0	4	73	ŞIRNAK	0	4	66	YOZGAT	0
	5	73	ŞIRNAK	0[a]	5	72	BATMAN	0[a]	5	62	TUNCELİ	0[a]
Year2004	Highest 1	34	İSTANBUL	12180	Year2010 Highest 1	34	İSTANBUL	15726	Year2016 Highest 1	34	İSTANBUL	15849
	2	16	BURSA	3218	2	16	BURSA	2348	2	38	KAYSERİ	4727
	3	6	ANKARA	1388	3	27	GAZİANTEP	1923	3	27	GAZİANTEP	4095
	4	27	GAZİANTEP	1079	4	6	ANKARA	1799	4	16	BURSA	3407
	5	35	İZMİR	839	5	35	İZMİR	1579	5	6	ANKARA	2596
	Lowest 1	79	KİLİS	0	Lowest 1	76	IĞDIR	0	Lowest 1	76	IĞDIR	0
	2	77	YALOVA	0	2	74	BARTIN	0	2	75	ARDAHAN	0
	3	76	IĞDIR	0	3	69	BAYBURT	0	3	73	ŞIRNAK	0
	4	75	ARDAHAN	0	4	66	YOZGAT	0	4	71	KIRIKKALE	0
	5	74	BARTIN	0[a]	5	65	VAN	0[a]	5	69	BAYBURT	0[a]
Year2005	Highest 1	34	İSTANBUL	13238	Year2011 Highest 1	34	İSTANBUL	17949	Year2017 Highest 1	34	İSTANBUL	15790
	2	16	BURSA	3608	2	16	BURSA	2798	2	16	BURSA	3476
	3	27	GAZİANTEP	1724	3	27	GAZİANTEP	2738	3	38	KAYSERİ	3420
	4	6	ANKARA	1395	4	6	ANKARA	2250	4	27	GAZİANTEP	3333
	5	35	İZMİR	1242	5	35	İZMİR	1684	5	6	ANKARA	3291
	Lowest 1	79	KİLİS	0	Lowest 1	76	IĞDIR	0	Lowest 1	75	ARDAHAN	0
	2	76	IĞDIR	0	2	73	ŞIRNAK	0	2	69	BAYBURT	0
	3	75	ARDAHAN	0	3	69	BAYBURT	0	3	65	VAN	0
	4	73	ŞIRNAK	0	4	66	YOZGAT	0	4	29	GÜMÜŞHANE	0
	5	69	BAYBURT	0[a]	5	62	TUNCELİ	0[a]	5	23	ELAZIĞ	0[a]

a. Only a partial list of cases with the value 0 are shown in the table of lower extremes.

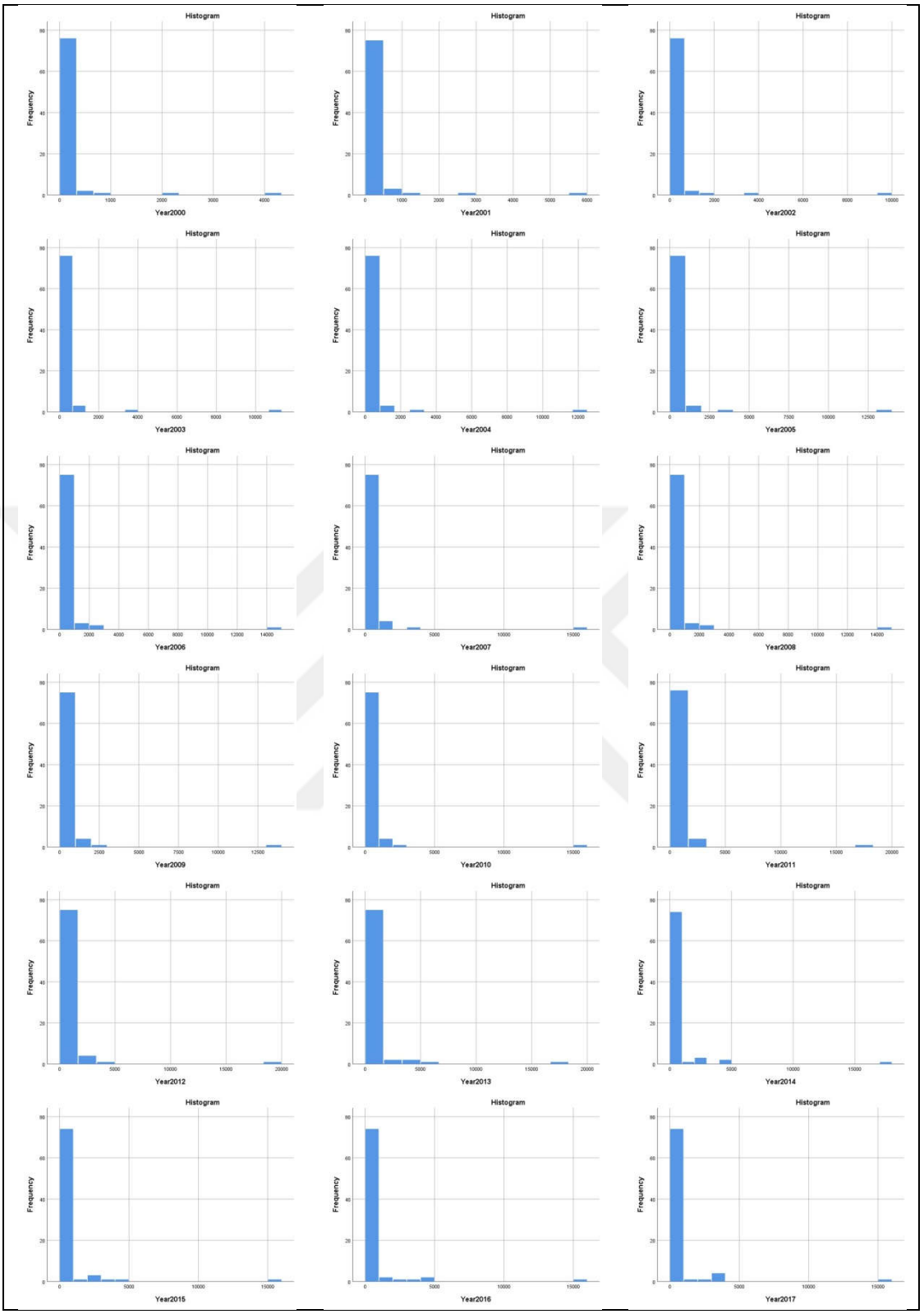


Figure A.49 : Histogram graphs.

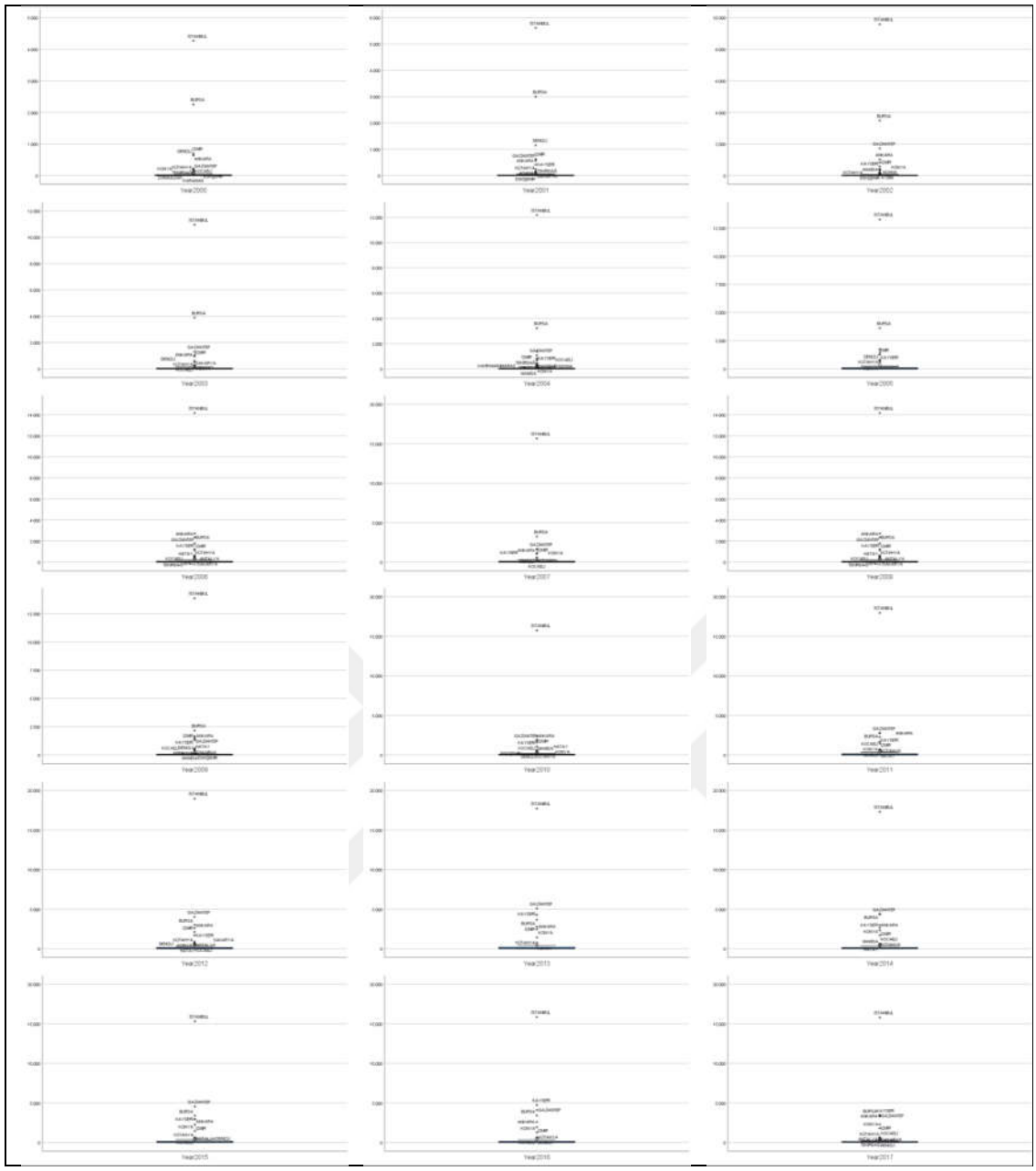


Figure A.50 : Boxplots.

Evaluation of time periods:

Table A.101 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table A.102 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mean_2000_2005	0,415	81	0,000	0,211	81	0,000
Mean_2006_2010	0,417	81	0,000	0,196	81	0,000
Mean_2011_2017	0,404	81	0,000	0,241	81	0,000

a. Lilliefors Significance Correction

Table A.103 : Descriptive statistics.

Descriptives									
		Statistic	Std. Error		Statistic	Std. Error		Statistic	Std. Error
Mean_2000_2005	Mean	236,72	122,158	Mean_2006_2010 Mean	351,79	186,258	Mean_2011_2017 Mean	489,08	222,829
	Median	4,67		Median	12,40		Median	27,00	
	Variance	1208735,457		Variance	2810042,255		Variance	4021886,545	
	Std. Deviation	1099,425		Std. Deviation	1676,318		Std. Deviation	2005,464	
	Minimum	0		Minimum	0		Minimum	0	
	Maximum	9307		Maximum	14716		Maximum	16977	
	Range	9307		Range	14716		Range	16977	
	Skewness	7,463	0,267	Skewness	8,112	0,267	Skewness	7,277	0,267
	Kurtosis	60,050	0,529	Kurtosis	69,601	0,529	Kurtosis	58,709	0,529

Table A.104 : Outlier-Extreme values.

Extreme Values												
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Mean_2000_2005 Highest	1	34	İSTANBUL	9307	Mean_2006_2010 Highest	1	34	İSTANBUL	14716	1	34	İSTANBUL	16977
	2	16	BURSA	3240		2	16	BURSA	2628	2	27	GAZİANTEP	4017
	3	27	GAZİANTEP	1102		3	6	ANKARA	1956	3	16	BURSA	3447
	4	6	ANKARA	1010		4	27	GAZİANTEP	1728	4	38	KAYSERİ	3070
	5	35	İZMİR	862		5	35	İZMİR	1243	5	6	ANKARA	2728
Mean_2000_2005 Lowest	1	76	IĞDIR	0	Mean_2006_2010 Lowest	1	76	IĞDIR	0	Mean_2011_2017 Lowest 1	13	BİTLİS	0
	2	73	ŞIRNAK	0		2	69	BAYBURT	0	2	12	BİNGÖL	0
	3	69	BAYBURT	0		3	65	VAN	0	3	75	ARDAHAN	0
	4	65	VAN	0		4	62	TUNCELİ	0	4	36	KARS	0
	5	62	TUNCELİ	0[a]		5	56	SİİRT	0[a]	5	76	IĞDIR	0[b]

a. Only a partial list of cases with the value 0 are shown in the table of lower extremes.
b. Only a partial list of cases with the value 0 are shown in the table of lower extremes.

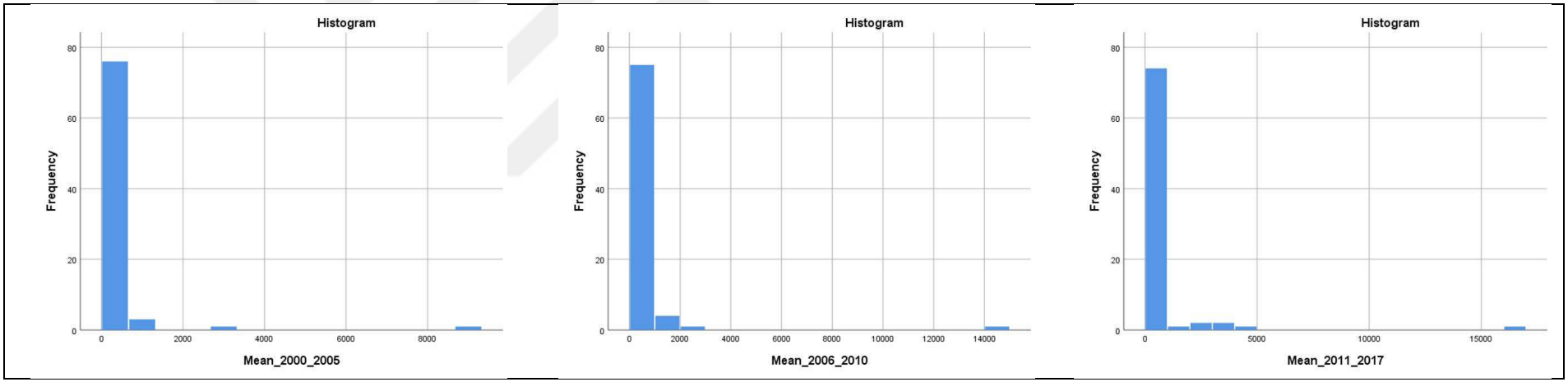


Figure A.51 : Histogram graphs.

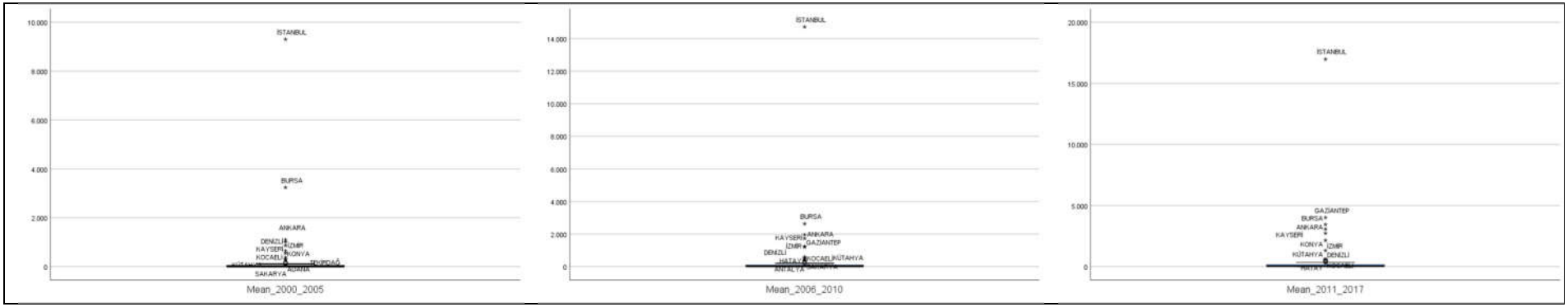


Figure A.52 : Boxplots.

Evaluation per each year (Lg):

Table A.105 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Year2000	81	100,0%	0	0,0%	81	100,0%
Lg_Year2001	81	100,0%	0	0,0%	81	100,0%
Lg_Year2002	81	100,0%	0	0,0%	81	100,0%
Lg_Year2003	81	100,0%	0	0,0%	81	100,0%
Lg_Year2004	81	100,0%	0	0,0%	81	100,0%
Lg_Year2005	81	100,0%	0	0,0%	81	100,0%
Lg_Year2006	81	100,0%	0	0,0%	81	100,0%
Lg_Year2007	81	100,0%	0	0,0%	81	100,0%
Lg_Year2008	81	100,0%	0	0,0%	81	100,0%
Lg_Year2009	81	100,0%	0	0,0%	81	100,0%
Lg_Year2010	81	100,0%	0	0,0%	81	100,0%
Lg_Year2011	81	100,0%	0	0,0%	81	100,0%
Lg_Year2012	81	100,0%	0	0,0%	81	100,0%
Lg_Year2013	81	100,0%	0	0,0%	81	100,0%
Lg_Year2014	81	100,0%	0	0,0%	81	100,0%
Lg_Year2015	81	100,0%	0	0,0%	81	100,0%
Lg_Year2016	81	100,0%	0	0,0%	81	100,0%
Lg_Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.106 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Year2000	0,204	81	0,000	0,837	81	0,000
Lg_Year2001	0,245	81	0,000	0,800	81	0,000
Lg_Year2002	0,194	81	0,000	0,840	81	0,000
Lg_Year2003	0,206	81	0,000	0,861	81	0,000
Lg_Year2004	0,180	81	0,000	0,873	81	0,000
Lg_Year2005	0,157	81	0,000	0,881	81	0,000
Lg_Year2006	0,127	81	0,003	0,925	81	0,000
Lg_Year2007	0,133	81	0,001	0,912	81	0,000
Lg_Year2008	0,137	81	0,001	0,923	81	0,000
Lg_Year2009	0,139	81	0,001	0,906	81	0,000
Lg_Year2010	0,125	81	0,003	0,927	81	0,000
Lg_Year2011	0,101	81	0,042	0,944	81	0,001
Lg_Year2012	0,096	81	0,063	0,952	81	0,004
Lg_Year2013	0,100	81	0,044	0,948	81	0,003
Lg_Year2014	0,089	81	0,168	0,953	81	0,005
Lg_Year2015	0,086	81	,200*	0,954	81	0,006
Lg_Year2016	0,072	81	,200*	0,961	81	0,014
Lg_Year2017	0,068	81	,200*	0,964	81	0,022

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table A.107 : Descriptive statistics.

Descriptives											
			Std.				Std.				Std.
		Statistic	Error			Statistic	Error			Statistic	Error
Lg_Year2000	Mean	0,8112	0,10324	Lg_Year2006	Mean	1,2524	0,11856	Lg_Year2012	Mean	1,4298	0,11808
	Median	0,6021			Median	1,1139			Median	1,3617	
	Variance	0,863			Variance	1,139			Variance	1,129	
	Std. Deviation	0,92919			Std. Deviation	1,06702			Std. Deviation	1,06268	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,63			Maximum	4,15			Maximum	4,28	
	Range	3,63			Range	4,15			Range	4,28	
	Skewness	1,093	0,267		Skewness	0,500	0,267		Skewness	0,383	0,267
	Kurtosis	0,458	0,529		Kurtosis	-0,604	0,529		Kurtosis	-0,524	0,529
Lg_Year2001	Mean	0,7921	0,11021	Lg_Year2007	Mean	1,1872	0,11874	Lg_Year2013	Mean	1,4642	0,11871
	Median	0,3010			Median	1,0792			Median	1,3010	
	Variance	0,984			Variance	1,142			Variance	1,141	
	Std. Deviation	0,99189			Std. Deviation	1,06870			Std. Deviation	1,06839	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,75			Maximum	4,19			Maximum	4,25	
	Range	3,75			Range	4,19			Range	4,25	
	Skewness	1,166	0,267		Skewness	0,603	0,267		Skewness	0,383	0,267
	Kurtosis	0,427	0,529		Kurtosis	-0,528	0,529		Kurtosis	-0,435	0,529
Lg_Year2002	Mean	0,9176	0,11543	Lg_Year2008	Mean	1,2487	0,11899	Lg_Year2014	Mean	1,4325	0,11698
	Median	0,6021			Median	1,1139			Median	1,4314	
	Variance	1,079			Variance	1,147			Variance	1,108	
	Std. Deviation	1,03890			Std. Deviation	1,07090			Std. Deviation	1,05282	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,98			Maximum	4,15			Maximum	4,24	
	Range	3,98			Range	4,15			Range	4,24	
	Skewness	0,998	0,267		Skewness	0,493	0,267		Skewness	0,451	0,267
	Kurtosis	0,091	0,529		Kurtosis	-0,616	0,529		Kurtosis	-0,389	0,529
Lg_Year2003	Mean	0,9906	0,11649	Lg_Year2009	Mean	1,1418	0,11695	Lg_Year2015	Mean	1,4424	0,11724
	Median	0,4771			Median	0,9542			Median	1,3010	
	Variance	1,099			Variance	1,108			Variance	1,113	
	Std. Deviation	1,04844			Std. Deviation	1,05258			Std. Deviation	1,05518	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	4,04			Maximum	4,14			Maximum	4,18	
	Range	4,04			Range	4,14			Range	4,18	
	Skewness	0,863	0,267		Skewness	0,706	0,267		Skewness	0,417	0,267
	Kurtosis	-0,212	0,529		Kurtosis	-0,377	0,529		Kurtosis	-0,528	0,529
Lg_Year2004	Mean	1,0354	0,11822	Lg_Year2010	Mean	1,2490	0,11725	Lg_Year2016	Mean	1,4868	0,11149
	Median	0,6990			Median	1,2041			Median	1,3222	
	Variance	1,132			Variance	1,113			Variance	1,007	
	Std. Deviation	1,06397			Std. Deviation	1,05521			Std. Deviation	1,00343	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	4,09			Maximum	4,20			Maximum	4,20	
	Range	4,09			Range	4,20			Range	4,20	
	Skewness	0,774	0,267		Skewness	0,531	0,267		Skewness	0,416	0,267
	Kurtosis	-0,349	0,529		Kurtosis	-0,573	0,529		Kurtosis	-0,145	0,529
Lg_Year2005	Mean	1,0954	0,12100	Lg_Year2011	Mean	1,3603	0,11656	Lg_Year2017	Mean	1,4967	0,11156
	Median	0,7782			Median	1,1761			Median	1,4150	
	Variance	1,186			Variance	1,101			Variance	1,008	
	Std. Deviation	1,08904			Std. Deviation	1,04905			Std. Deviation	1,00404	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	4,12			Maximum	4,25			Maximum	4,20	
	Range	4,12			Range	4,25			Range	4,20	
	Skewness	0,727	0,267		Skewness	0,514	0,267		Skewness	0,458	0,267
	Kurtosis	-0,492	0,529		Kurtosis	-0,531	0,529		Kurtosis	-0,274	0,529

Table A.108 : Outlier-Extreme values.

		Extreme Values											
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Lg Year2000	Highest 1	34	İSTANBUL	3,63	Lg Year2006 Highest 1	34	İSTANBUL	4,15	Lg Year2012 Highest 1	34	İSTANBUL	4,28
	2	16	BURSA	3,35	2	16	BURSA	3,43	2	27	GAZİANTEP	3,60
	3	35	İZMİR	2,85	3	6	ANKARA	3,37	3	16	BURSA	3,48
	4	20	DENİZLİ	2,81	4	27	GAZİANTEP	3,25	4	6	ANKARA	3,42
	5	6	ANKARA	2,81	5	38	KAYSERİ	3,08	5	35	İZMİR	3,32
	Lowest 1	80	OSMANİYE	0,00	Lowest 1	79	KİLİS	0,00	Lowest 1	76	IĞDIR	0,00
	2	79	KİLİS	0,00	2	77	YALOVA	0,00	2	75	ARDAHAN	0,00
	3	78	KARABÜK	0,00	3	76	IĞDIR	0,00	3	73	ŞIRNAK	0,00
	4	77	YALOVA	0,00	4	75	ARDAHAN	0,00	4	69	BAYBURT	0,00
	5	76	IĞDIR	,00[a]	5	74	BARTIN	,00[a]	5	66	YOZGAT	,00[a]
Lg Year2001	Highest 1	34	İSTANBUL	3,75	Lg Year2007 Highest 1	34	İSTANBUL	4,19	Lg Year2013 Highest 1	34	İSTANBUL	4,25
	2	16	BURSA	3,48	2	16	BURSA	3,51	2	27	GAZİANTEP	3,71
	3	20	DENİZLİ	3,06	3	27	GAZİANTEP	3,22	3	38	KAYSERİ	3,63
	4	35	İZMİR	2,80	4	6	ANKARA	3,20	4	16	BURSA	3,56
	5	27	GAZİANTEP	2,79	5	38	KAYSERİ	3,07	5	6	ANKARA	3,44
	Lowest 1	80	OSMANİYE	0,00	Lowest 1	76	IĞDIR	0,00	Lowest 1	76	IĞDIR	0,00
	2	79	KİLİS	0,00	2	75	ARDAHAN	0,00	2	75	ARDAHAN	0,00
	3	78	KARABÜK	0,00	3	74	BARTIN	0,00	3	73	ŞIRNAK	0,00
	4	77	YALOVA	0,00	4	69	BAYBURT	0,00	4	69	BAYBURT	0,00
	5	76	IĞDIR	,00[a]	5	66	YOZGAT	,00[a]	5	66	YOZGAT	,00[a]
Lg Year2002	Highest 1	34	İSTANBUL	3,98	Lg Year2008 Highest 1	34	İSTANBUL	4,15	Lg Year2014 Highest 1	34	İSTANBUL	4,24
	2	16	BURSA	3,54	2	16	BURSA	3,43	2	16	BURSA	3,64
	3	27	GAZİANTEP	3,24	3	6	ANKARA	3,37	3	27	GAZİANTEP	3,64
	4	6	ANKARA	3,01	4	27	GAZİANTEP	3,25	4	38	KAYSERİ	3,48
	5	35	İZMİR	2,92	5	38	KAYSERİ	3,08	5	6	ANKARA	3,42
	Lowest 1	80	OSMANİYE	0,00	Lowest 1	79	KİLİS	0,00	Lowest 1	79	KİLİS	0,00
	2	78	KARABÜK	0,00	2	77	YALOVA	0,00	2	75	ARDAHAN	0,00
	3	77	YALOVA	0,00	3	76	IĞDIR	0,00	3	73	ŞIRNAK	0,00
	4	76	IĞDIR	0,00	4	75	ARDAHAN	0,00	4	69	BAYBURT	0,00
	5	75	ARDAHAN	,00[a]	5	74	BARTIN	,00[a]	5	66	YOZGAT	,00[a]
Lg Year2003	Highest 1	34	İSTANBUL	4,04	Lg Year2009 Highest 1	34	İSTANBUL	4,14	Lg Year2015 Highest 1	34	İSTANBUL	4,18
	2	16	BURSA	3,59	2	16	BURSA	3,33	2	27	GAZİANTEP	3,66
	3	27	GAZİANTEP	3,11	3	6	ANKARA	3,22	3	16	BURSA	3,53
	4	6	ANKARA	3,03	4	27	GAZİANTEP	3,19	4	38	KAYSERİ	3,47
	5	35	İZMİR	2,97	5	38	KAYSERİ	3,14	5	6	ANKARA	3,47
	Lowest 1	78	KARABÜK	0,00	Lowest 1	79	KİLİS	0,00	Lowest 1	78	KARABÜK	0,00
	2	76	IĞDIR	0,00	2	76	IĞDIR	0,00	2	75	ARDAHAN	0,00
	3	75	ARDAHAN	0,00	3	75	ARDAHAN	0,00	3	71	KIRIKKALE	0,00
	4	74	BARTIN	0,00	4	73	ŞIRNAK	0,00	4	66	YOZGAT	0,00
	5	73	ŞIRNAK	,00[a]	5	72	BATMAN	,00[a]	5	62	TUNCELİ	,00[a]
Lg Year2004	Highest 1	34	İSTANBUL	4,09	Lg Year2010 Highest 1	34	İSTANBUL	4,20	Lg Year2016 Highest 1	34	İSTANBUL	4,20
	2	16	BURSA	3,51	2	16	BURSA	3,37	2	38	KAYSERİ	3,67
	3	6	ANKARA	3,14	3	27	GAZİANTEP	3,28	3	27	GAZİANTEP	3,61
	4	27	GAZİANTEP	3,03	4	6	ANKARA	3,26	4	16	BURSA	3,53
	5	35	İZMİR	2,92	5	35	İZMİR	3,20	5	6	ANKARA	3,41
	Lowest 1	79	KİLİS	0,00	Lowest 1	76	IĞDIR	0,00	Lowest 1	76	IĞDIR	0,00
	2	77	YALOVA	0,00	2	74	BARTIN	0,00	2	75	ARDAHAN	0,00
	3	76	IĞDIR	0,00	3	69	BAYBURT	0,00	3	73	ŞIRNAK	0,00
	4	75	ARDAHAN	0,00	4	66	YOZGAT	0,00	4	71	KIRIKKALE	0,00
	5	74	BARTIN	,00[a]	5	65	VAN	,00[a]	5	69	BAYBURT	,00[a]
Lg Year2005	Highest 1	34	İSTANBUL	4,12	Lg Year2011 Highest 1	34	İSTANBUL	4,25	Lg Year2017 Highest 1	34	İSTANBUL	4,20
	2	16	BURSA	3,56	2	16	BURSA	3,45	2	16	BURSA	3,54
	3	27	GAZİANTEP	3,24	3	27	GAZİANTEP	3,44	3	38	KAYSERİ	3,53
	4	6	ANKARA	3,14	4	6	ANKARA	3,35	4	27	GAZİANTEP	3,52
	5	35	İZMİR	3,09	5	35	İZMİR	3,23	5	6	ANKARA	3,52
	Lowest 1	79	KİLİS	0,00	Lowest 1	76	IĞDIR	0,00	Lowest 1	75	ARDAHAN	0,00
	2	76	IĞDIR	0,00	2	73	ŞIRNAK	0,00	2	69	BAYBURT	0,00
	3	75	ARDAHAN	0,00	3	69	BAYBURT	0,00	3	65	VAN	0,00
	4	73	ŞIRNAK	0,00	4	66	YOZGAT	0,00	4	29	GÜMÜŞHANE	0,00
	5	69	BAYBURT	,00[a]	5	62	TUNCELİ	,00[a]	5	23	ELAZIĞ	,00[a]

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.

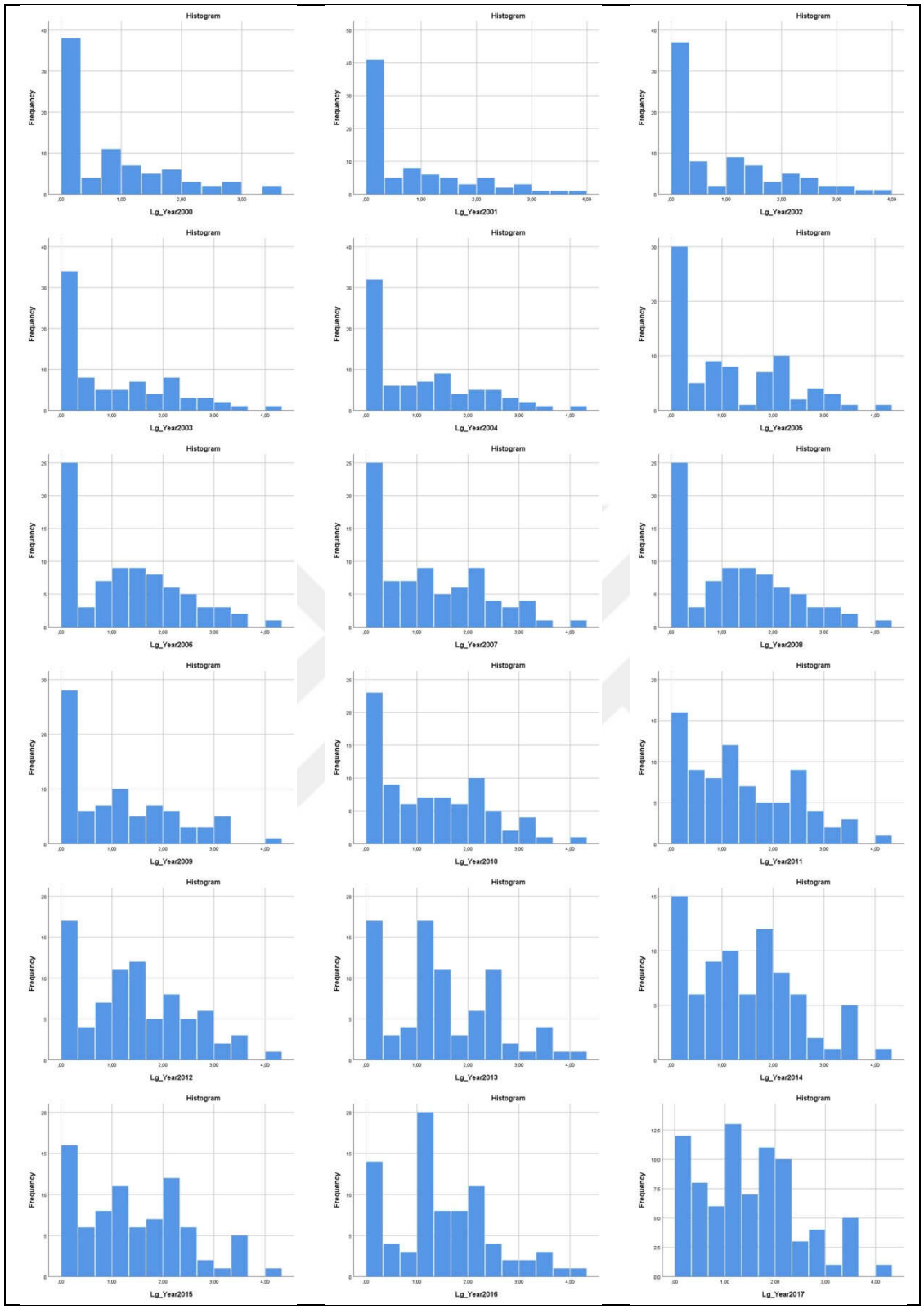


Figure A.53 : Histogram graphs.



Figure A.54 : Boxplots.

“Design Registrations (Design)”

Evaluation per each year:

Table A.109 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Year2000	81	100,0%	0	0,0%	81	100,0%
Year2001	81	100,0%	0	0,0%	81	100,0%
Year2002	81	100,0%	0	0,0%	81	100,0%
Year2003	81	100,0%	0	0,0%	81	100,0%
Year2004	81	100,0%	0	0,0%	81	100,0%
Year2005	81	100,0%	0	0,0%	81	100,0%
Year2006	81	100,0%	0	0,0%	81	100,0%
Year2007	81	100,0%	0	0,0%	81	100,0%
Year2008	81	100,0%	0	0,0%	81	100,0%
Year2009	81	100,0%	0	0,0%	81	100,0%
Year2010	81	100,0%	0	0,0%	81	100,0%
Year2011	81	100,0%	0	0,0%	81	100,0%
Year2012	81	100,0%	0	0,0%	81	100,0%
Year2013	81	100,0%	0	0,0%	81	100,0%
Year2014	81	100,0%	0	0,0%	81	100,0%
Year2015	81	100,0%	0	0,0%	81	100,0%
Year2016	81	100,0%	0	0,0%	81	100,0%
Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.110 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Year2000	0,412	81	0,000	0,228	81	0,000
Year2001	0,423	81	0,000	0,237	81	0,000
Year2002	0,417	81	0,000	0,209	81	0,000
Year2003	0,419	81	0,000	0,199	81	0,000
Year2004	0,419	81	0,000	0,198	81	0,000
Year2005	0,415	81	0,000	0,209	81	0,000
Year2006	0,414	81	0,000	0,209	81	0,000
Year2007	0,419	81	0,000	0,194	81	0,000
Year2008	0,414	81	0,000	0,209	81	0,000
Year2009	0,418	81	0,000	0,193	81	0,000
Year2010	0,419	81	0,000	0,191	81	0,000
Year2011	0,416	81	0,000	0,197	81	0,000
Year2012	0,414	81	0,000	0,207	81	0,000
Year2013	0,406	81	0,000	0,237	81	0,000
Year2014	0,399	81	0,000	0,260	81	0,000
Year2015	0,399	81	0,000	0,261	81	0,000
Year2016	0,407	81	0,000	0,258	81	0,000
Year2017	0,408	81	0,000	0,257	81	0,000

a. Lilliefors Significance Correction

Table A.111 : Descriptive statistics.

Descriptives											
			Std.				Std.				Std.
		Statistic	Error			Statistic	Error			Statistic	Error
Year2000	Mean	100,96	50,236	Year2006	Mean	345,22	175,945	Year2012	Mean	443,88	225,983
	Median	1,00			Median	9,00			Median	14,00	
	Variance	204413,286			Variance	2507488,050			Variance	4136531,135	
	Std. Deviation	452,121			Std. Deviation	1583,505			Std. Deviation	2033,846	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	3475			Maximum	13778			Maximum	17727	
	Range	3475			Range	13778			Range	17727	
	Skewness	6,410	0,267		Skewness	7,903	0,267		Skewness	7,930	0,267
	Kurtosis	43,613	0,529		Kurtosis	66,784	0,529		Kurtosis	67,236	0,529
Year2001	Mean	133,41	65,457	Year2007	Mean	358,62	194,914	Year2013	Mean	502,56	233,894
	Median	1,00			Median	10,00			Median	19,00	
	Variance	347055,044			Variance	3077314,239			Variance	4431209,025	
	Std. Deviation	589,114			Std. Deviation	1754,228			Std. Deviation	2105,044	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	4550			Maximum	15242			Maximum	17833	
	Range	4550			Range	15242			Range	17833	
	Skewness	6,302	0,267		Skewness	7,936	0,267		Skewness	7,333	0,267
	Kurtosis	43,118	0,529		Kurtosis	66,923	0,529		Kurtosis	59,162	0,529
Year2002	Mean	178,42	94,728	Year2008	Mean	345,22	175,945	Year2014	Mean	509,05	221,901
	Median	1,00			Median	9,00			Median	28,00	
	Variance	726838,997			Variance	2507488,050			Variance	3988433,473	
	Std. Deviation	852,549			Std. Deviation	1583,505			Std. Deviation	1997,106	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	7134			Maximum	13778			Maximum	16603	
	Range	7134			Range	13778			Range	16603	
	Skewness	7,291	0,267		Skewness	7,903	0,267		Skewness	6,932	0,267
	Kurtosis	57,536	0,529		Kurtosis	66,784	0,529		Kurtosis	54,144	0,529
Year2003	Mean	198,74	107,965	Year2009	Mean	293,40	158,102	Year2015	Mean	504,43	218,668
	Median	1,00			Median	5,00			Median	22,00	
	Variance	944174,269			Variance	2024697,042			Variance	3873063,523	
	Std. Deviation	971,686			Std. Deviation	1422,918			Std. Deviation	1968,010	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	8181			Maximum	12538			Maximum	16339	
	Range	8181			Range	12538			Range	16339	
	Skewness	7,454	0,267		Skewness	8,200	0,267		Skewness	6,900	0,267
	Kurtosis	59,358	0,529		Kurtosis	70,809	0,529		Kurtosis	53,774	0,529
Year2004	Mean	265,84	144,308	Year2010	Mean	353,37	191,899	Year2016	Mean	511,00	223,762
	Median	3,00			Median	11,00			Median	19,00	
	Variance	1686815,986			Variance	2982849,411			Variance	4055617,275	
	Std. Deviation	1298,775			Std. Deviation	1727,093			Std. Deviation	2013,856	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	11165			Maximum	15196			Maximum	16678	
	Range	11165			Range	15196			Range	16678	
	Skewness	7,755	0,267		Skewness	8,174	0,267		Skewness	6,872	0,267
	Kurtosis	64,162	0,529		Kurtosis	70,431	0,529		Kurtosis	53,315	0,529
Year2005	Mean	270,89	140,620	Year2011	Mean	392,37	205,569	Year2017	Mean	460,25	201,991
	Median	4,00			Median	12,00			Median	20,00	
	Variance	1601703,550			Variance	3422959,886			Variance	3304821,013	
	Std. Deviation	1265,584			Std. Deviation	1850,124			Std. Deviation	1817,917	
	Minimum	0			Minimum	0			Minimum	0	
	Maximum	10877			Maximum	16269			Maximum	15085	
	Range	10877			Range	16269			Range	15085	
	Skewness	7,701	0,267		Skewness	8,139	0,267		Skewness	6,891	0,267
	Kurtosis	63,713	0,529		Kurtosis	70,000	0,529		Kurtosis	53,710	0,529

Table A.112 : Outlier-Extreme values.

		Extreme Values											
		Case	Region	Value		Case	Region	Value		Case	Region	Value	
Year2000	Highest 1	34	İSTANBUL	3475	Year2006	34	İSTANBUL	13778	Year2012	34	İSTANBUL	17727	
	2	16	BURSA	2077		16	BURSA	2919		27	GAZİANTEP	3155	
	3	35	İZMİR	558		6	ANKARA	2212		16	BURSA	2972	
	4	6	ANKARA	438		27	GAZİANTEP	1648		6	ANKARA	2406	
	5	20	DENİZLİ	392		38	KAYSERİ	1154		35	İZMİR	1875	
	Lowest 1	80	OSMANİYE	0		80	OSMANİYE	0		80	OSMANİYE	0	
	2	79	KİLİS	0		79	KİLİS	0		76	IĞDIR	0	
	3	78	KARABÜK	0		77	YALOVA	0		75	ARDAHAN	0	
	4	77	YALOVA	0		76	IĞDIR	0		73	ŞIRNAK	0	
	5	76	IĞDIR	0[a]		75	ARDAHAN	0[a]		69	BAYBURT	0[a]	
Year2001	Highest 1	34	İSTANBUL	4550	Year2007	34	İSTANBUL	15242	Year2013	34	İSTANBUL	17833	
	2	16	BURSA	2509		16	BURSA	3849		27	GAZİANTEP	5133	
	3	20	DENİZLİ	1084		27	GAZİANTEP	1829		16	BURSA	3031	
	4	35	İZMİR	643		6	ANKARA	1627		6	ANKARA	2848	
	5	6	ANKARA	622		35	İZMİR	1065		35	İZMİR	2424	
	Lowest 1	80	OSMANİYE	0		76	IĞDIR	0		76	IĞDIR	0	
	2	79	KİLİS	0		75	ARDAHAN	0		75	ARDAHAN	0	
	3	78	KARABÜK	0		74	BARTIN	0		73	ŞIRNAK	0	
	4	77	YALOVA	0		69	BAYBURT	0		69	BAYBURT	0	
	5	76	IĞDIR	0[a]		66	YOZGAT	0[a]		66	YOZGAT	0[a]	
Year2002	Highest 1	34	İSTANBUL	7134	Year2008	34	İSTANBUL	13778	Year2014	34	İSTANBUL	16603	
	2	16	BURSA	2616		16	BURSA	2919		16	BURSA	4391	
	3	27	GAZİANTEP	1376		6	ANKARA	2212		27	GAZİANTEP	4320	
	4	6	ANKARA	611		27	GAZİANTEP	1648		38	KAYSERİ	2995	
	5	35	İZMİR	508		38	KAYSERİ	1154		6	ANKARA	2657	
	Lowest 1	80	OSMANİYE	0		80	OSMANİYE	0		79	KİLİS	0	
	2	79	KİLİS	0		79	KİLİS	0		75	ARDAHAN	0	
	3	78	KARABÜK	0		77	YALOVA	0		73	ŞIRNAK	0	
	4	77	YALOVA	0		76	IĞDIR	0		69	BAYBURT	0	
	5	76	IĞDIR	0[a]		75	ARDAHAN	0[a]		66	YOZGAT	0[a]	
Year2003	Highest 1	34	İSTANBUL	8181	Year2009	34	İSTANBUL	12538	Year2015	34	İSTANBUL	16339	
	2	16	BURSA	3126		16	BURSA	1946		27	GAZİANTEP	4381	
	3	35	İZMİR	747		6	ANKARA	1613		16	BURSA	3965	
	4	6	ANKARA	665		27	GAZİANTEP	1228		38	KAYSERİ	3123	
	5	38	KAYSERİ	570		38	KAYSERİ	1127		6	ANKARA	2971	
	Lowest 1	80	OSMANİYE	0		79	KİLİS	0		80	OSMANİYE	0	
	2	78	KARABÜK	0		76	IĞDIR	0		75	ARDAHAN	0	
	3	76	IĞDIR	0		75	ARDAHAN	0		71	KIRIKKALE	0	
	4	75	ARDAHAN	0		74	BARTIN	0		69	BAYBURT	0	
	5	74	BARTIN	0[a]		73	ŞIRNAK	0[a]		66	YOZGAT	0[a]	
Year2004	Highest 1	34	İSTANBUL	11165	Year2010	34	İSTANBUL	15196	Year2016	34	İSTANBUL	16678	
	2	16	BURSA	3385		16	BURSA	2515		38	KAYSERİ	4645	
	3	6	ANKARA	1180		27	GAZİANTEP	1760		27	GAZİANTEP	3960	
	4	27	GAZİANTEP	1051		6	ANKARA	1721		16	BURSA	3654	
	5	35	İZMİR	912		35	İZMİR	1625		6	ANKARA	2812	
	Lowest 1	79	KİLİS	0		80	OSMANİYE	0		76	IĞDIR	0	
	2	76	IĞDIR	0		76	IĞDIR	0		75	ARDAHAN	0	
	3	75	ARDAHAN	0		74	BARTIN	0		73	ŞIRNAK	0	
	4	74	BARTIN	0		73	ŞIRNAK	0		71	KIRIKKALE	0	
	5	73	ŞIRNAK	0[a]		71	KIRIKKALE	0[a]		66	YOZGAT	0[a]	
Year2005	Highest 1	34	İSTANBUL	10877	Year2011	34	İSTANBUL	16269	Year2017	34	İSTANBUL	15085	
	2	16	BURSA	3146		16	BURSA	2414		27	GAZİANTEP	3698	
	3	6	ANKARA	1237		27	GAZİANTEP	2398		16	BURSA	3515	
	4	27	GAZİANTEP	1158		6	ANKARA	1997		38	KAYSERİ	3443	
	5	35	İZMİR	1066		35	İZMİR	1487		6	ANKARA	2807	
	Lowest 1	79	KİLİS	0		76	IĞDIR	0		75	ARDAHAN	0	
	2	78	KARABÜK	0		73	ŞIRNAK	0		69	BAYBURT	0	
	3	77	YALOVA	0		69	BAYBURT	0		66	YOZGAT	0	
	4	76	IĞDIR	0		66	YOZGAT	0		65	VAN	0	
	5	75	ARDAHAN	0[a]		65	VAN	0[a]		62	TUNCELİ	0[a]	

a. Only a partial list of cases with the value 0 are shown in the table of lower extremes.

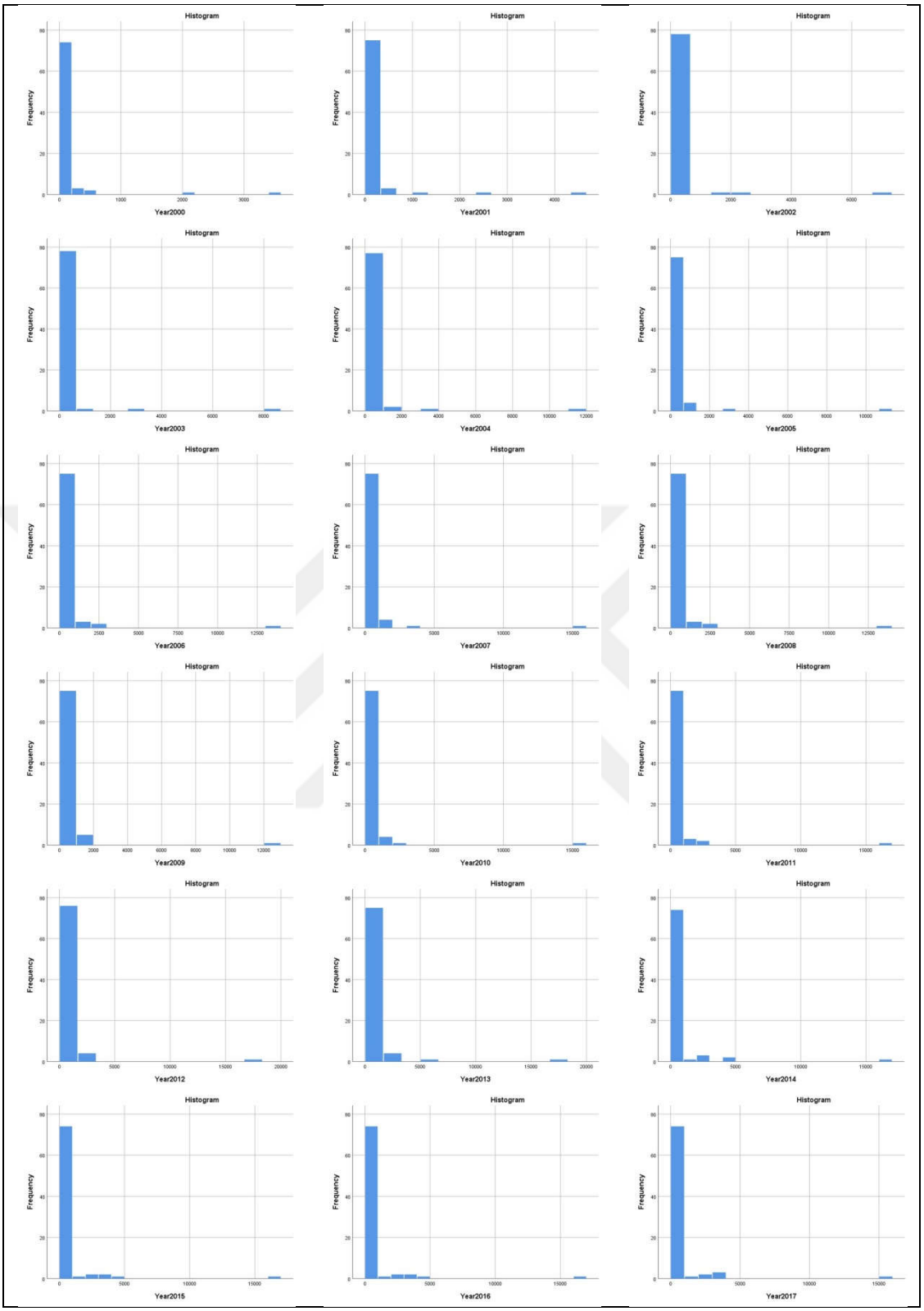


Figure A.55 : Histogram graphs.

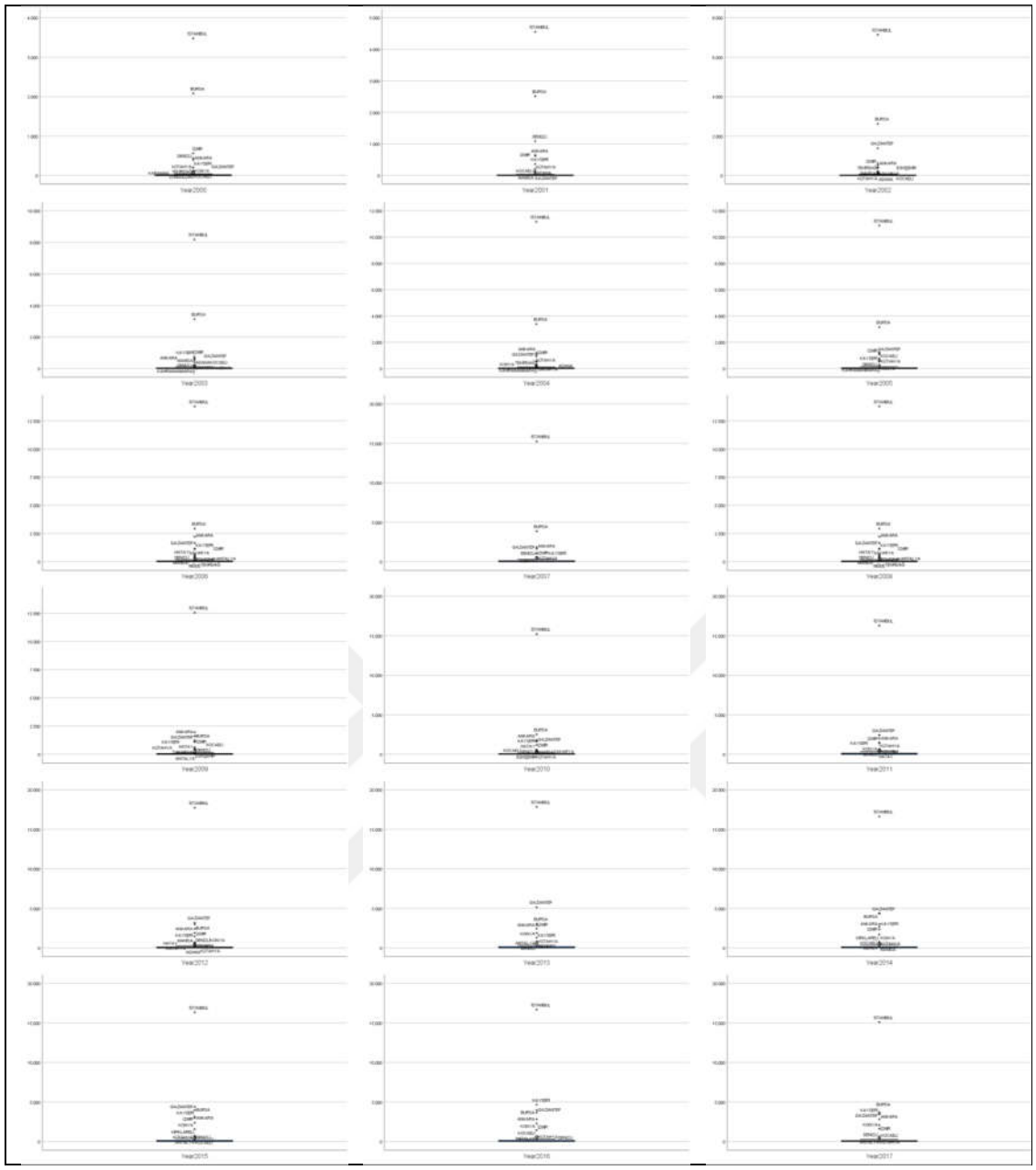


Figure A.56 : Boxplots.

Evaluation of time periods

Table A.113 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Mean_2000_2005	81	100,0%	0	0,0%	81	100,0%
Mean_2006_2010	81	100,0%	0	0,0%	81	100,0%
Mean_2011_2017	81	100,0%	0	0,0%	81	100,0%

Table A.114 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mean_2000_2005	0,416	81	0,000	0,209	81	0,000
Mean_2006_2010	0,417	81	0,000	0,198	81	0,000
Mean_2011_2017	0,404	81	0,000	0,239	81	0,000
a. Lilliefors Significance Correction						

Table A.115 : Descriptive statistics.

Descriptives									
		Mean_2000_2005		Mean_2006_2010			Mean_2011_2017		
		Statistic	Std. Error		Statistic	Std. Error		Statistic	Std. Error
	Mean	191,38	99,876	Mean	339,17	179,149	Mean	474,79	217,834
	Median	3,50		Median	11,60		Median	28,00	
	Variance	807992,385		Variance	2599634,914		Variance	3843598,734	
	Std. Deviation	898,884		Std. Deviation	1612,338		Std. Deviation	1960,510	
	Minimum	0		Minimum	0		Minimum	0	
	Maximum	7564		Maximum	14106		Maximum	16648	
	Range	7564		Range	14106		Range	16648	
	Skewness	7,391	0,267	Skewness	8,041	0,267	Skewness	7,339	0,267
	Kurtosis	58,828	0,529	Kurtosis	68,603	0,529	Kurtosis	59,522	0,529

Table A.116 : Outlier-Extreme values.

Extreme Values													
		Mean_2000_2005			Mean_2006_2010			Mean_2011_2017					
		Case	Region	Value		Case	Region	Value		Case	Region	Value
Highest	1	34	İSTANBUL	7564	Highest	1	34	İSTANBUL	14106	1	34	İSTANBUL	16648
	2	16	BURSA	2810		2	16	BURSA	2830	2	27	GAZİANTEP	3864
	3	6	ANKARA	792		3	6	ANKARA	1877	3	16	BURSA	3420
	4	35	İZMİR	739		4	27	GAZİANTEP	1623	4	38	KAYSERİ	2705
	5	27	GAZİANTEP	728		5	35	İZMİR	1204	5	6	ANKARA	2643
Lowest	1	76	IĞDIR	0	Lowest	1	76	IĞDIR	0	1	66	YOZGAT	0
	2	73	ŞIRNAK	0		2	74	BARTIN	0	2	62	TUNCELİ	0
	3	69	BAYBURT	0		3	69	BAYBURT	0	3	36	KARS	0
	4	65	VAN	0		4	65	VAN	0	4	12	BİNGÖL	0
	5	62	TUNCELİ	0[a]		5	62	TUNCELİ	0[a]	5	75	ARDAHAN	0[b]

a. Only a partial list of cases with the value 0 are shown in the table of lower extremes.
b. Only a partial list of cases with the value 0 are shown in the table of lower extremes.

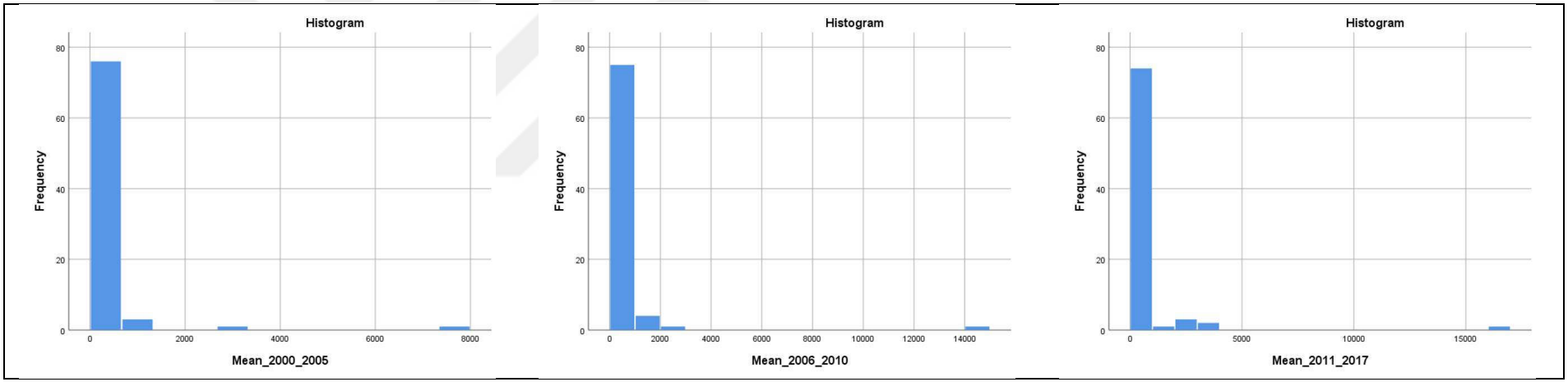


Figure A.57 : Histogram graphs.

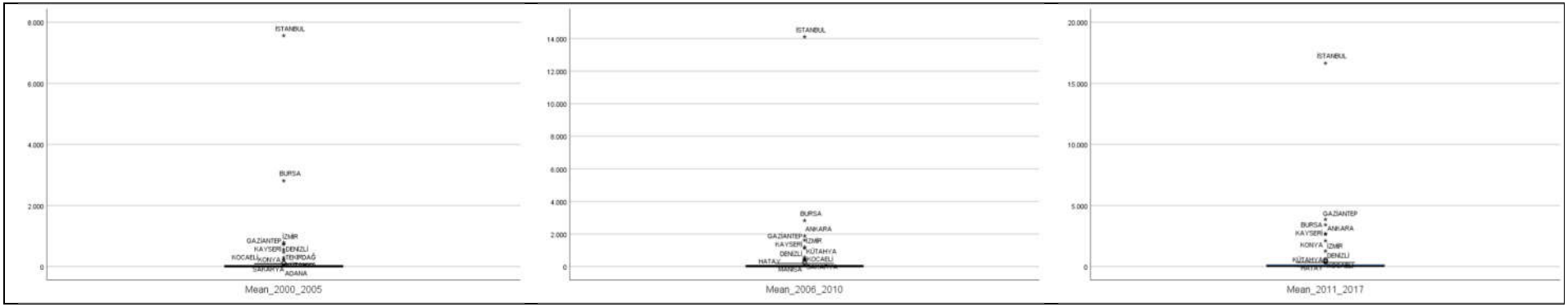


Figure A.58 : Boxplots.

Evaluation per each year (Lg)

Table A.117 : Case processing summary.

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Lg_Year2000	81	100,0%	0	0,0%	81	100,0%
Lg_Year2001	81	100,0%	0	0,0%	81	100,0%
Lg_Year2002	81	100,0%	0	0,0%	81	100,0%
Lg_Year2003	81	100,0%	0	0,0%	81	100,0%
Lg_Year2004	81	100,0%	0	0,0%	81	100,0%
Lg_Year2005	81	100,0%	0	0,0%	81	100,0%
Lg_Year2006	81	100,0%	0	0,0%	81	100,0%
Lg_Year2007	81	100,0%	0	0,0%	81	100,0%
Lg_Year2008	81	100,0%	0	0,0%	81	100,0%
Lg_Year2009	81	100,0%	0	0,0%	81	100,0%
Lg_Year2010	81	100,0%	0	0,0%	81	100,0%
Lg_Year2011	81	100,0%	0	0,0%	81	100,0%
Lg_Year2012	81	100,0%	0	0,0%	81	100,0%
Lg_Year2013	81	100,0%	0	0,0%	81	100,0%
Lg_Year2014	81	100,0%	0	0,0%	81	100,0%
Lg_Year2015	81	100,0%	0	0,0%	81	100,0%
Lg_Year2016	81	100,0%	0	0,0%	81	100,0%
Lg_Year2017	81	100,0%	0	0,0%	81	100,0%

Table A.118 : Normality tests.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Lg_Year2000	0,246	81	0,000	0,804	81	0,000
Lg_Year2001	0,273	81	0,000	0,784	81	0,000
Lg_Year2002	0,281	81	0,000	0,798	81	0,000
Lg_Year2003	0,215	81	0,000	0,818	81	0,000
Lg_Year2004	0,172	81	0,000	0,868	81	0,000
Lg_Year2005	0,167	81	0,000	0,871	81	0,000
Lg_Year2006	0,176	81	0,000	0,895	81	0,000
Lg_Year2007	0,138	81	0,001	0,911	81	0,000
Lg_Year2008	0,176	81	0,000	0,895	81	0,000
Lg_Year2009	0,157	81	0,000	0,887	81	0,000
Lg_Year2010	0,128	81	0,002	0,920	81	0,000
Lg_Year2011	0,102	81	0,037	0,941	81	0,001
Lg_Year2012	0,101	81	0,042	0,943	81	0,001
Lg_Year2013	0,098	81	0,051	0,950	81	0,003
Lg_Year2014	0,086	81	,200*	0,954	81	0,006
Lg_Year2015	0,113	81	0,013	0,942	81	0,001
Lg_Year2016	0,089	81	0,172	0,956	81	0,007
Lg_Year2017	0,080	81	,200*	0,959	81	0,010

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table A.119 : Descriptive statistics.

Descriptives												
			Std.				Std.				Std.
		Statistic	Error			Statistic	Error			Statistic	Error
Lg_Year2000	Mean	0,7227	0,10009	Lg_Year2006	Mean	1,1681	0,12246	Lg_Year2012	Mean	1,3516	0,11750
	Median	0,3010			Median	1,0000			Median	1,1761	
	Variance	0,811			Variance	1,215			Variance	1,118	
	Std. Deviation	0,90077			Std. Deviation	1,10214			Std. Deviation	1,05747	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,54			Maximum	4,14			Maximum	4,25	
	Range	3,54			Range	4,14			Range	4,25	
	Skewness	1,212	0,267		Skewness	0,563	0,267		Skewness	0,490	0,267
	Kurtosis	0,751	0,529		Kurtosis	-0,679	0,529		Kurtosis	-0,485	0,529
Lg_Year2001	Mean	0,7188	0,10389	Lg_Year2007	Mean	1,1789	0,11827	Lg_Year2013	Mean	1,4431	0,11788
	Median	0,3010			Median	1,0414			Median	1,3010	
	Variance	0,874			Variance	1,133			Variance	1,126	
	Std. Deviation	0,93505			Std. Deviation	1,06444			Std. Deviation	1,06095	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,66			Maximum	4,18			Maximum	4,25	
	Range	3,66			Range	4,18			Range	4,25	
	Skewness	1,318	0,267		Skewness	0,608	0,267		Skewness	0,383	0,267
	Kurtosis	1,067	0,529		Kurtosis	-0,455	0,529		Kurtosis	-0,470	0,529
Lg_Year2002	Mean	0,8008	0,11148	Lg_Year2008	Mean	1,1681	0,12246	Lg_Year2014	Mean	1,4520	0,11811
	Median	0,3010			Median	1,0000			Median	1,4624	
	Variance	1,007			Variance	1,215			Variance	1,130	
	Std. Deviation	1,00332			Std. Deviation	1,10214			Std. Deviation	1,06299	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,85			Maximum	4,14			Maximum	4,22	
	Range	3,85			Range	4,14			Range	4,22	
	Skewness	1,088	0,267		Skewness	0,563	0,267		Skewness	0,412	0,267
	Kurtosis	0,286	0,529		Kurtosis	-0,679	0,529		Kurtosis	-0,496	0,529
Lg_Year2003	Mean	0,8600	0,11300	Lg_Year2009	Mean	1,0872	0,11813	Lg_Year2015	Mean	1,4170	0,12190
	Median	0,3010			Median	0,7782			Median	1,3617	
	Variance	1,034			Variance	1,130			Variance	1,204	
	Std. Deviation	1,01696			Std. Deviation	1,06319			Std. Deviation	1,09714	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	3,91			Maximum	4,10			Maximum	4,21	
	Range	3,91			Range	4,10			Range	4,21	
	Skewness	1,034	0,267		Skewness	0,727	0,267		Skewness	0,383	0,267
	Kurtosis	0,039	0,529		Kurtosis	-0,457	0,529		Kurtosis	-0,659	0,529
Lg_Year2004	Mean	0,9943	0,11538	Lg_Year2010	Mean	1,2126	0,11702	Lg_Year2016	Mean	1,4931	0,11449
	Median	0,6021			Median	1,0792			Median	1,3010	
	Variance	1,078			Variance	1,109			Variance	1,062	
	Std. Deviation	1,03838			Std. Deviation	1,05314			Std. Deviation	1,03042	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	4,05			Maximum	4,18			Maximum	4,22	
	Range	4,05			Range	4,18			Range	4,22	
	Skewness	0,892	0,267		Skewness	0,571	0,267		Skewness	0,377	0,267
	Kurtosis	-0,122	0,529		Kurtosis	-0,466	0,529		Kurtosis	-0,291	0,529
Lg_Year2005	Mean	1,0176	0,11690	Lg_Year2011	Mean	1,3242	0,11582	Lg_Year2017	Mean	1,4461	0,11184
	Median	0,6990			Median	1,1139			Median	1,3222	
	Variance	1,107			Variance	1,086			Variance	1,013	
	Std. Deviation	1,05211			Std. Deviation	1,04234			Std. Deviation	1,00654	
	Minimum	0,00			Minimum	0,00			Minimum	0,00	
	Maximum	4,04			Maximum	4,21			Maximum	4,18	
	Range	4,04			Range	4,21			Range	4,18	
	Skewness	0,849	0,267		Skewness	0,508	0,267		Skewness	0,512	0,267
	Kurtosis	-0,236	0,529		Kurtosis	-0,547	0,529		Kurtosis	-0,235	0,529

Table A.120 : Outlier-Extreme values.

Extreme Values															
			Case	Region	Value			Case	Region	Value			Case	Region	Value
Lg_Year2000	Highest	1	34	İSTANBUL	3,54	Lg_Year2006	Highest	1	34	İSTANBUL	4,14	Lg_Year2012	Highest	1	34	İSTANBUL	4,25
		2	16	BURSA	3,32			2	16	BURSA	3,47			2	27	GAZİANTEP	3,50
		3	35	İZMİR	2,75			3	6	ANKARA	3,34			3	16	BURSA	3,47
		4	6	ANKARA	2,64			4	27	GAZİANTEP	3,22			4	6	ANKARA	3,38
		5	20	DENİZLİ	2,59			5	38	KAYSERİ	3,06			5	35	İZMİR	3,27
	Lowest	1	80	OSMANİYE	0,00		Lowest	1	80	OSMANİYE	0,00		Lowest	1	80	OSMANİYE	0,00
		2	79	KİLİS	0,00			2	79	KİLİS	0,00			2	76	IĞDIR	0,00
		3	78	KARABÜK	0,00			3	77	YALOVA	0,00			3	75	ARDAHAN	0,00
		4	77	YALOVA	0,00			4	76	IĞDIR	0,00			4	73	ŞIRNAK	0,00
		5	76	IĞDIR	,00[a]			5	75	ARDAHAN	,00[a]			5	69	BAYBURT	,00[a]
Lg_Year2001	Highest	1	34	İSTANBUL	3,66	Lg_Year2007	Highest	1	34	İSTANBUL	4,18	Lg_Year2013	Highest	1	34	İSTANBUL	4,25
		2	16	BURSA	3,40			2	16	BURSA	3,59			2	27	GAZİANTEP	3,71
		3	20	DENİZLİ	3,04			3	27	GAZİANTEP	3,26			3	16	BURSA	3,48
		4	35	İZMİR	2,81			4	6	ANKARA	3,21			4	6	ANKARA	3,45
		5	6	ANKARA	2,79			5	35	İZMİR	3,03			5	35	İZMİR	3,38
	Lowest	1	80	OSMANİYE	0,00		Lowest	1	76	IĞDIR	0,00		Lowest	1	76	IĞDIR	0,00
		2	79	KİLİS	0,00			2	75	ARDAHAN	0,00			2	75	ARDAHAN	0,00
		3	78	KARABÜK	0,00			3	74	BARTIN	0,00			3	73	ŞIRNAK	0,00
		4	77	YALOVA	0,00			4	69	BAYBURT	0,00			4	69	BAYBURT	0,00
		5	76	IĞDIR	,00[a]			5	66	YOZGAT	,00[a]			5	66	YOZGAT	,00[a]
Lg_Year2002	Highest	1	34	İSTANBUL	3,85	Lg_Year2008	Highest	1	34	İSTANBUL	4,14	Lg_Year2014	Highest	1	34	İSTANBUL	4,22
		2	16	BURSA	3,42			2	16	BURSA	3,47			2	16	BURSA	3,64
		3	27	GAZİANTEP	3,14			3	6	ANKARA	3,34			3	27	GAZİANTEP	3,64
		4	6	ANKARA	2,79			4	27	GAZİANTEP	3,22			4	38	KAYSERİ	3,48
		5	35	İZMİR	2,71			5	38	KAYSERİ	3,06			5	6	ANKARA	3,42
	Lowest	1	80	OSMANİYE	0,00		Lowest	1	80	OSMANİYE	0,00		Lowest	1	79	KİLİS	0,00
		2	79	KİLİS	0,00			2	79	KİLİS	0,00			2	75	ARDAHAN	0,00
		3	78	KARABÜK	0,00			3	77	YALOVA	0,00			3	73	ŞIRNAK	0,00
		4	77	YALOVA	0,00			4	76	IĞDIR	0,00			4	69	BAYBURT	0,00
		5	76	IĞDIR	,00[a]			5	75	ARDAHAN	,00[a]			5	66	YOZGAT	,00[a]
Lg_Year2003	Highest	1	34	İSTANBUL	3,91	Lg_Year2009	Highest	1	34	İSTANBUL	4,10	Lg_Year2015	Highest	1	34	İSTANBUL	4,21
		2	16	BURSA	3,50			2	16	BURSA	3,29			2	27	GAZİANTEP	3,64
		3	35	İZMİR	2,87			3	6	ANKARA	3,21			3	16	BURSA	3,60
		4	6	ANKARA	2,82			4	27	GAZİANTEP	3,09			4	38	KAYSERİ	3,49
		5	38	KAYSERİ	2,76			5	38	KAYSERİ	3,05			5	6	ANKARA	3,47
	Lowest	1	80	OSMANİYE	0,00		Lowest	1	79	KİLİS	0,00		Lowest	1	80	OSMANİYE	0,00
		2	78	KARABÜK	0,00			2	76	IĞDIR	0,00			2	75	ARDAHAN	0,00
		3	76	IĞDIR	0,00			3	75	ARDAHAN	0,00			3	71	KIRIKKALE	0,00
		4	75	ARDAHAN	0,00			4	74	BARTIN	0,00			4	69	BAYBURT	0,00
		5	74	BARTIN	,00[a]			5	73	ŞIRNAK	,00[a]			5	66	YOZGAT	,00[a]
Lg_Year2004	Highest	1	34	İSTANBUL	4,05	Lg_Year2010	Highest	1	34	İSTANBUL	4,18	Lg_Year2016	Highest	1	34	İSTANBUL	4,22
		2	16	BURSA	3,53			2	16	BURSA	3,40			2	38	KAYSERİ	3,67
		3	6	ANKARA	3,07			3	27	GAZİANTEP	3,25			3	27	GAZİANTEP	3,60
		4	27	GAZİANTEP	3,02			4	6	ANKARA	3,24			4	16	BURSA	3,56
		5	35	İZMİR	2,96			5	35	İZMİR	3,21			5	6	ANKARA	3,45
	Lowest	1	79	KİLİS	0,00		Lowest	1	80	OSMANİYE	0,00		Lowest	1	76	IĞDIR	0,00
		2	76	IĞDIR	0,00			2	76	IĞDIR	0,00			2	75	ARDAHAN	0,00
		3	75	ARDAHAN	0,00			3	74	BARTIN	0,00			3	73	ŞIRNAK	0,00
		4	74	BARTIN	0,00			4	73	ŞIRNAK	0,00			4	71	KIRIKKALE	0,00
		5	73	ŞIRNAK	,00[a]			5	71	KIRIKKALE	,00[a]			5	66	YOZGAT	,00[a]
Lg_Year2005	Highest	1	34	İSTANBUL	4,04	Lg_Year2011	Highest	1	34	İSTANBUL	4,21	Lg_Year2017	Highest	1	34	İSTANBUL	4,18
		2	16	BURSA	3,50			2	16	BURSA	3,38			2	27	GAZİANTEP	3,57
		3	6	ANKARA	3,09			3	27	GAZİANTEP	3,38			3	16	BURSA	3,55
		4	27	GAZİANTEP	3,06			4	6	ANKARA	3,30			4	38	KAYSERİ	3,54
		5	35	İZMİR	3,03			5	35	İZMİR	3,17			5	6	ANKARA	3,45
	Lowest	1	79	KİLİS	0,00		Lowest	1	76	IĞDIR	0,00		Lowest	1	75	ARDAHAN	0,00
		2	78	KARABÜK	0,00			2	73	ŞIRNAK	0,00			2	69	BAYBURT	0,00
		3	77	YALOVA	0,00			3	69	BAYBURT	0,00			3	66	YOZGAT	0,00
		4	76	IĞDIR	0,00			4	66	YOZGAT	0,00			4	65	VAN	0,00
		5	75	ARDAHAN	,00[a]			5	65	VAN	,00[a]			5	62	TUNCELİ	,00[a]

a. Only a partial list of cases with the value ,00 are shown in the table of lower extremes.

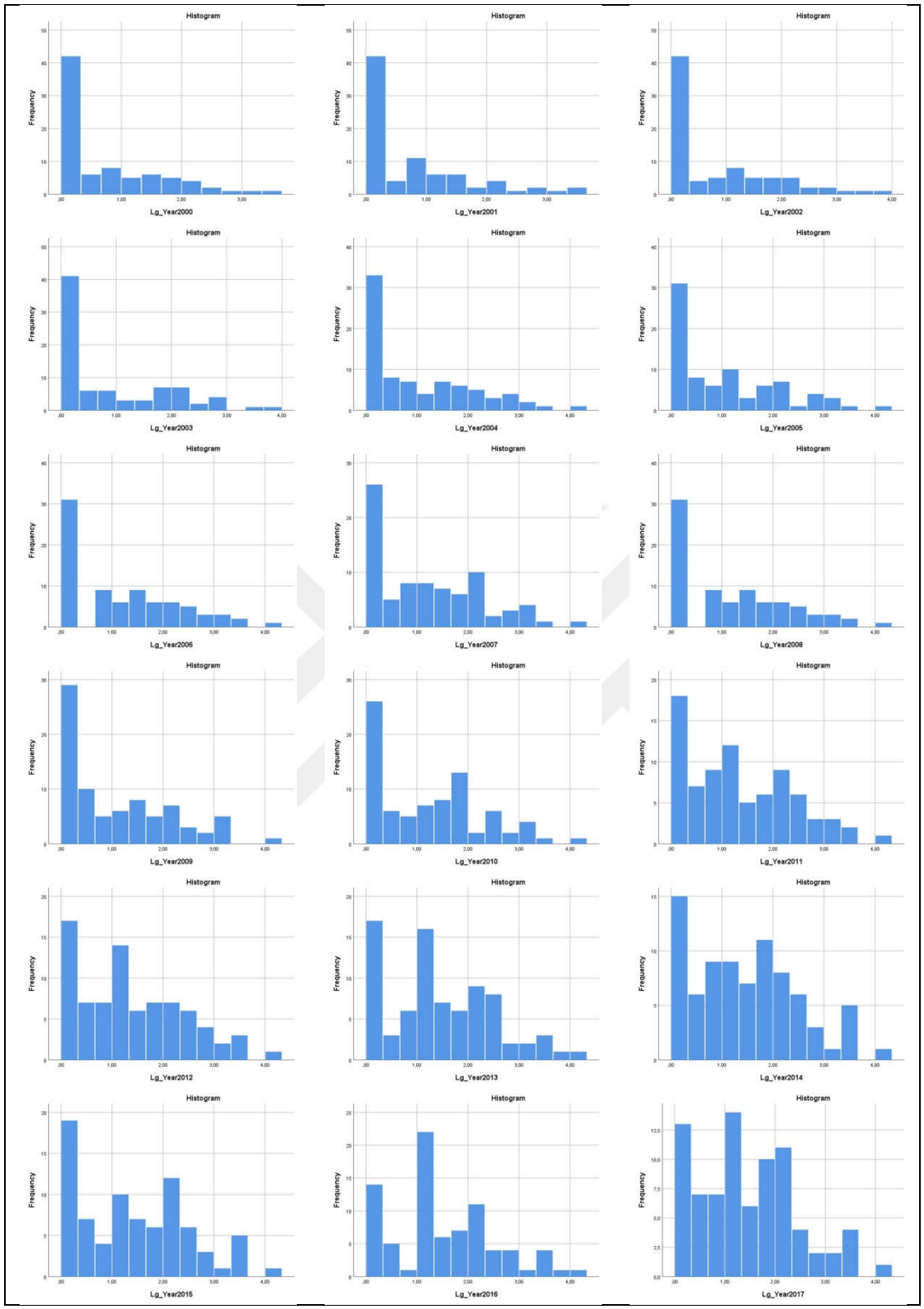


Figure A.59 : Histogram graphs.



Figure A.60 : Boxplots.

APPENDIX B: Classification of regions in terms of innovation performances (Empirical results by Markov Chains of Methodology 1)

Evaluation of "Distribution of Patent Applications" Indicator:

Methodology 1: This methodology considers mean values of the amount (count number) of the data by three time periods. These time periods are determined as 2000-2005 (t-1), 2006-2010 (t) and 2011-2017 (t+1).

By using counts (mean values) considering time periods (2000-2005, 2006-2010 and 2011-2017):

Table B.1 : Methodology 1 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	17	15	8	0	40
	3	0	2	20	3	25
	2	0	0	1	10	11
	1	0	0	0	5	5
		17	17	29	18	81
		2006-2010 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,43	0,38	0,20	0,00	0,49
	Medium-low	0,00	0,08	0,80	0,12	0,31
	Medium-up	0,00	0,00	0,09	0,91	0,14
	Upper	0,00	0,00	0,00	1,00	0,06
	Margin	0,21	0,21	0,36	0,22	
		Mobility Index	0,60			

Table B.2 : Methodology 1 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	17: AĞRI ARTVİN BİNGÖL BİTLİS ÇANKIRI ERZİNCAN HAKKARİ KARS MUŞ SİİRT TUNCELİ BAYBURT ŞIRNAK BARTIN ARDAHAN IĞDIR KİLİS	15: ADIYAMAN AMASYA EDİRNE KASTAMONU MARDİN RİZE SİNOP ŞANLIURFA VAN YOZGAT KARAMAN KIRIKKALE BATMAN KARABÜK OSMANİYE	8: DİYARBAKIR ELAZIĞ GÜMÜŞHANE KIRŞEHİR NEVŞEHİR SİVAS TOKAT ZONGULDAK	0	40
	Moderate Innovators	0	2: GİRESUN AKSARAY	20: AFYONKARAHİSAR AYDIN BİLECİK BOLU BURDUR ÇANAKKALE ÇORUM ERZURUM HATAY ISPARTA KIRKLARELİ KÜTAHYA MALATYA MUĞLA NİĞDE ORDU TRABZON UŞAK YALOVA DÜZCE	3: BALIKESİR KAHRAMANMARAŞ SAKARYA	25
	Strong Innovators	0	0	1: SAMSUN	10: ADANA ANTALYA DENİZLİ ESKİŞEHİR GAZİANTEP MERSİN KAYSERİ KONYA MANİSA TEKİRDAĞ	11
	Innovation Leaders	0	0	0	5: ANKARA BURSA İSTANBUL İZMİR KOCAELİ	5
		17	17	29	18	81

Table B.3 : Methodology 1 – Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	4	13	0	0	17
	3	0	2	12	3	17
	2	0	1	11	17	29
	1	0	0	0	18	18
		4	16	23	38	81
		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,24	0,76	0,00	0,00	0,21
	Medium-low	0,00	0,12	0,71	0,18	0,21
	Medium-up	0,00	0,03	0,38	0,59	0,36
	Upper	0,00	0,00	0,00	1,00	0,22
	Margin	0,05	0,20	0,28	0,47	
		Mobility Index	0,57			

Table B.4 : Methodology 1 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	4: AĞRI MUŞ ARDAHAN IĞDIR	13: ARTVİN BİNGÖL BİTLİS ÇANKIRI ERZİNCAN HAKKARİ KARS SİİRT TUNCELİ BAYBURT ŞIRNAK BARTIN KİLİS	0	0	17
	Moderate Innovators	0	2: MARDİN SİNOP	12: ADIYAMAN AMASYA GİRESUN KASTAMONU VAN YOZGAT AKSARAY KARAMAN KIRIKKALE BATMAN KARABÜK OSMANİYE	3: EDİRNE RİZE ŞANLIURFA	17
	Strong Innovators	0	1: KIRŞEHİR	11: BİLECİK BOLU BURDUR ÇANAKKALE DİYARBAKIR GÜMÜŞHANE NEVŞEHİR NİĞDE ORDU TOKAT UŞAK	17: AFYONKARAHİSAR AYDIN ÇORUM ELAZIĞ ERZURUM HATAY ISPARTA KIRKLARELİ KÜTAHYA MALATYA MUĞLA SAMSUN SİVAS TRABZON ZONGULDAK YALOVA DÜZCE	29
	Innovation Leaders	0	0	0	18: ADANA ANKARA ANTALYA BALIKESİR BURSA DENİZLİ ESKİŞEHİR GAZİANTEP MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA KAHRAMANMARAŞ SAKARYA TEKİRDAĞ	18
		4	16	23	38	81

REGIONAL INNOVATION PERFORMANCES OF TURKISH REGIONS AT NUTS–3 LEVEL

Patent Applications - Methodology 1

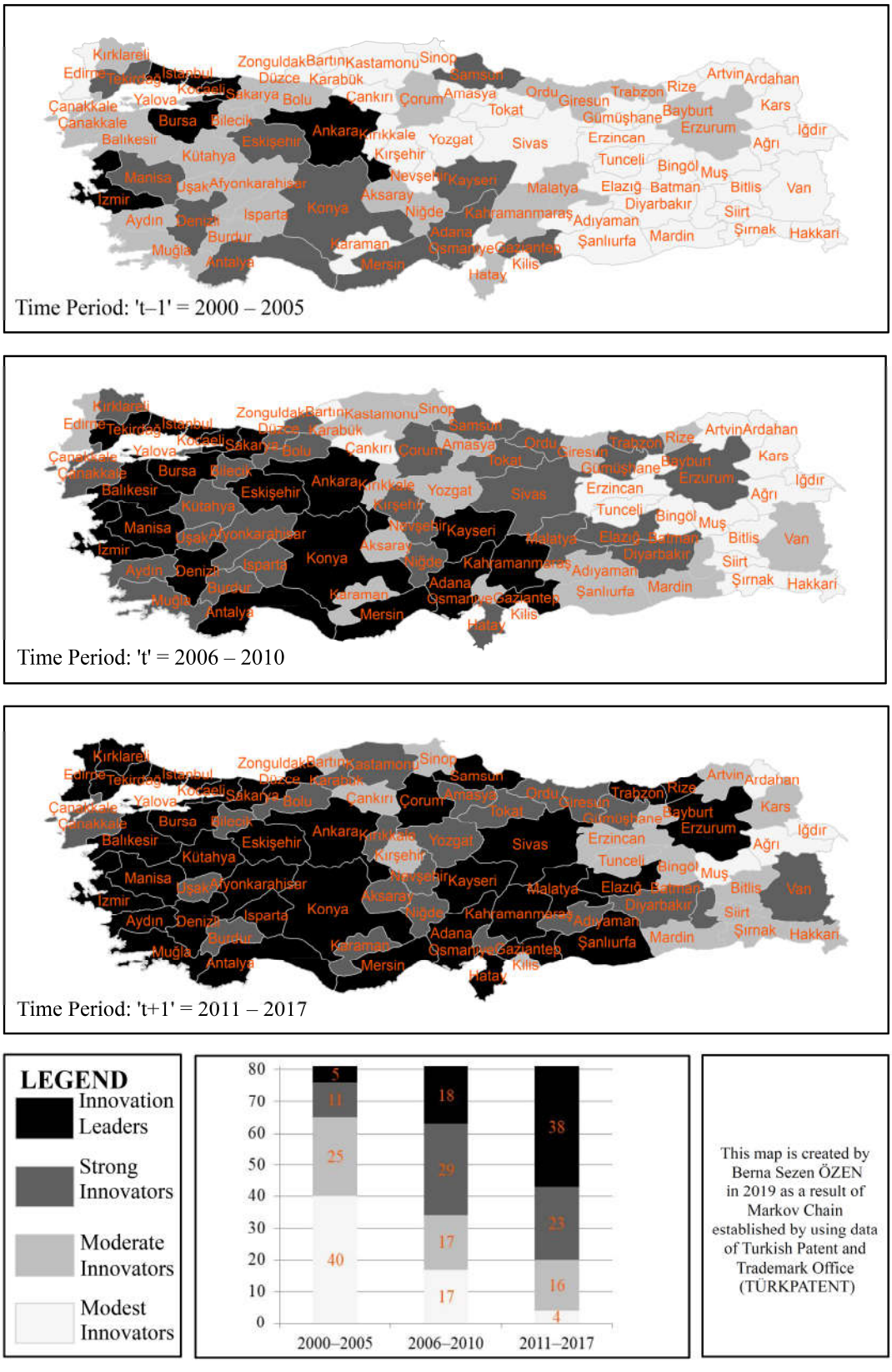


Figure B.1 : Methodology 1 – Regional maps of patent applications.

Evaluation of "Distribution of Patent Grants" Indicator:

Methodology 1: This methodology considers mean values of the amount (count number) of the data by three time periods. These time periods are determined as 2000-2005 (t-1), 2006-2010 (t) and 2011-2017 (t+1).

By using counts (mean values) considering time periods (2000-2005, 2006-2010 and 2011-2017):

Table B.5 : Methodology 1 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	0	0	0	0	0
	3	0	38	24	3	65
	2	0	0	2	8	10
	1	0	0	0	6	6
		0	38	26	17	81
		2006-2010 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,00	0,00	0,00	0,00	0,00
	Medium-low	0,00	0,58	0,37	0,05	0,80
	Medium-up	0,00	0,00	0,20	0,80	0,12
	Upper	0,00	0,00	0,00	1,00	0,07
	Margin	0,00	0,47	0,32	0,21	
		Mobility Index	0,55			

Table B.6 : Methodology 1 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	0	0	0	0	0
	Moderate Innovators	0	38: ADIYAMAN AĞRI AMASYA ARTVİN BİNGÖL BİTLİS ÇANKIRI DİYARBAKIR EDİRNE ERZİNCAN HAKKARİ KARS KASTAMONU KIRKLARELİ KIRŞEHİR MALATYA MARDİN MUŞ NEVŞEHİR RİZE SİİRT SİNOP TUNCELİ ŞANLIURFA VAN YOZGAT AKSARAY BAYBURT KARAMAN BATMAN ŞIRNAK BARTIN ARDAHAN IĞDIR YALOVA KARABÜK KİLİS OSMANİYE	24: AYDIN BOLU BURDUR ÇANAKKALE ÇORUM ELAZIĞ ERZURUM GİRESUN GÜMÜŞHANE HATAY ISPARTA MERSİN KÜTAHYA KAHRAMANMARAŞ MUĞLA ORDU SAMSUN SİVAS TOKAT TRABZON UŞAK ZONGULDAK KIRIKKALE DÜZCE	3: BİLECİK SAKARYA TEKİRDAĞ	65
	Strong Innovators	0	0	2: BALIKESİR NİĞDE	8: ADANA AFYONKARAHİSAR ANTALYA DENİZLİ ESKİŞEHİR GAZİANTEP KAYSERİ KONYA	10
	Innovation Leaders	0	0	0	6: ANKARA BURSA İSTANBUL İZMİR KOCAELİ MANİSA	6
		0	38	26	17	81

Table B.7 : Methodology 1 – Changes between t and t+1 time periods.

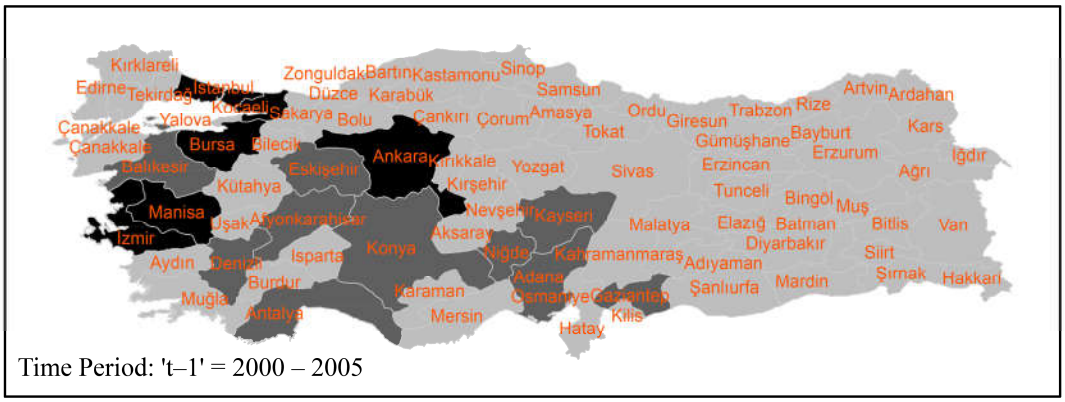
		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	0	0	0	0	0
	3	0	16	16	6	38
	2	0	0	10	16	26
	1	0	0	0	17	17
		0	16	26	39	81
		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,00	0,00	0,00	0,00	0,00
	Medium-low	0,00	0,42	0,42	0,16	0,47
	Medium-up	0,00	0,00	0,38	0,62	0,32
	Upper	0,00	0,00	0,00	1,00	0,21
	Margin	0,00	0,20	0,32	0,48	
		Mobility Index	0,55			

Table B.8 : Methodology 1 – Assessment of regions between t and t+1 time periods.

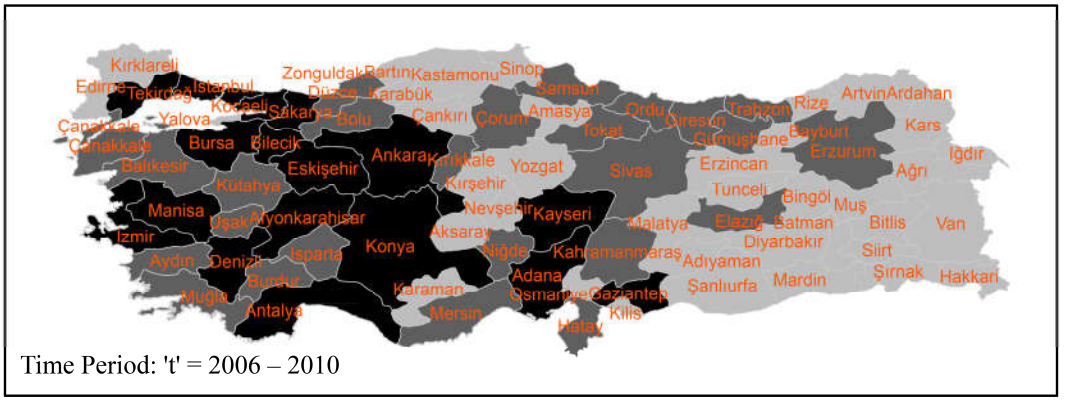
		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	0	0	0	0	0
	Moderate Innovators	0	16: AĞRI ARTVİN BİTLİS ERZİNCAN HAKKARİ KARS MUŞ SİİRT TUNCELİ VAN BAYBURT BATMAN ŞIRNAK ARDAHAN IĞDIR KİLİS	16: ADIYAMAN AMASYA BİNGÖL ÇANKIRI DİYARBAKIR KIRŞEHİR MARDİN NEVŞEHİR SİNOP ŞANLIURFA YOZGAT AKSARAY KARAMAN BARTIN KARABÜK OSMANİYE	6: EDİRNE KASTAMONU KIRKLARELİ MALATYA RİZE YALOVA	38
	Strong Innovators	0	0	10: BOLU ÇANAKKALE ERZURUM GÜMÜŞHANE KAHRAMANMARAŞ NİĞDE ORDU SİVAS TOKAT KIRIKKALE	16: AYDIN BALIKESİR BURDUR ÇORUM ELAZIĞ GİRESUN HATAY ISPARTA MERSİN KÜTAHYA MUĞLA SAMSUN TRABZON UŞAK ZONGULDAK DÜZCE	26
	Innovation Leaders	0	0	0	17: ADANA AFYONKARAHİSAR ANKARA ANTALYA BİLECİK BURSA DENİZLİ ESKİŞEHİR GAZİANTEP İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA SAKARYA TEKİRDAĞ	17
		0	16	26	39	81

REGIONAL INNOVATION PERFORMANCES OF TURKISH REGIONS AT NUTS–3 LEVEL

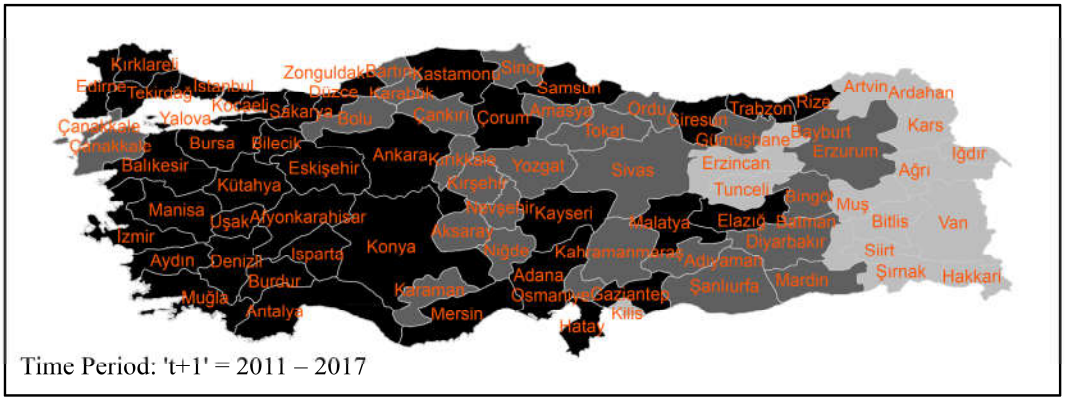
Patent Grants - Methodology 1



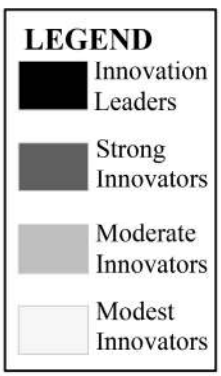
Time Period: 't–1' = 2000 – 2005

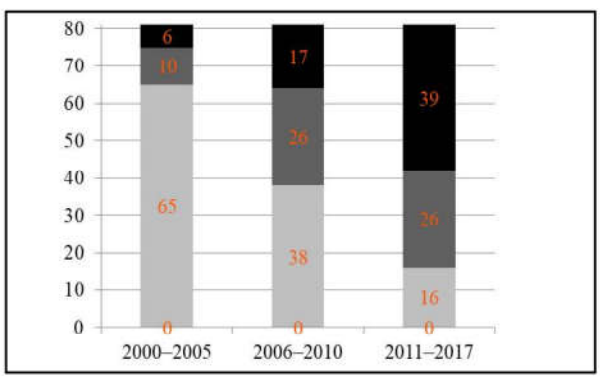


Time Period: 't' = 2006 – 2010



Time Period: 't+1' = 2011 – 2017





This map is created by Berna Sezen ÖZEN in 2019 as a result of Markov Chain established by using data of Turkish Patent and Trademark Office (TÜRKPATENT)

Figure B.2 : Methodology 1 - Regional maps of patent grants.

Evaluation of "Distribution of Utility Models Applications" Indicator:

Markov Chains-Methodology 1: This methodology considers mean values of the amount (count number) of the data by three time periods. These time periods are determined as 2000-2005 (t-1), 2006-2010 (t) and 2011-2017 (t+1).

By using counts (mean values) considering time periods (2000-2005, 2006-2010 and 2011-2017):

Table B.9 : Methodology 1 - Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	13	17	6	0	36
	3	0	6	15	1	22
	2	0	0	3	8	11
	1	0	0	0	12	12
		13	23	24	21	81
		2006-2010 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,36	0,47	0,17	0,00	0,44
	Medium-low	0,00	0,27	0,68	0,05	0,27
	Medium-up	0,00	0,00	0,27	0,73	0,14
	Upper	0,00	0,00	0,00	1,00	0,15
	Margin	0,16	0,28	0,30	0,26	
		Mobility Index	0,52			

Table B.10 : Methodology 1 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	13: AĞRI ARTVİN BİNGÖL BİTLİS GÜMÜŞHANE HAKKARİ MUŞ SİİRT TUNCELİ BAYBURT ŞIRNAK ARDAHAN KİLİS	17: ADIYAMAN BOLU ÇANKIRI EDİRNE ERZİNCAN KARS KIRŞEHİR MARDİN NİĞDE SİNOP VAN YOZGAT BATMAN BARTIN IĞDIR KARABÜK OSMANİYE	6: DİYARBAKIR ERZURUM KIRKLARELİ NEVŞEHİR TOKAT UŞAK	0	36
	Moderate Innovators	0	6: ELAZIĞ GİRESUN RİZE ŞANLIURFA AKSARAY KIRIKKALE	15: AFYONKARAHİSAR AMASYA BİLECİK ÇANAKKALE HATAY KASTAMONU MALATYA KAHRAMANMARAŞ ORDU SİVAS TRABZON ZONGULDAK KARAMAN YALOVA DÜZCE	1: ÇORUM	22
	Strong Innovators	0	0	3: ISPARTA KÜTAHYA MUĞLA	8: AYDIN BALIKESİR BURDUR GAZİANTEP MERSİN SAKARYA SAMSUN TEKİRDAĞ	11
	Innovation Leaders	0	0	0	12: ADANA ANKARA ANTALYA BURSA DENİZLİ ESKİŞEHİR İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA	12
		13	23	24	21	81

Table B.11 : Methodology 1 - Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	10	3	0	0	13
	3	1	12	10	0	23
	2	0	0	17	7	24
	1	0	0	0	21	21
		11	15	27	28	81

		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,77	0,23	0,00	0,00	0,16
	Medium-low	0,04	0,52	0,43	0,00	0,28
	Medium-up	0,00	0,00	0,71	0,29	0,30
	Upper	0,00	0,00	0,00	1,00	0,26
	Margin	0,14	0,19	0,33	0,35	
		Mobility Index	0,25			

Table B.12 : Methodology 1 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				Sum
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	
2006-2010 (t)	**Modest Innovators**	10: AĞRI ARTVİN BİTLİS HAKKARİ MUŞ SİİRT TUNCELİ BAYBURT ARDAHAN KİLİS	3: BİNGÖL GÜMÜŞHANE ŞIRNAK	0	0	13
	Moderate Innovators	1: IĞDIR	12: ADIYAMAN EDİRNE ERZİNCAN KARS KIRŞEHİR MARDİN NİĞDE SİNOP KIRIKKALE BATMAN BARTIN KARABÜK	10: BOLU ÇANKIRI ELAZIĞ GİRESUN RİZE ŞANLIURFA VAN YOZGAT AKSARAY OSMANİYE	0	23
	Strong Innovators	0	0	17: AMASYA BİLECİK ÇANAKKALE DİYARBAKIR ERZURUM KASTAMONU KIRKLARELİ KÜTAHYA MALATYA NEVŞEHİR ORDU SİVAS TOKAT UŞAK ZONGULDAK KARAMAN YALOVA	7: AFYONKARAHİSAR HATAY ISPARTA KAHRAMANMARAŞ MUĞLA TRABZON DÜZCE	24
	Innovation Leaders	0	0	0	21: ADANA ANKARA ANTALYA AYDIN BALIKESİR BURDUR BURSA ÇORUM DENİZLİ ESKİŞEHİR GAZİANTEP MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA SAKARYA SAMSUN TEKİRDAĞ	21
		11	15	27	28	81

REGIONAL INNOVATION PERFORMANCES OF TURKISH REGIONS AT NUTS-3 LEVEL

Utility Model Applications - Methodology 1

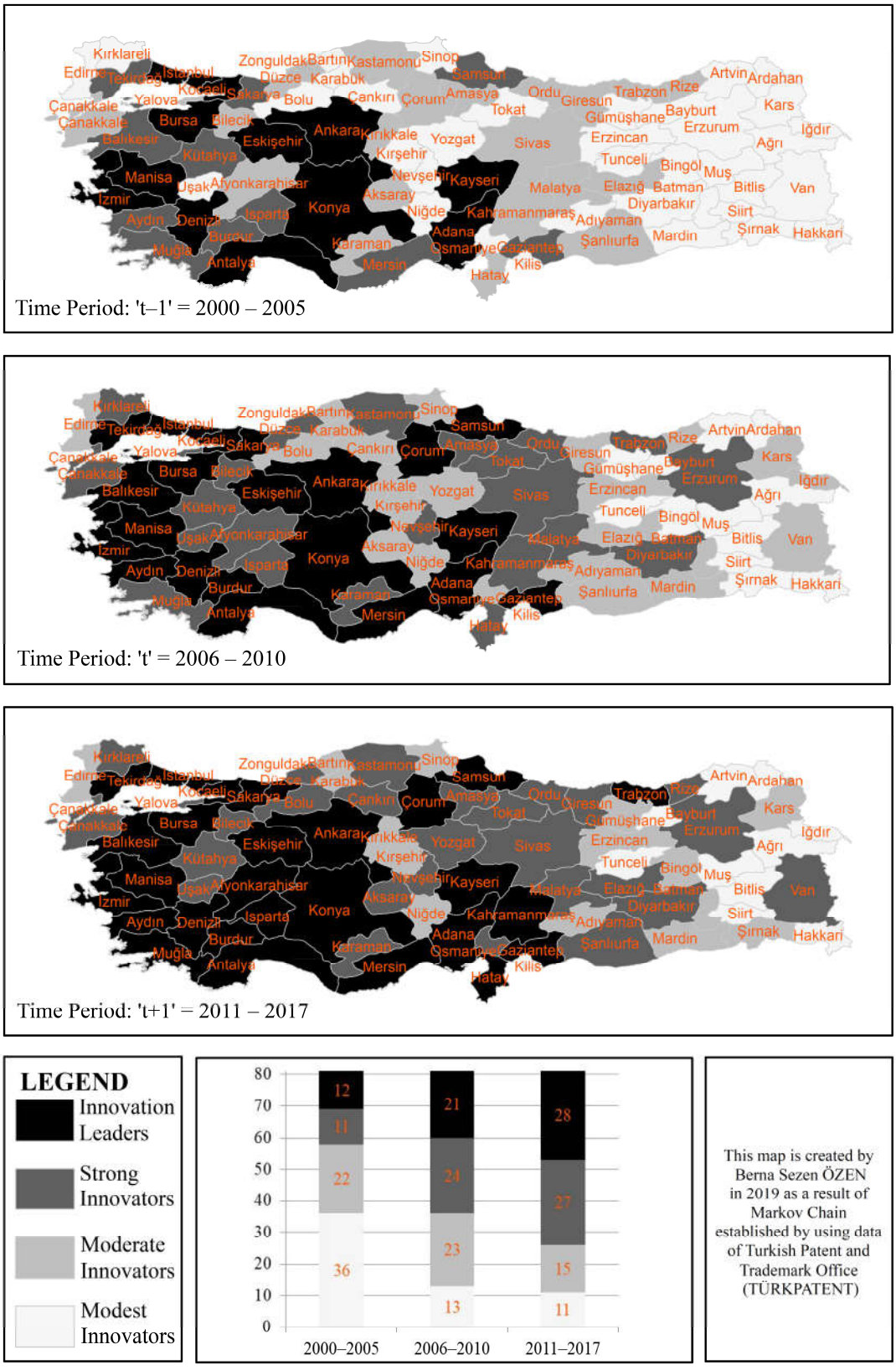


Figure B.3 : Methodology 1 - Regional maps of 'utility model applications'.

Evaluation of "Distribution of Utility Models Grants" Indicator:

Methodology 1: This methodology considers mean values of the amount (count number) of the data by three time periods. These time periods are determined as 2000-2005 (t-1), 2006-2010 (t) and 2011-2017 (t+1).

By using counts (mean values) considering time periods (2000-2005, 2006-2010 and 2011-2017):

Table B.13 : Methodology 1 - Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	12	16	5	0	33
	3	1	6	17	2	26
	2	0	0	2	9	11
	1	0	0	0	11	11
		13	22	24	22	81
		2006-2010 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,36	0,48	0,15	0,00	0,41
	Medium-low	0,04	0,23	0,65	0,08	0,32
	Medium-up	0,00	0,00	0,18	0,82	0,14
	Upper	0,00	0,00	0,00	1,00	0,14
	Margin	0,16	0,27	0,30	0,27	
		Mobility Index	0,56			

Table B.14 : Methodology 1 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	12: AĞRI BİNGÖL BİTLİS GÜMÜŞHANE HAKKARİ SİİRT TUNCELİ BAYBURT BATMAN ŞIRNAK BARTIN KİLİS	16: ADIYAMAN ARTVİN DİYARBAKIR EDİRNE ERZİNCAN ERZURUM KARS RİZE SİNOP VAN YOZGAT ZONGULDAK ARDAHAN IĞDIR KARABÜK OSMANİYE	5: BİLECİK BOLU NEVŞEHİR ORDU AKSARAY	0	33
	Moderate Innovators	1: ÇANKIRI	6: GİRESUN KIRŞEHİR MARDİN MUŞ NİĞDE KIRIKKALE	17: AMASYA ELAZIĞ HATAY ISPARTA KASTAMONU KIRKLARELİ KÜTAHYA MALATYA MUĞLA SİVAS TOKAT TRABZON ŞANLIURFA UŞAK KARAMAN YALOVA DÜZCE	2: ÇANAKKALE ÇORUM	26
	Strong Innovators	0	0	2: AFYONKARAHİSAR KAHRAMANMARAŞ	9: ADANA AYDIN BURDUR DENİZLİ GAZİANTEP MERSİN SAKARYA SAMSUN TEKİRDAĞ	11
	Innovation Leaders	0	0	0	11: ANKARA ANTALYA BALIKESİR BURSA ESKİŞEHİR İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA	11
		13	22	24	22	81

Table B.15 : Methodology 1 – Changes between t and t+1 time periods.

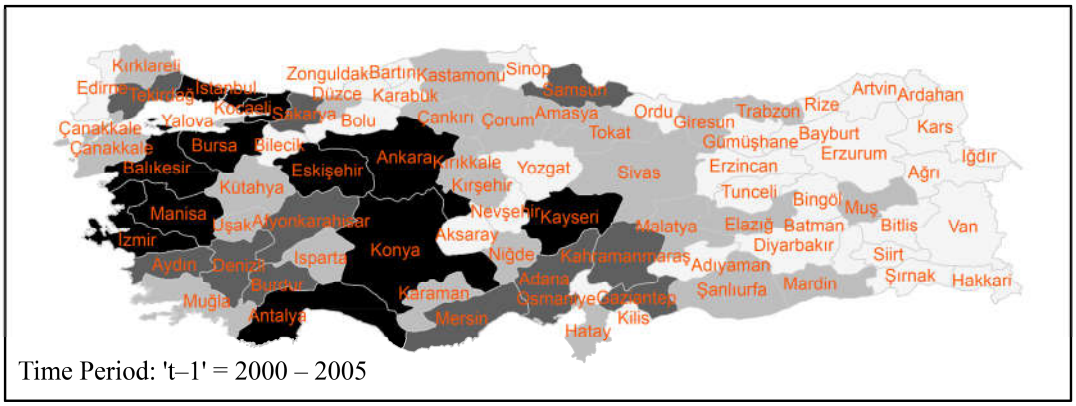
		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	9	4	0	0	13
	3	6	6	10	0	22
	2	0	2	15	7	24
	1	0	0	1	21	22
		15	12	26	28	81
		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,69	0,31	0,00	0,00	0,16
	Medium-low	0,27	0,27	0,45	0,00	0,27
	Medium-up	0,00	0,08	0,63	0,29	0,30
	Upper	0,00	0,00	0,05	0,95	0,27
	Margin	0,19	0,15	0,32	0,35	
		Mobility Index	0,36			

Table B.16 : Methodology 1 – Assessment of regions between t and t+1 time periods.

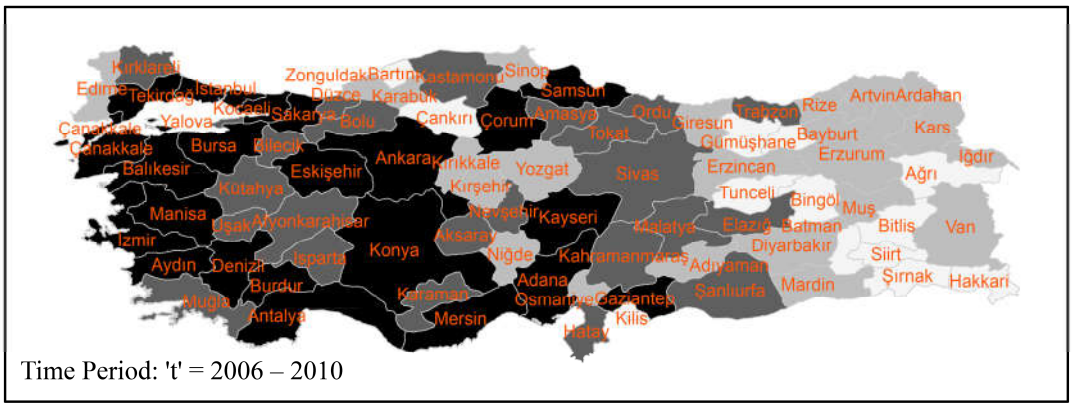
		2011-2017 (t+1)				Sum
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	
2006-2010 (t)	**Modest Innovators**	9: AĞRI BİNGÖL BİTLİS HAKKARİ SİİRT TUNCELİ BAYBURT ŞIRNAK KİLİS	4: ÇANKIRI GÜMÜŞHANE BATMAN BARTIN	0	0	13
	Moderate Innovators	6: ERZİNCAN KARS KIRŞEHİR MUŞ ARDAHAN IĞDIR	6: ADIYAMAN ARTVİN MARDİN SİNOP VAN KARABÜK	10: DİYARBAKIR EDİRNE ERZURUM GİRESUN NİĞDE RİZE YOZGAT ZONGULDAK KIRIKKALE OSMANİYE	0	22
	Strong Innovators	0	2: BİLECİK ŞANLIURFA	15: AMASYA BOLU ELAZIĞ KASTAMONU KIRKLARELİ KÜTAHYA MALATYA ORDU SİVAS TOKAT TRABZON UŞAK AKSARAY KARAMAN YALOVA	7: AFYONKARAHİSAR HATAY ISPARTA KAHRAMANMARAŞ MUĞLA NEVŞEHİR DÜZCE	24
	Innovation Leaders	0	0	1: ÇANAKKALE	21: ADANA ANKARA ANTALYA AYDIN BALIKESİR BURDUR BURSA ÇORUM DENİZLİ ESKİŞEHİR GAZİANTEP MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA SAKARYA SAMSUN TEKİRDAĞ	22
		15	12	26	28	81

REGIONAL INNOVATION PERFORMANCES OF TURKISH REGIONS AT NUTS–3 LEVEL

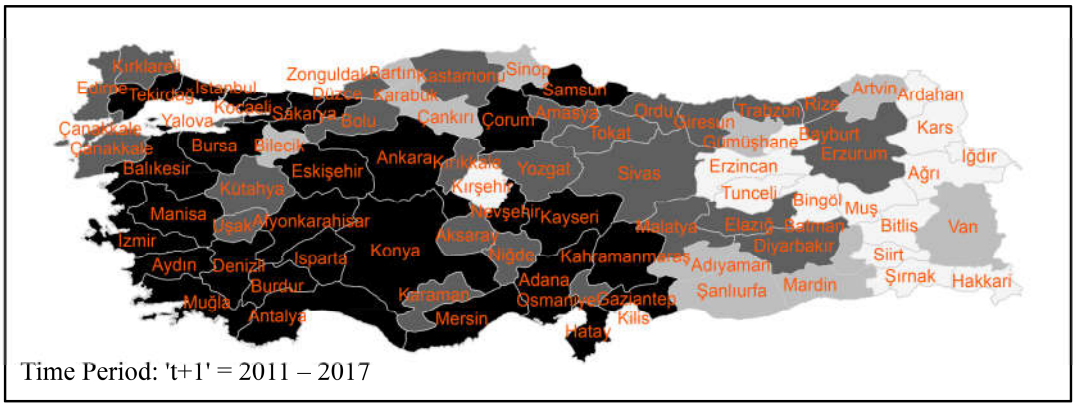
Utility Model Grants - Methodology 1



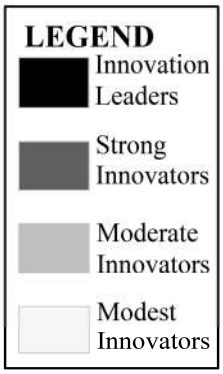
Time Period: 't–1' = 2000 – 2005

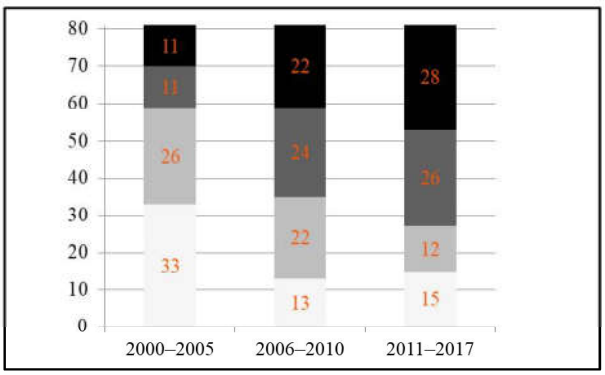


Time Period: 't' = 2006 – 2010



Time Period: 't+1' = 2011 – 2017





This map is created by Berna Sezen ÖZEN in 2019 as a result of Markov Chain established by using data of Turkish Patent and Trademark Office (TÜRKPATENT)

Figure B.4 : Methodology 1 – Regional maps of 'utility model grants'.

Evaluation of "Distribution of Trademark Applications" Indicator:

Methodology 1: This methodology considers mean values of the amount (count number) of the data by three time periods. These time periods are determined as 2000-2005 (t-1), 2006-2010 (t) and 2011-2017 (t+1).

By using counts (mean values) considering time periods (2000-2005, 2006-2010 and 2011-2017):

Table B.17 : Methodology 1 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	19	12	0	0	31
	3	0	9	14	0	23
	2	0	0	7	7	14
	1	0	0	0	13	13
		19	21	21	20	81
		2006-2010 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,61	0,39	0,00	0,00	0,38
	Medium-low	0,00	0,39	0,61	0,00	0,28
	Medium-up	0,00	0,00	0,50	0,50	0,17
	Upper	0,00	0,00	0,00	1,00	0,16
	Margin	0,23	0,26	0,26	0,25	
		Mobility Index	0,37			

Table B.18 : Methodology 1 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	19: AĞRI ARTVİN BİLECİK BİNGÖL BİTLİS ÇANKIRI GÜMÜŞHANE HAKKARİ KARS KIRŞEHİR MUŞ SİİRT SİNOP TUNCELİ BAYBURT ŞIRNAK ARDAHAN IĞDIR KİLİS	12: ADIYAMAN BURDUR ERZİNCAN KASTAMONU NİĞDE ZONGULDAK KIRIKKALE BATMAN BARTIN YALOVA KARABÜK OSMANİYE	0	0	31
	Moderate Innovators	0	9: AMASYA BOLU GİRESUN NEVŞEHİR UŞAK VAN YOZGAT AKSARAY DÜZCE	14: ÇANAKKALE ÇORUM DİYARBAKIR EDİRNE ELAZIĞ ERZURUM ISPARTA KIRKLARELİ MALATYA MARDİN ORDU SİVAS TOKAT ŞANLIURFA	0	23
	Strong Innovators	0	0	7: AFYONKARAHİSAR KÜTAHYA KAHRAMANMARAŞ RİZE TEKİRDAĞ TRABZON KARAMAN	7: AYDIN BALIKESİR HATAY MANİSA MUĞLA SAKARYA SAMSUN	14
	Innovation Leaders	0	0	0	13: ADANA ANKARA ANTALYA BURSA DENİZLİ ESKİŞEHİR GAZİANTEP MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA	13
		19	21	21	20	81

Table B.19 : Methodology 1 – Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	11	8	0	0	19
	3	0	8	13	0	21
	2	0	0	13	8	21
	1	0	0	0	20	20
		11	16	26	28	81
		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,58	0,42	0,00	0,00	0,23
	Medium-low	0,00	0,38	0,62	0,00	0,26
	Medium-up	0,00	0,00	0,62	0,38	0,26
	Upper	0,00	0,00	0,00	1,00	0,25
	Margin	0,14	0,20	0,32	0,35	
		Mobility Index	0,36			

Table B.20 : Methodology 1 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	11: ARTVİN BİNGÖL BİTLİS GÜMÜŞHANE HAKKARİ KARS MUŞ SİİRT TUNCELİ BAYBURT ARDAHAN	8: AĞRI BİLECİK ÇANKIRI KIRŞEHİR SİNOP ŞIRNAK IĞDIR KİLİS	0	0	19
	Moderate Innovators	0	8: AMASYA BURDUR ERZİNCAN KASTAMONU NİĞDE YOZGAT KIRIKKALE BARTIN	13: ADIYAMAN BOLU GİRESUN NEVŞEHİR UŞAK VAN ZONGULDAK AKSARAY BATMAN YALOVA KARABÜK OSMANİYE DÜZCE	0	21
	Strong Innovators	0	0	13: ÇORUM EDİRNE ELAZIĞ ERZURUM ISPARTA KIRKLARELİ KÜTAHYA MARDİN ORDU RİZE SİVAS TOKAT KARAMAN	8: AFYONKARAHİSAR ÇANAKKALE DİYARBAKIR MALATYA KAHRAMANMARAŞ TEKİRDAĞ TRABZON ŞANLIURFA	21
	Innovation Leaders	0	0	0	20: ADANA ANKARA ANTALYA AYDIN BALIKESİR BURSA DENİZLİ ESKİŞEHİR GAZİANTEP HATAY MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA MUĞLA SAKARYA SAMSUN	20
		11	16	26	28	81

REGIONAL INNOVATION PERFORMANCES OF TURKISH REGIONS AT NUTS–3 LEVEL

Trademark Applications - Methodology 1

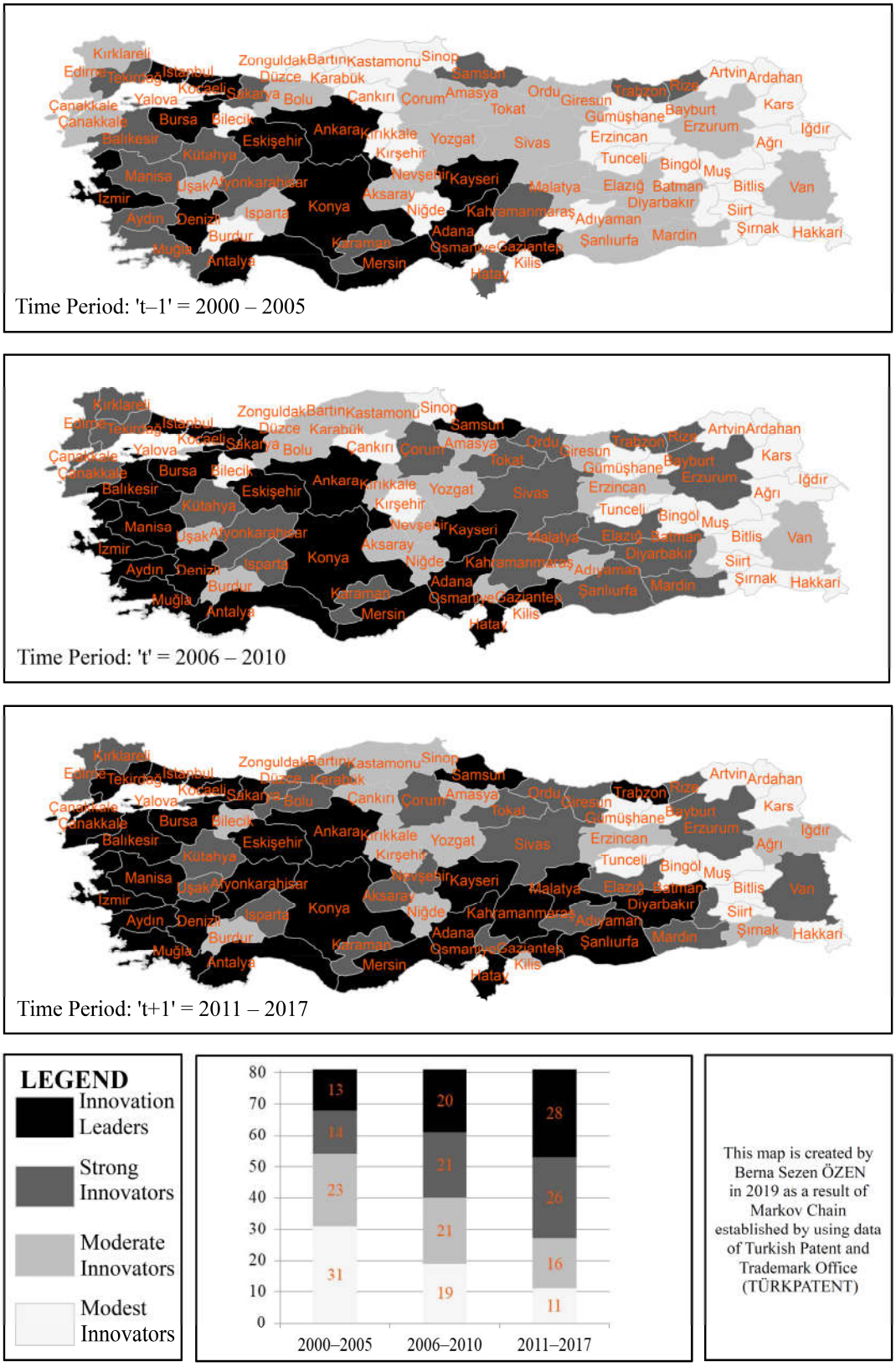


Figure B.5 : Methodology 1 – Regional maps of 'trademark applications'.

Evaluation of "Distribution of Trademark Registrations" Indicator:

Methodology 1: This methodology considers mean values of the amount (count number) of the data by three time periods. These time periods are determined as 2000-2005 (t-1), 2006-2010 (t) and 2011-2017 (t+1).

By using counts (mean values) considering time periods (2000-2005, 2006-2010 and 2011-2017):

Table B.21 : Methodology 1 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	18	16	1	0	35
	3	0	6	14	0	20
	2	0	0	6	8	14
	1	0	0	0	12	12
		18	22	21	20	81
		2006-2010 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,51	0,46	0,03	0,00	0,43
	Medium-low	0,00	0,30	0,70	0,00	0,25
	Medium-up	0,00	0,00	0,43	0,57	0,17
	Upper	0,00	0,00	0,00	1,00	0,15
	Margin	0,22	0,27	0,26	0,25	
		Mobility Index	0,44			

Table B.22 : Methodology 1 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	18: AĞRI ARTVİN BİNGÖL BİTLİS GÜMÜŞHANE HAKKARİ KARS KIRŞEHİR MUŞ SİİRT SİNOP TUNCELİ BAYBURT KIRIKKALE ŞIRNAK ARDAHAN IĞDIR KİLİS	16: ADIYAMAN BİLECİK BURDUR ÇANKIRI ERZİNCAN KASTAMONU NİĞDE VAN YOZGAT ZONGULDAK BATMAN BARTIN YALOVA KARABÜK OSMANİYE DÜZCE	1: MARDİN	0	35
	Moderate Innovators	0	6: AMASYA BOLU GİRESUN NEVŞEHİR UŞAK AKSARAY	14: ÇANAKKALE ÇORUM DİYARBAKIR EDİRNE ELAZIĞ ERZURUM ISPARTA KIRKLARELİ MALATYA ORDU SİVAS TOKAT TRABZON ŞANLIURFA	0	20
	Strong Innovators	0	0	6: AFYONKARAHİSAR KÜTAHYA KAHRAMANMARAŞ RİZE TEKİRDAĞ KARAMAN	8: AYDIN BALIKESİR HATAY MERSİN MANİSA MUĞLA SAKARYA SAMSUN	14
	Innovation Leaders	0	0	0	12: ADANA ANKARA ANTALYA BURSA DENİZLİ ESKİŞEHİR GAZİANTEP İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA	12
		18	22	21	20	81

Table B.23 : Methodology 1 – Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	8	10	0	0	18
	3	0	8	14	0	22
	2	0	0	12	9	21
	1	0	0	0	20	20
		8	18	26	29	81
		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,44	0,56	0,00	0,00	0,22
	Medium-low	0,00	0,36	0,64	0,00	0,27
	Medium-up	0,00	0,00	0,57	0,43	0,26
	Upper	0,00	0,00	0,00	1,00	0,25
	Margin	0,10	0,22	0,32	0,36	
		Mobility Index	0,41			

Table B.24 : Methodology 1 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				Sum
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	
2006-2010 (t)	**Modest Innovators**	8: BİTLİS GÜMÜŞHANE KARS MUŞ TUNCELİ BAYBURT ARDAHAN IĞDIR	10: AĞRI ARTVİN BİNGÖL HAKKARİ KIRŞEHİR SİİRT SİNOP KIRIKKALE ŞIRNAK KİLİS	0	0	18
	Moderate Innovators	0	8: AMASYA BİLECİK BURDUR ÇANKIRI ERZİNCAN NİĞDE YOZGAT BARTIN	14: ADIYAMAN BOLU GİRESUN KASTAMONU NEVŞEHİR UŞAK VAN ZONGULDAK AKSARAY BATMAN YALOVA KARABÜK OSMANİYE DÜZCE	0	22
	Strong Innovators	0	0	12: ÇORUM EDİRNE ELAZIĞ ERZURUM ISPARTA KIRKLARELİ KÜTAHYA MARDİN ORDU RİZE SİVAS TOKAT	9: AFYONKARAHİSAR ÇANAKKALE DİYARBAKIR MALATYA KAHRAMANMARAŞ TEKİRDAĞ TRABZON ŞANLIURFA KARAMAN	21
	Innovation Leaders	0	0	0	20: ADANA ANKARA ANTALYA AYDIN BALIKESİR BURSA DENİZLİ ESKİŞEHİR GAZİANTEP HATAY MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA MANİSA MUĞLA SAKARYA SAMSUN	20
		8	18	26	29	81

REGIONAL INNOVATION PERFORMANCES OF TURKISH REGIONS AT NUTS–3 LEVEL

Trademark Registrations - Methodology 1

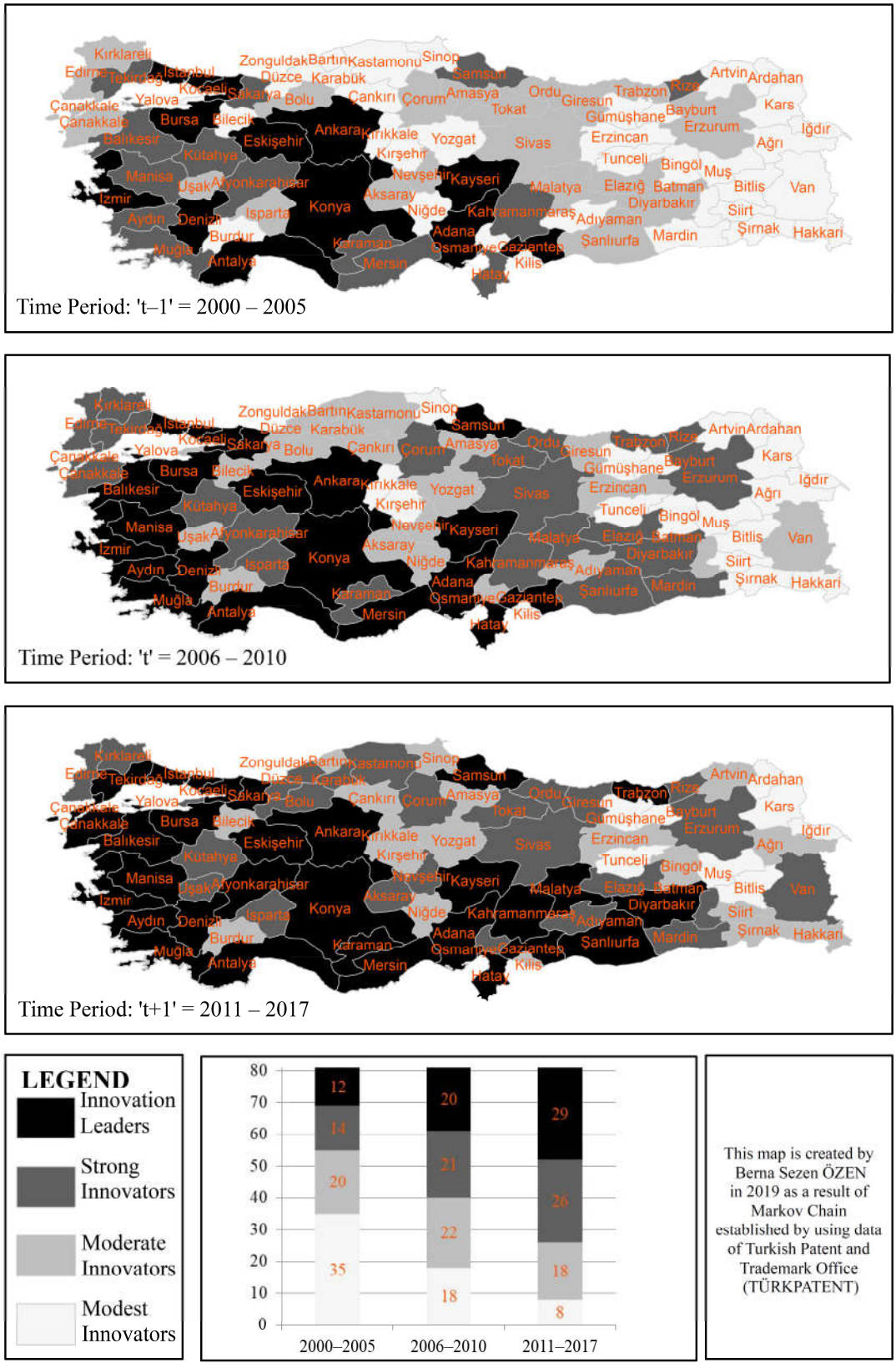


Figure B.6 : Methodology 1 – Regional maps of 'trademark registrations'.

Evaluation of "Distribution of Design Applications (File)" Indicator:

Methodology 1: This methodology considers mean values of the amount (count number) of the data by three time periods. These time periods are determined as 2000-2005 (t-1), 2006-2010 (t) and 2011-2017 (t+1).

By using counts (mean values) considering time periods (2000-2005, 2006-2010 and 2011-2017):

Table B.25 : Methodology 1 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	17	7	2	0	26
	3	3	14	7	0	24
	2	0	2	6	10	18
	1	0	0	0	13	13
		20	23	15	23	81
		2006-2010 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,65	0,27	0,08	0,00	0,32
	Medium-low	0,13	0,58	0,29	0,00	0,30
	Medium-up	0,00	0,11	0,33	0,56	0,22
	Upper	0,00	0,00	0,00	1,00	0,16
	Margin	0,25	0,28	0,19	0,28	
		Mobility Index	0,36			

Table B.26 : Methodology 1 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	17: ADIYAMAN ARTVİN BİNGÖL BİTLİS ERZİNCAN GÜMÜŞHANE HAKKARİ KARS MUŞ SİİRT TUNCELİ VAN BAYBURT ŞIRNAK BARTIN ARDAHAN IĞDIR	7: AĞRI ERZURUM MARDİN NEVŞEHİR TOKAT KARABÜK KİLİS	2: DİYARBAKIR ORDU	0	26
	Moderate Innovators	3: EDİRNE YOZGAT KIRIKKALE	14: BOLU BURDUR ÇANKIRI ELAZIĞ KASTAMONU KIRŞEHİR MALATYA SİNOP SİVAS ZONGULDAK AKSARAY BATMAN OSMANİYE DÜZCE	7: BİLECİK ÇORUM GİRESUN ISPARTA ŞANLIURFA UŞAK YALOVA	0	24
	Strong Innovators	0	2: KIRKLARELİ RİZE	6: AFYONKARAHİSAR AMASYA BALIKESİR MUĞLA NİĞDE TEKİRDAĞ	10: ANTALYA AYDIN ÇANAKKALE HATAY MERSİN KAHRAMANMARAŞ SAKARYA SAMSUN TRABZON KARAMAN	18
	Innovation Leaders	0	0	0	13: ADANA ANKARA BURSA DENİZLİ ESKİŞEHİR GAZİANTEP İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA	13
		20	23	15	23	81

Table B.27 : Methodology 1 – Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	13	6	1	0	20
	3	0	8	15	0	23
	2	0	1	12	2	15
	1	0	0	0	23	23
		13	15	28	25	81

		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,65	0,30	0,05	0,00	0,25
	Medium-low	0,00	0,35	0,65	0,00	0,28
	Medium-up	0,00	0,07	0,80	0,13	0,19
	Upper	0,00	0,00	0,00	1,00	0,28
	Margin	0,16	0,19	0,35	0,31	
		Mobility Index	0,30			

Table B.28 : Methodology 1 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				Sum
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	
2006-2010 (t)	**Modest Innovators**	13: ARTVİN BİNGÖL BİTLİS HAKKARİ KARS MUŞ SİİRT TUNCELİ YOZGAT BAYBURT ŞIRNAK ARDAHAN IĞDIR	6: ADIYAMAN ERZİNCAN GÜMÜŞHANE VAN KIRIKKALE BARTIN	1: EDİRNE	0	20
	Moderate Innovators	0	8: AĞRI ÇANKIRI ELAZIĞ KASTAMONU SİNOP TOKAT KARABÜK KİLİS	15: BOLU BURDUR ERZURUM KIRKLARELİ KIRŞEHİR MALATYA MARDİN NEVŞEHİR RİZE SİVAS ZONGULDAK AKSARAY BATMAN OSMANİYE DÜZCE	0	23
	Strong Innovators	0	1: NİĞDE	12: AFYONKARAHİSAR AMASYA BİLECİK ÇORUM DİYARBAKIR GİRESUN ISPARTA MUĞLA ORDU ŞANLIURFA UŞAK YALOVA	2: BALIKESİR TEKİRDAĞ	15
	Innovation Leaders	0	0	0	23: ADANA ANKARA ANTALYA AYDIN BURSA ÇANAKKALE DENİZLİ ESKİŞEHİR GAZİANTEP HATAY MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA KAHRAMANMARAŞ SAKARYA SAMSUN TRABZON KARAMAN	23
		13	15	28	25	81

REGIONAL INNOVATION PERFORMANCES OF TURKISH REGIONS AT NUTS–3 LEVEL

Design Applications (Number of Files) - Methodology 1

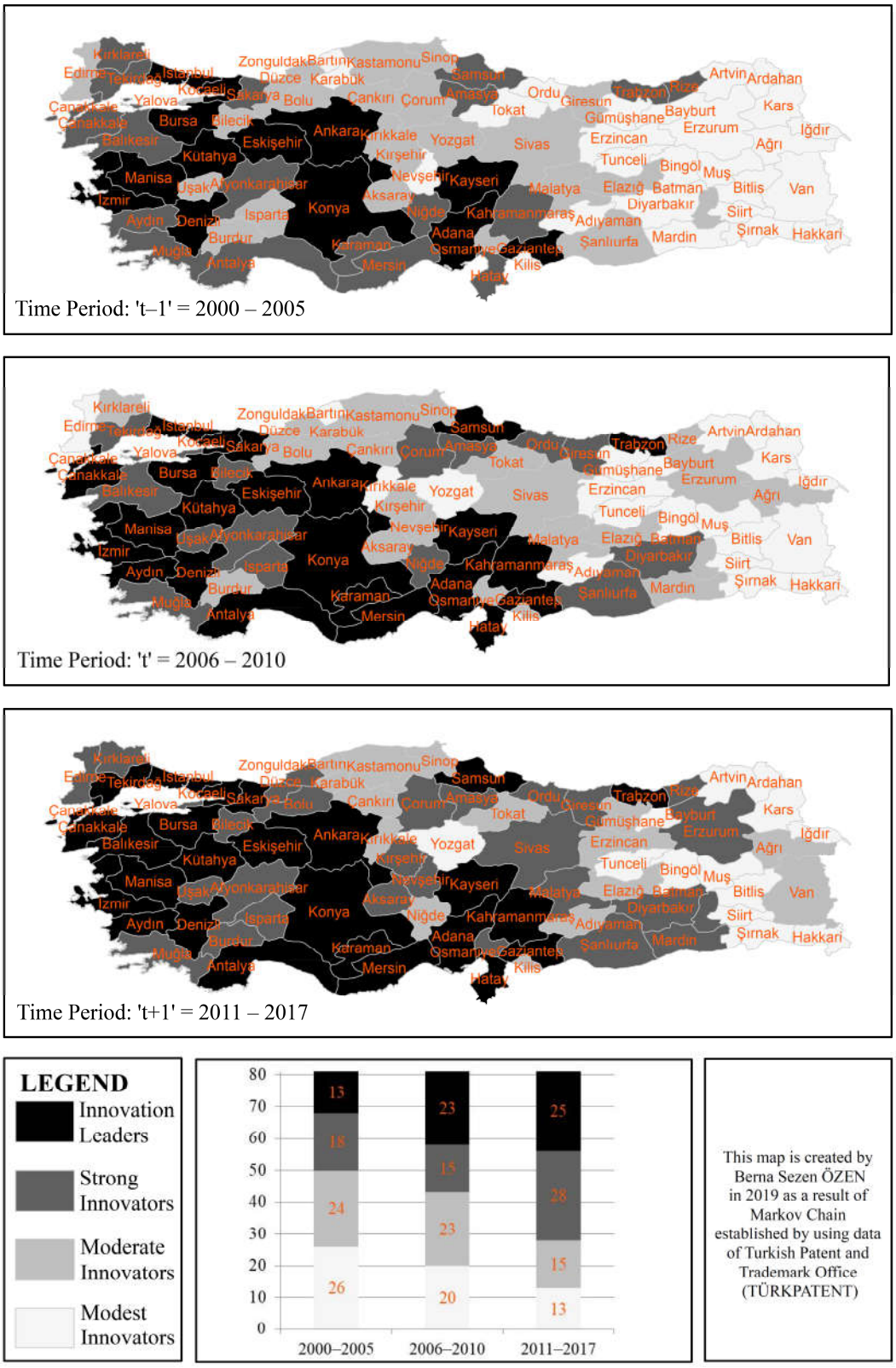


Figure B.7 : Methodology 1 – Regional maps of design applications (file).

Evaluation of "Distribution of Design Registrations (File)" Indicator:

Methodology 1: This methodology considers mean values of the amount (count number) of the data by three time periods. These time periods are determined as 2000-2005 (t-1), 2006-2010 (t) and 2011-2017 (t+1).

By using counts (mean values) considering time periods (2000-2005, 2006-2010 and 2011-2017):

Table B.29 : Methodology 1 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	16	11	2	0	29
	3	2	12	8	0	22
	2	0	2	6	8	16
	1	0	0	0	14	14
		18	25	16	22	81
		2006-2010 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,55	0,38	0,07	0,00	0,36
	Medium-low	0,09	0,55	0,36	0,00	0,27
	Medium-up	0,00	0,13	0,38	0,50	0,20
	Upper	0,00	0,00	0,00	1,00	0,17
	Margin	0,22	0,31	0,20	0,27	
		Mobility Index	0,38			

Table B.30 : Methodology 1 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	16: ARTVİN BİNGÖL BİTLİS ERZİNCAN GÜMÜŞHANE HAKKARİ KARS MUŞ SİİRT TUNCELİ VAN BAYBURT ŞIRNAK BARTIN ARDAHAN IĞDIR	11: ADIYAMAN AĞRI ÇANKIRI ERZURUM KASTAMONU MARDİN NEVŞEHİR SİNOP TOKAT KARABÜK KİLİS	2: DİYARBAKIR ORDU	0	29
	Moderate Innovators	2: YOZGAT KIRIKKALE	12: BOLU EDİRNE ELAZIĞ GİRESUN KIRŞEHİR MALATYA SİVAS ZONGULDAK AKSARAY BATMAN YALOVA OSMANİYE	8: AFYONKARAHİSAR BİLECİK BURDUR ÇORUM ISPARTA MUĞLA UŞAK DÜZCE	0	22
	Strong Innovators	0	2: KIRKLARELİ RİZE	6: AMASYA BALIKESİR NİĞDE TEKİRDAĞ TRABZON ŞANLIURFA	8: ANTALYA AYDIN ÇANAKKALE HATAY MERSİN KAHRAMANMARAŞ SAMSUN KARAMAN	16
	Innovation Leaders	0	0	0	14: ADANA ANKARA BURSA DENİZLİ ESKİŞEHİR GAZİANTEP İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA SAKARYA	14
		18	25	16	22	81

Table B.31 : Methodology 1 – Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	12	6	0	0	18
	3	0	9	16	0	25
	2	0	0	13	3	16
	1	0	0	0	22	22
		12	15	29	25	81
		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,67	0,33	0,00	0,00	0,22
	Medium-low	0,00	0,36	0,64	0,00	0,31
	Medium-up	0,00	0,00	0,81	0,19	0,20
	Upper	0,00	0,00	0,00	1,00	0,27
	Margin	0,15	0,19	0,36	0,31	
		Mobility Index	0,29			

Table B.32 : Methodology 1 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	12: ARTVİN BİNGÖL BİTLİS HAKKARİ KARS MUŞ TUNCELİ YOZGAT BAYBURT ŞIRNAK ARDAHAN IĞDIR	6: ERZİNCAN GÜMÜŞHANE SİİRT VAN KIRIKKALE BARTIN	0	0	18
	Moderate Innovators	0	9: ADIYAMAN AĞRI ÇANKIRI ELAZIĞ KASTAMONU SİNOP TOKAT KARABÜK KİLİS	16: BOLU EDİRNE ERZURUM GİRESUN KIRKLARELİ KIRŞEHİR MALATYA MARDİN NEVŞEHİR RİZE SİVAS ZONGULDAK AKSARAY BATMAN YALOVA OSMANİYE	0	25
	Strong Innovators	0	0	13: AFYONKARAHİSAR AMASYA BİLECİK BURDUR ÇORUM DİYARBAKIR ISPARTA MUĞLA NİĞDE ORDU ŞANLIURFA UŞAK DÜZCE	3: BALIKESİR TEKİRDAĞ TRABZON	16
	Innovation Leaders	0	0	0	22: ADANA ANKARA ANTALYA AYDIN BURSA ÇANAKKALE DENİZLİ ESKİŞEHİR GAZİANTEP HATAY MERSİN İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA KAHRAMANMARAŞ SAKARYA SAMSUN KARAMAN	22
		12	15	29	25	81

Design Registrations (Number of Files) - Methodology 1

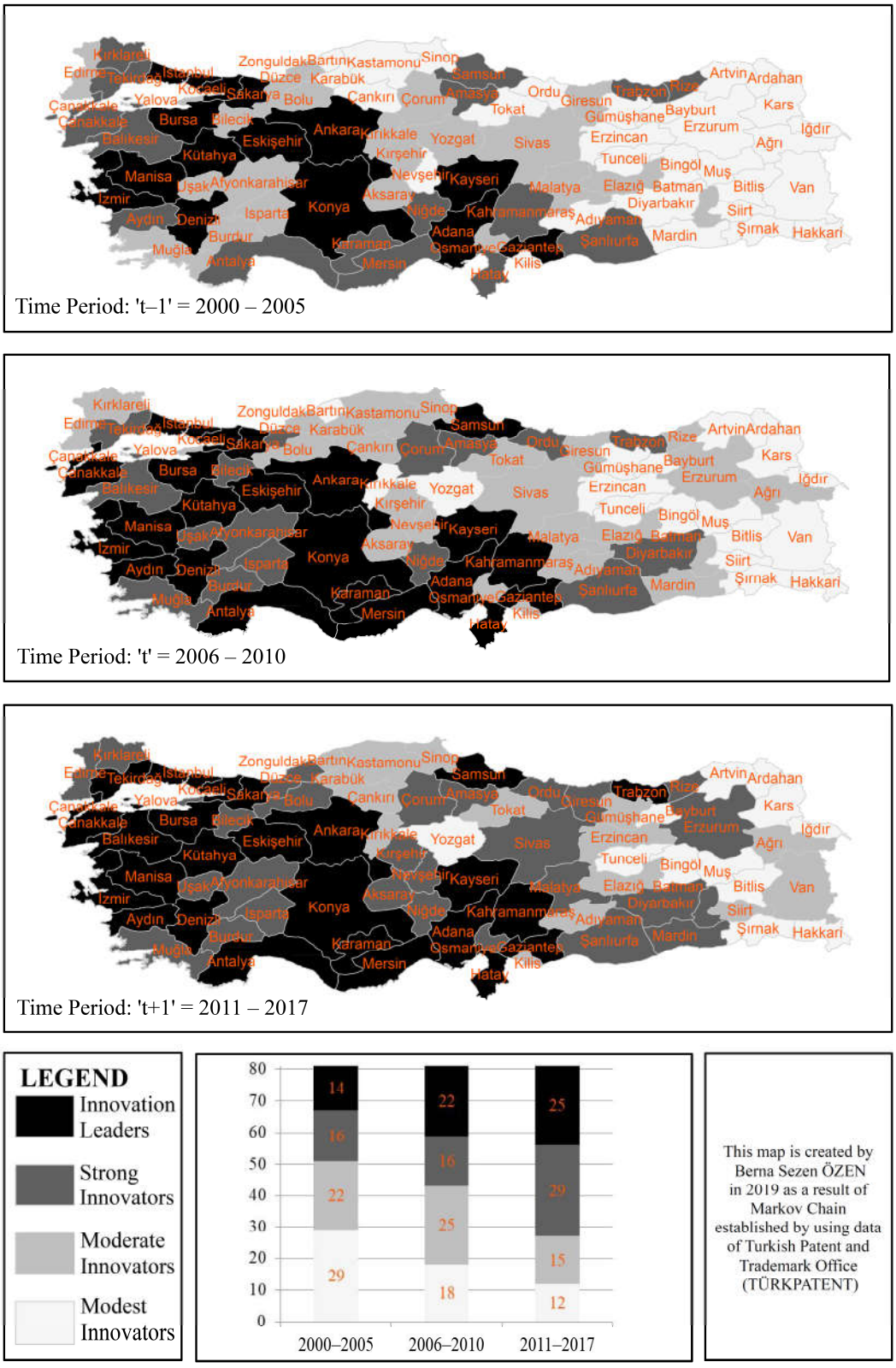


Figure B.8 : Methodology 1 – Regional maps of 'design registrations (file)'.

Evaluation of "Distribution of Design Applications (Design)" Indicator:

Methodology 1: This methodology considers mean values of the amount (count number) of the data by three time periods. These time periods are determined as 2000-2005 (t-1), 2006-2010 (t) and 2011-2017 (t+1).

By using counts (mean values) considering time periods (2000-2005, 2006-2010 and 2011-2017):

Table B.33 : Methodology 1 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	19	7	3	0	29
	3	1	10	7	1	19
	2	0	5	9	4	18
	1	0	0	0	15	15
		20	22	19	20	81
		2006-2010 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,66	0,24	0,10	0,00	0,36
	Medium-low	0,05	0,53	0,37	0,05	0,23
	Medium-up	0,00	0,28	0,50	0,22	0,22
	Upper	0,00	0,00	0,00	1,00	0,19
	Margin	0,25	0,27	0,23	0,25	
		Mobility Index	0,33			

Table B.34 : Methodology 1 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	19: AĞRI ARTVİN BİNGÖL BİTLİS ÇANKIRI ERZİNCAN GÜMÜŞHANE HAKKARİ KARS MUŞ SİİRT TUNCELİ VAN BAYBURT BARTIN ARDAHAN IĞDIR KİLİS OSMANİYE	7: MARDİN NEVŞEHİR ORDU TOKAT BATMAN YALOVA KARABÜK	3: BURDUR ERZURUM ŞIRNAK	0	29
	Moderate Innovators	1: ADIYAMAN	10: DİYARBAKIR EDİRNE ELAZIĞ GİRESUN KASTAMONU KIRŞEHİR MALATYA SİNOP YOZGAT KIRIKKALE	7: BİLECİK BOLU ÇORUM ISPARTA TRABZON ŞANLIURFA AKSARAY	1: ÇANAKKALE	19
	Strong Innovators	0	5: KIRKLARELİ RİZE SİVAS ZONGULDAK DÜZCE	9: AFYONKARAHİSAR AMASYA BALIKESİR MERSİN KAHRAMANMARAŞ MUĞLA SAMSUN UŞAK KARAMAN	4: ANTALYA AYDIN HATAY NİĞDE	18
	Innovation Leaders	0	0	0	15: ADANA ANKARA BURSA DENİZLİ ESKİŞEHİR GAZİANTEP İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA SAKARYA TEKİRDAĞ	15
		20	22	19	20	81

Table B.35 : Methodology 1 – Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	10	9	1	0	20
	3	1	10	10	1	22
	2	1	0	12	6	19
	1	0	0	1	19	20
		12	19	24	26	81
		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,50	0,45	0,05	0,00	0,25
	Medium-low	0,05	0,45	0,45	0,05	0,27
	Medium-up	0,05	0,00	0,63	0,32	0,23
	Upper	0,00	0,00	0,05	0,95	0,25
	Margin	0,15	0,23	0,30	0,32	
		Mobility Index	0,37			

Table B.36 : Methodology 1 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	10: ARTVİN BİNGÖL BİTLİS HAKKARİ KARS MUŞ SİİRT TUNCELİ ARDAHAN IĞDIR	9: ADIYAMAN AĞRI ERZİNCAN GÜMÜŞHANE VAN BAYBURT BARTIN KİLİS OSMANİYE	1: ÇANKIRI	0	20
	Moderate Innovators	1: YOZGAT	10: ELAZIĞ KASTAMONU MALATYA MARDİN ORDU RİZE SİNOP TOKAT KIRIKKALE KARABÜK	10: DİYARBAKIR EDİRNE GİRESUN KIRŞEHİR NEVŞEHİR SİVAS ZONGULDAK BATMAN YALOVA DÜZCE	1: KIRKLARELİ	22
	Strong Innovators	1: ŞIRNAK	0	12: AFYONKARAHİSAR AMASYA BİLECİK BOLU BURDUR ÇORUM ERZURUM MUĞLA TRABZON ŞANLIURFA UŞAK AKSARAY	6: BALIKESİR ISPARTA MERSİN KAHRAMANMARAŞ SAMSUN KARAMAN	19
	Innovation Leaders	0	0	1: NİĞDE	19: ADANA ANKARA ANTALYA AYDIN BURSA ÇANAKKALE DENİZLİ ESKİŞEHİR GAZİANTEP HATAY İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA SAKARYA TEKİRDAĞ	20
		12	19	24	26	81

Design Applications (Number of Designs) - Methodology 1

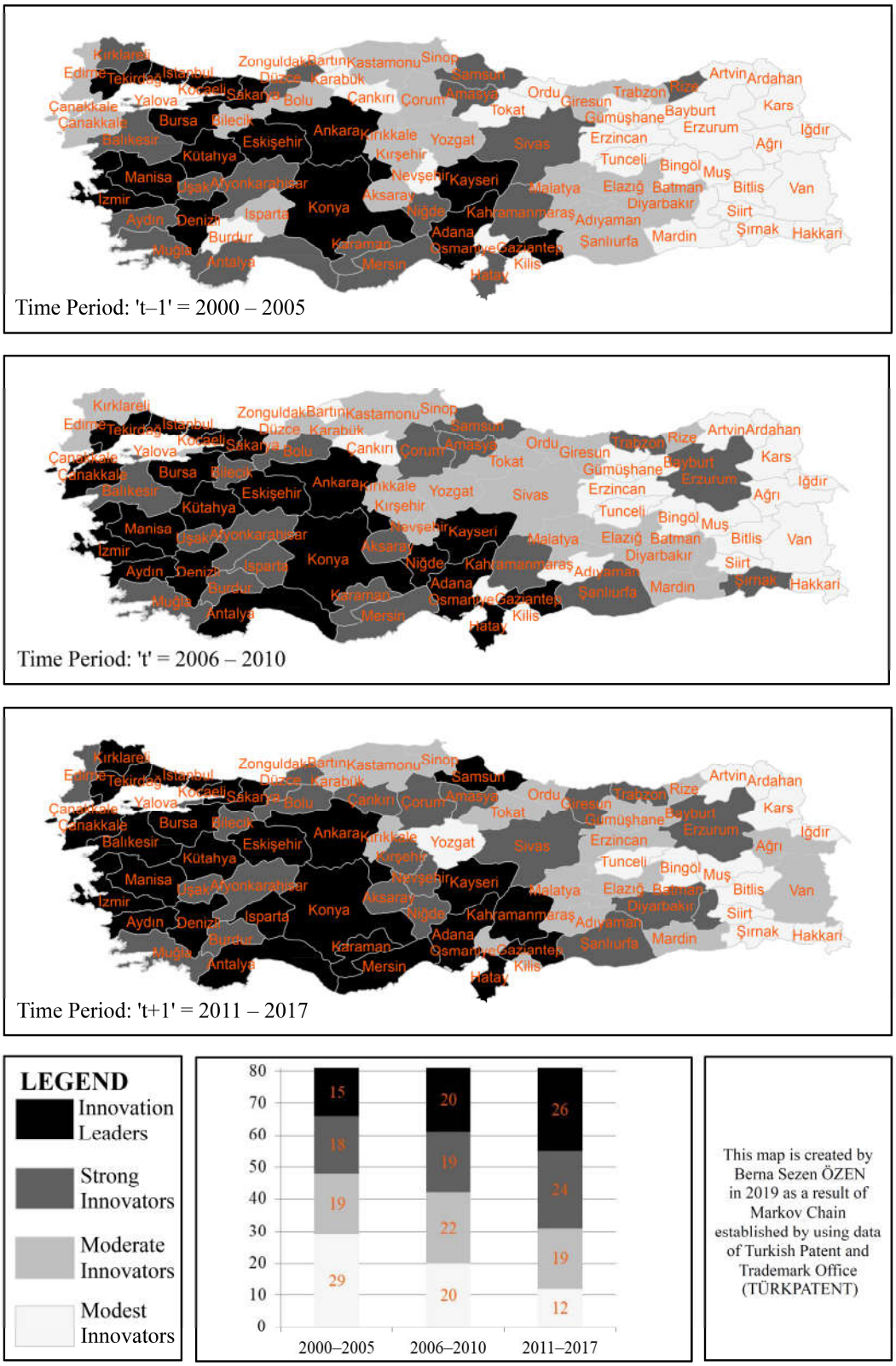


Figure B.9 : Methodology 1 – Regional maps of 'design applications (design)'.

Evaluation of "Distribution of Design Registrations (Design)" Indicator:

Methodology 1: This methodology considers mean values of the amount (count number) of the data by three time periods. These time periods are determined as 2000-2005 (t-1), 2006-2010 (t) and 2011-2017 (t+1).

By using counts (mean values) considering time periods (2000-2005, 2006-2010 and 2011-2017):

Table B.37 : Methodology 1 – Changes between t-1 and t time periods.

		2006-2010 (t)				
		4	**3**	**2**	**1**	Sum
2000-2005 (t-1)	**4**	16	8	4	0	28
	3	3	12	8	1	24
	2	0	1	9	6	16
	1	0	0	0	13	13
		19	21	21	20	81
		2006-2010 (t)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2000-2005 (t-1)	**Lower**	0,57	0,29	0,14	0,00	0,35
	Medium-low	0,13	0,50	0,33	0,04	0,30
	Medium-up	0,00	0,06	0,56	0,38	0,20
	Upper	0,00	0,00	0,00	1,00	0,16
	Margin	0,23	0,26	0,26	0,25	
		Mobility Index	0,34			

Table B.38 : Methodology 1 – Assessment of regions between t-1 and t time periods.

		2006-2010 (t)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2000-2005 (t-1)	**Modest Innovators**	16: AĞRI ARTVİN BİNGÖL BİTLİS ERZİNCAN GÜMÜŞHANE HAKKARİ KARS MUŞ SİİRT TUNCELİ VAN BAYBURT BARTIN ARDAHAN IĞDIR	8: DİYARBAKIR KASTAMONU MARDİN NEVŞEHİR TOKAT YALOVA KARABÜK OSMANİYE	4: BURDUR ERZURUM ORDU ŞIRNAK	0	28
	Moderate Innovators	3: ADIYAMAN ÇANKIRI KIRIKKALE	12: EDİRNE ELAZIĞ GİRESUN KIRKLARELİ KIRŞEHİR MALATYA RİZE SİNOP SİVAS YOZGAT BATMAN KİLİS	8: AFYONKARAHİSAR BİLECİK BOLU ÇORUM ISPARTA TRABZON AKSARAY DÜZCE	1: ÇANAKKALE	24
	Strong Innovators	0	1: ZONGULDAK	9: AMASYA BALIKESİR MERSİN KAHRAMANMARAŞ MUĞLA SAMSUN ŞANLIURFA UŞAK KARAMAN	6: ANTALYA AYDIN ESKİŞEHİR HATAY MANİSA NİĞDE	16
	Innovation Leaders	0	0	0	13: ADANA ANKARA BURSA DENİZLİ GAZİANTEP İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA SAKARYA TEKİRDAĞ	13
		19	21	21	20	81

Table B.39 : Methodology 1 – Changes between t and t+1 time periods.

		2011-2017 (t+1)				
		4	**3**	**2**	**1**	Sum
2006-2010 (t)	**4**	10	8	1	0	19
	3	1	7	11	2	21
	2	1	1	12	7	21
	1	0	0	1	19	20
		12	16	25	28	81
		2011-2017 (t+1)				
		Lower	**Medium-low**	**Medium-up**	**Upper**	Margin
2006-2010 (t)	**Lower**	0,53	0,42	0,05	0,00	0,23
	Medium-low	0,05	0,33	0,52	0,10	0,26
	Medium-up	0,05	0,05	0,57	0,33	0,26
	Upper	0,00	0,00	0,05	0,95	0,25
	Margin	0,15	0,20	0,31	0,35	
		Mobility Index	0,40			

Table B.40 : Methodology 1 – Assessment of regions between t and t+1 time periods.

		2011-2017 (t+1)				
		Modest Innovators	**Moderate Innovators**	**Strong Innovators**	**Innovation Leaders**	Sum
2006-2010 (t)	**Modest Innovators**	10: ARTVİN BİNGÖL BİTLİS HAKKARİ KARS MUŞ SİİRT TUNCELİ ARDAHAN IĞDIR	8: ADIYAMAN AĞRI ERZİNCAN GÜMÜŞHANE VAN BAYBURT KIRIKKALE BARTIN	1: ÇANKIRI	0	19
	Moderate Innovators	1: YOZGAT	7: ELAZIĞ KASTAMONU MARDİN SİNOP TOKAT KARABÜK KİLİS	11: DİYARBAKIR GİRESUN KIRŞEHİR MALATYA NEVŞEHİR RİZE SİVAS ZONGULDAK BATMAN YALOVA OSMANİYE	2: EDİRNE KIRKLARELİ	21
	Strong Innovators	1: ŞIRNAK	1: ORDU	12: AFYONKARAHİSAR AMASYA BİLECİK BOLU BURDUR ÇORUM ERZURUM MUĞLA ŞANLIURFA UŞAK AKSARAY DÜZCE	7: BALIKESİR ISPARTA MERSİN KAHRAMANMARAŞ SAMSUN TRABZON KARAMAN	21
	Innovation Leaders	0	0	1: NİĞDE	19: ADANA ANKARA ANTALYA AYDIN BURSA ÇANAKKALE DENİZLİ ESKİŞEHİR GAZİANTEP HATAY İSTANBUL İZMİR KAYSERİ KOCAELİ KONYA KÜTAHYA MANİSA SAKARYA TEKİRDAĞ	20
		12	16	25	28	81

REGIONAL INNOVATION PERFORMANCES OF TURKISH REGIONS AT NUTS–3 LEVEL

Design Registrations (Number of Designs) - Methodology 1

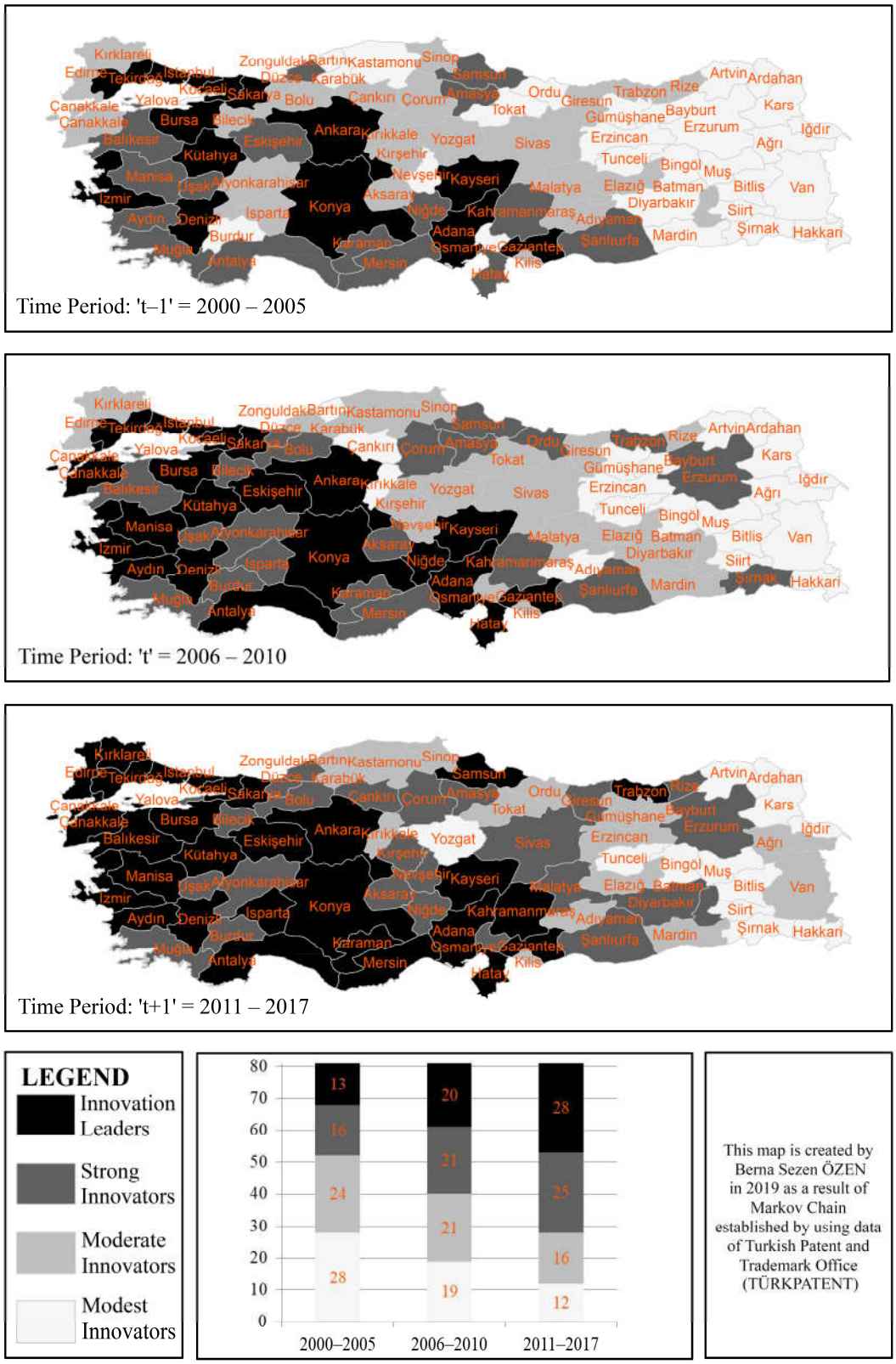


Figure B.10 : Methodology 1 – Regional maps of "design registrations (design)".

APPENDIX C: Summary table of the classification of regions in terms of innovation performances (Empirical results by Markov Chains of all tested methodologies)

All classifications resulting from the Markov Chains based on two different methods:

Table C.1 : Patents (*).

PATENT		Applications						Grants					
		Methodology 1			Methodology 2			Methodology 1			Methodology 2		
Code	Region	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1
01	ADANA	2	1	1	1	1	1	2	1	1	2	1	1
02	ADIYAMAN	4	3	2	3	4	3	3	3	2	2	3	3
03	AFYONKARAHİSAR	3	2	1	2	2	2	2	1	1	2	1	1
04	AĞRI	4	4	4	3	4	4	3	3	3	2	3	4
05	AMASYA	4	3	2	3	3	4	3	3	2	2	3	4
06	ANKARA	1	1	1	1	1	1	1	1	1	1	1	1
07	ANTALYA	2	1	1	1	1	1	2	1	1	1	1	1
08	ARTVİN	4	4	3	3	4	4	3	3	3	2	3	4
09	AYDIN	3	2	1	2	2	1	3	2	1	2	2	1
10	BALIKESİR	3	1	1	2	1	1	2	2	1	2	1	1
11	BİLECİK	3	2	2	2	2	3	3	1	1	2	1	2
12	BİNGÖL	4	4	3	3	4	4	3	3	2	2	3	4
13	BİTLİS	4	4	3	3	4	4	3	3	3	2	3	4
14	BOLU	3	2	2	2	3	2	3	2	2	2	1	4
15	BURDUR	3	2	2	2	3	2	3	2	1	2	2	2
16	BURSA	1	1	1	1	1	1	1	1	1	1	1	1
17	ÇANAKKALE	3	2	2	2	3	3	3	2	2	2	2	4
18	ÇANKIRI	4	4	3	3	4	4	3	3	2	2	3	4
19	ÇORUM	3	2	1	2	2	1	3	2	1	2	2	1
20	DENİZLİ	2	1	1	2	1	1	2	1	1	2	1	1
21	DİYARBAKIR	4	2	2	3	2	3	3	3	2	2	3	4
22	EDİRNE	4	3	1	3	3	2	3	3	1	2	3	1
23	ELAZIĞ	4	2	1	3	2	1	3	2	1	2	2	1
24	ERZİNCAN	4	4	3	3	4	4	3	3	3	2	3	4
25	ERZURUM	3	2	1	2	2	2	3	2	2	2	2	2
26	ESKİŞEHİR	2	1	1	1	1	1	2	1	1	2	1	1
27	GAZİANTEP	2	1	1	1	1	1	2	1	1	1	1	1
28	GİRESUN	3	3	2	2	4	3	3	2	1	2	1	2
29	GÜMÜŞHANE	4	2	2	3	2	4	3	2	2	2	2	4
30	HAKKARİ	4	4	3	3	4	4	3	3	3	2	3	4
31	HATAY	3	2	1	2	2	1	3	2	1	2	2	1
32	ISPARTA	3	2	1	2	2	1	3	2	1	2	2	1
33	MERSİN	2	1	1	2	1	1	3	2	1	2	1	1
34	İSTANBUL	1	1	1	1	1	1	1	1	1	1	1	1
35	İZMİR	1	1	1	1	1	1	1	1	1	1	1	1
36	KARS	4	4	3	3	4	4	3	3	3	2	3	4
37	KASTAMONU	4	3	2	3	4	3	3	3	1	2	3	2
38	KAYSERİ	2	1	1	1	1	1	2	1	1	1	1	1
39	KIRKLARELİ	3	2	1	2	2	2	3	3	1	2	3	1
40	KIRŞEHİR	4	2	3	3	3	4	3	3	2	2	3	4
41	KOCAELİ	1	1	1	1	1	1	1	1	1	1	1	1
42	KONYA	2	1	1	1	1	1	2	1	1	2	1	1
43	KÜTAHYA	3	2	1	2	2	1	3	2	1	2	2	1
44	MALATYA	3	2	1	2	2	2	3	3	1	2	3	1
45	MANİSA	2	1	1	1	1	1	1	1	1	1	1	1
46	KAHRAMANMARAŞ	3	1	1	2	1	1	3	2	2	2	2	2
47	MARDİN	4	3	3	3	4	4	3	3	2	2	3	4
48	MUĞLA	3	2	1	2	1	1	3	2	1	2	1	2
49	MUŞ	4	4	4	3	4	4	3	3	3	2	3	4
50	NEVŞEHİR	4	2	2	3	2	4	3	3	2	2	3	2
51	NİĞDE	3	2	2	2	3	4	2	2	2	2	1	4
52	ORDU	3	2	2	2	2	4	3	2	2	2	2	4
53	RİZE	4	3	1	3	3	1	3	3	1	2	3	2
54	SAKARYA	3	1	1	2	1	1	3	1	1	2	1	1
55	SAMSUN	2	2	1	2	2	1	3	2	1	2	2	1

Table C.1 (continued) : Patents (*).

	PATENT	Applications						Grants					
		Methodology 1			Methodology 2			Methodology 1			Methodology 2		
Code	Region	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1
56	SİİRT	4	4	3	3	4	4	3	3	3	2	3	4
57	SİNOP	4	3	3	3	4	4	3	3	2	2	3	4
58	SİVAS	4	2	1	3	2	2	3	2	2	2	2	3
59	TEKİRDAĞ	2	1	1	1	1	1	3	1	1	2	1	1
60	TOKAT	4	2	2	3	2	2	3	2	2	2	2	4
61	TRABZON	3	2	1	2	2	1	3	2	1	2	2	1
62	TUNCELİ	4	4	3	3	4	4	3	3	3	2	3	4
63	ŞANLIURFA	4	3	1	3	3	2	3	3	2	2	3	3
64	UŞAK	3	2	2	2	2	3	3	2	1	2	2	2
65	VAN	4	3	2	3	4	4	3	3	3	2	3	4
66	YOZGAT	4	3	2	3	4	4	3	3	2	2	3	4
67	ZONGULDAK	4	2	1	3	2	2	3	2	1	2	2	2
68	AKSARAY	3	3	2	2	3	3	3	3	2	2	3	4
69	BAYBURT	4	4	3	3	4	4	3	3	3	2	3	4
70	KARAMAN	4	3	2	3	4	4	3	3	2	2	3	4
71	KIRIKKALE	4	3	2	3	4	4	3	2	2	2	2	4
72	BATMAN	4	3	2	3	4	4	3	3	3	2	3	4
73	ŞIRNAK	4	4	3	3	4	4	3	3	3	2	3	4
74	BARTIN	4	4	3	3	4	4	3	3	2	2	3	4
75	ARDAHAN	4	4	4	3	4	4	3	3	3	2	3	4
76	IĞDIR	4	4	4	3	4	4	3	3	3	2	3	4
77	YALOVA	3	2	1	2	3	2	3	3	1	2	3	2
78	KARABÜK	4	3	2	3	3	3	3	3	2	2	3	4
79	KİLİS	4	4	3	3	4	4	3	3	3	2	3	4
80	OSMANİYE	4	3	2	3	4	4	3	3	2	2	3	4
81	DÜZCE	3	2	1	2	2	1	3	2	1	2	2	1

*: 't-1: Time Period (2000-2005)' , 't: Time Period (2006-2010)' , 't+1: Time Period (2011-2017)'
'1: Innovation Leaders', '2: Strong Innovators ', '3: Moderate Innovators', '4: Modest Innovators'

Table C.2 : Utility Models (*).

	UTILITY MODEL	Applications						Grants					
		Methodology 1			Methodology 2			Methodology 1			Methodology 2		
Code	Region	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1
01	ADANA	1	1	1	1	1	1	2	1	1	1	1	1
02	ADIYAMAN	4	3	3	3	4	4	4	3	3	3	4	4
03	AFYONKARAHİSAR	3	2	1	2	2	1	2	2	1	2	2	1
04	AĞRI	4	4	4	3	4	4	4	4	4	3	4	4
05	AMASYA	3	2	2	2	2	2	3	2	2	2	2	2
06	ANKARA	1	1	1	1	1	1	1	1	1	1	1	1
07	ANTALYA	1	1	1	1	1	1	1	1	1	1	1	1
08	ARTVİN	4	4	4	3	4	4	4	3	3	3	4	4
09	AYDIN	2	1	1	2	1	1	2	1	1	2	1	1
10	BALIKESİR	2	1	1	1	1	1	1	1	1	1	1	1
11	BİLECİK	3	2	2	2	2	4	4	2	3	3	2	4
12	BİNGÖL	4	4	3	3	4	4	4	4	4	3	4	4
13	BİTLİS	4	4	4	3	4	4	4	4	4	3	4	4
14	BOLU	4	3	2	3	3	3	4	2	2	3	2	2
15	BURDUR	2	1	1	2	1	1	2	1	1	2	1	1
16	BURSA	1	1	1	1	1	1	1	1	1	1	1	1
17	ÇANAKKALE	3	2	2	2	2	2	3	1	2	2	1	3
18	ÇANKIRI	4	3	2	3	4	2	3	4	3	2	4	4
19	ÇORUM	3	1	1	2	1	2	3	1	1	2	1	1
20	DENİZLİ	1	1	1	1	1	1	2	1	1	2	1	1
21	DİYARBAKIR	4	2	2	3	2	3	4	3	2	3	3	4
22	EDİRNE	4	3	3	3	4	4	4	3	2	3	3	4
23	ELAZIĞ	3	3	2	2	3	3	3	2	2	2	3	3
24	ERZİNCAN	4	3	3	3	4	4	4	3	4	3	4	4
25	ERZURUM	4	2	2	3	2	2	4	3	2	3	3	2
26	ESKİŞEHİR	1	1	1	1	1	1	1	1	1	1	1	1
27	GAZİANTEP	2	1	1	2	1	1	2	1	1	2	1	1
28	GİRESUN	3	3	2	2	4	2	3	3	2	2	3	2
29	GÜMÜŞHANE	4	4	3	3	4	4	4	4	3	3	4	4
30	HAKKARİ	4	4	4	3	4	4	4	4	4	3	4	4
31	HATAY	3	2	1	2	2	1	3	2	1	2	2	1
32	ISPARTA	2	2	1	2	2	2	3	2	1	2	2	1
33	MERSİN	2	1	1	1	1	1	2	1	1	2	1	1
34	İSTANBUL	1	1	1	1	1	1	1	1	1	1	1	1

Table C.2 (continued) : Utility Models (*).

UTILITY MODEL		Applications						Grants					
		Methodology 1			Methodology 2			Methodology 1			Methodology 2		
Code	Region	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1
35	İZMİR	1	1	1	1	1	1	1	1	1	1	1	1
36	KARS	4	3	3	3	4	4	4	3	4	3	4	4
37	KASTAMONU	3	2	2	2	3	3	3	2	2	2	2	3
38	KAYSERİ	1	1	1	1	1	1	1	1	1	1	1	1
39	KIRKLARELİ	4	2	2	3	2	4	3	2	2	2	2	2
40	KIRŞEHİR	4	3	3	3	4	4	3	3	4	2	3	4
41	KOCAELİ	1	1	1	1	1	1	1	1	1	1	1	1
42	KONYA	1	1	1	1	1	1	1	1	1	1	1	1
43	KÜTAHYA	2	2	2	2	2	2	3	2	2	2	2	2
44	MALATYA	3	2	2	2	2	2	3	2	2	2	2	2
45	MANİSA	1	1	1	1	1	1	1	1	1	1	1	1
46	KAHRAMANMARAŞ	3	2	1	2	2	1	2	2	1	2	2	1
47	MARDİN	4	3	3	3	4	4	3	3	3	2	4	4
48	MUĞLA	2	2	1	2	2	1	3	2	1	2	2	1
49	MUŞ	4	4	4	3	4	4	3	3	4	2	4	4
50	NEVŞEHİR	4	2	2	3	2	2	4	2	1	3	2	2
51	NİĞDE	4	3	3	3	4	4	3	3	2	2	4	4
52	ORDU	3	2	2	3	3	3	4	2	2	3	2	3
53	RİZE	3	3	2	3	3	2	4	3	2	3	3	2
54	SAKARYA	2	1	1	1	1	1	2	1	1	2	1	1
55	SAMSUN	2	1	1	2	1	1	2	1	1	2	1	1
56	SİİRT	4	4	4	3	4	4	4	4	4	3	4	4
57	SİNOP	4	3	3	3	3	4	4	3	3	3	3	4
58	SİVAS	3	2	2	2	2	2	3	2	2	2	2	2
59	TEKİRDAĞ	2	1	1	2	1	1	2	1	1	2	1	1
60	TOKAT	4	2	2	3	2	3	3	2	2	2	2	3
61	TRABZON	3	2	1	2	2	2	3	2	2	2	2	2
62	TUNCELİ	4	4	4	3	4	4	4	4	4	3	4	4
63	ŞANLIURFA	3	3	2	2	4	4	3	2	3	2	3	4
64	UŞAK	4	2	2	3	2	2	3	2	2	2	2	2
65	VAN	4	3	2	3	4	3	4	3	3	3	4	4
66	YOZGAT	4	3	2	3	4	3	4	3	2	3	4	3
67	ZONGULDAK	3	2	2	3	2	2	4	3	2	3	3	3
68	AKSARAY	3	3	2	2	3	2	4	2	2	3	2	2
69	BAYBURT	4	4	4	3	4	4	4	4	4	3	4	4
70	KARAMAN	3	2	2	2	2	3	3	2	2	2	2	2
71	KIRIKKALE	3	3	3	2	4	4	3	3	2	2	4	4
72	BATMAN	4	3	3	3	4	4	4	4	3	3	4	4
73	ŞIRNAK	4	4	3	3	4	4	4	4	4	3	4	4
74	BARTIN	4	3	3	3	4	4	4	4	3	3	4	4
75	ARDAHAN	4	4	4	3	4	4	4	3	4	3	4	4
76	IĞDIR	4	3	4	3	4	4	4	3	4	3	4	4
77	YALOVA	3	2	2	2	2	3	3	2	2	2	3	2
78	KARABÜK	4	3	3	3	4	4	4	3	3	3	3	4
79	KİLİS	4	4	4	3	4	4	4	4	4	3	4	4
80	OSMANİYE	4	3	2	3	4	4	4	3	2	3	4	4
81	DÜZCE	3	2	1	2	2	1	3	2	1	2	3	1

*: 't-1: Time Period (2000-2005)' , 't: Time Period (2006-2010)' , 't+1: Time Period (2011-2017)'
'1: Innovation Leaders', '2: Strong Innovators ', '3: Moderate Innovators', '4: Modest Innovators'

Table C.3 : Trademarks (*).

	TRADEMARK	Applications						Registrations					
		Methodology 1			Methodology 2			Methodology 1			Methodology 2		
Code	Region	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1
01	ADANA	1	1	1	1	1	1	1	1	1	1	1	1
02	ADIYAMAN	4	3	2	3	4	4	4	3	2	3	4	4
03	AFYONKARAHİSAR	2	2	1	2	2	2	2	2	1	2	2	1
04	AĞRI	4	4	3	3	4	4	4	4	3	3	4	4
05	AMASYA	3	3	3	3	4	4	3	3	3	3	3	4
06	ANKARA	1	1	1	1	1	1	1	1	1	1	1	1
07	ANTALYA	1	1	1	1	1	1	1	1	1	1	1	1
08	ARTVİN	4	4	4	3	4	4	4	4	3	3	4	4
09	AYDIN	2	1	1	2	1	1	2	1	1	2	1	1
10	BALIKESİR	2	1	1	1	1	1	2	1	1	2	1	1
11	BİLECİK	4	4	3	3	4	4	4	3	3	3	4	4
12	BİNGÖL	4	4	4	3	4	4	4	4	3	3	4	4
13	BİTLİS	4	4	4	3	4	4	4	4	4	3	4	4
14	BOLU	3	3	2	2	3	3	3	3	2	2	3	3
15	BURDUR	4	3	3	3	3	4	4	3	3	3	3	4
16	BURSA	1	1	1	1	1	1	1	1	1	1	1	1
17	ÇANAKKALE	3	2	1	2	2	2	3	2	1	2	2	1
18	ÇANKIRI	4	4	3	3	4	4	4	3	3	3	4	4
19	ÇORUM	3	2	2	2	2	2	3	2	2	2	2	2
20	DENİZLİ	1	1	1	1	1	1	1	1	1	1	1	1
21	DİYARBAKIR	3	2	1	2	2	1	3	2	1	3	2	1
22	EDİRNE	3	2	2	2	2	2	3	2	2	2	2	2
23	ELAZIĞ	3	2	2	2	2	2	3	2	2	2	2	2
24	ERZİNCAN	4	3	3	3	4	4	4	3	3	3	4	4
25	ERZURUM	3	2	2	2	2	2	3	2	2	2	2	2
26	ESKİŞEHİR	1	1	1	1	1	1	1	1	1	1	1	1
27	GAZİANTEP	1	1	1	1	1	1	1	1	1	1	1	1
28	GİRESUN	3	3	2	3	4	3	3	3	2	2	4	3
29	GÜMÜŞHANE	4	4	4	3	4	4	4	4	4	3	4	4
30	HAKKARİ	4	4	4	3	4	4	4	4	3	3	4	4
31	HATAY	2	1	1	2	1	1	2	1	1	2	1	1
32	ISPARTA	3	2	2	2	2	2	3	2	2	2	2	2
33	MERSİN	1	1	1	1	1	1	2	1	1	2	1	1
34	İSTANBUL	1	1	1	1	1	1	1	1	1	1	1	1
35	İZMİR	1	1	1	1	1	1	1	1	1	1	1	1
36	KARS	4	4	4	3	4	4	4	4	4	3	4	4
37	KASTAMONU	4	3	3	3	4	4	4	3	2	3	3	4
38	KAYSERİ	1	1	1	1	1	1	1	1	1	1	1	1
39	KIRKLARELİ	3	2	2	2	2	3	3	2	2	2	2	3
40	KIRŞEHİR	4	4	3	3	4	4	4	4	3	3	4	4
41	KOCAELİ	1	1	1	1	1	1	1	1	1	1	1	1
42	KONYA	1	1	1	1	1	1	1	1	1	1	1	1
43	KÜTAHYA	2	2	2	2	2	2	2	2	2	2	2	2
44	MALATYA	3	2	1	2	2	2	3	2	1	2	2	2
45	MANİSA	2	1	1	1	1	1	2	1	1	2	1	1
46	KAHRAMANMARAŞ	2	2	1	2	2	1	2	2	1	2	2	1
47	MARDİN	3	2	2	3	2	2	4	2	2	3	2	2
48	MUĞLA	2	1	1	2	1	1	2	1	1	2	1	1
49	MUŞ	4	4	4	3	4	4	4	4	4	3	4	4
50	NEVŞEHİR	3	3	2	3	3	2	3	3	2	2	3	2
51	NİĞDE	4	3	3	3	4	4	4	3	3	3	4	4
52	ORDU	3	2	2	2	2	2	3	2	2	3	2	2
53	RİZE	2	2	2	1	2	2	2	2	2	1	2	2
54	SAKARYA	2	1	1	2	1	1	2	1	1	2	1	1
55	SAMSUN	2	1	1	2	1	1	2	1	1	2	1	1
56	SİİRT	4	4	4	3	4	4	4	4	3	3	4	4
57	SİNOP	4	4	3	3	4	4	4	4	3	3	4	4
58	SİVAS	3	2	2	2	2	2	3	2	2	2	2	2
59	TEKİRDAĞ	2	2	1	2	2	1	2	2	1	2	1	1
60	TOKAT	3	2	2	2	2	4	3	2	2	2	2	3
61	TRABZON	2	2	1	2	2	1	3	2	1	2	2	1
62	TUNCELİ	4	4	4	3	4	4	4	4	4	3	4	4
63	ŞANLIURFA	3	2	1	2	2	1	3	2	1	2	2	1
64	UŞAK	3	3	2	3	3	3	3	3	2	3	3	4
65	VAN	3	3	2	3	3	3	4	3	2	3	3	3
66	YOZGAT	3	3	3	3	4	4	4	3	3	3	4	4

Table C.3 (continued): Trademarks (*).

	TRADEMARK	Applications						Registrations					
		Methodology 1			Methodology 2			Methodology 1			Methodology 2		
Code	Region	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1
67	ZONGULDAK	4	3	2	3	3	4	4	3	2	3	3	4
68	AKSARAY	3	3	2	3	3	3	3	3	2	3	3	4
69	BAYBURT	4	4	4	3	4	4	4	4	4	3	4	4
70	KARAMAN	2	2	2	2	2	2	2	2	1	2	2	2
71	KIRIKKALE	4	3	3	3	4	4	4	4	3	3	4	4
72	BATMAN	4	3	2	3	3	3	4	3	2	3	3	3
73	ŞIRNAK	4	4	3	3	4	4	4	4	3	3	4	4
74	BARTIN	4	3	3	3	4	4	4	3	3	3	4	4
75	ARDAHAN	4	4	4	3	4	4	4	4	4	3	4	4
76	IĞDIR	4	4	3	3	4	4	4	4	4	3	4	4
77	YALOVA	4	3	2	3	3	3	4	3	2	3	3	4
78	KARABÜK	4	3	2	3	4	4	4	3	2	3	4	4
79	KİLİS	4	4	3	3	4	4	4	4	3	3	4	4
80	OSMANİYE	4	3	2	3	3	4	4	3	2	3	3	4
81	DÜZCE	3	3	2	3	3	2	4	3	2	3	3	2

*: 't-1: Time Period (2000-2005)' , 't: Time Period (2006-2010)' , 't+1: Time Period (2011-2017)'
'1: Innovation Leaders', '2: Strong Innovators ', '3: Moderate Innovators', '4: Modest Innovators'

Table C.4 : Design (File) (*).

	DESIGN (FILE)	Applications						Registrations					
		Methodology 1			Methodology 2			Methodology 1			Methodology 2		
Code	Region	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1
01	ADANA	1	1	1	1	1	1	1	1	1	1	1	1
02	ADIYAMAN	4	4	3	3	4	4	4	3	3	3	4	4
03	AFYONKARAHİSAR	2	2	2	2	2	2	3	2	2	2	2	2
04	AĞRI	4	3	3	3	4	4	4	3	3	3	4	4
05	AMASYA	2	2	2	2	2	2	2	2	2	2	2	2
06	ANKARA	1	1	1	1	1	1	1	1	1	1	1	1
07	ANTALYA	2	1	1	2	1	1	2	1	1	2	1	1
08	ARTVİN	4	4	4	3	4	4	4	4	4	3	4	4
09	AYDIN	2	1	1	2	1	1	2	1	1	2	1	1
10	BALIKESİR	2	2	1	2	2	1	2	2	1	2	2	1
11	BİLECİK	3	2	2	2	2	3	3	2	2	2	2	3
12	BİNGÖL	4	4	4	3	4	4	4	4	4	3	4	4
13	BİTLİS	4	4	4	3	4	4	4	4	4	3	4	4
14	BOLU	3	3	2	2	3	2	3	3	2	2	3	2
15	BURDUR	3	3	2	3	2	2	3	2	2	3	2	2
16	BURSA	1	1	1	1	1	1	1	1	1	1	1	1
17	ÇANAKKALE	2	1	1	2	1	1	2	1	1	2	1	1
18	ÇANKIRI	3	3	3	3	4	4	4	3	3	3	4	4
19	ÇORUM	3	2	2	2	2	2	3	2	2	2	2	2
20	DENİZLİ	1	1	1	1	1	1	1	1	1	1	1	1
21	DİYARBAKIR	4	2	2	3	2	2	4	2	2	3	2	2
22	EDİRNE	3	4	2	3	4	3	3	3	2	3	4	3
23	ELAZIĞ	3	3	3	3	3	4	3	3	3	2	3	4
24	ERZİNCAN	4	4	3	3	4	4	4	4	3	3	4	4
25	ERZURUM	4	3	2	3	2	3	4	3	2	3	3	3
26	ESKİŞEHİR	1	1	1	1	1	1	1	1	1	1	1	1
27	GAZİANTEP	1	1	1	1	1	1	1	1	1	1	1	1
28	GİRESUN	3	2	2	2	2	2	3	3	2	2	2	2
29	GÜMÜŞHANE	4	4	3	3	4	4	4	4	3	3	4	4
30	HAKKARİ	4	4	4	3	4	4	4	4	4	3	4	4
31	HATAY	2	1	1	2	1	1	2	1	1	2	1	1
32	ISPARTA	3	2	2	2	2	2	3	2	2	2	2	2
33	MERSİN	2	1	1	2	1	1	2	1	1	2	1	1
34	İSTANBUL	1	1	1	1	1	1	1	1	1	1	1	1
35	İZMİR	1	1	1	1	1	1	1	1	1	1	1	1
36	KARS	4	4	4	3	4	4	4	4	4	3	4	4
37	KASTAMONU	3	3	3	3	4	4	4	3	3	3	4	4
38	KAYSERİ	1	1	1	1	1	1	1	1	1	1	1	1
39	KIRKLARELİ	2	3	2	2	2	2	2	3	2	2	2	2
40	KIRŞEHİR	3	3	2	3	4	2	3	3	2	3	4	2
41	KOCAELİ	1	1	1	1	1	1	1	1	1	1	1	1
42	KONYA	1	1	1	1	1	1	1	1	1	1	1	1
43	KÜTAHYA	1	1	1	1	1	1	1	1	1	1	1	1
44	MALATYA	3	3	2	3	3	3	3	3	2	3	3	3
45	MANİSA	1	1	1	1	1	1	1	1	1	1	1	1

Table C.4 (continued) : Design (File) (*).

DESIGN (FILE)		Applications						Registrations					
		Methodology 1			Methodology 2			Methodology 1			Methodology 2		
Code	Region	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1
46	KAHRAMANMARAŞ	2	1	1	2	1	1	2	1	1	2	1	1
47	MARDİN	4	3	2	3	3	4	4	3	2	3	3	4
48	MUĞLA	2	2	2	2	2	2	3	2	2	2	2	2
49	MUŞ	4	4	4	3	4	4	4	4	4	3	4	4
50	NEVŞEHİR	4	3	2	3	2	3	4	3	2	3	3	3
51	NİĞDE	2	2	3	2	2	4	2	2	2	2	2	4
52	ORDU	4	2	2	3	2	4	4	2	2	3	2	4
53	RİZE	2	3	2	2	3	4	2	3	2	2	3	4
54	SAKARYA	2	1	1	1	1	1	1	1	1	1	1	1
55	SAMSUN	2	1	1	2	1	1	2	1	1	2	1	1
56	SİİRT	4	4	4	3	4	4	4	4	3	3	4	4
57	SİNOP	3	3	3	3	3	4	4	3	3	3	4	4
58	SİVAS	3	3	2	2	3	2	3	3	2	2	3	2
59	TEKİRDAĞ	2	2	1	2	2	1	2	2	1	2	2	1
60	TOKAT	4	3	3	3	3	4	4	3	3	3	3	4
61	TRABZON	2	1	1	2	2	1	2	2	1	2	2	1
62	TUNCELİ	4	4	4	3	4	4	4	4	4	3	4	4
63	ŞANLIURFA	3	2	2	2	2	2	2	2	2	2	2	2
64	UŞAK	3	2	2	2	2	4	3	2	2	2	2	4
65	VAN	4	4	3	3	4	4	4	4	3	3	4	4
66	YOZGAT	3	4	4	3	4	4	3	4	4	3	4	4
67	ZONGULDAK	3	3	2	2	3	2	3	3	2	2	3	2
68	AKSARAY	3	3	2	3	3	4	3	3	2	2	3	4
69	BAYBURT	4	4	4	3	4	4	4	4	4	3	4	4
70	KARAMAN	2	1	1	2	1	1	2	1	1	2	1	1
71	KIRIKKALE	3	4	3	3	4	4	3	4	3	3	4	4
72	BATMAN	3	3	2	3	4	3	3	3	2	3	3	3
73	ŞIRNAK	4	4	4	3	4	4	4	4	4	3	4	4
74	BARTIN	4	4	3	3	4	4	4	4	3	3	4	4
75	ARDAHAN	4	4	4	3	4	4	4	4	4	3	4	4
76	IĞDIR	4	4	4	3	4	4	4	4	4	3	4	4
77	YALOVA	3	2	2	3	2	2	3	3	2	3	2	2
78	KARABÜK	4	3	3	3	3	4	4	3	3	3	3	4
79	KİLİS	4	3	3	3	4	4	4	3	3	3	4	4
80	OSMANİYE	3	3	2	3	4	4	3	3	2	3	4	4
81	DÜZCE	3	3	2	2	2	2	3	2	2	2	2	2

*: 't-1: Time Period (2000-2005)' , 't: Time Period (2006-2010)' , 't+1: Time Period (2011-2017)'
'1: Innovation Leaders', '2: Strong Innovators ', '3: Moderate Innovators', '4: Modest Innovators'

Table C.5 : Design (Design) (*).

DESIGN (DESIGN)		Applications						Registrations					
		Methodology 1			Methodology 2			Methodology 1			Methodology 2		
Code	Region	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1
01	ADANA	1	1	1	1	1	1	1	1	1	1	1	1
02	ADIYAMAN	3	4	3	2	4	4	3	4	3	2	4	4
03	AFYONKARAHİSAR	2	2	2	2	2	2	3	2	2	2	2	2
04	AĞRI	4	4	3	3	4	4	4	4	3	3	4	4
05	AMASYA	2	2	2	2	2	2	2	2	2	2	2	2
06	ANKARA	1	1	1	1	1	1	1	1	1	1	1	1
07	ANTALYA	2	1	1	2	1	1	2	1	1	2	1	1
08	ARTVİN	4	4	4	3	4	4	4	4	4	3	4	4
09	AYDIN	2	1	1	2	1	1	2	1	1	2	1	1
10	BALIKESİR	2	2	1	2	2	1	2	2	1	2	2	1
11	BİLECİK	3	2	2	2	2	2	3	2	2	2	2	2
12	BİNGÖL	4	4	4	3	4	4	4	4	4	3	4	4
13	BİTLİS	4	4	4	3	4	4	4	4	4	3	4	4
14	BOLU	3	2	2	2	2	2	3	2	2	3	2	2
15	BURDUR	4	2	2	3	2	3	4	2	2	3	2	4
16	BURSA	1	1	1	1	1	1	1	1	1	1	1	1
17	ÇANAKKALE	3	1	1	3	1	1	3	1	1	2	1	1
18	ÇANKIRI	4	4	2	3	4	3	3	4	2	3	4	4
19	ÇORUM	3	2	2	2	2	2	3	2	2	2	2	2
20	DENİZLİ	1	1	1	1	1	1	1	1	1	1	1	1
21	DİYARBAKIR	3	3	2	2	3	2	4	3	2	3	3	3
22	EDİRNE	3	3	2	3	4	2	3	3	1	3	3	2
23	ELAZIĞ	3	3	3	3	4	4	3	3	3	3	4	4
24	ERZİNCAN	4	4	3	3	4	4	4	4	3	3	4	4

Table C.5 (continued) : Design (Design) (*).

DESIGN (DESIGN)		Applications						Registrations					
		Methodology 1			Methodology 2			Methodology 1			Methodology 2		
Code	Region	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1	t-1	t	t+1
25	ERZURUM	4	2	2	3	2	4	4	2	2	3	2	2
26	ESKİŞEHİR	1	1	1	1	1	1	2	1	1	1	1	1
27	GAZİANTEP	1	1	1	1	1	1	1	1	1	1	1	1
28	GİRESUN	3	3	2	3	3	3	3	3	2	3	3	3
29	GÜMÜŞHANE	4	4	3	3	4	4	4	4	3	3	4	4
30	HAKKARİ	4	4	4	3	4	4	4	4	4	3	4	4
31	HATAY	2	1	1	1	1	1	2	1	1	2	1	1
32	ISPARTA	3	2	1	3	2	2	3	2	1	3	2	2
33	MERSİN	2	2	1	2	2	1	2	2	1	2	2	1
34	İSTANBUL	1	1	1	1	1	1	1	1	1	1	1	1
35	İZMİR	1	1	1	1	1	1	1	1	1	1	1	1
36	KARS	4	4	4	3	4	4	4	4	4	3	4	4
37	KASTAMONU	3	3	3	3	4	4	4	3	3	3	3	4
38	KAYSERİ	1	1	1	1	1	1	1	1	1	1	1	1
39	KIRKLARELİ	2	3	1	2	3	1	3	3	1	2	3	1
40	KIRŞEHİR	3	3	2	2	4	4	3	3	2	3	4	4
41	KOCAELİ	1	1	1	1	1	1	1	1	1	1	1	1
42	KONYA	1	1	1	1	1	1	1	1	1	1	1	1
43	KÜTAHYA	1	1	1	1	1	1	1	1	1	1	1	1
44	MALATYA	3	3	3	3	3	4	3	3	2	3	3	4
45	MANİSA	1	1	1	1	1	1	2	1	1	1	1	1
46	KAHRAMANMARAŞ	2	2	1	1	2	1	2	2	1	1	2	1
47	MARDİN	4	3	3	3	3	4	4	3	3	3	3	4
48	MUĞLA	2	2	2	2	2	2	2	2	2	2	2	2
49	MUŞ	4	4	4	3	4	4	4	4	4	3	4	4
50	NEVŞEHİR	4	3	2	3	3	3	4	3	2	3	3	3
51	NİĞDE	2	1	2	2	1	2	2	1	2	2	1	2
52	ORDU	4	3	3	3	2	4	4	2	3	3	2	4
53	RİZE	2	3	3	2	3	4	3	3	2	2	3	4
54	SAKARYA	1	1	1	1	1	1	1	1	1	1	1	1
55	SAMSUN	2	2	1	2	2	2	2	2	1	2	2	2
56	SİİRT	4	4	4	3	4	4	4	4	4	3	4	4
57	SİNOP	3	3	3	3	3	4	3	3	3	3	4	4
58	SİVAS	2	3	2	2	3	2	3	3	2	3	3	2
59	TEKİRDAĞ	1	1	1	1	1	1	1	1	1	1	1	1
60	TOKAT	4	3	3	3	3	4	4	3	3	3	3	4
61	TRABZON	3	2	2	2	2	2	3	2	1	2	2	1
62	TUNCELİ	4	4	4	3	4	4	4	4	4	3	4	4
63	ŞANLIURFA	3	2	2	2	2	3	2	2	2	2	2	4
64	UŞAK	2	2	2	2	2	4	2	2	2	2	2	4
65	VAN	4	4	3	3	4	4	4	4	3	3	4	4
66	YOZGAT	3	3	4	3	3	4	3	3	4	2	3	4
67	ZONGULDAK	2	3	2	2	3	2	2	3	2	2	3	2
68	AKSARAY	3	2	2	2	2	2	3	2	2	2	2	2
69	BAYBURT	4	4	3	3	4	4	4	4	3	3	4	4
70	KARAMAN	2	2	1	2	2	1	2	2	1	2	2	1
71	KIRIKKALE	3	3	3	3	4	4	3	4	3	2	4	4
72	BATMAN	4	3	2	3	3	3	3	3	2	3	3	4
73	ŞIRNAK	4	2	4	3	2	4	4	2	4	3	2	4
74	BARTIN	4	4	3	3	4	4	4	4	3	3	4	4
75	ARDAHAN	4	4	4	3	4	4	4	4	4	3	4	4
76	IĞDIR	4	4	4	3	4	4	4	4	4	3	4	4
77	YALOVA	4	3	2	3	3	2	4	3	2	3	3	2
78	KARABÜK	4	3	3	3	4	4	4	3	3	3	3	4
79	KİLİS	4	4	3	3	4	4	3	3	3	3	4	4
80	OSMANİYE	4	4	3	3	4	4	4	3	2	3	4	4
81	DÜZCE	2	3	2	2	2	2	3	2	2	2	2	2

***:** ‘t-1: Time Period (2000-2005)’ , ‘t: Time Period (2006-2010)’ , ‘t+1: Time Period (2011-2017)’
‘1: Innovation Leaders’, ‘2: Strong Innovators ‘, ‘3: Moderate Innovators’, ‘4: Modest Innovators’

CURRICULUM VITAE

Name Surname **:** Berna Sezen ÖZEN

EDUCATION:

- **B.Sc.** **:** 2009, Karadeniz Technical University, Faculty of Architecture, Department of Urban and Regional Planning.
- **M.Sc.** **:** 2012, Karadeniz Technical University, The Graduate School of Natural and Applied Sciences, Urban and Regional Planning Graduate Program.

PROFESSIONAL EXPERIENCE AND REWARDS:

- 2020-2022: Working as a research assistant in Karadeniz Technical University
- 2020-2012: Working as a research assistant in İstanbul Technical University
- 2012-2009: Working as a research assistant in Karadeniz Technical University
- 2012: Graduating as an Honor student
- 2009: Graduating as an Honor student (3.50/4.00) and first at Department of Urban and Regional Planning from B.Sc. from Karadeniz Technical University.

PUBLICATIONS, PRESENTATIONS AND PATENTS ON THE THESIS:

Publications:

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Projects:

- 2019G000370 Proje Numaralı “Konut Araştırma Projesi” “2019G000370 Proje Numaralı “Konut Araştırma Projesi” (Dezavantajlı Grupların Barınma ve Konut İhtiyacının Karşılanmasına Yönelik Kamunun ve Özel Sektörün Yapabileceklerini Belirleyen” Projesi, Çevre ve Şehircilik Bakanlığı, Mesleki Hizmetler Genel Müdürlüğü ile İTÜ Konut Uygulama ve Araştırma Merkezi Protokolü ile (Eylül 2019-Mayıs 2020), İTÜ, Döner Sermaye.
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