ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF ARTS AND SOCIAL SCIENCES

UNDERSTANDING THE CAUSES OF CHILD LABOR AND ITS SECTORAL DISTRIBUTION IN TURKEY

M.A. THESIS

Orçun KANUN

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İSTANBUL TEKNİK ÜNİVERSİTESİ ★ SOSYAL BİLİMLER ENSTİTÜSÜ

TÜRKİYE'DEKİ ÇOCUK İŞÇİLİĞİNİN SEBEPLERİNİ VE SEKTÖREL DAĞILIMINI ANLAMAK

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To my family,

FOREWORD

Since as early as I could remember, I know for a fact, after having faced many difficulties, that life is not a linear function. It has its own ups and downs, often leaving individuals surprised, if not shocked, in a tiresome pursuit of its true meaning. To me, being at peace with the life itself as it flows and keeping in mind that nothing happens without a purpose is what matters the most. Yet this should not stop anyone to try and be the best of him or herself which is exactly what I have so far been and will always be after.

Preparing this dissertation was not easy but I have learned so much in the process and given my best to help make it as good as possible. Still, this pursuit would have only led to a meager product without the invaluable guidance of my advisor Dr. Ayşegül Kayaoğlu Yılmaz to whom I am extremely grateful. I would also like to thank my family; my mother Saniye, my father Orhan and my brother Onur as well as my dear friend Yasemin and my love Damla for their priceless support in the meantime. Life is certainly more beautiful with them and I am closer to be best of myself with their help.

May 2018 Orçun KANUN

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ABBREVIATIONS

AG	**:** Age Group
BWC	**:** Bad Working Condition
AHH	**:** Age of Household Head
CAPI	**:** Computer Assisted Personal Interview
EO	**:** Elemantary Occupation
G	**:** Gender
HS	**:** Household Size
IDS	**:** Income Distribution Survey
ILO	**:** International Labor Organization
IPEC	**:** International Labor Organization of International Programme on the Elimination of Child Labor
IV	**:** Instrumental Variable
L	**:** Literacy
LR	**:** Likelihood Ratio
Lwd	**:** Having Literacy Without Diploma
MENA	**:** Middle East and North Africa
MNLM	**:** Multinomial Logit Model
OLS	**:** Ordinary Least Square
PPS	**:** Probability Proportion to Size
PSID	**:** Panel Study of Income Dynamics
PSU	**:** Primary Sampling Unit
PT	**:** Public Transportation
PV	**:** Private Vehicle
RRR	**:** Relative Risk Ratio
SIS	**:** State Institute of Statistics
SMW	**:** Skilled Manual Workers
S	**:** Student
ToR	**:** Type of Residency
TURKSTAT	**:** Turkish Statistical Institute
U.S.	**:** United States
VBF	**:** Vehicle by Firm
WLS	**:** Weighted Least Square

SYMBOLS

Chi^2	**:** Chi-Square
Df	**:** Degrees of Freedom
f(*)	**:** Function
G	**:** Goodness of Fit
p	**:** P-Value
P	**:** Probability
SE	**:** Standard Errors
W_i	**:** Welfare
X^2	**:** Chi-Square
β	**:** Beta coefficient

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UNDERSTANDING THE CAUSES OF CHILD LABOR AND ITS SECTORAL DISTRIBUTION IN TURKEY

SUMMARY

Although child labor in Turkey is a phenomenon that has begun to be attributed importance in recent years, not many studies are conducted about child labor in the economic literature. The focus of this dissertation is to make sense of the reasons behind child labor and the sectoral distribution of child workers in Turkey. Around this focus, this dissertation explains the degree of the impact of household characteristics, child-related factors and differentiation of household and spatial factors on child labor. Additionally, it comparatively demonstrates which sectors are significantly affected by these factors. In other words, the purpose of this study is to identify together which factors the number of child workers' changes when there is a change or development on certain factors or in case sectoral conditions are established.

The main contributions of this study to the literature can be explained as the following. Firstly, the 2012 Child Labor Survey collected and put together by the Turkish Statistics Institute has never been used in studies on child labor in Turkey before this dissertation. Besides, while being the first study to analyze the 2012 Child Labor Survey, this dissertation can also be considered as a study that explains the relationship between certain factors included in this data set reflecting that period to the literature and child labor. Although there are studies that focus on reasons of child labor, the relationship between child labor and household characteristics and whether children continue school attainment, the 2012 Child Labor Survey has not been used in those studies in that regard. In addition to these, researchers are not measuring the sectoral distribution together with various variables in an ad hoc study. Attempting to make sense of the reasons of child labor at sectoral level, this dissertation explains the comparative relationship of certain factors and sectors. The last point that we can consider to be a contribution to the literature is how related our findings are to policy and our policy recommendations based on our findings.

The definitions of variables with which we try to explain the child labor and sectoral differences and sub-sections of these definitions are listed before analyzing the data. The Turkish Statistics Institute's 2012 Child Labor Survey has been examined in the study and this micro data set is used for analysis. This data set has been prepared in a way that it could represent the whole country while containing questions that look at characteristics of child labor at the individual, household and societal level. This data set that has been designed for politicians and researchers is strengthened and detailed by weighted representation of participants. Making sense of the link between child-related factors and child labor – which is also one of the goals of this study – is of major importance. Child-related factors are analyzed by taking into account the gender, age group and school attainment of children. In what we can describe as the second part of analysis about household characteristics, the impact of household size on child labor is tried to be explained. Besides, the impact of household's

demographic characteristics, the education level of household and the age of household head on child labor are also looked at as part of this study. Lastly, the impact of variables such as the type of vehicles children use to go to work (i.e. public transportation, private vehicle or a vehicle arranged by the employer etc.), where they live (rural or urban), the circumstances of the sector they work in and professional status on child labor and in which sectors they are employed more are analyzed. Besides, these parameters are comparatively investigated at the sectoral level.

While choosing the empirical approach used in this study, the quality of the data set at hand and other empirical regression models used in the literature have been taken into account. Probit regression analysis and weighted probit analysis are two types of methods employed to understand reasons of child labor. Multinomial logistic regression is, however, a method that is used to make sense of the sectoral distribution of child workers. Often preferred in the literature are probit, logit and binary logit methods. However, multinomial logistic regression and weighted probit have been identified through various tests as the most appropriate methods for the used data to answer our research question. One of the primary reasons for this is that our data set contains weighted representation for each participant. This special information has facilitated the use of weighted probit method. Also, the variables contained in the data set are generally dummy and categorical variables therefore suitable for application of probit and logit models. Furthermore, the interpretations made in multinomial logistic regression are supported not only by coefficients but also by relative probabilities and whether they are meaningful with respect to these effects has been explained.

According to our findings, children related factors are controlled to understand their relationship to child labor and statistically significant results are listed below. All children related factors have shown statistical significance at %1 level. When all other variables are held constant, it is proven that female children are less likely to participate in the labor force than male children. In a comparison between agricultural and industrial sectors, female children are less likely to be employed in agricultural sector than male children. This situation – how significant is sectoral distribution of child workers with respect to their gender and this sectoral comparison - could draw attention with regards to what sort of measures should be taken by politicians. Besides, the age group of children has been proven to be a statistically significant variable at %1 level. Children between the ages of 6-14 are participating in the labor force less than those in the 15-17 age group. As opposed to that, no meaningful correlation between the age group of child workers and their sectoral distribution could be found. In addition to these variables, school attainment is a very important variable in the child labor literature that - like it is proven in this study and supporting many other studies - children not attending school are more likely to participate in the labor force than those who are. There is a very significant and inverse correlation between whether children continue to attend school and child labor. This finding is in line with most of the studies in the literature on child labor in Turkey. Besides, when we compare service sector and industrial sector, child workers who do not attend school are more likely to be employed in service sector. Surprisingly, despite our expectations of the household size's impact on child labor, no correlation between child labor and household size was discovered.

Besides, certain variables have been taken into account in this study to investigate the relation between child labor and spatial factors. Where child workers live has an

impact on child labor at %1 statistical significance level. If all other child related variables are considered to be constant, children living rural areas are on average more employed than those who are living in urban areas. It cannot be defied that this variable provides us a significant information because that there is a significant relationship between sectoral distribution of child labors and where they live has been proven. If all other children related variables are considered to be constant, it is more likely for child labors whose residence has been described as rural to be employed in agricultural sector than industrial sector. This proven situation could be tied to industrialization, characteristics of residential areas and household characteristics. Besides, professional status could be considered an informative and important variable when analyzing sectoral distribution of child labor. Besides, it has been discovered that the relationship between which type of vehicles children use to go to work and their sectoral distribution is significant. Public transportation and private vehicles are more preferred alternatives in industrial sector than service sector. In addition to these, the probability for child labors to work under bad circumstances is higher in industrial sector than in service sector.

Taking into account proven results, two alternatives could be offered as solutions to this problem to decrease the number of child workers thanks to this study. One of them is increasing compulsory education period and the other as an alternative could be for legislators to introduce increased oversight on certain sectors with respect to child labor. However, the measures regarding compulsory education have been put in place with the '4+4+4' system. But this study fails to provide a proof regarding comparative, causal explanation of this arrangement introduced in the education system because it has been conducted on a data set collected only in 2012.

In this framework, suggestions and areas that could further be developed based on this study's findings could be listed as the following. Firstly, this study is unable to provide a proof with regards to causality because it employs a data set collected only in 2012, however, a comparative empirical research could be conducted with using two different panel data sets collected in two different years. Another alternative suggestion is that different policy suggestions could be made by combining this study with macro level indicators. Finally, the household level variables (i.e. average household income level and salaries of the employed within the household) that we could not integrate because they were not present in the data set could be used to measure if the correlation between variables such as income and education is significant with child labor by collecting different data sets.

TÜRKİYE'DEKİ ÇOCUK İŞÇİLİĞİNİN SEBEPLERİNİ VE SEKTÖREL DAĞILIMINI ANLAMAK

ÖZET

Türkiye'de çocuk işçiliği son yıllarda önem verilmeye başlanan bir konu olmasına rağmen ekonomi literatüründe çocuk işçiliği adına çok sayıda çalışma yapılmamaktadır. Bu tez çalışmasının odaklandığı nokta çocuk işçiliğinin nedenlerini ve Türkiye'deki çocuk işçilerin sektörel dağılımını anlamlandırmaktır. Bu odak çerçevesinde, bu tez, hanehalkının özelliklerini, çocuk ile ilişkili faktörleri, hanehalkı ve mekansal faktörlerin demografik ayrışmasının, çocuk işçiliği üzerindeki etkisinin derecesini anlamlandırır. Ek olarak, hangi sektörlerin saydığımız bu faktörlerden önemli ölçüde etkilendiğini karşılaştırmalı olarak gösterir. Bir başka deyişle, bu çalışmanın amacı, belirli faktörler üzerinde herhangi bir değişiklik veya gelişme olursa, ya da sektörel koşulların oluşması durumunda, çocuk işçi sayısının hangi faktörlerle beraber değiştiğini belirlemektir.
Bu çalışmanın literatüre başlıca katkıları aşağıdaki gibi açıklanabilir. Öncelikle, Türkiye İstatistik Kurumu tarafından oluşturulmuş ve toplanmış olan 2012 Çocuk İşgücü Anketi, Türkiye'de çocuk işçiliği üzerinde yapılan araştırmalarda, bu tez çalışmadan önce hiç kullanılmamıştır. Ayrıca, bu tez, 2012 Çocuk İşgücü Anketini analiz eden ilk çalışma özelliğini taşırken, literatüre bu dönemi yansıtan veri setinin içerdiği belirli faktörlerle çocuk işçiliği ilişkisini açıklayan bir çalışma olarak da nitelendirilebilir. Literatürde her ne kadar çocuk işçiliğinin nedenleri, çocuk işçiliği ile hanehalkının özellikleri ve çocukların okula devam edip etmemesi gibi ilişkilere odaklanan çalışmalar yer alsa da, bu kapsamda 2012 Çocuk İşgücü Anketi bu çalışmalarda kullanılmamıştır. Bunlara ek olarak, araştırmacılar farklı değişkenlerle beraber Türkiye'de sektörel dağılımın nedenlerini özel bir çalışma ile ölçmemektedir. Sektörel bazda çocuk işçiliğinin sebeplerini anlamlandırmaya çalışan bu tez belirli değişkenlerle sektörlerin karşılaştırmalı ilişkisini açıklamaktadır. Literatüre katkı olarak sayabileceğimiz son nokta, bulgularımızın politikayla ne ölçüde ilgili olduğu ve bulgularımıza dayanan politika önermelerimizdir.

Verileri analiz etmeden önce çocuk işçiliği ve sektörel farklılıkları açıklamaya çalıştığımız değişkenlerin tanımlarına ve bu değişkenlerin alt başlıklarına çalışmanın içerisinde yer verilmiştir. Türkiye İstatistik Kurumu'nun yürüttüğü 2012 Çocuk İşgücü Anketi, bu çalışma kapsamında incelenmiş ve bu mikro veri seti analiz için kullanılmıştır. Bu veri seti, çocuk işçiliğinin özelliklerini; bireysel, hanehalkı ve toplum düzeyinde inceleyen sorular içerirken tüm ülkeyi temsil edebilir nitelikte hazırlanmıştır. Politikacılar ve araştırmacılara yönelik olarak tasarlanan bu veri seti, katılımcılar için ağırlıklandırma yapılarak pekiştirilmiş ve detaylandırılmıştır. Bu çalışmanın amaçları arasında yer alan çocuklarla ilişkili faktörler ile çocuk işçiliği arasındaki bağlantının anlamlandırılması önemli bir yer tutmaktadır. Çocuk ile ilişkili olan faktörler; çocukların cinsiyeti, yaş grubu ve okula devamlılıkları göz önünde bulundurularak analiz edilir. İkinci grup olarak nitelendirilebileceğimiz analizin kapsamında yer alan, hanehalkına özgü faktörler arasında hanehalkı büyüklüğünün çocuk işçiliği üzerindeki etkisi anlamlandırılmaya çalışılmaktadır. Ayrıca, hanehalkının demografik özellikleri, hanehalkının eğitim düzeyi ve

hanehalkı içinde söz sahibi olan ebeveynin yaşının; çocuk işçiliği üzerindeki etkisi bu çalışmanın kapsamında değerlendirilmiştir. Son olarak, çalışan çocukların işyerlerine gitmek için hangi araç türlerini kullandığı (Örneğin, toplu taşıma, binek aracı, çalışmış olduğu firmanın sağladığı araçlar vb.) ikamet ettikleri yer (Kır ya da Kent), çalışmakta oldukları sektörün çalışma koşulları, meslek statüleri gibi değişkenlerin çocuk işçiliği üzerindeki etkisi ve sektörel bazda hangi sektörde daha fazla istihdam edildikleri incelenmektedir. Ayrıca, sektörel bazda bu değişkenler karşılaştırmalı olarak araştırılmaktadır.

Bu çalışmada kullanılan ampirik yaklaşım seçilirken, elimizde bulunan verinin niteliği ve literatürde kullanılmış olan diğer ampirik regresyon modellemeleri de göz önünde bulundurulmuştur. Probit regresyon analizi ve ağırlıklı probit analizi çocuk işçiliğinin sebeplerini anlamak için kullanılan iki yöntemdir. Çok sınıflı lojistik regresyon yöntemi (Multinomial Logistic Regression) ise çocuk işçilerin sektörel dağılımlarını anlamlandırmak için kullanılan yöntemdir. Literatürde sıklıkla tercih edilen yöntem probit, lojit ve iki değişkenli lojit (Binary Logit) yöntemleridir. Ancak bizim araştırma sorumuzu yanıtlandırması amacıyla kullanılan veriye en uygun modelleme yöntemlerinin çok sınıflı lojit ve ağırlıklı probit olduğu farklı testler yapılarak saptanmıştır. Bunun ana sebeplerinden biri, kullanmış olduğumuz veri setinin her bir katılımcı için ağırlıklandırmaları içermesidir. Bu özel bilgi bize, ağırlıklandırılmış probit yönteminin kullanımında kolaylık sağlamıştır. Ayrıca, veri setinde yer alan değişkenler genel olarak, kukla ve kategorik değişkenlerdir bu sebepten dolayı probit ve lojit model kullanımına uygundur. Ayrıca, çok sınıflı lojit regresyonunda yapılan yorumlamalar sadece katsayılarla değil, göreceli olasılıklar oranı ile desteklenmiş, ve bu etkilerin yönü ile anlamlı olup olmadığı da açıklanmıştır.

Bulgularımıza göre, çocukla ilgili faktörler, çocuk işçiliği ile ilişkilerini anlayabilmek amacıyla kontrol edilmiş olup istatistiksel olarak anlamlı olan sonuçlara aşağıda yer verilmiştir. Tüm çocuklar ile ilgili faktörler %1 düzeyinde istatistiksel olarak anlamlılık göstermiştir. Diğer tüm değişkenler aynı olarak varsayıldığında, kız çocuklarının erkek çocuklara göre işgücüne katılma olasılıklarının daha az olduğu ispatlanmıştır. Tarım sektörü, sanayi sektörü ile kıyaslandığı zaman, kız çocuklarının tarım sektöründe istihdam edilme olasılığı erkek çocuklarına oranla daha fazladır. Bu durum, kız ve erkek çocuklarının istihdam edildikleri sektörlerde çalıştıkları veya çalıştırıldıkları alanların cinsiyet ayrımına göre ne kadar anlamlı olduğu ve sektörel bazlı bu karşılaştırmayla beraber politikacılar tarafından ne gibi önlemler alınması gerektiğine dikkat çekebilecek niteliktedir. Ayrıca, çocukların yaş grubunun, istatistiksel olarak anlamlı bir değişken olduğu, %1 düzeyinde kanıtlanmıştır. 6-14 yaş arası çocuklar 15-17 yaşında ki çocuklara göre daha az işgücüne katılmaktadır. Bu duruma karşıt olarak, çocuk işçilerin yaş gruplarıyla sektörel dağılım arasında anlamlı bir ilişki bulunmamıştır. Bu değişkenlere ek olarak, çocukların okula devamlılığı çocuk işçiliği literatüründe çok önemli bir değişkendir; çocuklar okula devam ederse, diğer birçok çalışmayı destekler nitelikte, bu tezde de kanıtlandığı gibi, okula gitmeyen çocukların okula gidenlere göre işgücüne katılma olasılıkları daha fazladır. Çocukların öğrenciliğe devam etme değişkeni ile çocuk işçiliği arasında oldukça anlamlı ve ters yönlü bir ilişki bulunmaktadır. Bu bulgu, Türkiye'deki çocuk işçiliği literatüründeki çalışmaların çoğu ile tutarlıdır. Ayrıca, hizmet sektörünü ve sanayi sektörünü karşılaştırdığımızda, okula gitmeyen çocuk işçilerin hizmet sektöründe istihdam edilme olasılığı daha yüksektir. Şaşırtıcı bir şekilde, hanehalkı büyüklüğünün çocuk

işçiliği üzerinde bir etkisi olduğu ile ilgili beklentilerimiz olsa da, çocuk işçiliği ile hanehalkı büyüklüğü arasında bir ilişkiye rastlanmamıştır.

Ayrıca, çocuk işçiliğiyle mekânsal faktörlerin de ilişkisini araştırmak amacıyla belirli değişkenler bu araştırmanın kapsamında ele alınmıştır. Çocuk işçilerin ikamet ettikleri yerin çocuk işçiliği üzerinde %1 anlamlılık düzeyinde istatistiksel olarak bir etkisi vardır. Çocuklarla ilgili tüm değişkenler aynı varsayılırsa, kırsal alanda yaşayan çocuklar, kentsel alanlarda yaşayanlardan ortalama olarak daha fazla istihdam edilmektedir. Bu değişkenin bize anlamlı bir bilgi verdiği yadsınamaz; çünkü çocuk işçiliğinin sektörel dağılımı ile ikamet ettikleri yer arasında anlamlı bir ilişki bulunduğu kanıtlanmıştır. Eğer çocuklara ait diğer değişkenlerin aynı olduğu kabul edilirse, ikametgâhı kırsal kesim olarak nitelendirilmiş çocuk işçilerin, sanayi sektöründense tarım sektöründe istihdam edilmeleri daha olasıdır. Kanıtlanmış bu durum, sanayileşme, ikamet edilen alanların özellikleri ve hanehalkı özelliklerine bağlı olabilir. Ayrıca, çalışılan mesleklerin statüsü, çocuk işçiliğinin sektörel dağılımını analiz ederken okuyucuları bilgilendirici ve önemli bir değişken olarak kabul edilebilir. Ayrıca, çocuk işçilerin işe giderken hangi araçları kullanıldığının sektörel dağılımla ilişkisinin anlamlı olduğu da farkedilmiştir. Toplu taşıma ve binek aracı, işe gitmek için sanayi sektöründe, hizmet sektörüne kıyasla daha çok tercih edilen alternatiflerdir. Bunlara ek olarak, çocuk işçilerin sanayi sektöründe kötü çalışma koşulları altında çalışma olasılığı, hizmet sektöründe kötü çalışma koşulları altında çalışma olasılığından daha yüksektir.

Bu çalışmayla beraber çocuk işçi sayısını azaltmak amacıyla, kanıtlanmış sonuçları da göz önünde bulundurulmasıyla, iki farklı alternatif bu probleme çözüm olarak önerilebilir. Bunlardan bir tanesi zorunlu eğitim süresinin arttırılması iken, diğer bir alternatif olarak değerlendirilebilecek durum yasa koyucuların çocuk işçiliği adına belirli sektörlere daha fazla denetim getirmesi olabilir. Ancak, zorunlu eğitim süresi ile ilgili düzenlemeler sonraki yıllarda 4+4+4 sistemi ile gerçekleştirilmiştir. Ama bu çalışma sadece 2012 yılında toplanmış bir veri seti üzerinden yapıldığı için karşılaştırmalı olarak eğitim sisteminde gerçekleştirilmiş olan bu düzenlemenin nedensel açıklaması konusunda bir kanıt ortaya koyamamaktadır.

Bu çerçevede, çalışmanın bulgularına dayanan öneriler ve geliştirilebilir alanlar, aşağıdaki gibi sıralanabilir. İlk olarak, bu çalışmada sadece 2012 yılında toplanmış bir veri seti kullanıldığı için nedensellik açısından bir kanıt ortaya koyamamaktadır, ancak farklı yıllarda toplanmış olan iki farklı panel veri setiyle karşılaştırmalı olarak farklı bir ampirik analiz yapılabilir. Diğer bir alternatif öneri ise, bu çalışma makro düzeydeki ekonomik göstergelerle birleştirilerek daha farklı politika önerileri yapılabilir. Son olarak, bizim bu çalışmada veri setinde yer almamasından dolayı tezde yer veremediğimiz hanehalkı düzeyinde değerlendirilebilecek değişkenler(örn. ortalama hanehalkı gelir düzeyi ve hanehalkı çalışanlarının maaşları) kullanılarak gelir eğitim gibi değişkenlerin korelasyonunun çocuk işçiliği ile anlamlı olup olmadığı başka veri setlerinde toplanıp ölçülebilir.

1. INTRODUCTION

Child labor is one of the most challenging problems the world suffers from today despite a considerable 3% decline in the number of child workers (i.e. aged 5-17) globally, from 215 million in 2008 to 168 million in 2012. However, as Diallo (2013) emphasizes, still about one tenth of the total child population is actively involved in the labor market, though in varying numbers due to socio-economic conditions where they live. Table 1.1.[1] below shows the ratio of children, aged between 5-7, involved in labor by region in 2008 and 2012. The number of children workers varies from 141,043 to 853,334 and from 110,411 to 835,334 in 2008 and 2012, respectively. A closer look reveals, despite all odds, a downward trend for child labor in all these regions but that should not overshadow the fact that there are still a staggering 77.7 million children whose labor are sold and bought in the market.

Table 1.1 : Child population and labor by region, 5-17 years aged group, 2008 and 2012.

Region	Years	Child Labor		Children Population
		('000)	%	('000)
Asia and The Pacific	**2008**	**113,607**	**13,3**	**853,334**
	2012	77,723	9,3	835,334
Latin America and the Caribbean	**2008**	**14,125**	**10**	**141,043**
	2012	12,505	8,8	142,693
Sub-Saharan Africa	**2008**	**65,064**	**25,3**	**257,108**
	2012	59,031	21,4	275,397
Other Regions of which MENA 2012	**2008**	**-**	**-**	**-**
	2012	9,244	8,4	110,411
World	**2008**	**215,269**	**13,6**	**1,586,288**
	2012	167,956	10,6	1,585,566

Source: ILO(2013)[2]

[1] The ILO report issued in 2013, reviews the children labor by analyzing four main regions.

[2] The 2008 child population does not represent in the ILO (2003) report.

According to the International Labor Organization (ILO) (2013), the Middle East and North Africa region (MENA) had 110.4 million child laborers while the Sub-Saharan Africa region had 59 million in 2012. There were, however, 12.5 million child workers in the Latin America and the Caribbean region the same year. In all regards, the number of children at work is alarmingly high, begging a thorough, scientific investigation.

Scholars have carried out various research to determine what causes child labor. Basu and Van (1998), for example, defend that entrepreneurs seeking cheap labor and self-centered parents who are comfortable with the idea of sending their kids to work to rather enjoy leisure themselves may be the main drivers behind it. However, in less developed countries, the underlying motive might differ as families suffer from amplified hardships as terrifying as starvation, that sending children to work is no longer regarded as a choice but a matter of survival. Unfortunately, though, those children are eventually required to carry out heavy tasks where they work, damaging their health, both physical and psychological. According to ILO Convention 182 Article 3 (1999), worst forms of employment for child workers include all types of slavery, forced or compulsory labor such as prostitution and production of pornographic content in addition to production and trafficking of drugs.

Entering the labor market at early ages has many direct and indirect, yet often irreversible, impacts on the lives of children. It does not just remain extremely destructive for their health, social and cognitive skills – as if that is not bad enough - but also presents an insurmountable barrier for children to obtain formal education and improve their human capitals, effectively condemning them to a life that does not actually offer much of a comfort to themselves or their loved ones. Therefore, both Psacharopoulos (1997) and Jensen and Nielsen (1997) find a significant negative relationship between schooling and working. In the light of this finding, Weiner (1991) points out that one of the main complaints of managers in India, for instance, is that the available labor force is not sufficiently educated with too many workers are not even able to read manuals or simple instructions written on machines.

Unfortunately, child labor is a major issue in Turkey as well. According to the country's official statistics agency TURKSTAT (2013), out of 15 million children aged 6-17, 890.000 individuals were in labor force in 2006 and this number went up

to 893.000 in 2012. Table 1.2 shows that 326.000 children were working in the field of agriculture alone in 2006 and six years later this number further increased by a troubling 22.4 percent to become nearly 400.000. Within industry and service sectors, however, there has been an opposite trend in the same period. The number of children at work in industrial jobs was 275.000 in 2006 and it dropped to 217.000 in 2012. Likewise, the service sector recorded a decline in child labor from 289.000 in 2006 to 277.000 in 2012.

TURKSTAT data also show that the number of boys was higher than the number of girls as child laborers in each sector, both in 2006 and 2012. The gender of children, however, can be a factor in sectoral distribution of child labor. In Turkey, male children are more preferably employed in factories, restaurants, coffee houses, barbershops and as street vendors since those jobs are considered to require manpower. On the other hand, agricultural sector employs more female children such as at household-owned lands. Despite this general expectation, TURKSTAT data suggest otherwise, as it can be seen in the Table 1.2.. The difference might have stemmed from the difficulty of accessing children in rural areas. Therefore, one can argue that those striking numbers might even underestimate the actual size and scope of the problem.

Table 1.2 : Children engaged in economic activities by sex and branch of economic activity, 2006 and 2012, in thousands.

	Branch of Economic Activity							
Gender	**Agriculture**		**Industry**		**Service**		**Total**	
	2006	2012	2006	2012	2006	2012	2006	2012
Male	172	236	189	168	240	210	601	614
Female	154	163	85	49	50	67	289	279
TOTAL	**326**	**399**	**275**	**217**	**289**	**277**	**890**	**893**

Source: TURKSTAT(2013)

In an attempt to protect children from occupational hazards and abuse, Turkey increased the year of compulsory education for its citizens from 5 to 8 years in 1997. The following year, it signed the ILO Convention 138 which rose the minimum age of employment to 15. In 2001, the country also ratified the ILO Convention 182 for elimination of worst forms of child labor. A year later, it began supplying students with course books for free to support education of children at elementary school. In 2006, this policy was expanded to cover secondary school students. In 2012, the

government introduced what is termed as the '4+4+4 education system' which prescribed a 12-year compulsory education instead of previously required 8 years. Those steps were all in the right direction and helped reduce child labor in the country but continued action is beyond necessary to ensure reliable protection for children from what might otherwise await them in workplaces.

It is a widely-practiced approach for scholars to generalize child labor and present it in a negative sense but there are exceptions, too. Focusing on what he calls "light work," Edmond (2008), for example, is one of those researchers who beg to differ, defending that "light work" might even be beneficial for children to some extent: "Light work is used to characterize the market work of children aged 12-14 that is non-hazardous and for less than 14 hours per week" which might improve the wellbeing of children under certain conditions. Patrinos and Pscharopoulos (1997), and Myers (1989) indicate that child laborers also attend school and in some cases their earnings from work are actually what make their schooling possible. Accordingly, understanding the work patterns of children and factors that lead them to work is critical because of the complex nature of the issue that might otherwise mislead observers.

Thankfully, many scholars continue to investigate the issue of child labor and the number of relevant studies conducted is rapidly increasing. There has been a big proliferation of emprical research on child labor. An econlit search of keywords 'child labor' reveals a total of 6 peer-reviewed journal articles in the 1980-90 period while the list is extended to contain 65 articles in 1990-2000 and finally 143 articles in 2000- 2005 (Edmonds, 2007). Focusing on the case of Turkey, the aim of this dissertation, similarly, is to provide a better understanding of factors underlying child labor and, when possible, offer policy recommendations to help relevant bodies, public and private, cope with this problem.

The remainder of this dissertation is organized as the following: In Section 2, we present a theorethical and empirical literature review in the world as well as in Turkey. Section 3 gives information on which aspects of child labor are empirically tested here in. In Section 4, we introduce our data with descriptive statistics and correlation analysis followed by the methodology used. Section 5 concludes findings and summarizes policy recommendations.

2. LITERATURE REVIEW

Child labor is a global phenomenon widespread not only in underdeveloped and developing economies but also in developed ones. According to Horrell and Humphries (1995), even in wealthy England where this problem is present since late 18th and early 19th century, children and parents, alike, still suffer from certain consequences. Table 2.1. represents the absence of measurable paid employment by children under 15 in developed economies. As is shown in the table, after 1970s, number of child labor is indicated as null. This should not mean that child labor was no longer encountered in those regions but perhaps the relevant countries lacked the technical infrastructure required to conduct research and surveys on child labor at the time. It may also be assumed that child labor rate was considerably low then but we do not have enough evidence to support that.

Irrespective of the financial standing of nations, people and governments are immensely worried about the number of children at work. Researchers and policy makers are, therefore, naturally urged to investigate this issue and it is possible to find numerous studies on determinants of child labor.

Table 2.1 : Economic activity rates for the 10-14 years old for selected countries.

	1950	**1960**	**1970**	**1980**	**1990**	**2000**	**2010**
W. Europe	4,10	3,4	1,7	0	0	0	0
Austria	7,80	7	3,6	0	0	0	0
Belgium	4,2	3,1	0,6	0	0	0	0
France	5,4	4,2	2,6	0	0	0	0
Germany	3,4	2,8	1,1	0	0	0	0
Netherlands	4,90	2,6	1,7	0	0	0	0
Switzerland	0,9	0,4	0,2	0	0	0	0
Australia	2,7	1,6	1,2	0	0	0	0
New Zealand	0,3	0,1	0,1	0	0	0	0

Source: (ILO, 1997)

In this section, main expressions and frameworks of theoretical studies will be explained and their contributions will be discussed in Section 2.1. Then, empirical

studies which discuss the causes of child labor in the world and particularly in Turkey will be analysed.

2.1 Theoretical Background

As theoretical framework, two kinds of approaches are used by researchers in order to analyze intra-household resource allocation which is beneficial to solve labor force problems. First one is the household production theory, which is based on maximizing common utility function of household with respect to the full income constraint. This concept has been widely used in child labor literature. This theory states that household consumes and produces at the same time, but household needs to allocate their time efficiently to maximize the common utility function. The second concept in theory, not as widely used, is bargaining model which opposes the common household utility function. This concept defends that each member of household has different utility, so they can allocate more household resources that they enjoy the most.

Basu (1999) analyzes child labor with both bargaining model and intra-household production theory in order to find a permanent solution to child labor. However, the root of this model is termed ‘unitary model’ which represents household as a single decision-making unit - an acceptable perspective only if the household has a leading member who dictates the terms for the rest or all members have the same utility function. Basu (1999) criticizes this concept, arguing that each people has a different bargaining power because that relies on the resources they bring to the household. General representation of this second concept is known as the collective model, according to Bourguigon and Chiappori (1994). Basu (1999) adopts this model which is taking explicit account of child labor (Moehling, 1995). The basic version of this model is represented in Appendix A. In the world literature, the solution of this model is unique because it has multiple equilibrium points with strong assumptions. He emphasizes two main policies, which are policy intervention and public action to alter the economic environment, assuming that parents on their own prefer not to send their children to work. Governments should enact minimal restrictions on child labor such as forbidding hazardous work and worst forms of jobs instead of imposing a general ban on all kinds of child labor. The reason for that is a general ban creates even worse situations than child labor. For instance, in poor

regions, children may suffer from acute hunger and starvation if their household income falls far below what they need for survival.

Another theory based study is applied by Basu and Van (1998), evaluating the child labor with two different models, trying to find possible solutions to child labor whether multiple equilibrium points exist or not. They found that "good" equilibrium exists where children cannot work and "bad" equilibrium exists where children work. In this study, parents have a rather altruistic approach to send their children to work in order to increase household income. In bad equilibrium condition, the income contribution of children cannot be included but is just exogenously used in equations. They propose that the rise in adult wages can help decrease child labor. However, Baland and Robinson (2000) study the determinants of child labor time efficiency by evaluating the social welfare implications. They argue that the effect of banning child labor will be 'Pareto improving' in general equilibrium. This statement is different than other studies but under poverty, children work at different types of jobs to survive. Grootaert and Kanbur (May 1995) emphasize the efficient time allocation from a different perspective and assert a trade off between child labor and education. They suggest that the welfare of children is based on decision making of household on allocation of labor and non-labor activities. Pure efficiency of time allocation of children is analyzed in that paper which argues that applying compulsory education would decrease child labor.

Nevertheless, it may not be entirely possible to totally eliminate child labor but Basu (1999) states that society could boycott sectors which are using child labor intensively. Likewise, he suggests that financial penalties might also be imposed on those employing children. Ranjan (2001), however, opposes imposition of sanctions on third-world countries because, he argues, it might be counter-productive since those countries' trade volume will decrease as a result. Children there might then have no choice but to join the labor force instead of going to school. Another likely result of financial sanctions is that they can decrease the relative price of unskilled labor-intensive goods which can be the most popular source of income for poor countries. This approach is similar to Stolper-Samuelson relationship which is about lower unskilled wage and higher skilled wage. Applying same policies might therefore create different results in different countries with different economic development levels.

2.2 Empirical Background

2.2.1 Review of studies about the child labor in the world

There are numerous empirical and descriptive studies on child labor. Each of them uses different variables and methods to explain this phenomenon. Patrinos and Psacharopoulos (1997), for instance, analyze the family size, schooling and employment status of child labor on the age-distortion of children with using a logit model using Peru Living Standard Survey. They state that number of siblings, siblings' age structure and their activities have a significant impact on child schooling. Also, higher number of younger siblings results in less schooling and creates more age-distortion in the classroom, driving more children away from school. The reason could be the family's poverty and less human capital to invest in education. According to Loayza and Polastri's own calculations from National Household Survey and National Living Standard Measurement Survey (2004), in the 1997-2002 period in Peru, the poverty index is 46.4%. On the other hand, Chernichovsky (1985) finds a very surprising result that the number of children in household and the schooling have positive relationship in rural Botswana. In other words, he argues that if the household have more children, children's education level will increase. This finding greatly differs from other studies but this may be due to difficulty of collecting data in rural areas. Its sample might be biased perhaps because it was mostly chosen from urban areas. Another possibility is that the respondents might have given misleading answers to the survey questions for some personal or family reasons. Moreover, Patrinos and Psacharopoulos (1995) use a logit model on Peru Living Standard Survey in 1991 and state that the number of siblings does not have so much of an effect on school enrollment despite the fact that it has a significant effect on the probability of child labor. Futhermore, they show that the age structure of siblings has an impact on schooling. If children have higher number of younger siblings, their schooling level will be lower. In undeveloped countries, older siblings may work in order to contribute to the family income while their younger siblings can still enjoy going to school or work in lighter jobs.

Another important reason of the child labor is poverty because children work in different types of jobs in order to earn an income and survive. Salmon (2005) uses a

maximum likelihood probit model to Bangladesh Labor Force Survey in order to understand the relationship between poverty and child labor, and shows that poverty forces children to work. Moreover, when children live with their households where potential income generation from family members is low, the potential child labor force is used from household as a last economic resource. One of the studies applied by Ray (2000) tests the positive relation between the hours of child labor and poverty, and the negative association between child schooling and poverty on the 1994 Peru Living Standards Measurement Survey and the 1991 Pakistan Integrated Household Survey. This hypothesis is confirmed for Pakistani data, but not for the Peruvian one. The reduction in poverty rates because of income from children's labor is higher in Pakistan than in Peru. According to World Bank Report (2017) the two countries' populations are very different. In the period of 1990-2016, Pakistan's population has remained approximately five times higher than Peru's. The difference has a very important effect on employment rates and areas of employment. This is also directly linked to income per each household. Second hypothesis of that study is that there is a negative association between child schooling and poverty. As stated before, this hypothesis is correct for Pakistani data, but not for Peru. The reason behind this might also be the population gap between the two countries. Basu and Van (1998) have a similar result (Ray, 2000) about the income of family and child labor. According to the luxury axiom of parents, they send their children to work only if their own income falls way below what they normally need.

Furthermore, low school attainment and child labor are both correlated with family background according to Patrinos and Psacharopoulos (1995). Another study, conducted in Guatemala (Balderston, 1984), supports this thesis, arguing that parental education level positively affects school attendance. If the parents' education level is high, they are more willing to send their children to school because they know the higher return of educated individual both for their country and own children. For this reason, schooling is a substitute of children employment. In parallel, Rosati and Rossi (2003) use the father's and mother's primary and secondary education as a regressor while deciding between sending a child to school or to work (or both) in Pakistan and Nicaragua. They use full model maximum likelihood estimator to estimate the school attendance and child labor decisions simultaneously on ILO-IPEC 1996 Statistical Information and Monitoring Program

on Child Labor survey (Pakistan) and the Living Standards Measurement Study Survey of 1998 (Nicaragua). They suggest that parental education level affects both schooling and child labor.

2.2.2 Review of studies about child labor in Turkey

Dayıoğlu and Assaad (2003) use 1994 Income Distribution Survey (IDS), conducted by State Institute of Statistics (SIS) to find determinants of child labor in urban Turkey. They check the responsiveness of age, region to live, unearned income and hourly wages of children on the employment status at any time over a 12 month-period in 1994 with a probit model, auxiliary regression with quintiles and bootstrapped model. They find that the parents' education level is a vital variable to understand the participation to child labor as other studies found similar results around the world (Grootaert & Kanbur, May, 1995) (Psacharopoulos, 1997). Tansel (2002) and Dayıoğlu (2006) show the level of education of parents has an effect on the education status of children in Turkey. This is not a very surprising finding because parents, who are well-educated, are more willing to send their children to school longer. Tansel (2002) applies an ordered probit model to Household Budget Survey in 1998 conducted by SIS. In different years, the result appears to be the same which means that the families' education level has an impact on participation to child labor in different data sets. Also, Tunalı (1996) explains the education and working experiences of children aged 6-14 in Turkey. He considers the age and gender of the child as well as education level of parents. According to Tunalı (1996), children who are older and have uneducated parents are more likely to participate in labor force.

Another important finding in Dayıoğlu and Assad (2003) is that children's employment status is responsive to their own and paternal wages but not to maternal one. Nevertheless, maternal education level does not have a statistically significant impact on children's employment. Also, they argue that unearned income, which is the opportunity cost of parents, has a negative impact on child labor. The data shows that children who have poorer families carry a higher risk of ending up in employment at early ages. This is a common finding of studies conducted in undeveloped countries (Basu, 1999), and Baland and Robinson (2000).

Furthermore, Dayıoğlu (2005) studies the Child Labor Surveys conducted in 1994 and 1999 by TURKSTAT. She shows that negative association between work and schooling has to be strengthened over time as evidenced by increasing magnitude of correlation coefficient. Also, the negative impact of poverty on the schooling of female children is higher than male children because of parents' preference to send their male children to school. Female children may help their families with housework or working in agricultural fields. Acaroğlu (2010) finds a positive relationship between uneducated decision makers and rate of being a child laborer in urban and rural areas. In his study, the probit model is applied on data collected from labor force survey of TURKSTAT covering the months of October, November and December of 2006. In urban areas, the uneducated decision-maker of household, who decides whether their children should participate in the labor force or not, is affecting both the male and female children almost equally. However, in rural areas, uneducated decision-maker of households increases girls' employment rate more than boys'. This gender gap in Turkish education is analyzed by Tansel (2002) from the side of primary, middle and high school attainment. According to that paper, in southeastern part of Turkey, girls drop out of school around third grade. Also, parental education level is found to be an important variable affecting attitudes towards to girls' education. Mother's schooling appears to be more important for schooling of daughters than sons worldwide as is found by Behrman and Wolfe (1984) and Lillard and Willis (1994).

3. HYPOTHESES

After providing an extensive literature review of child labor issue, the causes of child labor and its sectoral distribution in Turkey is emprically analyzed here. This study tests the determinants of child labor within four different types of factors with two different empirical models. The first set of factors is related to children. These are age, gender and being a student or not. As stated before (Grootaert, 1998), the extent and the direction of these effects are mostly country-specific, depending on the cultural context, labor market conditions, cost of schooling and wage patterns. In this dissertation, following hypotheses related to children are tested:

- H1a: Boys are more likely to be employed than girls.
- H1b: Children who are aged between 15-17 are more likely to be employed than children who are aged between 6-14.
- H1c: Children who currently attend school are less likely to be employed than who are not.
- H1d: Girls are more likely to be employed in agriculture sector compared to industrial sector than boys.
- H1e: Children who are aged between 15-17 are more likely to be employed in industrial sector compared to agriculture sector than children who are aged between 6-14.
- H1f: Children who are aged between 15-17 are more likely to be employed in industrial sector compared to service sector than children who are aged between 6-14.
- H1g: Children who currently attend school are less likely to be employed in industry sector compared to service sector than who are not.

In most of the studies done in recent years, Dayıoğlu (2005) states that female children have engaged in market oriented work and enrolling school with lower probability than male children. Moreover, types of residency and education level of household head are so crucial factors to affect the schooling and engagement to the labor force for males and females. Acaroğlu (2010) states that household head, who

are lower educational level in urban areas in Turkey, the employment rate of their female children is higher than male children. Also, when examined studies made in Turkey, Tunalı (1996) has showed that the age, sex of children, education level of their households and types of residency are significant and decisive to child labor force. For this reason, in my thesis, hypotheses which are related to the children will be tested these types of variables and their results in 2012 data.

The second set of factors are connected to parental characteristics. There is an emprical evidence that the schooling of parents and their nature of employment are interrelated with each other (Acaroğlu, 2010). After controlling for household income, the stability and security of income often appear as significant determinants of child labor.

Hypotheses about Household Characteristics are as the following:

- H2a: The larger the household size is, the more likely the children are to be employed.
- H2b: The larger the household size is, the more likely the children are to be employed in agriculture sector than in industry sector.
- H2c: The larger the household size is, the more likely the children are to be employed in service sector than industry sector.

Household size, income level, expenditure level and their hourly wages will be counted as household characteristics. Tansel (2002) stated that household income and schooling of children have positive association is confirmed in many studies[3]. However, in my data, there is no information which includes household income level, expenditure level and their hourly wages. Thus, only household size will be tested.

The third set of factors to influence child labor includes demographic composition of household. Apart from the parental income and wealth variables, demographic composition of a household can have an effect on child labor, too. Also, numerous studies have proved that the number and the gender of siblings, the absence of parents, the gender and the education level of the household head have significant effects on the intra-household allocation of time as stated Patrinos and Psacharopoulos, (1997) also Grootaert study (1998).

[3] Alderman et al. (1997) discuss the situations which increase the positive relationship between household income and demand for schooling of children.

Hypotheses about the Demographic Composition of Households are as the following:

- H3a: The household heads who have fewer years in formal education are more likely to send their children to work than who have more years in formal education.
- H3b: Older decision-makers of the households are more likely to send their children to work than younger decision-makers.
- H3c: The older decision-makers of households are more likely to send their children to work in agricultural sector when compared to industry sector than younger decision-makers.
- H3d: The older decision-makers of households are more likely to send their children to work in industry sector when compared to service sector than younger decision-makers.

The fourth set of derteminants to influence child labor includes spatial factors. The living areas of children have an impact on child labor. This spatial factor may be incorporated with other factors such as owning an agricultural land, livestock or education level of household, occupation types and sectoral distribution of child labor.

Hypotheses about Spatial Factors are as the following:

- H4a: Children employed in rural areas are more likely to be employed than those in urban areas.
- H4b: Children employed in urban areas are less likely to be employed in agricultural sector when compared to industrial sector than those in rural areas.
- H4c: Children employed under bad conditions are more likely to be employed in industrial sector when compared to agricultural sector than children who are not.
- H4d: Children employed under bad conditions are more likely to be employed in industrial sector when compared to service sector than children who are not.
- H4e: Children whose occupational status is highly or low skilled non-manual are more likely to be employed in industrial sector when compared to service sector.
- H4f: Children who are using a private vehicle to go to work are more likely to be employed in industrial sector than service sector.

The last set of factors is the community-level factors, such as the cost of schooling, labor market opportunities, cultural backgrounds and child labor wage but our data,

the 2012 Child Labor Force Survey, do not include these types of information, so we cannot test the community-level factors in our dissertation.

4. DATA and METHODOLOGY

In this section, the data source and the data design will be introduced and the descriptive statistics for variables and others will be explained. The pairwise correlation of variables and child labor as well as the pairwise tabulation of child labor and variables will also be presented. Tabulations for relevant variables with sectoral distribution will be shown in the following sections.

4.1 Data

The data on child labor is 2012 Child Labor Force Survey which was conducted by TURKSTAT and include many variables regarding possible reasons behind child labor. This survey was designed to provide policymakers and researchers with the individual, household and community level data to analyze the characteristics of child labor, their parental conditions and education levels. The data was collected in the first weeks of October, November and December starting on Monday and ending on Sunday. The Table 4.1 demonstrates the application period of survey and reference period below. Also, the data was collected through Computer Assisted Personal Interviews (CAPI) - face to face interviews with household members. Data collectors used computers to enter respondents' answers to the survey questions.

Table 4.1 : Implementation months and period of reference.

Implementation Months	Period of Reference
October	1-7 October
November	5-11 November
December	3-9 December

Source: (Turkish Statistical Institute, 2013)

The sampling method of this data is two-stage stratified clustered sample. The first stage of sampling consists of blocks with 100 households on average. First stage is selected with probability proportion to size (PPS). National Address Database is used in sampling which is the basis of the Address Based Population Registry System in Turkey. If the villages do not have a municipality, they are regarded to consist a

block themselves. 30 households were selected systematically within each selected PSU. Then, the selected households were systematically divided into two which are called form sets (A and B). Lastly, the stratification is based on Statistical Regions, Level 2 (26 Regions) and rural and urban settings. Moreover, in this data set, TURKSTAT employed the weighting method which is used to draw parameters from the data set resulting from sampling so as to represent the population of Turkey.

The questionnaire in the data set, had additional questions for the 6-14 age group:

- Questions that have been just added for the 6-14 age group to those that already exist in the labor force survey for the age group 15-17
- Additional questions for the 6-17 age group
    - Related to education
    - Other questions

While preparing the Child Labor Force Survey 2012, questions already existing for the age group 15-17 were preserved, but additional questions were added for the age group 6-14 such as about occupation, economic activity, size of workplace, occupation and status of employment etc...

The questions in the survey can be categorized in three major groups:

1. Related to labor force

In this part, whether the children are working or not, economic activity, working hours, employment status, location of workplace, causes of starting to work, other social benefits, age at first employment etc... are asked. Most questions in this group were already asked to the 15-17 age group in the labor force. Therefore, some additional questions are asked to this group such as social benefits and working conditions etc...

2. Related to education

In this part, standard questions related to education are asked to respondents: whether they are attending school and their last degree of school completed. Addition to the labor force questions, some other questions are asked such as their age at starting school, absence from school on any day within the reference week and the reason of absence from school.

3. Related to other activities for 6-17 age group

In this part, 6-17 age group children are asked whether they helped with household chores within the reference week and duration of this help.

In Turkey, in the frame of ILO-IPEC, in order to create a database regarding child labor, DİE/TURKSTAT applied child labor force survey which was collected several times; October 1994, October 1999, 2006 (October-November-December) and lastly 2012 (October-November-December). These data sets include the sectors in which children were working and their working conditions to understand social, economic and demographic conditions of these children.

4.1.1 The descriptive statistics of variables

In this section, the concentration is initially on explaining the variables and their characteristics. Then, the pairwise tabulations will be presented in order to observe any dissonance. Pairwise tabulations and the descriptive statistics of the data will enable us to see the variables' properties.

4.1.1.1 Variables

In analyzing the hypothesis, the dependent variable is determined as being a child laborer which is a dummy variable. When the variable value is equal to '1', the respondents answer 'Yes' the question "If you have children who are aged between 6-17, do they work?" and '0' otherwise in probit and weighted probit models. This variable inclues all individuals who are currently employed and persons employed in the past are defined according to International Classification on Status in Employment (ICSE) (International Labor Organization, 1993). ICSE defines 4 main categories for country level and 3 main categories for regional results (combining self employed and employer). As a child labor in my data, it includes regular or casual employee, self employed, unpaid family worker. In multinomial logit model, sector of child labor is a dependent variable. It is a categorical variable which is equal to '0' if the respondents answer 'agriculture' to the question "If children are working, which sector are they working in?" and if the answer is 'industry', the value of this category is '1'. The last category for this question is services with the value of two. In order to determine the reasons of child employment status and causes of sectoral distribution of child employment, the following individual-level variables are used to test the hypothesis of this dissertation:

- Household Size: Continuous variable with minimum value of ‘1’ and maximum value of ‘23’.
- Types of Residency: Dummy variable with value ‘0’ for the rural area (whose population is below 20.000) and value ‘1’ for the urban area (whose population is above 20.000).
- Gender: A dummy variable with value ‘0’ for men and value ‘1’ for women.
- Age Group: A dummy variable with value ‘0’ for children aged between 6 and 14 and with value ‘1’ for those aged between 15-17.
- Age of Household Head: Continuous variable with minimum value of 16 and maximum value of 97.
- Literacy: Dummy variable which is equal to ‘0’ if the respondents say ‘Yes’ to the question “If you never go to school, do you know how to read and write in Turkish?” and ‘1’ otherwise.
- Student: Dummy variable which is equal to ‘0’ if the respondents go to school and ‘1’ otherwise.
- Education level of Household Head: Categorical variable with value ‘0’ for no literacy, value ‘1’ for having literacy despite never going to school, value ‘2’ for primary school (5 years), value ‘3’ for extended primary school (8 years), value ‘4’ for secondary school, value ‘5’ for high school, value ‘6’ for vocational high school, value ‘7’ for undergraduate degree and value ‘8’ for graduate degree.
- Occupation: Categorical variable with value ‘0’ for highly or low skilled non-manual workers, value ‘1’ for skilled manual workers and value ‘2’ for elementary occupations.
- Vehicle types: Categorical variable about how the child laborers go to work. The value ‘0’ is used for walking, value ‘1’ for vehicles provided by their employers, value ‘2’ for public transportation, value ‘3’ for private vehicle.
- Bad working conditions: Dummy variable that is equal to ‘0’ if the respondents work under physically bad conditions such as excessive noise, insufficient lightening or too cold or hot weather and 1 otherwise.

4.1.1.2 The summary statistics of the variables

In this section, the summary statistics of the variables are given in Table 4.2. The child labor and the education level of decision-maker of the household are so

important variables that need to be checked. In this category, mean, standard deviation and minimum & maximum values of variables are represented.

Table 4.2 : Summary statistics of the variables.

Variables	Mean	Std. Dev.	Min	Max
Household Size	5,317	2,117	1	23
Types of Residency (Rural:0, Urban:1)	0,715	0,451	0	1
Gender (Male:0, Female:1)	0,489	0,499	0	1
Age Group(Between 6-14: 0, Between 15-17: 1)	0,259	0,438	0	1
Age of Household Head	44,469	10,082	16	97
Literacy (Yes:0, No:1)	0,039	0,194	0	1
Student (Yes:0, No:1)	0,083	0,276	0	1
Education Level of Household Head (Reference Category: No literacy)	2,191	1,981	0	7
Child Labor (Yes:0, No:1)	0,057	0,232	0	1
Sector (Reference Category: Agriculture)	0, 928	0,862	0	2
Occupation (Reference Category: Highly or Low skilled non-manual workers)	1,058	0,719	0	2
Vehicle Types (Reference Category: Walking)	0,905	1,114	0	3
Bad Working Condition (Yes:0, No:1)	0,8679	0,3387	0	1

4.1.1.3 Pairwise tabulations of the variables

The 2012 Child Labor Force Survey covers 27.118 households. The sample contains information on child labor and child schooling for 20,084 children aged between 6-14 and 7,034 children aged between 15-17. Moreover, the 97.6 percent of children who are aged between 6-14 years do not work as a child laborer in the sample. The remaining 2.4 percent of the same age group children do. The 84.7 percent of children who are aged between 15-17 do not work at any type of job, but the remaining 15.4 percent of the same age group work as a child laborer at various types of sectors in our data set shown in Table 4.3. Moreover, Table 4.4. represents more detailed information of child labor in the sample. It shows us the breakdowns of sectoral distribution of child labor within different age groups. The 30.7 percent of child labor who are aged between 15-17 work in agricultural sector whereas another 29.7 percent in the same age group are actively working in industrial sector and the

remaining 39.6 percent are employed in service sector. Strikingly, 64.4 percent of child laborers who are aged between 6-14 work in agricultural sector whereas another 15 percent of the same age group are actively working in industrial sector and the remaining 20 percent are employed in service sector.

Table 4.3 : Child labor vs. age group.

	The Age Group		
Child Labor	**6-14 Age**	**15-17 Age**	**Total**
Not Employed	19.604 97,61%	5.954 84,65%	25.558 94,25%
Employed	480 2,39%	1.080 15,35%	1.560 5.75%
Total	20.084 100%	7.034 100%	27.118 100%

Table 4.4 : Sector of child labor vs. age group.

	Age Group		
Sector	**6-14 Age**	**15-17 Age**	**Total**
Agriculture	309 64,38%	331 30,65%	640 41,03%
Industry	72 15,00%	321 29,72%	393 25,19%
Services	99 20,62%	428 39,63%	527 33,78%
Total	480 100%	1.080 100%	1.560 100%

In the data, the sample includes the 13.841 male and 13.277 female individuals. Also, as Table 4.5 shows, the number of employed female children are lower than the number of employed male children. 92.1 percent of male children do not work at any type of job in any sector whereas the remaining 7.9 percent of them are employed. Likewise, the 96.5 percent of female children are not employed while the remaining 3.5 percent are actively working. Furthermore, Table 4.6 demonstrates the sectoral distribubtion of child labor within different age groups. While the biggest group of male children are employed in service sector with 36.7 percent, a majority of female children are working in agricultural sector with 56.1 percent.

Table 4.5 : Child labor vs. gender.

Child Labor	Gender		Total
	Male	**Female**	
Not Employed	12.748 92,10%	12.810 96,48%	25.558 94,25%
Employed	1.093 7,90%	467 3,52%	1.560 5.75%
Total	13.841 100%	13.277 100%	27.118 100%

Table 4.6 : Sector of child labor vs. gender.

Sector	Gender		Total
	Male	**Female**	
Agriculture	378 34,58%	262 56,10%	640 41,03%
Industry	314 28,73%	79 16,92%	393 25,19%
Services	401 36,69%	126 26,98%	527 33,78%
Total	1.093 100%	467 100%	1.560 100%

The types of residency are also an important factor on the child labor and our data set offers us a rather unexpected distribution of employed children between rural and urban areas. It appears that a higher ratio of children is working in rural regions (9.7 percent) than in urban regions (4.2 percent). Furthermore, in urban areas, more than half of these employed children work in service sector whereas in rural areas the 75.2 percent of employed children work in agricultural sector as is indicated in Table 4.8.

Table 4.7 : Child labor vs. types of residency.

Child Labor	Types of Residency		Total
	Rural	Urban	
Not Employed	6.976 90,29%	18.582 95,82%	25.558 94,25%
Employed	750 9,71%	810 4,18%%	1.560 5.75%
Total	7.726 100%	19.392 100%	27.118 100%

Table 4.8 : Sector of child labor vs. types of residency.

Sector	Types of Residency		Total
	Rural	Urban	
Agriculture	564 75,20%	76 9,38%	640 41,03%
Industry	81 10,80%	312 38,52%	393 25,19%
Services	105 14,00%	422 52,09%	527 33,78%
Total	750 100%	810 100%	1.560 100%

The education level of the household head is also a critical variable because he or she is usually the one who decides what their children should do when left between going to school or to work. The breakdown of the education level of the household is represented in Table 4.9. According to our data set, 4.81 percent of all employed children have a household head who has only graduated from a 5-year primary school. Unsurprisingly, a larger group of employed children (10.96 percent) have a household head who is not literate at all and no child laborer has a decision-maker in his or her household with a graduate degree. The secondary school graduate decision-makers, however, appear to be more likely to send their children to work than 8-year primary school graduates. Also, the percentages of employed children are so close for high school graduate and vocational high school graduate decision-makers. In a closer look to sectoral distribution of child labor, it is seen that less educated household heads (below 8-year primary school) mostly send their children to work in agricultural sector, which is represented in Table 4.10. However, if the

education level of the household head is above high school, their children are mostly working in industrial sector.

Table 4.9 : Child labor vs. education level of household head.

Education Level of Household Head	Child Labor		Total
	Not Employed	Employed	
No Literacy	1.943 7,60%	171 10,96%	2.114 7,80%
Having Literacy without Diploma	1.284 5,02%	131 8,40%	1.415 5,22%
Primary School 5 Years	12.316 48,19%	1.011 64,81%	13.327 49,14%
Primary School 8 Years	153 0,60%	11 0,71%	164 0,60%
Secondary School	2.771 10,84%	113 7,24%	2.884 10,64%
High School	2.113 8,27%	49 3,14%	2.162 7,97%
Vocational High School	2.028 7,93%	55 3,53%	2.083 7,68%
Undergraduate	2.710 10,60%	19 1,22%	2.729 10,06%
Graduate	240 0,94%	0 0,00%	240 0,89%
Total	25.558 100,00%	1.560 100,00%	27.118 100%

Table 4.10 : Sector of child labor vs. education level of household head.

The Education Level of Decision Maker	Sector			Total
	Agriculture	**Industry**	**Services**	
No Literacy	94 14,69%	40 10,18%	37 7,02%	171 10,96%
Having Literacy without Schooling	51 7,97%	40 1,02%	40 0,76%	131 8,40%
Primary School 5 Years	431 48,19%	261 66,41%	319 60,53%	1.011 64,81%
Primary School 8 Years	2 0,31%	5 1,27%	4 0,76%	11 0,71%
Secondary School	29 4,53%	23 5,85%	61 11,57%	113 7,24%
High School	17 2,67%	12 3,05%	20 3,80%	49 3,14%
Vocational High School	13 2,03%	11 3,53%	31 5,88%	55 3,53%
Undergraduate	3 0,47%	1 0,25%	15 2,85%	19 1,22%
Graduate or Phd Degree	0 0,00%	0 0,00%	0 0,00%	0 0,00%
Total	640 100,00%	393 100,00%	527 100%	1.560 100%

Children can work in different types of sectors, but every sector does not have the same working conditions. Table 4.11 shows the number of children in different sectors and their working conditions. Accordingly, 51.5 percent of the child laborers work under bad contiditions in agricultural sector whereas 27.7 of them work suffer from the same fate in industrial sector. The service sector is where lowest share of employed children works under bad conditions with 20.9 percent. Contrasting with that latest figure, 35.8 percent of children employed in service sector appear to be working under risk while the same vulnerable group is equal of 39.4 percent in the agricultural sector and 24.8 percent in industrial sector.

Table 4.11 : Sector of child Labor vs. bad working condition.

Sector	Bad Working Conditions		Total
	Yes	No	
Agriculture	106 51,46%	534 39,43%	640 41,03%
Industry	57 27,67%	336 24,82%	393 25,19%
Services	43 20,87	484 35,75%	527 33,78%
Total	206 100%	1.354 100%	1.560 100%

Table 4.12 represents the sector of child labor and their occupational types. In the service sector, child laborers are more likely to be highly or low skilled non-manual workers. In agricultural sector, however, child laborers are skilled manual workers. In industry sector, child laborers are mostly skilled manual workers, too.

Table 4.12 : Sector of child labor vs. occupation.

Sector	Occupation			Total
	Highly or Low Skilled Non-Manual Workers	Skilled Manuel Workers	Elemantary Occupations	
Agriculture	2 0,55%	405 54,07%	233 51,66%	640 41,03%
Industry	20 5,56%	242 32,31%	131 29,05%	393 25,19%
Services	338 93,89%	102 13,62%	87 19,29%	527 33,78%
Total	360 100%	749 100%	451 100%	1.560 100%

Table 4.13 is about how the children laborers go to work. The largest group of them in each sector turn out to be going to work on their feet (41.1 percent in agriculture, 23.9 percent in industry and 35 percent in service sector).

Table 4.13 : Sector of child labor vs. vehicle types.

Sector	Vehicle Types				Total
	Walking	Vehicle by Firm	Public Transport	Private Vehicle	
Agriculture	303 41,11%	30 18,99%	35 12%	62 37,80%	430 32,07%
Industry	176 23,88%	93 58,86%	77 27,30%	43 26,22%	389 29,01%
Services	258 35,00%	35 22,15%	170 6,03%	59 35,96%	522 38,93%
Total	737 100%	158 100%	282 100%	164 100%	1.341 100%

4.1.1.4 Descriptive statistics of the variables

Table 4.14 shows the summary statistics for variables employed when probing the association between education level of decision maker and child labor.

Table 4.14 : Summary statistics for dummy variables.

Gender	**Frequency**	**%**
Female	13.841	51,04%
Male	13.277	48,96%
Total	27.118	100%
Types of Residency		
Rural	7.726	28,49%
Urban	19.392	71,51%
Total	27.118	100%
Student		
Yes	24.861	91,68%
No	2.257	8,32%
Total	27.118	100%
Literacy		
Yes	17.806	96,09%
No	725	3,91%
Total	18.531	100%
Age Group		
6 to 14	20.084	74,06%
15 to 17	7.034	25,94%
Total	27.118	100%

The breakdown of our sample regarding age groups of children is as follows: 74.06 percent of the children are between 6 and 14 years old with the remaining 25.94 percent being between 15 years and 17 years old. If the age group in the data was collected as a continious variable, it would have been more informative for researchers.

With respect to their gender, our sample is divided in two nearly identical parts as 51.04 percent of the respondents are female and the remaining 48.96 percent are male. In terms of location of their residency, however, we face a more asymmetrical picture with only 28.49 percent of the interviewees are living in rural areas and the overwhelming majority of 71.51 percent of them reside in urban areas.

In terms of education level, our data show that 91.68 percent of the respondents are attending school with about a minority 9 percent are not receiving any formal education. Literacy rate, fortunately, is even higher than the rate of schooling as 96 percent of the respondents turn out to know how to read and write. Still an important 4 percent, however, appear to be completely illeterate.

Table 4.15 presents summary statistics for the variables which have more importance for our research question. The frequency of employment status of the respondents and household heads education level are stated in next page.

In our sample, % 94.25 of the respondents are employed, but %5.75 of them are not. At the same time, the sample breakdown with respect to education level of the household heads is as follows: 7.80 percent of the decision-makers are not literate. The main education level group belongs to those with a 5-year primary school degree (49.14 percent). The smallest group, however, is of those with an 8-year primary school degree (0.6 percent) as this extended type of primary education was introduced after most of our sample parents' time. The remainder of the education level breakdown is as follows: 10.64 percent graduated from secondary school and another 7.97 percent have a high-school degree with vocational high-school degree holders standing at 7.68 percent. Also, 10.06 percent of the decision makers have undergraduate degrees while those with a gradute degree makes only a small 0.89 percent.

Table 4. 15 : Summary statistics table for dummy and categorical variable.

The Child Labor	**Frequency**	**%**
Yes	25.558	94,25%
No	1.560	5,75%
Total	27.118	100%
Education Level of Household Head		
No Literacy	2.114	7,80%
Having Literacy without Diploma	1.415	5,22%
Primary School (5 Years)	13.327	49,14%
Primary School (8 Years)	164	0,60%
Secondary School	2.884	10,64%
High School	2.162	7,97%
Vocational High School	2.083	7,68%
Undergraduate	2.729	10,06%
Graduate	240	0,89%
Total	27.118	100%

In the following subsection, the pairwise correlation relationship of the variables with the child labor will be stated. Then, it will be decided which variables are appropriate to assess the linkages between identified causes of child labor.

4.1.1.5 The pairwise correlation of variables with child labor

The correlation between child labor and student variable is 0.3796 as is seen Table A.1 (see Appendix A). Firstly, this correlation is the highest correlation with child labor in the survey. Secondly, high correlation coefficient might indicate that the student variable could be a good factor to explain child labor. Also, all variables have significant correlation coefficient at 0.05 and 0.01 significance level with child labor. Table A.2 stated the pairwise correlation between child labor and other variables at 0.01 significance level. According to the correlation tables, all of the correlation coefficients are significant at the both 1% and 5% level with child labor. As expected, it is affirmed that education level of household head has a negative association with the child labor. This means that while education level of household head will increase, the number of child labor will decrease.

In Table A.1 (see Appendix A), household size and the age of household head has low correlation with the child labor in the survey. Also, as might have been widely expected, while the age of household head increases, the number of child labor will increase, too. Moreover, if household size is larger, the number of child laborers increases too because these two variables have positive low correlation coefficient with each other.

4.2 Methodology

This section will give information regarding the assumptions of the probit model and the logit model as well as differences between them. The 2012 Child Labor Force Survey by TURKSTAT includes weights of each individual to whom the survey questions were asked, enabling us to apply weighted probit regression on the data as we have accordingly done in this dissertation.

4.2.1 Probit Model Specifications

In 2012 Child Labor Force Survey, many variables are dummy variable. Therefore, in my thesis, the weighted probit model is preferred to analyze the data because the linear probability model has certain shortcomings while using with these dummies. Firstly, the linear probability model does not sensibly capture the extreme values of the explanatory variables. In other words, the predicted values may even be outside the interval from zero to one. Secondly, the linear probability model assumes that the error terms are always homoskedastic. The homoscedasticity assumption is needed to prove that the OLS estimators are efficient. The proof of OLS estimators are efficient is a crucial element of the Gauss-Markov theorem. The presence of heteroskedasticity can cause the Gauss-Markov theorem to be violated and lead to other undesirable characteristics for the OLS estimators. Therefore, there are two popular non-linear alternatives to the linear probability model, as given below;

- The probit model
- The logit model (Logistic Regression)

Before explaining these two models, it is important to underline that they do not require making many key assumptions of linear regression and general linear models that are based on OLS algorithms, specifically regarding linearity, homoscedasticity, measurement level and normality. The linear relationship between dependent and

independent variables is not required in probit and logit model. The residuals are not normally distributed, so homoscedasticity is not required. And lastly, the interval and ratio scale cannot be required to measure the dependent variable. However, some of different assumptions are used in these models. First, the observations need to be independent from each other. This means that the observations should not come from repeated measurement or matched data. Among independent variables, there is no multicollinearity in these two models. The independent variables cannot be highly correlated with each other. The other assumption is that the probit and logit model require large samples.

Logit and probit models are appropriate to model a dichotomous dependent variable, e.g. yes/no, agree/disagree, like/dislike, male/female etc… Logit and probit regression models are widely preferable models, which are used in psychology and economics literature. Logit -also known as logistic regression- is more popular in health sciences like epidemiology because it gives opportunity to interpret the coefficients in terms of relative risk ratio (RRR), like odd ratio. Probit models can be generalized to account for non-constant error variances in more advanced econometric settings and are used in some contexts by economists and political scientists. The probit model is an equation (4.1):

$$f(\mu_y) = f^{-1}(P) \tag{4.1}$$

A logistic regression is an equation (4.2),

$$f(\mu_y) = \ln\left(\frac{P}{1-P}\right) \tag{4.2}$$

These are not only two functions that can be used for categorical variables. However, these two can be called the most common. Keeping in mind the binary case, the independent variable can have two values, 0 or 1. The main focus point is that how predictor relates the probability that y=1. However, the functions, is given above, cannot use the probability itself. There are two reasons for this situation.

- Probability can only have values between 0 and 1, in the mean time the right hand side of the equation can differ from -∞ to ∞.

- The relationship between probability and the predictors cannot be linear, it's sigmoidal(S-shaped)

Therefore, the function of probability does two things: (1) converts probabilities into the value, which runs from -∞ to ∞ and (2) possesses a linear relationship with the dependent variables. Probit and Logit functions both do that.

Is the probit better than logit? Answering this question is not so easy because both methods yield similar inferences and fit the non-linear functions. Both functions rescale the number to fall between 0 and 1. Both models can be used for modeling the relationship between one or more numerical or categorical variables and a categorical outcome. Both of them have different versions like binary, ordinal, or multinomial categorical outcomes. And each of the two requires specific coding of the outcome. They differ in how they define f (*), indicated with equations above. Also, the probit gives us the chance to compute marginal effect of a change in one explanatory variable at the same mean. As in other non-linear models, the marginal effect of an explanatory variable on the dependent variable is not a constant. In Logit model, as a difference from probit model, the cumulative standard logistic distribution function is used. However, the probit model uses something called the cumulative distribution function of the standard normal distribution to define f (*). The results tend to be so similar, but preferring one over the other depends on the discipline. In most child labor studies, logit and probit models are used. I present some selected studies from world and Turkish literature, in Table A.3 to show which type of regression models are employed in their studies.

4.2.2 Weighted probit model and reasons of weighting

I use the weighted probit regression model in my analysis. Four different models are used to analyze the hypothesis. The probability of being a child laborer can be analyzed with cumulative z distribution. In each specific model, relevant independent variables are being used. The general representation of the model is an equation (4.3), given below;

$$\Pr(ChildLabor = 1) = f(b_0 + x_1 b_1 + x_2 b_2) \tag{4.3}$$

Also, in order to visualize one of our models, the equation (4.4) for Model 4 in my thesis is represented below;

$$\Pr(CL1\ /G, AG, S, HS, Lwd, PSc5yr, PSc8yr, SecSc, HSc, VocSc, Ungrd, \quad (4.4a)$$

$$Grd, AHH\ , ToR) = \Phi(-1.6257 - 0.4652G + 0.6306AG + 1.1261S \quad (4.4b)$$

$$-0.0180HS + 0.1157Lwd + 0.1961PSc5Yr + 0.0735PSc8Yr \quad (4.4c)$$

$$+0.0046SecSc - 0.1718HS - 0.401VocSc - 0.6136Ungrd \quad (4.4d)$$

$$+0.0006AHH - 0.4122ToR \quad (4.4e)$$

There are various views to use sample weights in regression analysis. However, Solon et al. (2015) directly aims at the heart of this topic. In sampling approach, each segment of the population has different probabilities. If we want to use our sample to calculate a descriptive statistic that accurately measures the true value in the population, then we need to weight. Solon et al. (2015) reviews three motivations for the possible use of weights.

- To achieve more precise estimates by correcting for heteroskedasticity
- To achieve consistent estimates by correcting for endogenous sampling
- To identify average partial effects in the presence of heterogeneous effects

4.2.2.1 To achieve more precise estimates by correcting for heteroskedasticity

There is no automatic gain in efficiency from using weights. Many different practitioners have different views to use weighting. As an example in Gary and Young (2011), where weighting actually reduces the efficiency of the estimates. When the individual-level error terms are clustered within group, the precision level reduces. The group average effect can be relatively large and fairly homoskedastic. Also Solon et al. (2015) recommend researchers to perform appropriate diagnostics when heteroskedasticity is an issue. They recommend us to use heteroskedasticity-robust standard error estimates because the true variance structure means that some heteroskedasticity may still remain in the error term. Finally, the weighted and unweighted estimates are good to be reported together in the paper. The weighting gives an opportunity to impose heteroskedasticity and unnecessarily increase the standard errors.

4.2.2.2 To achieve consistent estimates by correcting for endogenous sampling

This can be explained with an example of analysis of most labor economists. Most labor economists would apply their analysis in the framework of linear regression of log earnings on years of schooling with controls for other variables such as years of work experience. Despite the fact that regression models have been estimated countless times by OLS, researchers who are aware of the endogeneity of years of schooling generally have sought to devise instrumental variables (IV) estimators of the regression. In these type of cases, when the regression was estimated with the full PSID without making any correction for oversampling of the low income population, it would cause inconsistent estimation of the regression parameters. This type of sampling can be endogenous because the sampling criteria, family income, are related to the error term in the regression for log earnings. As this example, suitably weighted estimation would achieve consistency. Unweighted estimates may well be biased, but will be corrected when weighted by the inverse probability of selection. On the other hand, (Friedmen, 2013) if the sampling probability is often accepted to vary across certain strata, whose indicators are included in the estimating equation, then the probability of selection should no longer be linked to the error term, and weighting is not necessary. Finally, the weighted and unweighted representation of regression model is very useful to show the consistent estimation.

4.2.2.3 To identify average partial effects in the presence of heterogeneous effects

Partial effect relies on different factors of each independent variable and every factor will be different. This gives us opportunity to clarify the real representation of the population. However, this generates the question whether one might want to weight in order to identify a particular average of heterogeneous effects, such as the population average partial effect. Many empirical researchers believe that by performing WLS with weights reflecting the shares of population, they achieve consistent estimation of population average partial effects. This has supported the example of the average effect of unilateral divorce on divorce rates for the U.S. population, published in (Friedberg, 1998)

4.2.3 Multinomial logit model

The Multinomial Logit model (MNLM) is the most popular and commonly used nominal regression model. This is the extension of standard logistic regression. MNLM is the linear regression analysis to be applied when the dependent variable is nominal with more than two levels such as sectoral distribution in labor economics (Garson, 2014). Also, the independent variables can be either dichotomous or continuous. Starweather and Moske (2011) stated that the multinomial logistic regression is very useful because it does not assume normality, linearity or homoscedasticity. The assumptions of multinomial logit model are given as follows;

- Independence among dependent variable choices
- Imperfect separation

For assumption 1 to be realized, the categories of outcomes need to be exclusive and exhaustive. MNLM is covering all possible forms of outcomes. Also, this assumption states that the choice in a category is not associated with the choice of another category (i.e. dependent variable). As for assumption 2, when separating groups of outcome variable, unrealistic coefficients will be forecast and effect sizes will be greatly overestimated.

In MNLM, the sample size and examination for outlying cases must be analyzed carefully. Specifically, multicollinearity should be checked with simple correlations among the independent variables. Sample size guidelines for MNLM just shows a minimum of 10 cases per independent variable. However, in my thesis, the sample size is very large to make the analysis.

In my dissertation, the sectoral distribution of child labor is analyzed. Sector has a nominal outcome with the categories; Agriculture, Service and Industry. In each specific model, relevant independent variables are being used. Assume that $\square_1$ is an independent variable; gender. The following equations can represent the effect of gender on sector of child labor by estimating three binary logits. The $\beta_{1,\text{Agriculture/ Service}}$ is the coefficient for the first independent variable for the first independent variable for the comparison between Agriculture and Service. When choosing service as a base category or comparison group, the equation (4.5) is represented as follows;

$$ln\left\{\frac{\Pr(Agriculture, x)}{\Pr(Service, x)}\right\} = \beta_{0,Agriculture/Service} \ + \ x_1 \ \beta_{1,Agriculture/Service} \tag{4.5}$$

When choosing industry as a base category or comparison group, the representation is an equation (4.6), given below,

$$ln\left\{\frac{\Pr(Agriculture, x)}{\Pr(Industry, x)}\right\} = \beta_{0,Agriculture/Industry} \ + \ x_1 \ \beta_{1,Agriculture/Industry} \tag{4.6}$$

In order to clarify the model, the representation of equation of MNLM is given equation (4.7), while industry sector is a base category.

$$ln\left\{\frac{\Pr(Agriculture, x)}{\Pr(Industry, x)}\right\} = 0.6577 + 0.0416HS - 4.7280ToR + 1.1239G \tag{4.7a}$$

$$+0.2643AG + 0.0149AHH + 0.8987Lit - 1.1572S + 1.7737SMW \tag{4.7b}$$

$$+2.4957EO + 0.9337VBF - 0.4697PT + 1.5409PV - 0.7297BWC \tag{4.7c}$$

Generally, with J alternatives in dependent variable, only J-1 binary logits will be estimated. The problem with fitting the MNLM by estimating series of binary is that in each model, different samples are used. For example, when comparing industry and agriculture, the service category is dropped. Likewise, the other binary models also exclude cases corresponding to the excluded category. This gives an opportunity to estimate the effect of different independent variables on each category.

4.2.4 The likelihood ratio test

The likelihood ratio test is generally used to make comparison between fit of model with and without predictors. It states the significance level of coefficients in the model. The restricted model indicates a logistic model which has just constant

coefficient in the model. Non-restricted model refers to a logistic model which includes all desired effect and k-number of predictors according to Altaş and Öztunç (2013). Another common situation is to consider 'nested' models. One model is obtained from the other one by adding the new parameters to be zero. Assumptions to be tested:

H_0 = Reduced model is true

H_A = Current model is true

Please take note of the difference between these two models (Null hypothesis and Alternative hypothesis). They test the null hypothesis that is equal to '0' (Omitted the k predictor in the question) whereas the current model includes these omitted predictors. The difference between two deviance value shows G for goodness of fit and likelihood ratio test. The likelihood ratio test is:

$$D = -2\left[\frac{Maximum\ Likelihood\ of\ the\ Reduced\ Model}{Maximum\ Likelihood\ of\ the\ Current\ Model}\right] \tag{4.8a}$$

$$G = X^2 = D(Reduced\ Model) - D(Current\ Model, including\ variable) \tag{4.8b}$$

$$G = X^2 = -2ln\left(\frac{Lnull}{Lk}\right) \tag{4.8c}$$

The parameter k is the number of coefficients in the tested model. Then, p-value is $P(X^2_k \geq G^2)$. The H_0 will reject if the p-value is less than the test value.

4.2.5 Wald test

Despite the fact that Likelihood Ratio (LR) test is generally considered superior, the computational process can be prohibitive when the sample is so large and the model is complex. The Wald test enables computation using test without fitting additional models. Wald test is used to understand whether estimated regression coefficients for the mentioned predictors are significantly different from zero. If the null hypothesis is rejected, the predictor is making a significant contribution to the prediction of the outcome.

$$Wald = \left[\frac{\hat{b}_j}{SE(\hat{b}_j)} \right]^2 \tag{4.9}$$

$\hat{b}_j$: is the coefficient of estimated regression model and $SE(\hat{b}_j)$ is the standard error of estimated coefficients. According to Azen and Walker (2011), wald statistic is basically identical to the t statistic in linear regression and has X^2 distribution with 1 degree of freedom.

4.2.6 Omitted variable bias

The omitted variable bias is a standard form of a bias while the situation appears in an estimate of parameter. While omitted variable bias is detected, this may reveal two different types of causes. First, the regression model does not run in appropriate form. The other, one (or more than one) variable is missed while running the model. For instance, while modelling the wage or income of the people as the dependent variable we may suffer from omitted variable bias since there is no way to measure or add the innate ability of worker or motivation of worker into the regression. Education level of household head and education variables can have relationship with income of these households. Also, education level of hosehold head affect the education of their children, too. Education enables many households earn more money and obtain better employment status. For instance, university graduates normally obtain higher salaries upon graduation and typically enjoy higher life time wages with lower rates of unemployment compared to people who didn't attend college. Therefore, the estimated coefficients on variables such as education are likely to be biased because of the correlation between unobserved ability, educational attainment of the worker, income of households. When the educational attainment and unobserved ability have a positive relationship, the omitted variable bias will be upward direction. Conversely, if the educational attainment and unobserved ability have negative relationship, the omitted variable bias will be downward direction. However, in my data, there is no income related variables for households and child labor as well.

5. EMPRICAL RESULTS and DISCUSSIONS

This dissertation applies the weighted probit regression in order to use the data with most appropriate model. In this section, I will summarize the probit model results; then, I will present the weighted probit model results and multinomial logit model results.

5.1 Empirical Results and Discussions

As mentioned earlier in section 4.2.1., 4.2.2. and 4.2.3. there is some evidence that many researchers could yield using the probit and logit model in the literature. Table 5.4 and 5.5 is the summary of four different models, which summarize the average marginal effect of probit and average marginal effects of weighted probit models, respectively. Also, in Table 5.6, industrial sector examines a reference category to expected signs of the coefficients and p-values. Relative risk ratios and coefficients are used to interpret the comparison between each sector and relevant variables.

Children related factors (i.e. gender, age group and educational attendance) have statistically significant association with the probability of being a child worker in both probit and weighted probit model. In multinomial logit model, gender and student variable are found to be statistically significant factor when comparing the child labor in agricultural sector and manufacturing sector. According to probit model results, on average, girls are less likely to be employed than boys, when all other variables are held constant. In other words, on average girls are 4.35 percentage point less likely being a child labor than boys, ceteris paribus. Even though females are attending labor force less than males, for females the relative risk for working in agricultural sector to industry sector would be expected to increase by factor 3.0768 compared to males, as other variables in the model are held constant. The sectoral distribution of male children workers is just the opposite of females. A male child laborer is more likely to be employed in industrial sector than agricultural sector.

Furthermore, when all other variables held constant, the probability of being a child labor for children who are aged between 15-17 is 5.75 percantage point more likely compared to children who are younger, on average according to probit model result.

In weighted probit model, this percentage decreases to 5.60 percent. Also, on average, the probability of being a child labor, children who do not attend school are 9.87 percentage point more likely employed than children who attend school, ceteris paribus. In multinomial logit model, this must be noted that attending school has a greater importance too. The relative risk ratio of working in service sector versus industry sector, the expected risk would be decreased by 0.1906 factor for children who do not attend to school than children who attend to school. In overall, higher economic significance in explaining the probability of being a child laborer, confirming H1a, H1b, H1c and H1d. The weighted probit model results also confirm those three hypotheses.

While the children-related factors are statistically significant, the household characteristics (i.e. household size) are found to be statistically insignificant with the probability of being a child laborer in Model 2 and Model 3, refuting H2a. If household size increases by one individual, the probability of being a child worker is not affected. However, Increasing the household size by one individual surprisingly decreases the probability of being a child worker by 0.13 percentage points. Using weighted probit model also results in refutation of H2a.

In addition to children factors and household characteristics set of factors, Model 3 adds the demographic decomposition of household (i.e. age and education level of household head). Household heads whose highest degree is from a 5-year primary school are found to be sending their children to work 1.57 percentage points more than those who have no literacy, ceteris paribus. The interaction term of average household income and education level of household head are so efficient variables to understand the families' decision to send children to work (or not) because the interaction between income and education level cannot be ignored. However, 2012 Child Labor Survey does not include any information about the average household income. Moreover, having a household head whose latest degree is from a high school decreases the probability of sending children to work by 1.57 percentage point compared to an illiterate one as all other variables held constant. When the household head has an undergraduate degree, the probability of sending children to work is on average 3.46 percentage point lower than those who have no literacy, ceteris paribus. Also, there is no household head with a graduate degree who has sent his/her children to work in our sample. Also, household heads with vocational high school

degrees is founded statistically insignificant factor in probit and weighted probit model, partially confirming H3a. This variable is just significant at 0.1 significance level in Model 3 probit model. Interestingly, the age of decision-maker of households has no statistically significant association with the being a child laborer, refuting H3b. In Model 3, as a distinct model from Model 2, the sign of household size variable was changed while it is still insignificant. While multicollinearity is checked for each model, perfect multicollinearity was not identified. This issue might be caused by Omitted Variable Bias while adding new independent variables into the model. The omitted variable bias may be upward or downward. Detecting which variable has a relation to household size is difficult. If the omitted variable has positive correlation with household size, the omitted variable bias will be downward bias, otherwise upward.

Moreover, whole set of factors test in this dissertation which are children-related factors, household characteristics, demographic composition of household and spatial factors (i.e. type of residency). The type of residency is statistically associated with being a child laborer. Children who live in urban areas are on average 3.26 percentage points less likely to be employed than those who live in rural areas, ceteris paribus, confirming H4a. The type of residency has also statistically significant association on the sectoral distribution of child labor. Children workers who live in urban areas are less likely to be employed in agricultural sector than industrial sector. The relative risk of working in agricultural sector compared to industry sector could be expected to decrease by a factor of 0.0088 for children who are living in urban areas as other variables in the model are held constant, confirming H4b. As expected, children laborers who live in rural areas are more likely to be employed in agricultural sector than industry sector, confirming H4c. As expected, types of residency have an effect on sectoral distribution of child labor because in rural areas, children may be employed in household-owned land. However, in our 2012 Child Labor Survey, there is no information related on household-owned land to measure this association.

Different from probit and weighted probit model, occupational status, vehicle types and working condition variables are used in multinomial logit model. The occupational level of child labor is predicted significantly on sectoral distribution. The reference category of this variable is highly or low skilled non-manual workers.

When child laborers start working as a highly or low skilled non-manual workers, they are less likely to be employed in service sector than industrial sector, confirming H4e. If the child laborers work in the form of an elementary occupation, they are less likely to be employed in service sector than industry sector. In detailed, the relative risk ratio of working in service sector versus industry sector, the expected risk could be decreased by 0.0325 factor for children who are skilled manual workers versus children whose occupational status is highly or low skilled non-manual workers.

About the type of vehicles used to go to work by children laborers, the reference category is walking. Child laborers working in service sector are more likely to use public transportation than those who are working in industry sector, refuting H4f. The probability of using a private vehicle to go to work is highest in agriculture, followed by service and industry sectors. In other words, for vehicle types, the relative risk of being in agricultural sector compared to industry sector would be expected to increase by a factor of 4.6686 for children who go to job with their private vehicle versus walking. Also, for vehicle types, the relative risk of being in service sector compared to industry sector would be expected to increase by a factor of 4.4393 for children who go to job with their private vehicle versus walking.

Moreover, the relative risk to work in service sector versus in industry could be expected to increase by a factor of 5.6671 for children who are not working under bad conditions versus children who are working under bad working condition, ceteris paribus, confirming H4d.

As discussed earlier, in logistic regression, the effects of each independent variable are measured with LR test. Table 5.1 shows contribution of independent variables to the outcome. The hypothesis that all the coefficients are associated with types of residency, student, occupation, vehicle types, bad working conditions can be rejected to H_0 at the 0.01 level. (All X^2, degrees of freedom and p values are given in Table 5.5) Also, gender and age group are rejected to null hypothesis at the 0.05 level. (All X^2, degrees of freedom and p values are given in Table 5.5)

Table 5.1 : Likelihood-ratio tests for independent variables.

Sector	Chi^2	Df	$p>Chi^2$
Household Size	0.434	2	0.805
Types of Residency	169.700	2	0.000
Gender	7.614	2	0.022
Age Group	6.016	2	0.049
Age of Household Head	1.640	2	0.440
Literacy	0.345	2	0.841
Student	10.594	2	0.005
Occupation	62.505	2	0.000
Vehicle Types	13.275	2	0.001
Bad Working Condition	25.978	2	0.000

H_0: All coefficients associated with given variable(s) are 0.

Another way to estimate the full model, which includes all of the variables, will be through Wald test statistic in Table 5.2. According to Wald test results, the effect of types of residency on sectors of child labor is significant at the 0.01 level (X^2=83.221, df=2, p=0.000). The effect of being a student on sectors of child labor is significant at the 0.01 level. (X^2=9.354, df=2, p=0.009). The effect of occupation on sectors of child labor is significant at the 0.01 level (X^2=44.122, df=2, p=0.000). The effect of vehicle types on child labor is significant on sectors of child labor at the 0.01 level (X^2=11.993, df=2, p=0.002). The effect of bad working conditions on sectors of child labor is significant at the 0.01 level (X^2=19.333, df=2, p=0.000). The effect of gender on sectors of child labor is significant at the 0.05 level.

Table 5.2 : Wald tests for independent variables.

Sector	Chi^2	Df	$p>Chi^2$
Household Size	0,425	2	0.809
Types of Residency	83,221	2	0.000
Gender	6,990	2	0.030
Age Group	5,318	2	0.070
Age of Household Head	1,534	2	0.464
Literacy	0,338	2	0.845
Student	9,354	2	0.009
Occupation	44,122	2	0.000
Vehicle Types	11,993	2	0.002
Bad Working Condition	19,333	2	0.000

H_0: All coefficients associated with given variable(s) are 0.

We can also reject the hypothesis that categories Agriculture-Industry, Agriculture-Services, Industry-Services are indistinguishable as indicated in Table 5.3.

Table 5.3 : Wald tests for combining outcome categories.

Categories tested	Chi^2	Df	$p>Chi^2$
Agriculture- Industry	83.829	10	0.000
Agriculture- Services	79.435	10	0.000
Industry-Services	44.356	10	0.000

H_0: All coefficients except intercepts associated with given pair of outcomes are 0 (i.e. Categories can be collapsed)

Table 5.4 : The avereage marginal effects of probit model.

	Marginal Effects			
Variables	Model 1	Model 2	Model 3	Model 4
Children Factors				
Gender (Reference Category: Male)	-0.0431***	-0.0431***	-0.0429***	-0.0435***
Age Group (Reference Category: 6-14 Ages)	0.0550***	0.0555***	0.0549***	0.0575***
Student (Reference Category: Yes)	0.1107***	0.1095***	0.1035***	0.0987***
Household Characteristics				
Household Size		0,0009	-0,0005	-0.0013*
Demographic Composition of Household				
Education Level of Household(Reference Category: No literacy)				
Having Literacy without Diploma			0,0128	0,1199
Primary School(5 Years)			0.0169***	0.0157***
Primary School(8 Years)			-0,0061	-0,0052
Secondary School			-0,0047	-0,0016
High School			-0.0185***	-0.0157***
Vocational High School			-0.0121*	-0,0071
Undergraduate			-0.0380***	-0.0346***
Age of Household Head			0,0001	-0,00001
Spatial Factors				
Type of Residency (Reference Category: Rural)				-0.0326***

There is no household head with a graduate degree who has sent his/her children to work in our sample.
Significant values * p<0.1; ** p<0.05; *** p<0.01

Table 5.5 : The avereage marginal effects of weighted probit model.

	Marginal Effects			
Variables	Model 1	Model 2	Model 3	Model 4
Children Factors				
Gender (Reference Category: Male)	-0.0409***	-0.0410***	-0.0409***	-0.0413***
Age Group (Reference Category: 6-14 Ages)	0.0540***	0.0543***	0.0531***	0.0560***
Student (Reference Category: Yes)	0.1115***	0.1107***	0.1054***	0.1000***
Household Characteristics				
Household Size		0.0006	-0.0006	-0.0016*
Demographic Composition of Household				
Education Level of Household(Reference Category: No literacy)				
Having Literacy without Diploma			0.0102	0.0101
Primary School(5 Years)			0.0190**	0.0180***
Primary School(8 Years)			0.0045	0.0063
Secondary School			-0.0040	0.0004
High School			-0.0161**	-0.0124
Vocational High School			-0.0097	-0.0032
Undergraduate			-0.0379***	-0.0333***
Age of Household Head			0.0003	0.00005
Spatial Factors				
Type of Residency (Reference Category: Rural)				-0.0366***

There is no household head with a graduate degree who has sent his/her children to work in our sample.

Significant values * p<0.1; ** p<0.05; *** p<0.01

Table 5.6 : The multinomial logit model (Base Outcome of Industry)

Sector of Child Labor	Agriculture			Service		
Variables	**RRR**	**Coefficient**	**Significance**	**RRR**	**Coefficient**	**Significance**
Household Size	1,0424	0,0416	0,683	0,9191	-0,0844	0,414
Types of Residency (Rural:0, Urban:1)	0,0088	-4,7280	0,000	0,4926	-0,7080	0,239
Gender (Male:0, Female:1)	3,0768	1,1239	0,027	1,5634	0,4469	0,416
Age Group						
Reference Category: Between 6-14 Ages						
- Between 15-17 Ages	1,3026	0,2643	0,685	4,1980	1,4346	0,053
Age of Household Head	1,0150	0,0149	0,544	1,0245	0,0242	0,369
Literacy (Yes:0, No:1)	2,4564	0,8987	0,442	1,3189	0,2768	0,804
Student (Yes:0, No:1)	0,3143	-1,1572	0,087	0,1906	-1,6571	0,031
Occupation						
Reference Category: Highly or Low skilled non-manual workers						
- Skilled Manual Workers	5,8925	1,7737	0,176	0,0325	-3,4242	0,000
- Elemantary Occupations	12,1297	2,4957	0,062	0,0347	-3,3585	0,000
Vehicle Types						
Reference Category: Walking						
- Vehicle by Firm	2,5438	0,9337	0,271	1,9646	0,6752	0,397
- Public Transport	0,6252	-0,4697	0,489	3,2730	1,1857	0,034
- Private Vehicle	4,6686	1,5409	0,015	4,4393	1,4904	0,015
Bad Working Condition (Yes:0, No:1)	0,4820	-0,7297	0,206	5,6671	1,7347	0,015
Constant	1,9303	0,6577	0,730	2,6161	0,9616	0,585
Industry (Base Outcome)						

Relative Risk Ratio (RRR) can be obtained the by exponentiating the multinomial logit coefficients.

6. CONCLUSION

This dissertation examines the determinants of child labor and its sectoral distribution in Turkey, using data from TURKSTAT's 2012 Child Labor Survey. A number of children-related, demographic and spatial factors are taken into account such. Children-related factors include gender, age group and school attainment. The demographic characteristics cover education level of household head and spatial factors include types of residency, occupational status of children workers as well as type of vehicle used to go to work and working conditions. Findings have proved that all these factors have a significant effect on the child labor force.

Gender, age group, being a student and education level of household head have been evaluated through the weighted probit model. A multinomial logit model with more independent variables is also used to investigate sectoral distribution of child labor between agriculture, service and industry sectors. According to the findings obtained as a result, being a student is understood to be strongly related to being a child worker. Participating in the labor force at early ages is less likely when children attend school. And if the children attend school, they are more likely to be employed in service sector than industry sector. Moreover, male children are more likely to be actively working than females and they are more likely to be employed in industrial sector rather than agricultural sector. Our findings also show that 6-14 age group of children is less likely to work than the older 15-17 age group. Education level of household head has a significant relation with sending children to work. More educated household heads are found to be less interested in sending their children to work than those with lower education degrees. The interaction between household income and level of household head's education would have also been informative but our data set does not include statistics on household income.

The data on occupational status, bad working conditions as well as types of residency and vehicles have been analyzed through a multinomial logit model and partially weighted probit model. As per our findings, children who live rural areas are more likely to be employed than those who live in urban areas. The multinomial logit model shows that child laborers who live in rural areas are more likely to be working

in agricultural sector than industry sector. Children who have higher skills are more likely working in industry sector than service sector. Children laborers who use public transportation are more likely to be employed in service sector than industry sector. Usage of private vehicles to go to work are most common in agriculture sector followed by service and industry sectors. Bad working conditions have a significant association with sectoral distribution of child labor. Child laborers are more likely to be employed under bad working conditions in industry sector compared to service sector.

According to the results of weighted probit and multinomial logit models, improving household heads' education as well as a proper urbanization with increased access to schools and industrialization of rural areas would help combat the problem of child labor.

REFERENCES

Acaroğlu, H. (2010). An emprical approach about some important features of child labor in Turkey. *Business & Economics Horizons , 3* (3), 135-146.

Alderman, & Harold. (1997). The Income Gap in Cognitive Skills in Rural Pakistan. *Economic Development and Cultural Change , 46* (1), 97-122.

Altaş, D., & Öztunç, H. (2013). An Empirical Analysis of Television Commercial Ratings in Alternative Competitive Environments Using Multinomial Logit Model. *Eurasian Journal of Business and Economics , 6* (11), 39-51.

Azen, R., & Walker, C. M. (2011). *Categorical Data Analysis for the Behavioral and Social Sciences.* New York.

Baland, J. M., & Robinson, J. A. (2000). Is child labor inefficient? *Journal of Political Economy , 108*, 663-679.

Balderston, J. B. (1984). *Determinants of children's school participation. In Malnourished Children of the Rural Poor.* (J. B. Balderston, Ed.) Boston: Auburn House Publishing Company.

Basu, K. (1999). Child Labor: Cause, Consequence, and Cure, with Remarks on International Labor Standards. *Journal of Economic Literature , 37*, 1083–1119.

Basu, K., & Van, P. H. (1998). The Economics of Child Labor. *The American Economic Review , 88* (3), 412-427.

Bourguignon, F., & Chiappori, P. A. (1994). *"The Collective Approach to Household Behavior," in The Measurement of Household Welfare.* (R. Blundell, I. Preston, & I. Walker, Eds.) Cambridge, UK: Cambridge University Press.

Chernichovsky, D. (1985). Socioeconomic and demographic aspects of school enrollment and attendance in rural Botswana. *Economic Development and Cultural Change , 33* (2), 319-332.

Dayıoğlu, M. (2005). Patterns of Change in Child Labour and Schooling in Turkey: The Impact of Compulsory Schooling. *Oxford Development Studies , 33* (2), 195-210.

Dayıoğlu, M. (2006). The impact of household income on child labour in urban Turkey. *The Journal of Development Studies , 42* (6), 939-956.

Dayıoğlu, M., & Assaad, R. (2003). *The Determinants of child labor in urban Turkey, Working Paper 0302.* Cairo: Economic Reserach Forum.

Dayioglu, M., & Assaad, R. (2003). *The Determinants of child labor in urban Turkey.* Cairo: Economic Reserach Forum.

Edmonds, E. V. (2008). *Defining child labour: A review of the definitions of child labour in policy research.* Geneva: International Programme on the Elimination of Child Labour.

Edmonds, E. V. (2007). Handbook of Development Economics. In E. V. Edmonds, *Chapter 57 Child Labor* (Vol. 4, pp. 3607-3709). Bonn, Germany: Elsevier.

Friedberg, L. (1998). Did Unilateral Divorce Raise Divorce Rates? Evidence from Panel Data. *American Economic Review , 88* (3), 608-27.

Friedmen, J. (2013). *Tools of the trade: when to use those sample weights.* Retrieved 01 20, 2018, from Thw World Bank: http://blogs.worldbank.org/impactevaluations/tools-of-the-trade-when-to-use-those-sample-weights

Garson, D. G. (2014). *Logistic Regression: Binary&Multinomial:2016 Edition.* Statistical Associates Publishers; 2016 edition .

Gary, S., & Young, L. J. (2011). The Fragility of Estimated Effects of Unilateral Divorce Laws on Divorce Rates. *The BE Journal of Economic Analysis & Policy , 11* (1).

Grootaert, C. (1998). Child Labor in Côte d'Ivoire: Incidence and Determinants. *Policy Research Working Paper World Bank* , no: 1905.

Grootaert, C., & Kanbur, R. (May, 1995). *Child Labor, A Review, Policy Reserach Working Paper 1454.* The World Bank, Development Economics. Washington: The World Bank.

Grootaert, C., & Kanbur, R. (May 1995). *POLICY RESEARCH WORKING PAPER 1454.* Washington: Development.

Humphries, J., & Horrell, S. (1995). The Exploitation of Little Children": Child Labor and the Family Economy in the Industrial Revolution. *Explorations in Economic History , 32* (4), 485-516.

ILO. (1997). *Economically Active Population, 1950-2010.* STAT Working Papers.

International Labor Organization. (1993). *Resolution concerning the International Classification of Status in Employment (ICSE).* International Labor Organization.

International Labour Organization. (1999). *C182 - Worst Forms of Child Labour Convention, 1999 (No. 182).* Geneva: International Labour Organization.

International Labour Organization, International Programme on the elimination of Child Labor (IPEC). (2013). *Marking progress against child Labour, Global estimates and Trends 2000-2012.* Geneva: International Labour Office.

Jensen, P., & Nielsen, H. S. (1997). Child Labour or School Attendance? Evidence from Zambia. *Journal of Population Economics , 10* (4), 407–424.

Lillard, L. A., & Willis, R. J. (1994). Intergenerational educational mobility: Effects of family and state in Malaysia. *Journal of Human Resources , 29* (4), 1126-1166.

Loayza, N. P. (2004). Poverty and growth in Peru. *1985* (90), pp. 1990-97.

Moehling, C. M. (1995). *The Intrahousehold Allocation of Resources and the Participation of Children in Household Decision-Making: Evi- dence from Early Twentieth Century America.* (D. o. mimeo, Ed.) Northwestern University.

Myers, W. (1989). Urban working children: a comparison of four surveys from South America. *International Labor Review , 128*, 321-335.

Patrinos, H. A., & Psacharopoulos, G. (1997). Family Size, Schooling and child labor in Peru- An Emprical Analysis. *Journal of Population Economic , 10* (4), 387-405.

Patrinos, H. A., & Psacharopoulos, G. (1995). Educational Performance and Child Labor in Paraguay. *Journal of Educational Development , 15* (1), 47-60.

Patrinos, H., & Psacharopoulos, G. (1997). Family size, schooling and child labor in Peru–An empirical analysis. *Journal of population economics , 10* (4), 387-405.

Psacharopoulos, G. (1997). Child labor versus educational attainment Some evidence from Latin America. *Journal of population economics , 10* (4), 377-386.

Ranjan, P. (2001). *Credit Constraints and the phenomenon of child labor* (Vol. 64). Journal of Development Economics.

Ray, R. (2000). Cnild Labors Child Schooling, and Their Interaction with Adult Labor: Empirical Evidence for Peru and Pakistan. *The World Bank Economic Review , 14* (2), 347-367.

Rossi, M., & Rosati, F. C. (2003). Children's working hours and school enrollment: Evidence from Pakistan and Nicaragua. *The World Bank Economic Review , 17* (2), 283-295.

Salmon , C. (2005). Child Labor in Bangladesh Are Children the Last Economic Resource of the Household? *Journal of Developing Socities , 21* (1-2), 35-54.

Sanguinetty, J. A. (1981). Determinants of Years of Schooling in Individuals: a Study in Four Latin Latin American Cities . *(unpublished)* .

Solon, G., Haider, S. J., & Woolridge, J. M. (2015). What Are We Weighting For? *Journal of Human Resources , 50* (2), 301-316.

Starweather, J., & Moske, A. K. (2011, 09 10). *Multinomial Logistic Regression.* Retrieved 03 02, 2018, from www.it.unt.edu: https://it.unt.edu/sites/default/files/mlr_jds_aug2011.pdf

Tansel, A. (2002). Determinants of school attainment of boys and girls in Turkey: individiual, household and community factors. *Economics of Education Review 21 , 21* (5), 455-470.

The Pennsylvania State University. (n.d.). *Analysis of Discrete Data-More on Goodness-of-Fit and Likelihood ratio tests.* Retrieved 06 03, 2018, from www.onlinecourses.science.psu.edu: https://onlinecourses.science.psu.edu/stat504/node/220

Tunalı, İ. (1996). Education and work: Experiences of 6- to14-year-old children in Turkey, education and the labour market in Turkey. (T. Bulutay, Ed.) 106-143.

Turkish State Institute of Statistics. (2016). *Doğum İstatistikleri.* Toplam doğurganlık hızının en yüksek ve en düşük olduğu 10 il. Ankara: State Institute of Statistics.

Turkish Statistical Institute. (2013). *Working Child 2012.* Implementation. Ankara: TURKSTAT.

TURKSTAT. (2013). *Çoçuk İşgücü Anketi Sonuçları, 2012.* TURKSTAT. Ankara: TURKSTAT.

Udry, C. (2003). *Child labor.* Economic Growth Center, Yale University. Center Discusion Paper.

Weiner, M. (1991). *The child and the state in India: Child labor and education policy in comparative perspective.* Princeton,N.J.: Princeton University Press.

Wolfe, B. L., & Jere , B. R. (1984). Who is schooled in developing countries? The roles of income, parental schooling, sex, residence and family size. *Economics of Education Review , 3* (3), 231-245.

WorldBank. (2017). *World Development Indicators: Population dynamics.* WorldBank.

Yacouba Diallo, A. E. (2013). *Global Child Labor Trends.* Geneva: International Labour Organization.

APPENDICES

APPENDIX A: Data description

APPENDIX B: Theorethical Model Explanation

APPENDIX A

Table A.1 : Pairwise correlation coefficients of child labor and other variables at 5% level.

	Child Labor	**Family Size**	**Types of Residency**	**Gender**	**Age**	**Age of Household Head**	**Student**	**Education Level of Household Head**
Child Labor	1.00							
Household Size	0,0431*	1.00						
Types of Residency	-0.1072*	-0.2141*	1.00					
Gender	-0.0940*	0.0278*	0.0063	1.00				
Age	0.2440*	-0.0323*	0.0039	-0.0033	1.00			
Age of Household Head	0.0469*	0.2211*	-0.1314*	-0.0021	0.1649*	1.00		
Student	0.3796*	0.1472*	-0.1091*	0.0139*	0.3462*	0.0690*	1.00	
Education Level of Household Head	-0.1149*	-0.3382*	0.2294*	0.0089	-0.0488*	0.2574*	-0.1723*	1.00

*correlation coefficients are significant at the 5% level; without * correlation coefficients are not significant at the 5% level

Table A.2 : Pairwise correlation coefficients of child labor and other variables at 1% level.

	Child Labor	**Family Size**	**Types of Residency**	**Gender**	**Age**	**Age of Household Head**	**Student**	**Education Level of Household Head**
Child Labor	1.00							
Household Size	0.0431*	1.00						
Types of Residency	-0.1072*	-0.2141*	1.00					
Gender	-0.0940*	0.0278*	0.0063	1.00				
Age	0.2440*	-0.0323*	0.0039	-0.0033	1.00			
Age of Household Head	0.0469*	0.2211*	-0.1314*	-0.0021	0.1649*	1.00		
Student	0.3796*	0.1472*	-0.1091*	-0.0139	0.3462*	0.0690*	1.00	
Education Level of Household Head	-0.1149*	-0.3382*	0.2294*	0.0089	-0.0488*	0.2574*	0.1723*	1.00

*correlation coefficients are significant at the 1% level; without * correlation coefficients are not significant at the 1% level

Table A.3 : The list of selected studies about child labor.

Article	Types of Analysis	Scope of Analysis
Dayıoğlu(2005)	Bivariate Probit Model	Relationship between compulsory education, child labor and schooling
Dayıoğlu&Assad(2003)	**Probit Model**	**Trying to find the determinants of child labor.**
Tansel(2002)	Ordered Probit Model	Understanding the constraints causing the large gender gap in Turkish education
Acaroğlu(2010)	**Probit Model**	**Child labor in Turkey from the perspective of human capital: Poverty, child labor and human capital cycle**
Patrinos and Psacharopoulos(1997)	Logit Model	The effects of being indigenous, number of siblings, activities and sibling age structure on child schooling
Salmon(2005)	**Maximum Likelihood Probit Model**	progress child non-school activity and child employment. **The probability of child labor on the income of household.**
Smits and Hoşgör (2006)	Multivariate Logistic Regression Model	Family background effects on participation in primary and secondary education of children in Turkey
Ray (2000)	**Estimating Labor supply equation**	**The relationships between poverty and schooling/ poverty and child labor**
Salmon(2005)	Maximum Likelihood Probit Model	Analyzing the magnitude, nature and determinants of child labor in Bangladesh

APPENDIX B

Moehling (1995) characterizes the basic unitary model, which represents the household with one parent (Agent 1) and one child (Agent 2). He assumes one good economy and xi as the extent of good which is consumed by agent i. Each member of the household is supposed to be concerned about the consumption of all other members. Ui is the utility function of i. The household utility function shows the weighted average of u1 and u2 where the weight is attached to the parent's utility. Utility depends on both the income of family and child, denoted respectively y1 and y2. The weight amount shows how much money they get for household budget. The household's decision problem with collective model is represented equation (A.1.1, A.1.2 and A.1.3) as follows;

$$max_{\{x1,x2\}}\alpha(y1,y2)u1(x1,x2) + [1-\alpha(y1,y2)u2(x1,x2)] \qquad \text{(A.1.1)}$$

subject to

$$x1 + x2 \ \leq y1 + y2 \qquad \text{(A.1.2)}$$

It is assumed that

$$\frac{d\alpha}{dy1} \geq 0, \quad \frac{d\alpha}{dy2} \leq 0, \quad \frac{du1}{dx1} > 0, \quad \frac{du1}{dx2} \geq 0, \quad \frac{du2}{dx1} \geq 0, \quad \frac{d2}{dx2} > 0 \ \ and\ 0 \leq \alpha \leq 1 \qquad \text{(A.1.3)}$$

Basu (1999) extends this basic unitary model to add the *e*, as $e\varepsilon[0,1]$,which is denoted to work done by child laborer in new equation. The child consumption of leisure time shows 1-*e.* Basu shows the new extended equation (A.2.1 and A.2.2) as follows;

$$max_{\{x1,x2,e\}}\alpha(y1,y2)u1(x1,x2,e) + [1-\alpha(y1,y2)u2(x1,x2,e)] \qquad \text{(A.2.1)}$$

subject to

$$x1 + x2 \ \leq y1 + y2 \qquad \text{(A.2.2)}$$

Also, Basu adds the budget constraint into the model, which is different from the Moehling's unitary model. Respectively, w_1 and w_2 are the wage of adults and wage of children. Then, the budget constraint of this model becomes equation (A.3.1) as the following;

$$x1 + x2 \ \leq w1 + ew2 \qquad \text{(A.3.1)}$$

Keeping in mind adults always work in full time, the optimization problem of solution is represented as (x_1^*, x_2^*, e^*) with y_1 and w are given exogenous to be a household equilibrium. After this extension of the model, Basu assumes two axioms which are luxury and substitution axioms. According to the luxury axiom, if income of the household is sufficient, they cannot send their children to work. For substitution axiom, adult labor can do what children do in the labor market. Within these strong assumptions, every household, *i*, has critical wage w_i, such that each household can send their children only if their wages are less than market level. For that reason, the author creates the wage level W that can be maximum and minimum. Each has different equilibrium. The maximum and minimum level of wages are defined as the following;

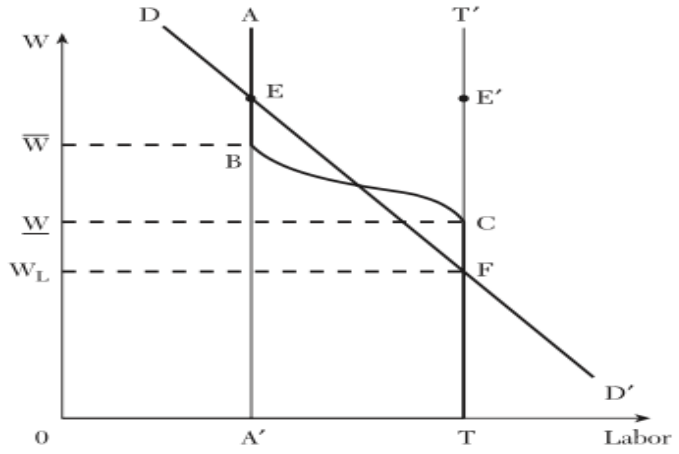

Figure A.1 : Association between child labor and adults' wages.

Source: (Basu, 1999)

$\overline{W}$ = *Maximum* W_i.

$\underline{W}$ = *Minimum* W_i

Figure A.1. represents the relationship between child labor and adults' wages. AA' is the supply curve of adult labor in the economy and TT' is another curve of supply from labor. As discussed before, keep in mind adult workers can do whatever child labor do. In that figure, ABCT shows the changes of number of labor within adults' wages. From E point, the adult wage is high and the child labor is low. As a result of the ban on child labor by law, there is no child labor in the market. Between point B to point C, the amount of child labor can be different because the adult wage is critical. However, there is an equilibrium on the point F and the adult wage is low where the child labor exists. However, the same economy can be optimal at point E, too. There is a transparent multiple equilibrium in the Figure A.1. The DD' curve is aggregate demand curve of labor. There exist multiple equilibria in this economy. According to the Walrasian description of economy, both of these two equilibria could be Pareto optimal, so between point E and point F neither Pareto can dominate the other. However, if the adults are working, households can be better off at E. Let's think about E' point where wages are the same as at E but all children work. Apparently, households who are working are better off at E' than at F because in

both cases the wages of households are preferably higher. Then, at point E, households prefer not to send their children to work because we know that E is superior to E'. Hence, by transitivity, E is preferred to F. This means that child labor is not acceptable according to the Basu theory.

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