

ISTANBUL TECHNICAL UNIVERSITY ★ INSTITUTE OF SOCIAL SCIENCES

**SIBLING COMPOSITION AND EDUCATIONAL
ATTAINMENT OF BOYS AND GIRLS**

**M.A. Thesis by
Zeynep Gülçin KOÇ, B.Sc.**

Department: Economics

Programme: Economics

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**M.A. Thesis by
Zeynep Gülçin KOÇ, B.Sc.
412061022**

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**Supervisor (Chairman): Asst. Prof. Dr. Mehtap HİSARCIKLILAR
Members of the Examining Committee: Prof. Dr. Gülay GÜNLÜK ŞENESEN (İ.Ü.)
Asst. Prof Dr. İpek İLKARACAN AJAS**

JUNE 2008

**AİLE İÇİNDEKİ ÇOCUKLARIN DAĞILIMI VE
KIZ, ERKEK ÇOCUKLARIN ÖĞRENİM DURUMLARI**

**YÜKSEK LİSANS TEZİ
Müh. Zeynep Gülçin KOÇ
412061022**

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**Tez Danışmanı: Yrd. Doç. Dr. Mehtap HİSARCIKLILAR
Diğer Jüri Üyeleri: Prof. Dr. Gülay GÜNLÜK ŞENESEN (İ.Ü.)
Yrd. Doç. Dr. İpek İLKARACAN AJAS**

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PREFACE

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SUMMARY

SIBLING COMPOSITION AND EDUCATIONAL ATTAINMENT OF BOYS AND GIRLS

Zeynep Gülçin KOÇ

This study investigates the effects of sex composition, number and birth order of siblings on the educational attainment of children in Turkey. The aim of this study is to examine gender-based differentiation on educational attainment of boys and girls since educational participation is an important concern. The sample data used in this study comes from 2006 Household Labour Force Survey conducted by Turkish Statistical Institute. Two different approaches are used for examining effects of explanatory variables and determination of gender-based differentiation. Parental characteristics, siblings' characteristics, household characteristics and locative characteristics are used as explanatory variables for estimation of dependent variable. Dependent variable takes four values according to the last school graduation level of children such as: no graduate, primary school graduate, middle school graduate and high school graduate. Ordered probit model and random effects ordered probit with censoring model are applied to estimate final grade attainment of children in order to observe the changes in the effects of explanatory variables. The two models are estimated separately for boys and girls in order to investigate gender differences at primary school, middle school and high school levels. Parental education, number and sex composition of siblings are found to be the major factors affecting educational attainment. The results obtained from the analyses suggest that for school attainment of girls, having a mother who has completed higher education and living in urban areas are the most important factors. For school attainment of boys, having older brothers and sisters are found significant.

**Keywords: Educational Attainment, Siblings Sex Composition, Siblings Size,
Birth Order, Family Background Effects**

ÖZET

AİLE İÇİNDEKİ ÇOCUKLARIN DAĞILIMI VE KIZ, ERKEK ÇOCUKLARIN ÖĞRENİM DURUMLARI

Zeynep Gülçin KOÇ

Bu çalışma, Türkiye’deki çocukların öğrenim durumu üzerinde, aile içindeki kardeşlerin cinsiyet dağılımının, sayısının ve doğum sırasının etkilerini incelemektedir. Öğrenime katılım önemli bir konu olduğundan, bu çalışmanın amacı kız ve erkek çocukların öğrenimi üzerinde cinsiyete bağlı farklılaşmanın incelenmesidir. Bu çalışmada kullanılan örneklem verisi için Türkiye İstatistik Kurumu tarafından düzenlenen 2006 yılı Hanehalkı İşgücü Anketi kullanılmıştır. Açıklayıcı değişkenlerin etkilerini incelemek ve cinsiyete bağlı farklılaşmayı belirlemek amacıyla iki model kullanılmıştır. Bağımlı değişkenin tahmin edilmesinde, anne-babanın özellikleri, kardeşlerin özellikleri, aileiçi özellikler ve çevresel özellikler açıklayıcı değişkenler olarak kullanılmıştır. Bağımlı değişken, çocukların mezun oldukları son okul seviyesine göre dört değer almaktadır: mezun olmama, ilkokul mezunu olma, ortaokul mezunu olma ve lise mezunu olma. Açıklayıcı değişkenlerde meydana gelen değişiklerin çocukların mezun oldukları son okul seviyeleri üzerindeki etkilerinin gözlenmesi, sıralı probit modeli ve rassal etkileri içeren sansürlü sıralı probit modeli uygulanarak gerçekleştirilmiştir. Bu modeller, ilkokul, ortaokul ve lise seviyelerinde cinsiyet farklılaşmasını araştırmak üzere, kız ve erkekler için ayrı ayrı tahmin edilmiştir. Anne-babanın eğitiminin, aile içindeki çocukların sayısının ve cinsiyet dağılımlarının öğrenim durumunu etkileyen başlıca faktörler olduğu bulunmuştur. Analizlerden elde edilen sonuçlar, kızların öğreniminde, daha yüksek okul seviyelerinden mezun anneye sahip olmanın ve kentsel bölgelerde yaşamının önemli olduğunu, erkeklerin öğreniminde ise büyük erkek kardeş ve büyük kız kardeşe sahip olmanın anlamlı olduğunu göstermektedir.

Anahtar Kelimeler: Öğrenim durumu, Kardeşlerin cinsiyet dağılımı, sayısı, doğum aralığı, Ailesel etkiler

1. INTRODUCTION

Gender-based differences in educational achievement have been a global issue that needs to be tackled. Therefore, educational attainment of children and the determinants of gender-based differences have been studied for many different countries. Most of these studies emphasize that family budget, parental behaviour and number of siblings as well as the cultural, religious and locative characteristics are the main factors explaining the relationship between gender and educational attainment.

Being a developing country, gender-based differences in educational achievement is also observed in Turkey. This study examines reasons of gender differentiation in educational attainment with an emphasis on the effects of sex composition, size and the birth order of the siblings. Regional comparisons are also made.

1.1. Background

There are many studies showing that resources are unequally distributed among the family members in many developing countries¹. This unequal distribution of resources has a usual tendency of taking the form of unequal treatment against females. In this respect, females are in a more disadvantaged position than males within the family. In many developing countries women receive less education by comparison with their male siblings even though the gender gap has been declining in recent years (Aguayo, Chapa, Rangel, Trevino and Valero-Gil, 2007). According

¹ For instance: Thomas (1990) finds evidence of non-random resources in Brazilian households, studies by Parish and Willis (1993) for Taiwan show the different investments on health and educational outcomes of children.

to the World Bank (2005), in 1990, secondary school enrolment in low-income countries was 26% for girls and 42% for boys. By 2001, female secondary enrolment had increased to 41% as compared to 51% for male enrolment. For it is known that development brings different changes to income, consumption, urbanization and educational costs, many developing countries find it hard to adjust themselves to these additional costs and this can result in gender discrimination in schooling.

In most of the previous studies, the main theoretical explanation for the relationship between sibling sex composition and children's education is based on socio-economic standing of the family, which is called parental optimal-intra household resource allocation. The family is seen as a decision-making unit striving to produce utility for its members out of a set of real inputs such as time and money (Becker, 1967 and 1981; Becker and Tomes, 1976). According to this view, a family has a limited set of resources and parents control the usage of this set. These models show that when the markets are perfect, parents will invest in the education of their children such that the expected marginal benefits from education equals to its marginal costs. In many societies such as Japan and China, parents prefer to spend more money on their sons' education than to their daughters', while in some others it is the other way around (Rand, 2006). The following chapters explain the theoretical background on the reasons of differences in educational investments to the children within the family.

1.2. Theories on Educational Investments in Family

In the literature, the intra-household allocation models explain educational investments in the household. Early studies of household demand assume that family members act as if they are maximizing a family utility function. Models differ in terms of explaining the behaviour of family decisions and can be grouped into two: Unitary models and collective theories of family decision-making. Unitary theories of family decision making treat the family as a monolithic unit that acts as a single decision maker. However there is an increasing consensus in the literature on household behaviour, stating that the decisions of all family members cannot be modelled so as indicating that the household has a set of stable preferences, which the unitary model is based on. Collective theories indicate that parents have different

preferences and utility function of parents should be written separately. Models such as cooperative and non-cooperative bargaining models have been suggested in the framework of collective household models.

1.2.1. Unitary theories of family decision making

According to family models of Becker and Tomes (1976), parents tend to spend their money in favour of the welfare of their children. Budget constraint of the household plays a major role in specifying the investment on educational attainment. Under the budget constraint is binding; parents are expected to invest in their children until the rate of return of each children's education is equal to the market rate of interest. In this model, mother and father are assumed to act together when expenditure in welfare of children is considered. There is only one utility function, which is called family utility function instead of two different utility functions. In addition to Becker and Tomes (1976); Behrman, Pollack and Taubman, (1982) bring a new dimension to this subject; they argue that parents are only interested in their children's lifetime wealth and market earnings. They suggest that, in addition to the fact that parents invest in their children's education by means of the returns to human capital investments, they also invest in their education with reference to earnings equality since they do not want to cause an inequality among their children. Therefore, children with a low rate of return on investment and who have siblings with a high rate of return on investment are more likely to receive more resources than similar children without such siblings.

1.2.2. Collective theories of family decision making

1.2.2.a. Cooperative Nash bargaining solution

An alternative to the unitary hypothesis of family decision-making is a cooperative Nash solution. Manser and Brown (1980) and McElroy and Horney (1981) propose a new collective model in which household members bargain over the distribution of consumption among themselves. They model the process of intra-household allocation decisions as a bargaining problem rather than the pure investment model of Becker (1967). They show that the bargaining power of individuals depends on the resources they command as well as on their individual

incomes and consumption depends not only on the household's total income, but also on which member earns it. Individual payoffs in case of breakdown of cooperation serve as threat points in the negotiation over household expenditures, thereby helping to shape the allocation of leisure and consumption among household members. Several possible determinants of these threat points have been suggested in the literature, such as land ownership, education, laws and customs about the sharing of household assets in case of divorce, and social norms regarding gender-specific tasks and parenting responsibilities (McElroy, 1990; Lundberg and Pollak, 1993). In addition, Chiappori (1992) comes with an assumption that household decisions are Pareto efficient that a family chooses some efficient point on the household utility function, using only data on household aggregate consumption. Extending the study of McElroy (1990) and Lundberg and Pollack (1993), Echevarria and Merlo (1995) constructed a model to explore the issue of gender differences in education. In their model, men and women are assumed to be identical except for the fact that women bear children. They study a two-sex overlapping generations model where men and women of each generation bargain over consumption, number of children and investment in the education of their children conditional on gender. In their model, men and women are assumed to have the same preferences over their own consumption and over the utility of their children; moreover they face the same wage schedule. In addition, it is assumed that parental preferences are neutral between boys and girls turning their model into a one-time bargain as a Nash-bargaining problem.

1.2.2.b. Non- cooperative bargaining solution

Woolley (1988) challenges whether or not that divorce is the appropriate threat point for Nash bargaining between parents and examines a model in which the threat point is a non-cooperative Nash equilibrium within marriage. As Woolley (1988) observes an alternative to assuming that allocation is efficient within households is the hypothesis that public goods² like childcare are provided by voluntary contributions in a non-cooperative equilibrium. He proposed this model of family

² Household public goods can be summarized as household heating and lighting, shared automobile trips as well as well being of children.

decision-making as the threat point for Nash bargaining and investigated its comparative statics under the assumption of Stone-Geary utility (Bergstrom, 1995).

2. EXPLANATIONS OF SIBLINGS' SEX COMPOSITION EFFECTS

2.1. Explanatory Variables

Effects of siblings' sex composition on educational attainment depend on parental decisions within intra-households models. As explained above, both unitary and collective family decision making theories assume that parents tend to invest in their children's education according to their benefits or costs. Difference between girls and boys' educational attainment depend on many factors including income of the family, number and gender of siblings in the family, birth interval and birth order of siblings, parental characteristics, cultural and religious factors and locative factors. The following chapter resumes these explanatory factors on the education of siblings.

Socio-economic Standing of the Family

When a family is relatively poor and does not have access to sufficient funds to finance optimal level of investment, resources are allocated according to the rates of return on the investments as mentioned before. If the rate of return on educational investments is greater for male children than for female children, males will receive more of such investments and consequently have higher levels of educational attainment than females (Becker and Tomes, 1976; Becker, 1981; Kaestnar, 1997). Since males are systematically granted higher status than females, it is expected that more resources would be distributed to sons than to daughters. Butcher and Case (1994) emphasize that these circumstances can lead to a systematic relationship between siblings sex composition and educational attainment. When the return to education to parents is higher for men than for women, it is predicted that a girl with only sisters will receive more education than a girl with brothers and that a boy with only brothers will receive less education than a boy with at least one sister. Butcher

and Case (1994) suggest that if male children are those with high rates of return than female children, girls with more brothers will be having higher education compared to girls without brothers.

Gender of Siblings

According to Becker (1967), because of previous labour market discrimination against women which affect their expected returns to educational investments, women's investment in human capital may be lower than men's. Within the context of a pure investment model, he shows that systematic gender differences in human capital investments may arise as an optimal response to biological differences between men and women. With a constraint on the allocation of women's time, child bearing and some other household duties lowers the returns from the investment in the education of girls relative to boys. In addition to this, there is an unavoidable phenomenon that women receive less of the benefit of their investments. Men, on the other hand, capture a larger fraction of the total returns to education in the labour market (King and Hill, 1993). What more, cost of education may be different for males and females. Opportunity cost of education is higher for men who would earn higher wages in the labour market. Thus if parents want to maximize the current household income, they may want to send sons to the labour market to supplement family income. In addition, some cultures may consider girls suitable for certain household chores such as cooking, cleaning and babysitting. Parents may demand daughters to help with household works rather than emphasize on schoolwork and education, while they expect the sons to continue schooling. On the contrary, sons receive less education compared to their female siblings in some cultures. Men can be locked in the place where they were born and they may be required to continue the family business. If the oldest son is considered to inherit the family livelihood such as farming or fishing, which does not require formal education beyond basic skills of reading and math, parents may not see the need for investing in his education (Rand, 2006). Moreover, in a poor family, the oldest son may be expected to start working early and to support his younger siblings. Children, of whom there are plenty; spend less time in school and more time helping around the house or the farm. It is customary for young adult males to remain on their father's farm until they

are allowed to marry- and often to stay after marriage (Fafchamps and Quisumbing, 1998).

Number of Siblings

When possible explanations of gender differences in educational attainment are considered, number of siblings should also be examined. Previous studies on the subject show that as the number of siblings' increases, the level of education decreases. Blake (1989) states that the number of siblings diminishes the amount of economical or social- interaction resources that any child can expect to receive. In addition, the 'Quantity-quality trade-off theory' (Becker, 1981) and the 'Resource dilution theory' (Powell and Steelman, 1989) point out that an increase in the number of siblings reduces the amount of resources available for each child. Powell and Steelman (1989) explain their theory such that as families expand in size, the amount of resources that can be channelled to any child necessarily declines. In essence, siblings are competitors for scarce resources. This finding is often explained using an argument of finite resources such that parents have limited time, money, and patience to devote to the education of their children, and those with fewer children can invest more per child. Under such circumstances, the child's gender, their birth order and their siblings' characteristics are likely to become important factors in decisions on intra-household allocation of resources. Children with fewer brothers and sisters obtain more schooling than those with more siblings.

Birth Interval

In addition to number of siblings, birth interval of cohorts also affects the education of boys and girls in a family. Rosenzweig (1986) suggests that birth interval is likely to reveal something about the quality of previously born children. First born children have an advantage over later born siblings because parents spend more time with them alone, the mother is younger at birth and financial resources in low-income households may be less strained at childhood while there is only one child in the family. On the other hand, with longer birth intervals younger siblings in resource constraint families may be better off since parents are probably closer to the peak of their earnings and there is less competition for the scarce resources. In addition to this, it may be the case that the older siblings have left home or are contributing

financially, thus increasing the potential to allocate more resources towards younger siblings (Behrman et al, 1986). With the help of their findings, Rand (2006) mentions that it is important to be the oldest son in a family. Previously, the oldest son was expected to inherit the family estate in Japan. In return, he and his bride were considered to maintain the family lineage and to take care of parents in old age. Since the Japanese economy grew rapidly after World War II and has become substantially richer, the typical household size has become smaller as parents have fewer numbers of children. The effects of sibling composition have considerably weakened over the past 50 years, as parents now have more resources for each child's education (Rand, 2006). Kessler (1991), studying the interaction of gender and birth order, emphasizes that in some situations, gender may interact with birth order in a way that favours males and children born lower in the birth order. For example, parents may prefer to spend more on their son's education, either due to their higher labour market returns or owing to cultural norms requiring sons to look after elderly parents. Parents with an expectation of higher direct market returns will invest in favour of sons rather than daughters regardless of the child's birth order.

Parental Education

Parental education affects human capital investments through many ways. It improves family income and therefore demand for children's human capital. Also it changes the values, knowledge and preferences of the parents. It is correlated with many outcomes besides higher income such as later-age school leaving and higher qualifications for children. For example, better-educated parents are likely to lead better-educated children. For these reasons, parental education has been studied as one of the explanatory variables on the schooling attainments of siblings. For France, Santos and Wolff (2007), using the data set of Passage to Retirement of Immigrants Survey (PRI) of 2003, restrict the sample to the case of children having been raised by both parents until they are 12 and whose parents live in couple. Among 9,504 children, they find that the child's educational attainment increases with the level of schooling of the father. The child's level of education is increased when both mother and father have the same education and this positive effect is even higher when the mother is more educated than the father. In addition to education level, occupational status of parents is likely to be one of the most important factors affecting school

attainment. Parents with a higher education eventually have a higher salary and they can afford to send their children to school and it is easier for them to provide a better education for their children. On the other hand, children with parents working in agriculture is expected to have a higher opportunity cost of schooling since children are expected to help their parents with farm work. Moreover, it can be argued that the educated parents are less influenced by tradition and are less likely to discriminate between their children (Hisarciklilar, 2003).

Parental Preferences

Furthermore, gender differences may occur if parental preference exists for children of a particular sex. While parental sex preference seems to be rare in the United States, Conley (2000) mentions that it may be the case that certain families stop having children based on having reached to a desired sex composition among the group; parents may keep having children until they finally get a boy/girl. There is some evidence that black women prefer daughters in the United States due to the fact that the birth interval between the first and second born child is smaller if the first born was a boy than if it was a girl. Kaestnar (1997) finds that for the black teenagers between the ages of 15-18 who grew up with a sister, or who had relatively more sisters had higher levels of educational achievement than people with no or fewer sisters. In addition to these, there is a different point presented by Thomas (1994), which implies that mothers allocate more resources to female children and that fathers allocate more resources to male children. According to him, the primary reason for these gender-specific preferences is that the rate of return to investments differs by the gender of the child and the gender of the parent. A mother's investment in her daughter has a greater benefit than her investment in her son because the mother has a longer and closer relationship with her daughter than her son.

Culture and Religion

Different cultural and religious attitudes towards men and women determine educational attainment preferences. For example, although Japan is one of the developed countries, it has a tradition of strongly man-dominated society. Men are more likely to be placed into the internal labour market where they receive considerable on-the-job training and where earnings are determined heavily by

seniority. Although women's labour force participation in Japan reaches to 50%, a majority of these women are chosen to the secondary labour market³ and are confined to job assignments, which require little skill and training. Ono (2003) explains this situation such that, employers fear that women will leave the labour force when they marry and the returns from investments made in the women's training will be lost, many employers avoid hiring women into the permanent employment positions, placing them instead into the short-term secondary labour market. He also adds that, in Japan society, over-educated women may find themselves bounded by opportunities for job placement and marriage. Another eastern country, China has also a family system that causes gender inequality. In this system, marriage means that a woman has joined her husband's extended family, where older and male family members have power over younger and female members. Sons are permanent members of their natal families and retain lifetime contractual relationships with their parents. Throughout their lives, they are expected to contribute to the economic well being of their parents. In contrast, daughters are only transitory members of their natal families; after marriage, they begin to contribute to the family households of their parents-in-law. In this tradition, daughters generally cannot claim property from their parents and also have no formal obligation to support them.

Gender differences in schooling attainment can be continued with Israel, where the population is consisted of Jews and Muslims. Among Israeli Jews, family size has a negative relationship with educational attainment while among Israeli Muslims, who are less socio-economic advantaged, live in less urban settings and have much higher fertility rates, family size and educational attainment are not negatively related. Shavit and Pierce (1991) suggest that, unlike Jewish families, Muslim families draw on a large blood relation network beyond the nuclear family, which weakens the financial, emotional and time constraints associated with additional children. In addition, in Thailand and Brazil, there is a negative relationship between family size and educational attainment while in Vietnam the relationship is negative only for families with six or more children and effects are modest once other family

³ The primary labour market is the market consisting of high wage paying jobs, concrete careers and long-term success whereas the secondary labour market consists of high-turnover, low-pay and usually part-time and/or temporary jobs. The majority of service sector, light manufacturing and retail jobs are considered as secondary labour.

characteristics are controlled (Maralani, 2004). One of the interesting examples can be given from Indonesia since it has the world's fourth largest population and it is one of the largest Muslim nations. Using the data set of Indonesian Family Life Survey (IFLS) of 1993-1997, Maralani comes with the conclusion that the relationship between family size and children's schooling is positive or neutral for earlier cohorts but recently it is negatively correlated.

Locative Variables

Living in urban or rural residence also influences educational attainment of children. In most previous studies locative factors such as urban living is included as a dummy variable to measure the effects. According to Cadge, Chung, Curran and Varangrat (2001) migration and village location determines girls' education since their analysis covers a rural district in North-eastern Thailand. Although the data come from just one district in North-eastern Thailand, it is one of the largest districts, representative of one of the poorest regions of the country that has experienced the greatest change in social and economic development. As for Aguayo et al (2007), using a data set of Encuesta Nacional de Ingreso Gasto (ENIG) for Mexico, did not find enough statistical evidence to support the idea that poor families, neither in rural nor in urban areas, provide more education to their 12 to 18 years old sons than daughters in Mexico. "In fact, contrary to the common belief, we found that non-poor families invest more in the education of their daughters, especially in the rural areas. Fortunately, this education discrimination against male children has been decreasing over the years. It is also found that female head of households are more likely to have children with higher levels of schooling and that children having both parents at home or having older brothers or sisters present higher levels of educational attainment" (Aguayo et al, p: 12, 2007).

2.2. Previous Literature on Educational Attainment of Siblings

Previous literature on this subject focus on the model that under a family budget constraint, parents tend to maximize their utility function over their children's education deciding whether or not sending them to school or deciding which child to send. In most of the studies, gender dummy is used to estimate the difference

between girls and boys. In addition to gender dummy, many different variables, which will be explained, are also estimated to analyse the gender difference on educational attainment.

2.2.1. Dependent variables and estimation methods

In the literature, many estimation methods are used by choosing educational attainment as a dependent variable. Table 2.1 summarizes previous studies, their dependent variables as well as their estimation methods. In order to analyse the effects of siblings, parental, household or locative characteristics on the educational attainment, ordinary least squares (OLS), probit and logit modelling techniques are applied.

When the dependent variable takes the values such as years of schooling, highest grade completed, maximum education obtained or school-leaving age, ordinary least squares (OLS) method is applied. It is one of the simple ways for estimating the effects (Hauser and Kuo, 1998; Conley, 2000; Bauer and Gang, 2000; Barnett and Wolff, 2003; Aguayo et al, 2007). Yet it is not an appropriate method to be used due to the reason that in some studies, dependent variable showing the educational attainment is likely to be discrete and sequential rather than continuous⁴. But OLS technique assumes that dependent variable is continuous and normally distributed. So, applying other techniques such as logit and probit modelling are preferred.

Ono (2003), using university entry as a dependent variable and Maralani (2004) controlling a child's continuation of education beyond primary school, apply logit modelling to estimate the effects of gender differences on educational attainment. In order to analyse the differences between girls and boys at different levels of education, sequential logit modelling can be used. Completing high school, entering college at given high school completion and earning college degree are the dependent variables in study of Butcher and Case (1994) whereas completing

⁴ Dependent variables like university entry or school grade levels take discrete values.

HS/SC/BA levels of education ⁵ by Kaestnar (1997) are examined using sequential logit technique.

Ordered probit method is another technique that is used to estimate gender differentiation on schooling. Rand (2006), using ordered probit method, estimate the differences between girls and boys separately on middle, high and post-secondary school education. Likewise, Santos and Wolff (2007) adding a gender dummy variable, analyses six different levels of educational attainment for France. Tansel (1998) and Hisarciklilar (2002) estimate the final grade attainment using the same method for Turkey.

In addition, IV estimation is also used by Pekkala (2003); Dayioğlu, Kirdar and Tansel (2007). Pekkala (2003) examines returns to schooling in 5 different models. All of the models include explanatory variables for region of residence and year dummies; whereas she adds birth interval and minority gender to second model; university region at the age of entry to third model; alcoholism and parental separation to fourth model and number of brothers to the last model. For more estimation techniques and gender differentiation usage, Table 2.1 can be examined.

⁵ HS level of education indicates finishing 12 years, SC level of education indicates finishing 13-15 years and BA level of education indicates finishing 16+ years of schooling (Kaestnar, 1997).

Table 2.1. Summary of the Dependent Variables and Estimation Techniques Used in Previous Literature

Author	Date	Country	Dependent Variable	Estimation Method	Gender Difference
Powell,B; Steelman,L.C.	1989	United States	Owing Loan/ Self pay Parental Contribution Part-time Employment/ Personal Savings/Scholarships/Loans	OLS Logit	gender dummy
Butcher,K.F; Case,A.	1994	United States	Years of Schooling Completing High School Entering College given High School Completion Earning College Degree	OLS Sequential Logit	separate regressions
Kaestner;R.	1997	United States	Cognitive Achievement of Children Completing HS/SC/BA Level of Education (HS: 12 years, SC: 13-15 years, BA: 16+ years of schooling)	OLS Sequential Logit	separate regressions
Hauser,R.; Kuo,H.	1998	United States	Mean Years of Completed Schooling	OLS	separate regressions
Tansel, A.	1998	Turkey	Years of Schooling	Ordered Probit	separate regressions
Bauer,T; Gang,I.	2000	Germany	Completing Education	OLS	separate regressions
Conley,D.	2000	United States	Highest Grade Completed	OLS	gender dummy
Curran,S; Cadge,W.	2001	Thailand	Completing Primary Schooling Completing Lower-Secondary Schooling Completing Upper-Secondary Schooling	Multinomial Logit	gender dummy
Barnet-Verzat; Wolff,F.	2003	France	School-leaving Age	OLS	separate regressions
Hisarciklilar, M.	2003	Turkey	Final Grade Attainment	Ordered Probit, Random Effects Ordered Probit with Censoring	separate regressions

Table 2.1. Summary of the Dependent Variables and Estimation Techniques Used in Previous Literature, continued

Author	Date	Country	Dependent Variable	Estimation Method	Gender Difference
Pekkala,S.	2003	Finland	Maximum Education Obtained Returns to Schooling	OLS IV Estimation	separate regressions
Ono,H.	2003	Japan	University Entry	Logit	gender dummy
Chu,C; Tsay,R; Yu,R.	2004	Taiwan	Years of Schooling	OLS	separate regressions
Dancer,D; Rammohan,A.	2004	Egypt	School Grade for Age	Logit	separate regressions
Maralani V.	2004	Indonesia	Completed Education School Enrolment& Continuation Beyond Primary School	OLS Logit	gender dummy
Smiths,J; Hosgor,A.	2006	Turkey	School Enrolment	Multivariate Logit	separate regressions
Rand, Y.	2006	Japan	Middle School Education High School Education Post-secondary School Education	Ordered Probit	separate regressions
Aguayo,E; Chapa,J.	2007	Mexico	Years of Education	OLS	gender dummy
Dayioglu,M; Kirdar, M; Tansel A.	2007	Turkey	School Attendance	OLS & 2SLS Estimation	gender dummy
Kirdar,M.	2007	Turkey	School Grade Levels Timing of School-drop across Ethnic Groups	Probit Complementary Log-Log model	separate regressions
Santos,M; Wolff, F.	2007	France	No Diploma-Primary Schooling- Secondary Schooling- Baccalaureate- Undergraduate- Graduate- Postgraduate Studies	Ordered Probit with censoring	gender dummy

2.2.2. Explanatory variables

In most empirical studies explanatory variables like; number and gender of siblings, parental education and occupation, household income are used to estimate the possible explanations for gender differences in education. Table 2.2 summaries these variables used in the previous literature. Explanatory variables interpret the dependent variable, which is generally a measurement of either years of completed schooling or completed levels of education. These explanatory variables can be grouped as: siblings' characteristics, parental characteristics, household characteristics, locative characteristics and other variables.

Siblings' characteristics are very important due to the fact that educational attainment of siblings is linked directly to these characteristics. In the models, while some authors study gender effects by separate regressions for girls and boys, the others add a dummy variable for gender specification. A very common variable is number of siblings, nearly used in every study so far. Some studies also include number of younger/older sisters/brothers, proportion of girls in the family, birth interval and birth order of siblings as independent variables. In addition to these, age is also considered one of the variables of siblings' characteristics. Being the oldest sibling is also included in some of the studies.

Parental characteristics emphasize on parents education or occupation. Most of the studies include maternal and parental education as well as occupation separately in the model. Father and mother employed in agriculture are considered to be one of the variables that are commonly used. It can also be seen that completed years of education of the head of the house is one of the descriptive statistics in the framework of parental characteristics.

Household income or earnings, such as income levels, land ownership, adult expenditure and wealth index are estimated to explain possible effects of gender differentiation. Some studies add a dummy variable for poor households. Household characteristics also generated by family type that varies from very large family to singleton one⁶ and from both parents are alive to the families with one mother/father.

⁶ Singleton family refers to a family having only one child.

Table 2.2. Summary of Explanatory Variables Used in Previous Literature

Author	Powell,B; Steelman,L.C.	Butcher,K.F; Case,A.	Kaestner;R.	Hauser,R.; Kuo,H.	Tansel, A.	Bauer,T; Gang,I.	Conley,D.
Date	1989	1994	1997	1998	1998	2000	2000
Siblings Characteristics							
<i>Gender of Children</i>	Dummy variable for gender		dummy for having a sister or brother	dummy for having a sister or brother			dummy variable for gender
<i>Sibship Size</i>	number of brothers number of sisters	number of siblings number of siblings squared	number of siblings	number of siblings number of siblings squared		number of siblings brother/	number of siblings number of sisters
<i>Age of Children</i>		age, age squared, age cubed oldest siblings	age 7-11 years age 12-18 years age 28-36 years		age age squared	age age squared	age of siblings
<i>Birth Interval - Birth Order</i>		birth interval	birth order	birth cohort of siblings oldest sibling		birth order, birth distance	
Parental Characteristics							
<i>Parental Education</i>	father's education	level of mother's education level of father's education	father's education mother's education	years of father's education years of mother's education	father's education mother's education	father's education mother's education	father's education mother's education
<i>Parental Occupation</i>		father's occupation dummy for a working mother	mother-figure's labour force participation	parental occupation	mother/ father self employed	father skilled worker father worker: other	
Household Characteristic							
<i>Household Income</i>	family income (in dollars)	dummy for poor households		income 1 (\$ 0-1199) income 2 (\$ 2000-4999) income 3 (\$ 5000-7999)	Ln per adult expenditure	payments to parents	
<i>Household size and composition</i>					no mother/father	mother catholic/protestant	
Locative Characteristics					urban location undeveloped street squatter settlement		
Other Variables	dummy variable for personal savings, loans used, scholarships		dummy variable for racial groups cognitive achievement tests (PIAT)	farm background	Ln population density , distance to metro centres/ Istanbul, regions	parents died before age 14	dummy variable for any sisters

Table 2.2. Summary of Explanatory Variables Used in Previous Literature, continued

Author	Curran,S; Cadge,W.	Barnet-Verzat; Wolff,F.	Hisarciklilar,M.	Pekkala,S.	Ono,H.	Chu,C; Tsay,R;Yu,R.	Dancer,D; Rammohan,A.
Date	2001	2003	2003	2003	2003	2004	2004
Siblings Characteristics							
<i>Gender of Children</i>	dummy variable for gender	dummy variable for gender			dummy variable for gender		dummy variable for gender
<i>Sibship Size</i>	number of siblings	number of siblings number of sisters proportion of female children		number of brother/ sister number of older/ younger siblings	number of siblings number of additional brother/ sister	number of siblings number of older brothers/sisters number of younger brothers/ sisters	number of children number of siblings age>15 proportion of female children
<i>Age of Children</i>	age 6-12 years age 16-19 years	Age				born after 1956	age age squared
<i>Birth Interval - Birth Order</i>				birth interval to next/ previous child	birth cohort	birth order	birth order
Parental Characteristics							
<i>Parental Education</i>	adults with less than 4 years of school att.	father's education mother's education	father's education mother's education	father's education mother's education		father's education mother's education	dummy variable for head's non schooling
<i>Parental Occupation</i>		father's occupation	mother working in agriculture, father working in agriculture	mother works parent unemployed	father's occupational prestige	working mother	
Household Characteristic							
<i>Household Income</i>	land ownership owns a motorcycle in 1984	income of the parents	total family income per capita	Ln (average family income) Ln (wage earnings 1985/1999) Ln (total earnings 1985/1999)			
<i>Household size and composition</i>			family size	very large family singleton child			dummy variable for female headship
Locative Characteristics	remote village		dummy variable 1 for urban area	family moved region before child 16, distance to university region at age 17-18	city size 1= towns & villages 2= large cities 3= large metropolitan areas		dummy variable 1 for urban area
Other Variables	migration variables		Regions, existence of an elderly household member, existence of a female relative		dummy for advancement to university	mother older than 40 father's ethnicity father's birth cohort	

Table 2.2. Summary of Explanatory Variables Used in Previous Literature, continued

Author	Maralani V.	Smiths,J; Hosgor,A.	Rand, Y.	Aguayo,E; Chapa,J.	Dayioglu,M; Kirdar, M; Tansel A.	Kirdar,M.	Santos,M; Wolff, F.
Date	2004	2006	2006	2007	2007	2007	2007
Siblings Characteristics							
<i>Gender of Children</i>	Dummy variable for gender			dummy variable for gender	dummy variable for gender		dummy variable for gender
<i>Sibship Size</i>	number of siblings	number of brothers and sisters	number of siblings number of older brothers/sisters number of younger brothers/sisters		number of siblings	number of children number of siblings <5	number of siblings number of sisters
<i>Age of Children</i>	oldest son/daughter age	Age	oldest son/daughter	age	age		age, age at migration, age squared, age cubic
<i>Birth Interval - Birth Order</i>		birth order	birth order	child order			
Parental Characteristics							
<i>Parental Education</i>	father's education mother's education	father's education mother educated or not	father's education high school, post-sch. Mother's education HS or more	years of education of the head of the house	father's education mother's education	father's education mother's illiterate	father's education mother's education
<i>Parental Occupation</i>		father's occupation mother's occupation				father employed in agriculture	
Household Characteristic							
<i>Household Income</i>		low/middle/high income		dummy variable 1 if the child lives in a poor household	wealth index	wealth index	Ln (household income) financial status before 16
<i>Household size and composition</i>		extended family	only child	both parents are alive	no father		raised by both parents till 12
Locative Characteristics	dummy variable 1 for urban area	variable for urbanization	grew up in a city	dummy variable 1 for urban area	reside in city population of city		parents in a large town before migration
Other Variables		mother's age at the marriage, gender role attitudes survey, mother speaking Turkish regions	father died before age 35	weekly hours worked by the child	mother's age mother's age at first marriage mother not married mother tongue regions	mother's age mother not proficient in Turkish regions ethnicity	born in France parents years in France when child at 12 parents origin country

Dummies for urban versus rural residence, dummies for region of residence, growing up in a city, distance to metro centres and variables for migration and dummies for ethnicity or religion can be grouped in locative characteristics to measure child's educational attainment.

2.2.3. Main results

Previous literature that examines siblings' sex composition on educational attainment of boys and girls can be seen in Table.2.3 with their usage of data sets and findings. Main results conclude that educational attainment of siblings depends on many variables from gender of siblings to birth intervals and from household income to number of siblings. Below, main results are summarized with some examples from the table.

While some early studies on the subject of gender differentiation result in that siblings sex composition plays a major role either by increasing or decreasing the education levels of siblings; the others result in that there is no significant importance. The study held by Powell and Steelman (1989) suggests that brothers in the family decrease the educational attainment of daughters. They find that an additional brother in the family reduces the probability that parents contribute to their daughters' education by 5%. In addition to Powell and Steelman, Conley (2000) and Ono (2003) also find that women receive less formal education than their male siblings. Ono (2003) concludes that brothers reduce the education level of sisters in a family, which can be seen a result of Japanese culture as intra-household resources are allocated in favour of sons and away from daughters. In addition, Barnet and Wolff (2003) result in that girls with brothers receive fewer resources than those with sisters in rich families in France. But they find no significant difference between having either sisters or brothers for boys using the data set of Survey of Three Generations (CNAV) and Survey of Effort of Education (INED) conducted in 1992 (Barnet and Wolff, 2003).

In contrast to this, some of the studies show that additional brother does not affect at all when sibling sex composition is consisted merely by daughters. Women raised only with brothers may be in a better position to compete for classroom resources and teacher's attention than are women raised with any sisters (Butcher

and Case, 1994). In contrary, studies by Parish and Willis (1993) result that the health and educational outcomes of children are significantly affected by the gender composition of their siblings. In Taiwan in rural households, the presence of older sisters has a positive effect on the health and educational attainment of children, regardless of gender. One explanation for this is the possibility that older sisters may be contributing in a financial sense or may be getting married earlier and moving away, thereby reducing the consumption on household resources. This is also supported by Chu, Yu and Tsay (2004) resulting for male children, older sisters are beneficial whereas older brothers are detrimental.

Most of the previous literature emphasizes that there is no relationship between siblings' sex composition and education. This can be explained by Butcher and Case's study on the change of the impact of sibling sex composition between the cohort born 1920 to 1940 and that born 1941 to 1961, with the negative effect of having a sister declining for the younger cohort resulting in a change in the way households allocate educational resources (Butcher and Case, 1994). The change of parental behaviour on spending money on education concludes in equal educational chances for both brothers and sisters. Also Hauser and Kuo (1998) find that there is little reliable evidence that sibling composition affects educational attainment of women. For developing countries, Parker and Pederzini (1999), have found that gender gap in education has fallen recently in Mexico, girls and boys below ages 20 display no significant difference. What more, Aguayo et al (2007), also indicate that there is no difference between boys and girls' education in their research for Mexico. Also in Tanzania, Morduch (2000) finds little evidence of gender differences in the educational attainment of males and females. Although there is a positive association between educational outcomes and the number of female siblings, he finds no variation in schooling attainment based on the child's gender, or whether the sisters are older or younger.

Table 2.3. Summary of the Data Sets and Findings of Previous Literature

Author	Powell,B; Steelman,L.C.	Butcher,K.F; Case,A.	Kaestner;R.	Hauser,R.; Kuo,H.	Tansel, A.	Parker,S; Pederzini,C.	Bauer,T; Gang,I.
Date	1989	1994	1997	1998	1998	1999	2000
Country	United States	United States	United States	United States	Turkey	Mexico	Germany
Data Set	Survey of Midwestern Universities	PSID, NLSW,CPS	NLSY	OCG,SIPP, NSFH	(HIES) SIST	Conteo	GSOEP
Date of Data Set	1985	1985-1967-1989	1958-1965	1973- 1986-1988	1994	1995	1996
Population of Data	800 students	3,826 individuals	5,000 child & 8,400 teenagers- adults	40,000-34,000- 7,000 individuals	12,000 house with children	50,000 households	3,456 individuals
Type of Data Set	cross-sectional	longitudinal	longitudinal	longitudinal	cross-sectional	cross- sectional	cross-sectional
Findings	An additional brother in the family reduces the probability that parents contribute to their daughter's education by 5%.	Having any sisters affects women's educational attainments negatively.	For black people, more sisters yield greater educational attainment.	Sibling composition does not affect educational attainment.	There are significant gender differences at middle and high school levels.	Girls and boys below ages 20 display no significant difference.	The educational attainment in Germany is independent of the sibling sex composition.

Table 2.3. Summary of the Data Sets and Findings of Previous Literature, continued

Author	Conley,D.	Curran,S; Cadge,W.	Hisarciklilar, M.	Barnet, V., Wolff,F.	Pekkala,S.	Ono,H.	Chu,C; Tsay,R;Yu,R.	Dancer,D; Rammohan,A.
Date	2000	2001	2002	2003	2003	2003	2004	2004
Country	United States	Thailand	Turkey	France	Finland	Japan	Taiwan	Egypt
Data Set	PSID	Nang Rong Survey	THLFS	la CNAV, l'INED	FLP	SSM	PSFD	EIHS
Date of Data Set	1989	1984-1994	1988	1992	1970-1999	1995	1999-2003	1997
Population of Data	7,573 individuals	5,000 households	16,539 households and 52,882 individuals	5,300 households and 10774 individuals	65,000 families & 120,000 children	2,208 individuals	2,626 families with 10,764 children	2,500 households and 14,231 individuals
Type of Data Set	cross-sectional	longitudinal	cross-sectional	cross-sectional	longitudinal	cross-sectional	longitudinal	cross-sectional
Findings	Women receive less formal education than their male counterparts.	No difference between siblings but being a girl significantly lowers the odds of lower secondary schooling.	While family income per capita is found to have an insignificant effect on boys' education	The girls with brothers receive fewer resources than those with sisters in the richer families.	Sex composition of siblings plays minor role on educational attainment.	Additional brother reduces women's educational attainment.	Elder brothers and sisters are both helpful to the schooling of female respondents but for males, elder sisters are beneficial whereas elder brothers are detrimental.	Relative to a male child, female and rural children are not only less likely to have the right schooling for age.

Table 2.3. Summary of the Data Sets and Findings of Previous Literature, continued

Author	Maralani V.	Smiths,J; Hosgor,A.	Rand, Y.	Aguayo,E; Chapa,J.	Dayıoglu,M; Kirdar, M; Tansel A.	Kirdar,M.	Santos,M; Wolff, F.
Date	2004	2006	2006	2007	2007	2007	2007
Country	Indonesia	Turkey	Japan	Mexico	Turkey	Turkey	France
Data Set	IFLS	TFS, DHS	NUJLSOA	ENIGH	DHS	DHS	PRI
Date of Data Set	1993-1997	1978, 1998	1999	1992-1998-2004	1998	1993,1998	2003
Population of Data	5,100 families with 21,500 children	4,912 children	1,541 men 1,615 women	50,862-48,110- 91,378 individuals	8,576 women and 8,059 households	8,804 children	6,211 families on 19,285 children
Type of Data Set	longitudinal	cross-sectional	longitudinal	cross-sectional	cross-sectional	cross-sectional	cross-sectional
Findings	The relationship between family size and children's schooling is positive.	For primary participation of girls, education of both parents, the number of brothers, and whether or not the mother was able to speak Turkish are important.	No significant different effect on women's education.	No difference between boys and girls' education.	Sex composition of siblings' matters only for female children.	Ethnicity has a direct impact on girls' school enrolment but not on boys'.	There is no gender difference in the education of siblings.

Parental education and parental unemployment also affect the educational attainment of boys and girls. In order to study the effect of both paternal and maternal education, Pekkala (2003) with the data set of Finnish Longitudinal Population, comes to the conclusion that parental education has a positive impact on children's educational attainment. On 65,000 families and 120,000 children, those with basic or secondary education come more often from families with lower parental income and education than average, and are raised by single or unemployed parents in Finland. On the other hand, those with post-secondary and college education are from richer and more educated families with fewer siblings than average. Girls would especially benefit in terms of higher earnings if they had a working mother as a role model. A mother who works also plays a positive role in terms of the sons' education. Earlier studies show that education in Finland is largely inherited despite political efforts to ensure equal educational opportunities for everyone (Pekkala, 2003).

Pekkala (2003) controlling birth order effects, reach the conclusion that birth interval has more of an effect on boys' schooling than on girls'. The average years of education of boys increases as the interval to the next child changes from one year to 2-4 years but falls thereafter. In families with 3-4 children the average years of education of the older children decreases steadily with the birth interval to the next child. Contrary, Parish and Willis (1993) also find that in Taiwan, females, born in large households or later in the birth order, are particularly disadvantaged in educational attainment. Hence, relative to females that are only children, females from large families suffer from both an income effect due to a large number of siblings and a substitution effect due to greater resources substituted towards male children. Dancer and Rammohan (2004) find in their study that relative to a male child, birth order and sibling characteristics also affect female children more adversely in Egypt. Furthermore, they note that schooling outcomes are better for earlier born children. They show that for the first born in households with five other children, having sisters rather than brothers improves the schooling outcomes across all their samples.

Cadge et al, (2001) find that migration affects education. In their study, it appears having a male migrant who does not maintain ties to the household through

remittances actually increases the educational opportunities of girls. One explanation may be that such a temporary migrant relieves resource constraints by simply not being around to consume them and therefore increases opportunities for all siblings. However, the effect is only significant for girls and only when the migrant is male. Again, since males are more likely to consume resources for education, the out migration of a male increase the educational resources available to a girl to a greater degree than the out migration of a sister who would not have laid claim to those educational resources anyway.

3. SITUATION OF EDUCATIONAL ATTAINMENT OF SIBLINGS IN TURKEY

3.1. Turkey's Educational Background

The Turkish education system consists of two main parts: formal and non-formal education. Formal education system is the regular education conducted within a school for individuals in a certain age group and has four levels: pre-primary education, primary education, secondary education and higher education. Non-formal education covers education, training, guidance and applied activities, which are not included in the formal education system and applies to individuals who lack a formal education, or who are currently at a particular stage (Ministry of Education, 2007).

Pre-Primary Education

Pre-primary education includes the education of children in the age group of 3 to 5 who have not reached the age of primary education. Pre-primary education in Turkey is optional. The objective of pre-primary education is to ensure that children develop physically, mentally and emotionally and acquire good habits that they are prepared for primary education. The government does not have the necessary capacity to provide kindergarten classes to all children. The enrolment of children attending public and private kindergartens is 25%, yet in August 2007, the government declared a target of 50% of children attending to public kindergartens by 2011 (Ministry of Education, 2007).

Primary Education

Primary education, which consists of eight-year education since 1997, is compulsory for children at the age 6-14. All state schools are free and families can also prefer private schools. In August 1997, a new Basic Education Law⁷ was approved which changed the duration of compulsory schooling from five to eight years. Schooling enrolment can be observed from Table 3.1, which shows the net enrolment rates after 1997 (TURKSTAT, 2008). As it can be seen from the table, there is an increase in both boys and girls' school enrolment whereas girls' enrolment ratios are much more higher than boys. From 1997 to 2008 for boys, enrolment increased from 90.25% to 98.53% and for girls it has increased from 78.97% to 96.14%. Overall enrolment also changed from 84.74% reaching to 97.37%.

Table 3.1. Net Enrolment Rates of Primary Education of 1997-98 to 2007-2008 academic years.

Net Enrolment Rates %	Total	Male	Female
<i>(Primary education)</i>			
1997-98	84.74	90.25	78.97
1998-99	89.26	94.48	83.79
1999-2000	93.54	98.41	88.45
2000-01	95.28	99.58	90.79
2001-02	92.40	96.20	88.45
2002-03	90.98	94.49	87.34
2003-04	90.21	93.41	86.89
2004-05	89.66	92.58	86.63
2005-06	89.77	92.29	87.16
2006-07	90.13	92.25	87.93
2007-08	97.37	98.53	96.14

Source: TURKSTAT (2008), Schooling ratio by educational year and level of education.

Secondary Education

At the end of their primary education, at the age of 14, students have to take an exam called OKS⁸ if they want to continue with their education. This exam tests

⁷ Basic Education Law, 4306

⁸ OKS: High School Entrance Examination

the students' skills in Turkish, Mathematics, Natural Sciences, and Social Sciences. According to their scores, children are placed in different kinds of high schools. But this examination will be changed after summer 2008 according to new instructions⁹ accepted. New system yields three examinations instead of one and the average score of these three examinations would determine the high school a student would enter.

The aim of secondary education is to provide students with general culture to prepare them for higher education. High schools are part of the secondary education system in Turkey. Secondary education covers different kinds of high schools that provide a minimum of four years of education. These high schools can be grouped as below:

- General High Schools
- Anatolian High Schools
- Science High Schools
- Fine Arts High Schools
- Vocational High Schools
- Technical High Schools
- Islamic Theological High Schools
- Private High Schools

The Anatolian, Science and Private High Schools are most popular among the rest of the high schools. In these schools there is an extra year¹⁰ at the beginning to teach one foreign language and in the following years, all lessons are taught in that foreign language. The enrolment rates of boys and girls for secondary education can be seen from Table 3.2. Net enrolment of all students has changed from 37.87% to 58.56%. It can clearly be observed that girls' secondary enrolment lags behind boys' enrolment in every year. In 2008, education for boys increased to 61.17% and as for girls this number is reached to 55.81%, which is the highest ratio since 1997 (TURKSTAT, 2008).

⁹ Official Gazette: 27.08.2003, instruction no: 25212 and 28.11.1964, instruction no: 11868.

¹⁰ Prep clas

Table 3.2. Net Enrolment Rates of Secondary Education of 1997-98 to 2007-2008 academic years.

Net Enrolment Rates %	Total	Male	Female
<i>(Secondary education)</i>			
1997-98	37.87	41.39	34.16
1998-99	38.87	42.34	35.22
1999-2000	40.38	44.05	36.52
2000-01	43.95	48.49	39.18
2001-02	48.11	53.01	42.97
2002-03	50.57	55.72	45.16
2003-04	53.37	58.08	48.43
2004-05	54.87	59.05	50.51
2005-06	56.63	61.13	51.95
2006-07	56.51	60.71	52.16
2007-08	58.56	61.17	55.81

Source: TURKSTAT (2008), Schooling ratio by educational year and level of education.

Higher Education

At the end of high school, students take an examination called ÖSS¹¹, and they are required to pass this exam in order to continue their studies at a university. Exam scores are weighted to provide students in each track with different opportunities when entering higher education. Higher education is given by universities aiming to meet society's requirements for skilled personnel at various levels. Higher education institutions in Turkey are:

- Universities
- Faculties
- Institutes
- Higher Schools
- Vocational Higher Schools
- Conservatories
- Research and Application Centres

It is reported that during the 2006-2007 school year, the number of universities reached to a number of 93, and over 2,4 million students are enrolled in these universities (TURKSTAT, 2008). In Turkey, university entry depends on a

¹¹ ÖSS: High School Finishing Examination

centralised examination system, and hence might not reflect the real preferences of parents.

3.2. Studies on Gender Differentiation in Education in Turkey

The subject of educational enrolment and children's education are very important in Turkey. According to Human Development Report of 2007-2008, Turkey is in the rank of 84 with a literacy rate of 87.4% (World Bank, 2008). As far as this study concerns, there are 5 previous works studied on gender differentiation in education in Turkey. The first study belongs to Tansel (1998), continuing with Tansel with collaboration of Dayioglu and Kirdar in 2007. Hisarciklilar (2003), Hosgor and Smiths (2006) and Kirdar (2007) also make contribution to this subject with different aspects.

In all studies, there are common explanatory variables used to determine schooling enrolment of boys and girls. These variables can be summarized as parental education, parental occupation, household income and regions of Turkey¹². They differ from each other with the usage of other variables that will be explained below.

In addition to common variables, three of the studies¹³ use the same data set, which is Turkish Demographic and Health Survey (DHS) of 1998, conducted by the Institute of Population Studies of Hacettepe University in coordination with Macro International. Tansel (1998) uses Household Income and Expenditure Survey of 1994 conducted by the State Institute of Statistics of Turkey, Hisarciklilar (2003) uses Household Labour Force Survey of 1988 conducted by the Turkish Statistical Institute. In addition, Hosgor and Smiths (2006) include 1998 Turkish Fertility Survey (TFS) into their work.

In the early work of Tansel (1998), children's years of schooling is estimated by an ordered probit model with separate regressions for girls and boys. Gender differentiation in education is explained by variables such as household income,

¹² Regions of Turkey are West, South, North, Central and East in all studies except the study by Tansel (1998) in which regions are described as Aegean, Mediterranean, Central Anatolia, Black Sea, East Anatolia, Southeast Anatolia and Marmara Region.

¹³ These studies are; Hosgor and Smiths (2006), Dayioglu et al. (2007), Kirdar (2007).

parental education, parental employment status and location effects. She differs from other authors by including variables of distance to metro centres and distance to Istanbul into her work. In addition, urban-rural distinction is made differently compared to others. Urban location, undeveloped street and squatter settlement are used for determination of locative characteristics. In her study, she finds that effect of income on schooling of girls is larger than that of boys in all schooling levels, including primary and secondary education. Parental education effects are larger on girls' than on boys' schooling. The effect of father being self-employed was negative at the middle and high school levels for boys and at the middle school level for girls. She mentions that this finding implies the work opportunity within the family business or the farm fields may be an alternative to schooling in particular for boys. Most interesting finding of her study is that the effect of location on education. She indicates that the longer distances to the regional metro centres are associated with lower school attainments for both boys and girls at the middle and high school levels. Distance to Istanbul is also associated with lower schooling attainment at the primary school level for both boys and girls.

Another study by Hisarciklilar (2003) applies two different approaches to examine the effects of family background, demographic and locative characteristics on the educational attainment of boys and girls. In the first approach, enrolment in different levels of schooling is estimated by sequential logit modelling and in the second approach, final grade attainment is estimated by censored ordered probit modelling incorporating random family effects into the model. Controlling the variables of existence of an elderly household member and existence of a female relative differs her study from others since these variables allow examining the opportunity cost of girls' schooling. As a conclusion, she finds that maternal education; financial limitations of the family, place of residence and household size are important factors influencing education. It is found that, especially girls with higher educated mothers and living in urban areas with smaller households have a higher probability of attaining to high school.

The study by Hosgor and Smiths (2006) regresses school enrolment with multivariate logistic estimation for boys and girls separately. What makes them different from other studies is that they lean on the subject of gender role attitudes.

For that matter, a survey of containing 5 questions is conducted on mothers. The questions asked are: “Men are wiser than women- Women should not argue with men- Important decisions should be made by men- It is better for a male than for a female child to have education- A man has the right to beat his wife when she argues with him” The gender role attitude variables are formed as dummies indicating whether or not the mother agrees with these questions. Whether the mother is speaking Turkish or not is also included as one of the explanatory variables. They find two different results for primary and secondary education in Turkey. For primary participation of girls, education of parents, the number of brothers, and whether or not the mother was able to speak Turkish are identified as major explanatory factors. Mother's education is significant for girls whereas it is not significant for boys. The occupation of the father has no effect at all on participation in primary or secondary education of boys but the effect of the father's occupation on primary participation of the girls is negative. Finally, it is found that the presence of brothers or sisters decreases the probability of both boys and girls to participate in secondary education and the presence of brothers also change the chance of being enrolled in primary education.

The study by Dayioglu et al, (2007), estimates the schooling attendance of siblings using OLS and 2SLS methods. Effects of sibship size, birth order and sex composition are regressed to determine the possible explanations for different schooling attainments of boys and girls. They include characteristics of mother such as; mother's age, mother's age at the first marriage and mother's tongue into the model. However, their work is restricted to urban areas in Turkey, which is defined as settlements with a population above 10,000. They find that sibship size has no significant effect on educational attainment but both birth order and sex composition have effects. They indicate that birth order of children does matter for their educational outcomes. Middle born children are found to fare worse for all household income groups except for roughly the top 15% of the income distribution. They result in finding a parabolic shape for the birth order effect and it is seen that this shape is at its strongest for the poorest households and weakens as household income increases. Another result they come up with is that sex composition of siblings' matters for female children but not for male children. For poor families, a higher fraction of male children decreases the school enrolment probability of female

children. Rather surprisingly for richer families they find the impact of the fraction of male siblings on female children's school enrolment is just the opposite. In these families, the fraction of male children increases school enrolment probability of female children.

In 2007, Kirdar studies impact of ethnic differences on school attainment in Turkey. Determining school grade levels by probit estimation model, he is differing from all other authors by dividing the data set into 4 ethnic groups: Turks, Kurds, Arabs, and Caucasians¹⁴. His sample is consisted of 8,804 children of whom 6,644 are ethnic Turks, 1,859 are ethnic Kurds, 223 are ethnic Arabs and 78 are ethnic Caucasians (DHS, 1993, 1998). He finds that the levels of non-enrolment are quite high for some ethnic groups. The average of non-enrolment rates in 1993 and 1998 are 28.6% for ethnic Kurdish boys and 27.7% for ethnic Arabic boys. He emphasizes non-enrolment rates are even more striking for females. 52.5% of ethnic Kurdish girls and 44.9% of ethnic Arabic girls are not enrolled in school in this time period. What more, there exist remarkable disparities in socio-economic characteristics across ethnic groups. For example, while the illiteracy rate — the average for the years 1993 and 1998— is 35.2% for ethnic Turkish mothers, it is striking 89.8% for ethnic Kurdish mothers and 71.3% for ethnic Arabic mothers. As a result he finds that location of residence and family characteristics emerge as significant contributors to the disparities in educational outcomes across ethnic groups in Turkey and ethnicity has a direct impact on girls' educational outcomes.

¹⁴ Kirdar groups Circassian, Georgian, and Laz into one and name this group as "Caucasian" (2007).

4. DESCRIPTION OF THE DATA

4.1. Data and Statistics on Final Grade Attainment

The data used for this study is Turkish Household Labour Force Survey of 2006 conducted by the Turkish Statistical Institute. Household labour force survey data is particularly preferred because of the fact that it contains detailed information on both parents and their children, which is essential in examining the effects of household characteristics on educational attainment of siblings. Another reason for using this data set is that, it is the latest available and that it contains the most recent information.

The 2006 survey data includes information on 129,527 households and 497,137 individuals. Due to the fact that educational attainment of children and their siblings is investigated, households without children and children without parents¹⁵ are excluded from the data set. After matching the parents and the children in the household, family characteristics such as parental education, parental occupation, household income, number of brothers and sisters, number of older/younger brothers and sisters are obtained from the data set and used as explanatory variables¹⁶. In addition to family characteristics, locative characteristics such as regions of Turkey¹⁷ and urban/rural distinction are also used to examine the effects on educational attainment of siblings.

The sample used in this study is restricted to children aged between 15-24. In the survey, people are asked to report the age interval they were in at the time of the survey. There are 12 age intervals from 0 to 65+ ages. The restriction on the age group is made with using two age intervals¹⁸. In this study, age 15 is chosen as the

¹⁵ Children without mother, children without father, children without both parents.

¹⁶ See Appendix A for the data matching process and information on excluded observations.

¹⁷ Regions of Turkey are defined as West, South, North, Central and East regions, rearranging 12 regions given as NUTS1 in the Turkish Household Labour Force Survey of 2006.

¹⁸ Age Box-2: 15-19 ages; Age Box-3: 20-24 ages

lower cut-off point firstly for the reason that the data set does not allow to choose any other younger age interval. Second of all, although education starts at the age of 7 and is compulsory for every child in Turkey, there can be late entries to schools¹⁹. By including children aged 15 or over, it becomes certain that children who have not yet attained to any school, will never attain and they can be grouped as children having no degree of education. The choice of the upper age cut-off is made because after 24 years old, the child is thought as if he/she must have finished high school education and also because older children have a higher tendency to leave the household. According to the restriction, the total number of children is 55,010 of which 20,571 children are still continuing with their education and 34,439 children have completed their education at the time of the survey.

Table 4.1 shows the percentage distribution of last school graduation of children aged 15-24²⁰. These percentages are calculated by gender and by place of residence. The final grade attainment rates make a peak around middle schooling for both boys and girls. These high rates can be explained by that 8-year education is made compulsory for everyone with the law in 1997. After middle school, high school graduation rates come second. The attainment rates for girls are lower than the rates of boys in middle school and high school degrees but higher than boys in having no degree, primary school degree and university degree. When no degree is concerned, girls have the highest non- attainment rates, nearly doubling the rates of boys. Especially girls in rural areas are reaching to 24.72% forming the biggest group at this education level. Contrary to no degree, girls have the highest percentages of university graduation level. This percentage is especially different in urban/ rural areas, where girls' rates are reaching to 5.89% in urban areas and 2.06% in rural areas.

¹⁹ For example, some children who are 8 or 9 years old who have never been enrolled before may start their education.

²⁰ Note that the sample used in the calculations includes children who were still continuing with their education at the time of the survey. Therefore, the reported percentages would be slightly different than the actual figures. However, the numbers still give an idea on the gender and urban/rural comparisons.

Table 4.1. Final grade attainment rates by gender and place of residence for children aged 15-24

	Total		Urban		Rural	
Last School Graduated	Boys	Girls	Boys	Girls	Boys	Girls
No Degree	8.16	17.09	7.20	13.08	10.27	24.72
Primary School	10.40	12.09	8.64	8.98	14.30	18.00
Middle School	48.86	39.50	46.03	40.30	48.68	38.00
High School	30.92	26.74	33.73	31.76	24.70	17.21
University	3.66	4.57	4.39	5.89	2.05	2.06
Total	100	100	100	100	100	100

Table 4.2 shows final grade attainment rates by gender and by regions of Turkey of the children aged 15-24. Compared to other regions, non- attainment ratios are very high for both boys and girls in the East and the South. Especially in the East, girls are reaching to the highest value of 44.22% and boys have the ratio of 19.27% in no degree level. In the South region, the ratio of no degree is also higher for girls compared with boys. In general, middle school attainment rates are higher than other educational levels like it is found before in Table 4.1. For university education, girls in the West have the highest amount of attainment rates followed by girls in the Central Anatolia. This can be explained by that good universities are usually located in West and Centre regions. Except university level of the West, the Centre and the South, attainment rates of boys are usually higher than girls in every region. The attainment rates are dramatically lower in the East compared with the rest. The East has the lowest rates of attainment in middle school, high school and university degree. This situation can be explained by the fact that, the East is not developed enough and most of the families work in agriculture resulting in their children also working in agriculture because of parental preferences.²¹

²¹ See Appendix B for frequency distribution of last school graduation.

Table 4.2. Final grade attainment rates by gender and regions for children aged 15-24

Region	Gender	No Degree	Primary School	Middle School	High School	University	Total
West	Boys	4.35	10.67	48.21	32.08	4.68	100
	Girls	6.94	11.89	45.11	29.36	6.70	100
South	Boys	8.72	11.52	46.27	30.61	2.89	100
	Girls	11.66	12.38	42.51	29.59	3.85	100
Centre	Boys	3.17	9.82	48.25	34.82	3.94	100
	Girls	3.13	9.02	46.19	35.22	6.44	100
North	Boys	3.65	9.04	48.62	34.13	4.56	100
	Girls	5.24	12.88	46.29	31.36	4.22	100
East	Boys	19.27	10.43	43.22	25.38	1.71	100
	Girls	44.22	13.33	24.87	16.36	1.22	100

Mother and father's education are one of the explanatory variables used to investigate the differences in educational attainment of siblings. Table 4.3 summarizes the education level of mothers and father's of children used in the data set. While mothers in rural areas are very different from fathers- especially in no degree and university degree levels, yet the final grade attainment rates for mothers are always lower than the rates of fathers in all school levels. When this table is compared with the Table 4.1 of attainment rates for children, it can be seen that the attainment rates of primary school graduation are higher than other education levels for both parents whereas attainment rates of children are highest around middle school. Due to comparison, it can be concluded that children are better educated compared to their parents. This result is understandable as education increases over time.

In addition to parents' education, the occupation of parents also affects schooling of children. Parents who are working in agriculture are also determined and used as one of the explanatory variables in this study. Table 4.4 shows percentage distribution of children's last school graduation by their parents' work in agriculture. According to the table, girls' non-attainment rates are higher compared

to boys' rates if their fathers or mothers are working in agriculture. On the contrary, girls have higher distribution rates when university degree is concerned. In other education levels except primary degree, boys have higher ratios than girls.

Table 4.3. Education level of mothers and fathers of children aged 15-24

	Total		Urban		Rural	
Last School Graduated	Father	Mother	Father	Mother	Father	Mother
No Degree	13.43	40.25	11.18	35.21	18.05	50.60
Primary School	56.60	48.32	52.91	49.95	64.18	44.97
Middle School	10.75	4.12	11.86	5.09	8.46	2.12
High School	12.92	5.38	15.59	7.10	7.45	1.85
University	6.30	1.94	8.46	2.66	1.86	0.46
Total	100	100	100	100	100	100

Table 4.4. The rates of parents working in agriculture by last school graduation of children

	Fathers working in Agriculture		Mothers working in Agriculture	
Last School Graduated (children)	Boys	Girls	Boys	Girls
No degree	11.35	27.14	8.6	18.70
Primary School	16.55	21.05	15.01	21.50
Middle School	46.56	35.89	49.35	41.25
High School	23.73	13.89	25.59	16.49
University degree	1.80	2.03	1.99	2.06
Total	100	100	100	100

The data set also allows this study to use the number of siblings to explain the effects of educational attainment by gender. Children aged 15-24 are grouped into five according to the number of siblings they have. Table 4.5 shows the distribution of the siblings' size and Table 4.6 shows the rates of final grade attainment by siblings' size. When the tables are observed it is seen that, as the number of children in a household increases, the percentage of graduation from higher education levels

decreases. This is consistent with the “Quantity-quality trade-off theory” of Becker (1981) explained in Part 2. When the number of children increases, the resources available for each child decrease, resulting in lower level school attainments for the siblings in a household.²²

Table 4.5. The distribution of children’ size

Children Size	Frequency	Percentage
1	7,306	12.74
2	16,731	29.17
3	13,295	23.18
4	7,896	13.77
5 >	12,668	21.14
Total	57,359	100

Table 4.6. Final grade attainment rates by children’ size

Children Size	No degree	Primary School	Middle School	High School	University
1	3.98	13.15	10.97	17.09	26.10
2	9.43	21.16	31.10	35.99	42.23
3	13.61	21.10	25.77	24.63	20.14
4	15.28	16.48	14.70	11.59	7.24
5 >	57.7	28.11	17.46	10.7	4.29
Total	100	100	100	100	100

4.2. The Variables

The educational attainment of boys and girls within the household is examined in this study. The explanatory variables used can be summarized as: parental characteristics, siblings’ characteristics, locative characteristics and family income per child. Final grade attainment of children are estimated using these explanatory variables with the dependent variable taking the value of 0 for no degree,

²² See Appendix B for the other tables including children’ size.

1 for primary school degree, 2 for middle school degree and 3 for high school degree²³.

Parental Characteristics

Parental characteristics of children are educational and occupational status of fathers and mothers. Parental education might affect children's schooling directly via parents' tastes towards education, determining the quality and quantity of time spent with the child, parents acting as role models; indirectly via household income, genetic inheritance and the bargaining power of the mother. In order to observe the effects of educational status of parents, three educational dummy variables are created for each parent such as: parents not having any degree of education, parents having a primary education degree and parents having a degree higher than primary education²⁴. Parents without any degree of education are chosen to be the reference category. In order to investigate the effects of parents' work in agriculture, two occupational dummy variables are created: a dummy variable for mother's work in agriculture and a dummy variable for father's work in agriculture. In addition, a dummy variable for working mothers is also included in this study to control for its effects on siblings' final grade attainment. Mother is considered to be not working if she answered that she is neither full-time nor part-time working.

Family Income per Child

All of intra-household allocation theories depend on family income and educational attainment of children. As family income increases, the probability of a child having higher degree of education also increases. Families with less resources and income might not be able to allocate these resources equally within their

²³ Household labour force survey data has 7 different categories to determine final grade attainment. These categories are; category 0 for individuals younger than 6 years old or illiterate; category 1 for individuals who are literate but not graduated from any school; category 2 for primary school graduate; category 3 for middle school, technical middle school or 8-year primary school graduate; category 4 for high school graduate; category 5 for technical high school graduate, category 6 for university graduate. The dependent variable is created by combining some of the categories together. No degree represents children of categories 0 and 1, primary degree represents children of category 2, middle school degree represents children of category 3 and high school degree represent children of category 4 and category 5 together.

²⁴ This category includes parents with middle school, high school and university degrees.

children. In this study, father and mother's total income²⁵ is divided into the number of their children to capture the effect of family income on gender differentiation of educational attainment.

Siblings' Characteristics

The number of brothers and sisters in a family has effects on the educational attainment of children. The resources allocated for children like income and time spent will be affected. Increment in the number of siblings will result in decrement of children's educational attainments financially by reduction of income, and decrement of the amount and quality of time that the parents' spend with each child. In addition to number of siblings a child owns, gender composition of siblings may have different influences on educational outcomes. Since effects of the number and composition of siblings on the gender based differentials in educational attainment is the main focus of this study, number and composition of siblings' characteristics are included in the models in two different ways. First of all, the number of siblings of each child is created as eight different dummy variables for girls and boys differently²⁶. These dummy variables are: children not having any brothers, children having one brother, children having two brothers and children having more than two brothers, children not having any sisters, children having one sister, children having two sisters and children having more than two sisters. Children not having any sisters and brothers are chosen as the reference category to observe the effects of number of different gender siblings on boys and girls. Another way of controlling characteristics of siblings is made by including age intervals. Six new variables are created such as: number of older brothers, number of coeval²⁷ brothers, number of younger brothers, number of older sisters, number of coeval sisters and number of younger sisters. With the help of these variables, birth order effects on educational attainment can be observed.

²⁵ The income of mother and father indicates the latest income they earned the month before the survey was conducted.

²⁶ Dummy variables are used to capture the specific effects of gender composition of siblings for each female and male child. Instead of using dummy variables, another way to control the number of siblings on educational attainment can be done by including number of brothers and sisters that each child owns. This control is also estimated by ordered probit model and the results of parameter estimations and marginal effects can be found at the end of Appendix C.

²⁷ Coeval refers to equally old.

Locative Characteristics

Locative characteristics such as urban/rural distinction and regional variables are also included to observe the effects. Turkish Household Labour Force Survey data set has information on urban/rural residence and regions are divided into 12 groups according to NUTS1. These 12 regions are rearranged and regrouped into five regional dummy variables: West, Centre, South, North and East. Centre region dummy variable is chosen as the reference category. As seen before from the tables, there are differences on the rates of school attainment between urban- rural areas and within the five regions. Families usually work in agriculture in rural areas, mostly increasing the opportunity cost of schooling for children.

Mean and standard deviations of the variables used for children aged 15-24 are given in Table 4.7.

Table 4.7. Mean and Standard Deviations for children aged 15-24 by gender

	BOYS		GIRLS	
Explanatory Variables	Mean	SD	Mean	SD
Parental Characteristics				
Mother without education	0.4062	0.4911	0.4193	0.4934
Mother with primary education	0.4844	0.4998	0.4725	0.4993
Mother with higher education	0.1093	0.3120	0.1083	0.3107
Father without education	0.1360	0.3428	0.1421	0.3492
Father with primary education	0.5787	0.4938	0.5612	0.4962
Father with higher education	0.2853	0.4516	0.2966	0.4568
Mother working in agriculture	0.1086	0.3111	0.1226	0.3280
Father working in agriculture	0.1543	0.3612	0.1782	0.3827
Working mother	0.2032	0.4024	0.2192	0.4137
Siblings' Characteristics				
Having No Brother	0.3469	0.4760	0.2788	0.4484
Having One Brother	0.3494	0.4768	0.3742	0.4839
Having Two Brothers	0.1666	0.3726	0.1979	0.3984
Having More than Two Brothers	0.1371	0.3440	0.1491	0.3562
Having No Sisters	0.3927	0.4884	0.3711	0.4831
Having One Sister	0.3443	0.4752	0.3241	0.4680
Having Two Sisters	0.1522	0.3592	0.1603	0.3669
Having More than Two Sisters	0.1107	0.3138	0.1445	0.3517
Younger Brothers	0.6773	0.9977	0.7550	1.0054
Coeval Brothers	0.2435	0.4802	0.2705	0.5038
Older Brothers	0.2850	0.5893	0.3079	0.6084
Younger Sisters	0.6324	0.9939	0.7162	1.0612
Coeval Sisters	0.2440	0.4881	0.2743	0.5106
Older Sisters	0.1899	0.5004	0.1936	0.4913
Locative Characteristics				
Living in West	0.3978	0.4895	0.3721	0.4834
Living in Centre	0.1319	0.3384	0.1229	0.3283
Living in South	0.1114	0.3146	0.1027	0.3036
Living in North	0.1154	0.3195	0.1152	0.3192
Living in East	0.2435	0.4292	0.2872	0.4525
Living in an urban area	0.6835	0.4651	0.6461	0.4782
Income per child	131.7113	307.5217	119.2789	285.2869
Sample Size	28,998		26,012	

5. THE MODELS

This study applies two different models to determine the effects of educational attainment. The first model applied is ordered probit modelling on the final educational achievement of boys and girls in Turkey. The second model applied is random effects ordered probit with censoring modelling. Looking at the numbers of children²⁸, it should be kept in mind that most of the children are currently attending to school and will likely to have an ultimate grade greater than their current grade. The difference between these two models is that in the first model, only children who are no longer students and who have already completed their education is included in the sample; whereas in the second model, children who are still continuing with their education at the time of the survey are also included. Another important difference between these two models is that random effects are included in the second model. Because of this, second model allows this study to capture unobserved family effects such as parental preferences and IQ levels or talents of children.

In the first model, excluding students, who completed their education at the time of the survey, from the data set results in reducing the data set from 55,010 to 34,439 children. But including these graduated students would lead to biased estimates for the coefficients since their grade level at the time of the survey does not represent their final grade attainment²⁹. In order to deal with this problem, random effects ordered probit with censoring modelling is applied to estimate effects on educational attainment. All the estimations and analysis are performed using STATA³⁰.

²⁸ 20,571 children out of 55,010 were still attending to school at the time of the survey.

²⁹ For example; a child can be observed as a primary graduate individual but if she/he still continues to middle school, the final education would be middle school graduate which is higher than primary education.

³⁰ None of the statistical packages, including STATA has a built-in command for estimating a random effects ordered probit model with censoring. A code written by Hisarciklilar (2003) is used for these estimations.

5.1. The Ordered Probit Model and Results

In the ordered probit model, children aged 15-24 who have already graduated from school are measured with a dependent variable that consists of 4 categories: No degree, primary school degree, middle school degree and high school degree.

The models are estimated with the explanatory variables of parental, siblings' and locative characteristics. As mentioned before, the children who were still continuing to school at the time of the survey are excluded in order to estimate ordered probit model as a first step. 17,586 boys and 16,853 girls with a total number of 34,439 children are chosen to explain if there are any gender based differences on educational attainment. In addition to this, estimation is made with two different regressions. Characteristics of siblings are defined as the number of brothers/sisters a child has and birth order of that child. Using the explanatory variables of siblings' characteristics together would cause a multicollinearity problem. In order to avoid this problem, the explanatory variables of siblings' characteristics are used in two different regressions to gather information both on number of siblings and birth order of siblings. Table 5.1 presents the results of the ordered probit modelling explained by numbers of siblings and Table 5.2 presents the results of the ordered probit modelling explained by birth order of siblings. The estimations are made separately for each gender to capture the effects on educational attainment of boys and girls.

Table 5.1. Ordered Probit Model Estimate Results for Final Grade Attainment Explained by Number of Siblings

Explanatory Variables	BOYS	GIRLS
Parental Characteristics		
sMother with primary education	0.3121*** (15.44)	0.48674*** (23.09)
Mother with higher education	0.6272*** (13.63)	1.12174*** (20.51)
Father with primary education	0.4320*** (18.04)	0.47254*** (18.67)
Father with higher education	1.0376*** (32.45)	1.00865*** (31.11)
Mother working in agriculture	0.1377*** (3.45)	0.01814 (0.44)
Father working in agriculture	-0.0384 (-1.45)	-0.1023*** (-3.85)
Working mother	-0.1113*** (-3.48)	-0.0149 (-0.43)
Siblings' Characteristics		
Having One Brother	-0.1500*** (-7.08)	-0.1239*** (-5.28)
Having Two Brother	-0.2614*** (-10.28)	-0.3569*** (-13.47)
Having More than Two Brother	-0.4541*** (-16.29)	-0.6274*** (-21.41)
Having One Sisters	-0.1142*** (-5.63)	-0.0294 (-1.33)
Having Two Sisters	-0.2017*** (-7.75)	-0.1678*** (-6.29)
Having More than Two Sisters	-0.3213*** (-10.87)	-0.3799*** (-13.46)
Locative Characteristics		
Living in West	-0.0751*** (-2.73)	-0.2364*** (-7.49)
Living in South	0.0289 (0.83)	-0.1225*** (-3.17)
Living in North	0.1340*** (3.74)	-0.0075 (-0.19)
Living in East	0.0475 (1.51)	-0.6554*** (-19.43)
Living in an urban area	0.1186*** (5.72)	0.25481*** (12.02)
Income per child	0.0001 (1.56)	0.0002*** (3.29)
cut1	-1.0331	-0.6927
cut2	-0.2378	0.03898
cut3	0.7807	0.88806
Sample Size	17.586	16.853

Note: The numbers in parenthesis are the t-ratios.

*** Significant at the 1% level.

** Significant at the 5% level

* Significant at the 10% level.

Table 5.2. Ordered Probit Model Estimate Results for Final Grade Attainment Explained by Birth Order of Siblings

Explanatory Variables	BOYS	GIRLS
Parental Characteristics		
Mother with primary education	0.3299*** (16.33)	0.5085*** (24.1)
Mother with higher education	0.6602*** (14.37)	1.1517*** (21.09)
Father with primary education	0.4335*** (18.07)	0.4981*** (19.57)
Father with higher education	1.0341*** (32.32)	1.0252*** (31.53)
Mother working in agriculture	0.1232*** (3.09)	-0.0051 (-0.12)
Father working in agriculture	-0.0343 (-1.29)	-0.1053*** (-3.96)
Working mother	-0.1018*** (-3.19)	0.0065 (0.19)
Siblings' Characteristics		
Younger Brothers	-0.1237*** (-14.39)	-0.1853*** (-19.97)
Coeval Brothers	-0.0869*** (-5.12)	-0.1778*** (-10.44)
Older Brothers	-0.0154 (-1.1)	-0.0729*** (-5.26)
Younger Sister	-0.1117*** (-13.05)	-0.1503*** (-17.27)
Coeval Sisters	-0.0232 (-1.34)	-0.0504*** (-2.94)
Older Sisters	0.0721*** (4.13)	0.1113*** (6.24)
Locative Characteristics		
Living in West	-0.0761** (-2.77)	-0.2581*** (-8.17)
Living in South	0.0186 (0.54)	-0.1372*** (-3.54)
Living in North	0.1305*** (3.65)	-0.0310 (-0.8)
Living in East	0.0548* (1.74)	-0.6582*** (-19.49)
Living in an urban area	0.1051*** (5.06)	0.2426*** (11.41)
Income per child	0.0001*** (2.8)	0.0002*** (4.05)
cut1	-0.9416	-0.6909
cut2	-0.1422	0.0498
cut3	0.8816	0.9071
<i>Sample Size</i>	17.586	16.853

Note: The numbers in parenthesis are the t-ratios.

*** Significant at the 1% level.

** Significant at the 5% level

* Significant at the 10% level

In two ordered probit models, most of the variable estimates are found highly significant. In addition to significance, sign of the variable estimates are found consistent with the explanations discussed in Part 2. While parental education have positive effects on the educational attainment of children, the number of siblings have decreasing effects as expected before. Only for female children, coefficient of having one additional sister is found insignificant. When birth order effects are concerned, it can be seen that having any other siblings than having older sisters decrease the probability of higher education. For male children, the coefficients of having older brothers and coeval sisters are found insignificant. But having older sisters increases the chance of a child getting a higher education for both genders. Parents working in agriculture have different effects depending on the gender of child. When a mother is working in agriculture, it only has an increasing effect on the education level of the male children but when a father is working in agriculture; the effect is significant only for female children and it is negative.

Regional dummies are found differently and they have a tendency to change according to gender of children. For boys, living in south and east have no significant effect on educational attainment while for girls, living in north is not significant compared to living in the central region of Turkey. Children belonging to families living in urban areas tend to have higher degrees of attainment compared with rural areas, which is mentioned as before. Family income per child has positive effects on girls' schooling but has no significant effect on boys' education.

The variable estimates found give a general idea about the direction of the relationship between attainment and explanatory variables. But in order to observe real effects of these variables, marginal effects³¹ should be calculated. Marginal effects provide the effects of a change in the explanatory variable to be observed on each educational outcome. Table 5.3 presents the marginal effects calculated from ordered probit model explained by number of siblings and Table 5.4 presents the marginal effects calculated from ordered probit model explained by birth order of siblings.

³¹ See Greene (2003) for the derivation of the marginal effects.

Marginal Effects

When the Table 5.3 is observed, mothers who have primary education degree compared to no degree increase the probability of male children's high school education by 11.80% points and increase the probability of female children's middle school and high school education by 2.86% points and 15.89% points respectively. This effect is even greater when mothers are graduated from higher education levels. While higher educated mothers increase boys' high school attainment by 24.58% points, it decreases primary and middle school probabilities by 10.19% points and 8.89% points. What more important, mothers' education is more efficient on girls' high school attainment. It increases girls' probability of attainment by 42.03% points nearly doubling boys' probability of attainment.

Compared with mothers' education, fathers' education has greater impact on male children's education than female children's education. When a father is graduated from higher education level, it increases the probability of boys' high school attainment by 39.60% points and also increases girls' high school education by 36.23% points. When fathers' education is concerned, it has nearly the same effects on educational attainment of both siblings.

The effects of parents working in agriculture change from male children to female children. For female children, mothers working in agriculture have no significant effects, but fathers working in agriculture increase the probability of no-degree and primary school graduation by 2.74% points and 1.29% points and decrease high school graduation by 3.22% points. For male children, fathers working in agriculture have no significant effect, but mothers working in agriculture increase boys' high school attainment by 5.28% points.

Surprisingly, mothers who work do not have significant effect on girls' but have negative effect on boys' education. When a male child has a working mother, his probability of attending to high school is decreased by 4.16% points. This finding conflicts with the explanations given in Part 2.

The number of siblings has decreasing effects on high school attainment for boys and decreasing effects on middle and high school attainments for girls. The sex of the siblings does not have great differences on attainment such that; when a boy

has one additional brother, the probability of attaining to high school is decreased by 5.62% points, and when a boy has one additional sister, the probability of attaining to high school is decreased by 4.29% points. For girls, having one additional sister is insignificant whereas having one additional brother decreases the probability of high school graduation by 3.92% points. Having more than two brothers and sisters have important effects on both boys and girls' schooling. More brothers decrease boys' high school education by 16.02% points and girls' high school education by 17.30% points. More sisters decrease boys' high school education by 11.55% points and girls' high school education by 11.12% points. For higher numbers of siblings owned, the number of brothers has greater decreasing impact than number of sisters.

Birth order effects can be obtained from Table 5.4. Except having older sisters, having younger or coeval siblings decrease the probability of boys' high school attainment and girls' middle and high school attainments. As mentioned above, for boys having older brothers and coeval sisters are not significant. But especially having younger brothers decreases educational attainment of male children by 4.67% points and education of female children by 5.89% points. Coeval sisters have less influence compared with coeval brothers but still decrease educational attainment of female children by 1.60% points. When older sisters are concerned, they are the only variables that have increasing effects amongst birth order explanatory variables. Having older sisters increases boys' high school education by 2.72% points and increases girls' high school education by 3.54% points.

According to the results of marginal effects, south and east regions are insignificant for boys' education and north region has no significant effect on girls' education. On the other hand for boys, while living in north increases the probability of high school attainment, living in west decreases this probability compared to centre region. For girls, living in other regions in comparison with centre region has decreasing effects on attainment of middle and high school. In particular, the decreasing effect is notable in east region. Female children living in east region has 19.50% points less probability of attending to high school than female children living in centre region.

Children living in urban areas have more probability of attending to high school compared with children living in rural areas. The effect of urbanization is

nearly twice as much as for girls than for boys such that, it has an effect of 4.46% points increase for boys and 8.06% points increase for girls.

As for increase in the family income, it has no significant effect for boys. As for girls, it has increasing but very small effect on the primary, middle and high school attainment.

Table 5.3. Marginal Effects of the Ordered Probit Model for Final Grade Attainment Explained by Number of Siblings

Gender	BOYS				GIRLS			
Explanatory Variables	No Degree	Primary School Degree	Middle School Degree	High School Degree	No Degree	Primary School Degree	Middle School Degree	High School Degree
Mother with primary education	-0.0408	-0.0563	-0.0209	0.118	-0.1227	-0.0648	0.0286	0.1589
Mother with higher education	-0.055	-0.1019	-0.0889	0.2458	-0.171	-0.1722	-0.0771	0.4203
Father with primary education	-0.0622	-0.0778	-0.0193	0.1593	-0.1284	-0.0566	0.0387	0.1462
Father with higher education	-0.0915	-0.1607	-0.1438	0.396	-0.1972	-0.1505	-0.0146	0.3623
Mother working in agriculture	-0.0169	-0.0248	-0.0111	0.0528				
Father working in agriculture					0.0274	0.0129	-0.0081	-0.0322
Working mother	0.0155	0.0203	0.0058	-0.0416				
Having One Brother	0.0206	0.0273	0.0082	-0.0562	0.033	0.0157	-0.0095	-0.0392
Having Two Brothers	0.0392	0.0475	0.0089	-0.0955	0.1018	0.0394	-0.035	-0.1062
Having More than Two Brothers	0.0752	0.0808	0.0041	-0.1602	0.1908	0.0555	-0.0733	-0.173
Having One Sister	0.0156	0.0208	0.0065	-0.0429				
Having Two Sisters	0.0296	0.0367	0.0079	-0.0742	0.0461	0.0202	-0.0145	-0.0517
Having More than Two Sisters	0.0507	0.058	0.0068	-0.1155	0.1101	0.0402	-0.0392	-0.1112
Living in West	0.0101	0.0137	0.0045	-0.0283	0.0642	0.0289	-0.0196	-0.0735
Living in South					0.0335	0.0149	-0.0104	-0.038
Living in North	-0.0164	-0.0242	-0.0108	0.0514				
Living in East					0.185	0.0708	-0.0608	-0.195
Living in an urban area	-0.0161	-0.0216	-0.0068	0.0446	-0.0677	-0.0322	0.0194	0.0806

Table 5.4. Marginal Effects of the Ordered Probit Model for Final Grade Attainment Explained by Birth Order of Siblings

Gender	BOYS				GIRLS			
Explanatory Variables	No Degree	Primary School Degree	Middle School Degree	High School Degree	No Degree	Primary School Degree	Middle School Degree	High School Degree
Mother with primary education	-0.0427	-0.0597	-0.0221	0.1246	-0.1274	-0.0685	0.0311	0.1648
Mother with higher education	-0.0561	-0.1066	-0.0958	0.2584	-0.1720	-0.1779	-0.0805	0.4304
Father with primary education	-0.0619	-0.0784	-0.0193	0.1596	-0.1350	-0.0599	0.0425	0.1524
Father with higher education					-0.1984	-0.1545	-0.0139	0.3668
Mother working in agriculture	-0.0151	-0.0223	-0.0097	0.0471				
Father working in agriculture	0.0046	0.0063	0.0020	-0.0129	0.0281	0.0134	-0.0087	-0.0328
Working mother	0.0140	0.0186	0.0054	-0.0380				
Younger Brothers	0.0163	0.0226	0.0078	-0.0467	0.0483	0.0244	-0.0138	-0.0589
Coeval Brothers					0.0463	0.0235	-0.0133	-0.0565
Older Brothers	0.0020	0.0028	0.0010	-0.0058	0.0190	0.0096	-0.0054	-0.0232
Younger Sister	0.0147	0.0204	0.0071	-0.0421	0.0392	0.0198	-0.0112	-0.0478
Coeval Sisters					0.0131	0.0067	-0.0038	-0.0160
Older Sisters	-0.0095	-0.0132	-0.0046	0.0272	-0.0290	-0.0147	0.0083	0.0354
Living in West	0.0101	0.0139	0.0046	-0.0286	0.0701	0.0317	-0.0224	-0.0793
Living in South					0.0375	0.0167	-0.0123	-0.0420
Living in North	-0.0159	-0.0236	-0.0105	0.0500				
Living in East	-0.0071	-0.0100	-0.0037	0.0208	0.1851	0.0718	-0.0630	-0.1940
Living in an urban area	-0.0141	-0.0192	-0.0061	0.0395	-0.0642	-0.0311	0.0192	0.0761
Income per child	0.0000	0.0000	0.0000	0.0000	-0.0001	0.0000	0.0000	0.0001

5.2.The Random Effects Ordered Probit with Censoring Model and Results

The random effects ordered probit with censoring model is estimated with children aged 15-24 who have already graduated from school and who are still continuing to school altogether. The dependent variable is the same variable used in the ordered probit model only with a different assumption that the children who are still continuing to school is assumed to graduate from their grade by the end of the education year. No degree, primary school degree, middle school degree and high school degree graduation is estimated with the same parental, siblings' and locative explanatory variables used as before.

Including the children who were still continuing to school at the time of the survey provides 28,998 boys and 26,012 girls with a total number of 55,010 children to be chosen to explain gender-based differentiation on educational attainment. Control of siblings' characteristics is made with two different regressions. Table 5.5 presents the results of the random effects ordered probit with censoring modelling explained by numbers of siblings and Table 5.6 presents the results of the random effects ordered probit with censoring modelling explained by birth order of siblings. The estimations are made separately for boys and girls in order to observe the different effects on educational attainment of siblings.

Table 5.5. Random Effects Ordered Probit with Censoring Model Estimate Results Explained by Number of Siblings

Explanatory Variables	BOYS	GIRLS
Parental Characteristics		
Mother with primary education	0.4847*** (19.25)	0.8336*** (24.89)
Mother with higher education	1.0450*** (20.12)	1.8716*** (23.98)
Father with primary education	0.5841*** (18.89)	0.7821*** (19.14)
Father with higher education	1.3650*** (32.86)	1.6300*** (30.30)
Mother working in agriculture	0.1188** (2.48)	-0.0242 (-0.40)
Father working in agriculture	-0.1225*** (-3.79)	-0.2723*** (-6.67)
Working mother	-0.1083*** (-2.91)	0.0053 (0.11)
Siblings' Characteristics		
Having One Brother	-0.1425*** (-5.81)	-0.1529*** (-4.48)
Having Two Brother	-0.2866*** (-9.22)	-0.4749*** (-12.00)
Having More than Two Brother	-0.5196*** (-14.59)	-0.9194*** (-19.97)
Having One Sisters	-0.0620** (-2.57)	-0.0208 (-0.66)
Having Two Sisters	-0.1237*** (-3.96)	-0.2258*** (-5.58)
Having More than Two Sisters	-0.3150*** (-8.63)	-0.5804*** (-12.69)
Locative Characteristics		
Living in West	-0.0277 (-0.85)	-0.2403*** (-5.37)
Living in South	0.0719 (1.73)	-0.1619*** (-2.88)
Living in North	0.2007*** (4.74)	-0.0202 (-0.36)
Living in East	0.1717*** (4.53)	-0.9029*** (-17.82)
Living in an urban area	0.2382*** (9.51)	0.5499*** (16.96)
Income per child	0.0002*** (4.8)	0.0004*** (4.64)
cut1	-1.3410	-1.0817
cut2	-0.4108	-0.0914
cut3	0.5965	0.8736
Rho	0.4079	0.5820
Sample Size	28.998	26.012

Note: The numbers in parenthesis are the t-ratios.

*** Significant at the 1% level.

** Significant at the 5% level

* Significant at the 10% level

Table 5.6. Random Effects Ordered Probit with Censoring Model Estimate Results Explained by Birth Order of Siblings

Explanatory Variables	BOYS	GIRLS
Parental Characteristics		
Mother with primary education	0.5283*** (20.13)	0.9024*** (25.60)
Mother with higher education	1.1201*** (20.80)	1.9950*** (24.33)
Father with primary education	0.6181*** (19.16)	0.8501*** (19.70)
Father with higher education	1.4245*** (32.72)	1.7244*** (30.21)
Mother working in agriculture	0.0999** (2.02)	-0.0595 (-0.93)
Father working in agriculture	-0.1243*** (-3.72)	-0.2914*** (-6.85)
Working mother	-0.0966** (-2.51)	0.0349 (0.68)
Siblings' Characteristics		
Younger Brothers	-0.1811*** (-16.13)	-0.2741*** (-18.21)
Coeval Brothers	-0.1123*** (-4.96)	-0.2797*** (-11.34)
Older Brothers	0.0448*** (2.69)	-0.1483*** (-6.83)
Younger Sister	-0.1444*** (-13.07)	-0.2376*** (-16.94)
Coeval Sisters	0.0313 (1.54)	-0.0425 (-1.52)
Older Sisters	0.1527*** (7.13)	0.2222*** (8.80)
Locative Characteristics		
Living in West	-0.0423 (-1.26)	-0.2815*** (-6.04)
Living in South	0.0642 (1.49)	-0.1845*** (-3.15)
Living in North	0.1926*** (4.40)	-0.0519 (-0.89)
Living in East	0.1976*** (5.02)	-0.9456*** (-17.87)
Living in an urban area	0.2318*** (8.94)	0.5561*** (16.42)
Income per child	0.0003*** (5.84)	0.0004*** (5.17)
cut1	-1.3165	-1.1594
cut2	-0.3497	-0.1193
cut3	0.7000	0.8972
Rho	0.4422	0.6128
Sample Size	28.998	26.012

Note: The numbers in parenthesis are the t-ratios.

*** Significant at the 1% level.

** Significant at the 5% level

* Significant at the 10% level

Compared with the results of ordered probit regressions estimated before, it can be seen from Table 5.5 and Table 5.6 that most of the variable estimates have same significance and same signs. But nearly for all variables, the estimated values are greater in random effects ordered probit with censoring model.

When girls' estimation results are compared, there is no difference in significance or in sign of any explanatory variable except that random effects ordered probit with censoring model results with higher estimation values. These high values are especially distinctive in fathers' education and occupation. Mothers working in agriculture, working mothers, having one additional sister and living in north are found insignificant as found before.

As for boys, there are some differences between two approaches. First of all, fathers working in agriculture and having older brothers are found significant contrary to the findings in the ordered probit modelling. Another difference can be seen in regional variables. South region remains insignificant as before but West region is also found insignificant for male children. As found before, having coeval sisters are found insignificant again. Like results of girls' estimations, boys' estimation results have higher values than the values of ordered probit model. These high values can be explained by the differences of two approaches. Addition of children continuing to school and unobserved family effects in the second approach let the coefficients to be more efficient than the first approach due to the increasing value of the estimates.

When results are examined, it is seen that parental education estimations are higher than before; especially fathers with higher education on schooling attainment of siblings become more important. In addition to fathers, having more than two brothers and having older sisters also have increasing effects compared with the first approach. Regional dummies have higher values but different effects for boys and girls. However, living in urban areas for both genders become more important resulting in that compared to children in rural areas, they attain to higher education levels. Marginal effects showing the real effects on the explanatory variable are calculated and summarized in the tables. Table 5.7 presents the marginal effects calculated from random effects ordered probit with censoring model explained by number of siblings and Table 5.8 presents the marginal effects calculated from

random effects ordered probit with censoring model explained by birth order of siblings.

Marginal Effects

In comparison with the results of ordered probit modelling, it is seen from Table 5.7 that the effects of parental education are increased. For boys, the increase in mothers' education estimation values is greater than fathers and as for girls, the increment in both parents' education values are nearly the same. But fathers graduated from higher education levels play major role on educational attainment of both gender. Mothers with higher education increase the probability of male children's high school attainment by 28.22% points and female children's higher school attainment by 46.63% points. When fathers are observed, these values are reaching to 39.58% points for boys and 51.98% points for girls.

In the first estimation using ordered probit model, fathers working in agriculture are found insignificant for boys but in the second estimation using random effects ordered probit model with censoring, it is found significant and negative. But the effects of fathers working in agriculture is more effective in girls' attainment since it decreases the possibility of a girls' higher school graduation by 10.75% points. This value is much more greater than the estimation value found in ordered probit model. As for working mothers and mothers working in agriculture, there is no important difference between two approaches and the coefficients are still insignificant for girls.

One of the main differences between two models occurs in the effects of number of siblings. When the number of siblings increases, it has negative effects on boys and girls. But the effect on girls' attainment is much more higher than boys'. For boys, having more than two brothers decreases the attainment possibility by 19.76% points and having more than two sisters decrease this probability by 11.82% points. The ratios are higher for girls reaching to 35.23% points decrement if a girl has more than two brothers and 22.83% points decrement if a girl has more than two sisters. From the results of marginal effects it can be said that for girls' education, number of siblings play a very important role indifferent of gender of the siblings owned.

Another important difference can be observed from the comparison of birth order results of the two approaches. The estimation results vary from boys to girls differently. For male children, having older brothers is found insignificant before but in the second model it becomes significant and positive. It increases the attainment of a boy by %1.59 points while having coeval brothers and younger brothers decreases the attainment of high school by 2.59% points and 4.19% points. Coeval sisters are insignificant as found before and the effect of having older sisters are increased compared with the Table 5.4. When a boy has older sisters, his probability of attaining to high school is increased by 5.30% points. Surprisingly, the effect of older brothers changes for girls but the effect of older sisters remain the same. When a girl has older brothers, her probability of attaining to high school is decreased by 5.80% points and increased by 8.48% points if a girl has older sisters. When results are considered, it can be assured that the effects of composition of siblings on educational attainment are very different.

Regional effects have nearly the same effects as found in the ordered probit model before. Apart from South region, West region is also found insignificant for boys and North region is found insignificant for girls. The highest value belongs to East region where it decreases the probability of girls' education by 34.83% points compared to centre region.

Living in urban areas seem to be more important in the second model reaching to an increment of 8.69% points for boys and 21.48% points for girls. It can be concluded that for girls, living in centre and urban areas is very important for their educational attainment.

Income per child has increasing but very little effect on schooling of each gender as found in the first model before.

Gender Differentiation

As this study tries to understand if there are any differences between the schooling attainments of boys and girls, LR test is applied for detection. Differences in signs and in coefficient significances of the explanatory variables of number and birth order of siblings' are observed from the two model estimations. Applying a LR test

for a pooled sample, the gender differentiation on the effects of variables is controlled. In the sample, the interactions of variables with gender of children are added and joint significance of these variables is tested. In the end, it is found that the two models for boys and girls are significantly different from each other.

5.3. Discussion

Final grade attainment of boys and girls in Turkey are examined using parental characteristics, siblings' characteristics and locative characteristics by applying two different models. First of all, ordered probit modelling is applied to estimate attainment of no degree, primary school, middle school and high school degree for graduated children separately according to their gender. Second of all, random effects ordered probit with censoring model is applied to graduated children and children who are still continuing to school altogether. In two models, it is found that parental education and number and composition of siblings and urbanization play major roles on the final grade attainment of male and female children differently.

A random family component, which is assumed to be common to all the children from the same household, is included because children coming from the same family are considered to be sharing some unobserved family characteristics. But if the boys and girls in the same family share different characteristics, it is more convenient to include two random components into the model. However, this inclusion would cause complications in the estimation of the model (Hisarciklilar, 2003).

Another issue for the estimated models arises from the definition of birth order of siblings. Birth order for a child is defined as if he/she has younger, coeval, older brothers and younger, coeval, older sisters in order to capture the effects of siblings' composition on the educational outcomes. Many studies including birth order effects prefer to include birth order of the children by: being first child, second child, third child or younger than third child (Bauer and Gang, 2000; Dancer and Rammohan, 2004; Rand, 2006). But Turkish Household Labour Force Survey data set does not allow this study to separate children by this kind of distinction. Because

of this, this study lacks information about the children when they are first-born or later-born. According to the results, having older sisters have positive effects on attainment for both genders, whereas having older brothers have positive effects only on boys' attainment.

In the estimation of models, income per each child is included as one of the explanatory variables. But according to data set, there are many people working in agriculture. Most of the family members, especially mothers, are coded as unpaid farm workers. Because of this reason, income estimations do not reflect its real effect on educational attainment. When estimation results are observed, it can be seen that income per child plays minor role for both genders.

Table 5.7. Marginal Effects of the Random Effects Ordered Probit with Censoring Model Explained by Number of Siblings

Gender	BOYS				GIRLS			
Explanatory Variables	No Degree	Primary School Degree	Middle School Degree	High School Degree	No Degree	Primary School Degree	Middle School Degree	High School Degree
Mother with primary education	-0.0112	-0.1440	-0.0167	0.1719	-0.0335	-0.1303	-0.1511	0.3149
Mother with higher education	-0.0107	-0.2289	-0.0425	0.2822	-0.0247	-0.1381	-0.3036	0.4663
Father with primary education	-0.0156	-0.1771	-0.0185	0.2112	-0.0359	-0.1301	-0.1344	0.3004
Father with higher education	-0.0218	-0.3240	-0.0500	0.3958	-0.0457	-0.1883	-0.2859	0.5198
Mother working in agriculture	-0.0024	-0.0349	-0.0044	0.0416				
Father working in agriculture	0.0030	0.0376	0.0041	-0.0447	0.0126	0.0474	0.0474	-0.1075
Working mother	0.0026	0.0331	0.0036	-0.0394				
Having One Brother	0.0034	0.0433	0.0049	-0.0516	0.0061	0.0251	0.0286	-0.0598
Having Two Brothers	0.0082	0.0898	0.0087	-0.1066	0.0252	0.0860	0.0761	-0.1873
Having More than two Brothers	0.0188	0.1661	0.0127	-0.1976	0.0724	0.1797	0.1001	-0.3523
Having One Sister	0.0014	0.0188	0.0021	-0.0223				
Having Two sisters	0.0031	0.0380	0.0041	-0.0452	0.0102	0.0390	0.0399	-0.0891
Having More than two sisters	0.0096	0.0996	0.0090	-0.1182	0.0352	0.1092	0.0839	-0.2283
Living in West					0.0099	0.0399	0.0443	-0.0941
Living in South					0.0071	0.0277	0.0290	-0.0638
Living in North	-0.0038	-0.0577	-0.0076	0.0691				
Living in East	-0.0035	-0.0504	-0.0063	0.0602	0.0562	0.1653	0.1268	-0.3483
Living in an urban area	-0.0060	-0.0731	-0.0078	0.0869	-0.0259	-0.0946	-0.0943	0.2148
Income per child	0.0000	-0.0001	0.0000	0.0001	0.0000	-0.0001	-0.0001	0.0001

Table 5.8. Marginal Effects of the Random Effects Ordered Probit with Censoring Model Explained by Birth Order of Siblings

Gender	BOYS				GIRLS			
Explanatory Variables	No Degree	Primary School Degree	Middle School Degree	High School Degree	No Degree	Primary School Degree	Middle School Degree	High School Degree
Mother with primary education	-0.0098	-0.056	-0.1198	0.1856	-0.0289	-0.1357	-0.1736	0.3382
Mother with higher education	-0.0086	-0.0656	-0.2169	0.291	-0.0194	-0.1319	-0.3226	0.4739
Father with primary education	-0.0134	-0.0707	-0.1379	0.222	-0.0316	-0.1375	-0.1555	0.3246
Father with higher education	-0.0182	-0.1074	-0.2785	0.4041	-0.0381	-0.1875	-0.3119	0.5375
Mother working in agriculture	-0.0016	-0.0101	-0.0232	0.0349				
Father working in agriculture	0.0025	0.014	0.0286	-0.0451	0.0108	0.0495	0.0546	-0.1148
Working mother	0.0018	0.0107	0.0223	-0.0348				
Younger Brothers	0.003	0.0184	0.0419	-0.0633	0.007	0.0394	0.058	-0.1044
Coeval Brothers	0.0021	0.0124	0.0259	-0.0405	0.0097	0.0462	0.0539	-0.1098
Older Brothers	-0.0008	-0.0047	-0.0104	0.0159	0.0047	0.0237	0.0296	-0.058
Younger Sister	0.0025	0.015	0.0334	-0.0509	0.0063	0.0349	0.0499	-0.091
Coeval Sisters								
Older sisters	-0.0024	-0.0152	-0.0354	0.053	-0.0057	-0.032	-0.0471	0.0848
Living in West					0.0091	0.0452	0.0556	-0.11
Living in South					0.0065	0.0308	0.0354	-0.0727
Living in North	-0.0029	-0.0185	-0.0445	0.0659				
Living in East	-0.0031	-0.0196	-0.0457	0.0685	0.0486	0.1714	0.1435	-0.3635
Living in an urban area	-0.0046	-0.0261	-0.0532	0.0839	-0.0207	-0.093	-0.1032	0.2168
Income per child	0	0	-0.0001	0.0001	0	-0.0001	-0.0001	0.0002

6. CONCLUSION

The effects of birth order, size and sex composition of siblings are examined on the educational attainments of children in Turkey with the help of parental and locative characteristics. Since educational participation is an important concern, the main aim of this study is to examine gender-based differentiation on educational attainment of male and female children. Although some measures are taken, such as the law that was introduced in 1997 for making 8-year education compulsory, there are still some differences in the educational attainment levels of boys and girls in Turkey.

Two different estimation approaches are used to model the final grade attainment (no degree, primary school degree, middle school degree and high school degree levels) of boys and girls within the family. Firstly, an ordered probit model and secondly a random effects ordered probit model incorporating the censoring in the data are estimated to examine the effects of household, parental, regional, residential and siblings' characteristics. The results obtained from the two models are consistent with each other, however second approach also allows to include unobserved family characteristics into the model. The results of these two models confirm the importance of gender, parental education, siblings' size and sex composition on schooling decisions for children.

As expected, parental education is found to be an important factor influencing children's educational attainment, the effect depending on the gender of the child. Mothers' education has a positive and greater effect on girls' education than on boys'. The impact is even bigger when mothers are graduated from higher levels of education. Fathers' education has a strongly positive and equal effect on the schooling of both girls and boys.

With regard to the opportunity costs of education, occupation of parents has different effects on children. Fathers' work in agriculture has a decreasing impact on the educational attainment of both boys and girls whereas mothers' work in agriculture has a positive effect on boys' education level. Fathers working in agriculture have higher decreasing impact on girls' schooling than the impact of mothers working in agriculture on boys. In addition, children living in rural areas are less likely to receive schooling compared to children living in urban areas.

The presence of brothers and sisters has similar effects on girls and boys. As the size of siblings owned increases, a child's educational attainment decreases. Siblings' size may give a clue on parental decisions for education. Parents can choose quality over quantity and therefore may choose to prefer having fewer children and they can provide better education for their children. Parents with fewer children are also able to allocate more time to spend with each child. Whatsmore, educational outcomes will increase since children with fewer siblings receive more resources than children with more siblings.

The effect of sex composition of siblings changes for boys and girls differently. While having younger or coeval sisters and brothers decrease the attainment of boys and girls, having older brothers only have positive effects on boys' schooling. This result is very important since girls with brothers, regardless of birth order, are not supposed to attain higher levels of schooling compared to boys. However, having older sisters increase the probability of higher levels of attainment for both gender.

This study has examined the effects of siblings' characteristics on final grade attainment but has not controlled the effects of age and birth interval of siblings due to data limitations. Therefore, estimation of a model with these variables would add new results to educational attainment for children.

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APPENDIX A: Data Matching Process

The data has 129,527 households and 497,137 observations in total. The matching process was mainly based on the 3 questions asked in the survey:

- Question 12A- the code of individual number of your spouse (if any)
- Question 12B- the code of individual number of your mother (if any)
- Question 12C- the code of individual number of your father (if any)

Using these 3 questions, the relationship between the members of the household is determined as children and parents. While creating the new data set, the following observations/households were excluded from the data set:

1. Households with only one member are dropped such that 8,825 households are consisted of only one person.
2. Households only consisting of people who have not reported to have a spouse are dropped. In 36,586 observations (people), none of the household members has reported to have a spouse.
3. None of the household members reported to have a father and a mother – resulting in 48,877 observations to be deleted³².

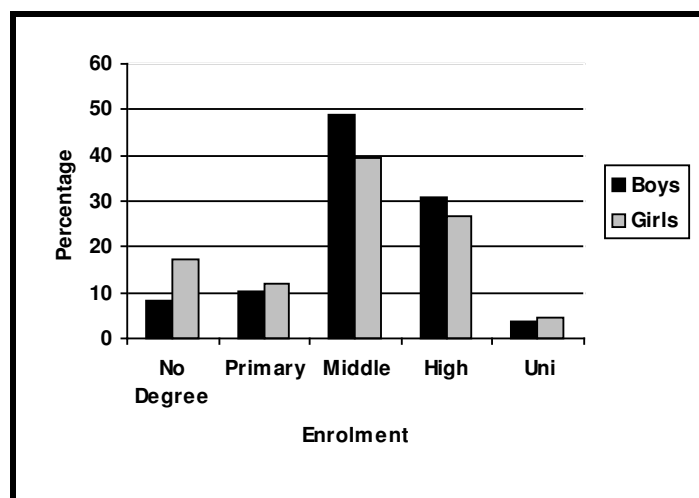
After these exclusions, a sub sample is created for parents. There are 95,713 males who reported to have a spouse and there are 95,950 females who reported to have a spouse. These males and females are matched comparing the answers they have given in the question 12A and their individual code numbers, leaving 7 people unmatched. In the end, 95,953 couples are matched as parents. While creating parents, there have been some problems. Most of the problems were due to coding mistakes such as the gender of one of the parents was entered wrong. The coding of father is mixed with the coding of mother. These coding mistakes were corrected.

Another sub sample was created for children. Out of parents, 2,640 couples that did not have any children are dropped. There are 196,266 children reported living with their two parents in the same household. For 219 children, there was no coding number for the presence of a father or mother. In the end, 206,014 children are matched with their parents.

³² The households with a single parent are excluded due to the fact that, characteristics of parents are included to observe the separate effects on educational attainment of children.

APPENDIX B: Summary Statistics Using 2006 Household Labour Force Survey

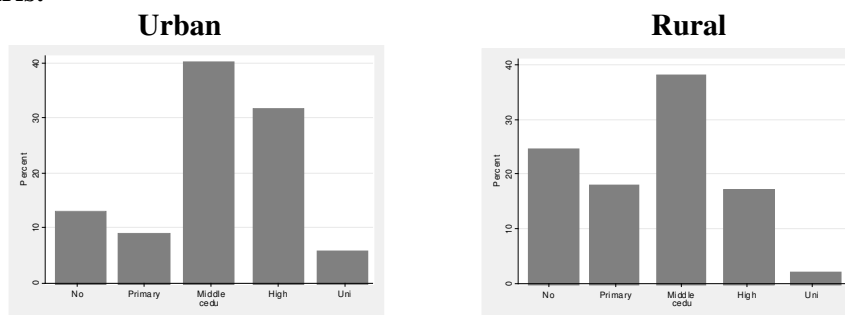
Data



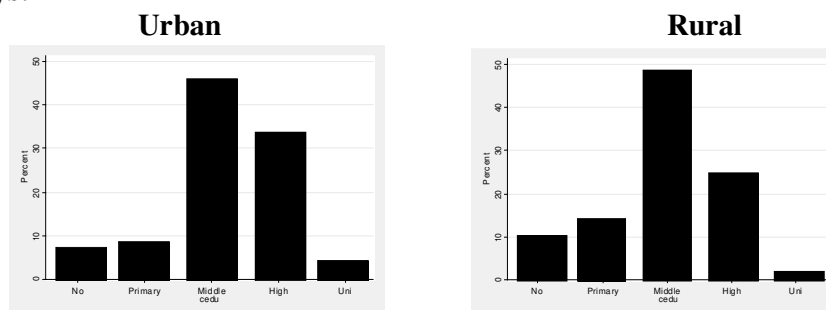
Data Source: 2006 Household Labour Force Survey Data

Figure B.1. Last School Graduated, children aged 15-24

For Girls:



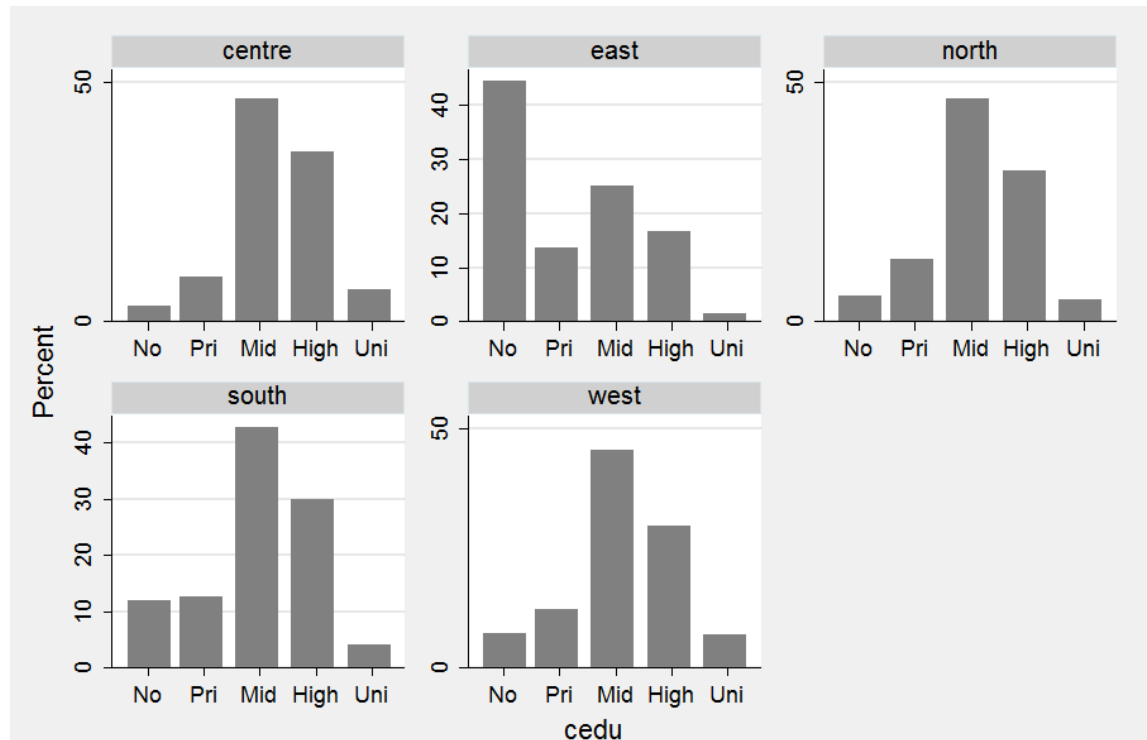
For Boys:



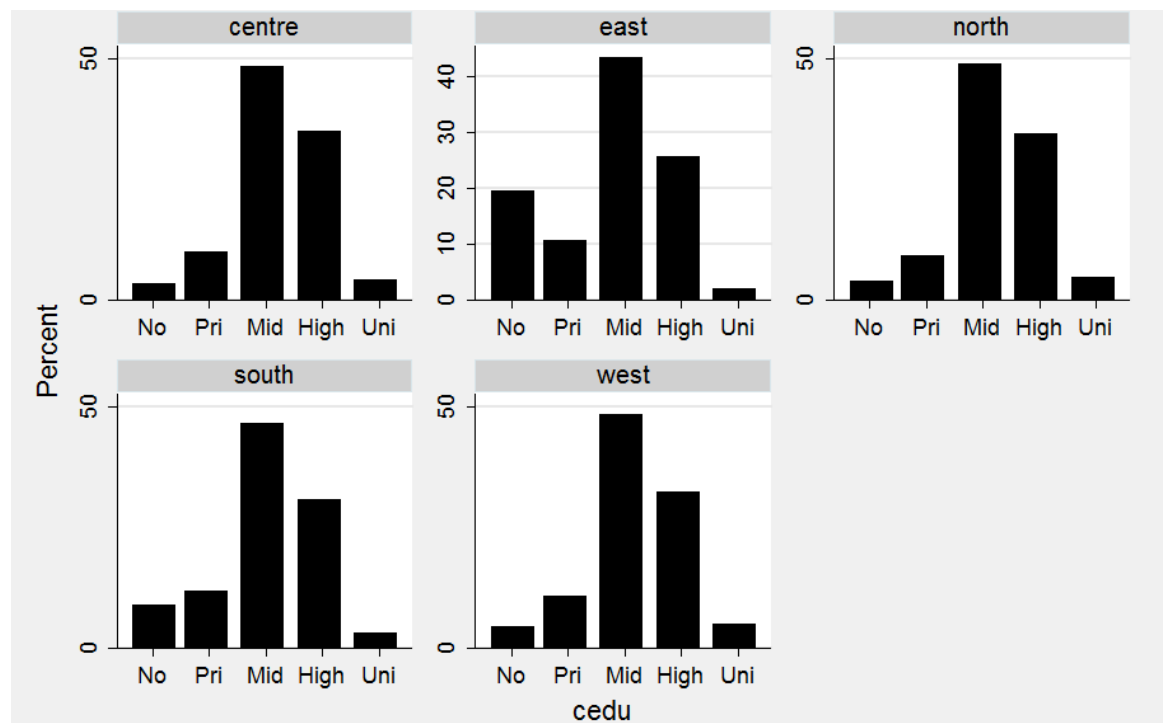
Data Source: 2006 Household Labour Force Survey Data

Figure B.2. Frequency distribution for last school graduation by place of residence, children aged 15-24

For Girls:



For Boys:



Data Source: 2006 Household Labour Force Survey Data

Figure B.3. Frequency distribution for last school graduation by region, children aged 15-24

Table B.1. Education level of mothers of children aged 15-24 by total number of children

Children Size	No Degree	Primary School	Middle School	High School	University
1	8.66	14.00	16.90	22.50	30.01
2	15.09	35.30	47.14	54.68	59.66
3	17.66	28.80	24.90	17.80	8.81
4	17.73	12.64	6.61	4.21	1.26
5 >	40.86	9.26	4.45	0.81	0.26
Total	100	100	100	100	100

Table B.2. Education level of fathers of children aged 15-24 by total number of children

Children Size	No Degree	Primary School	Middle School	High School	University
1	8.68	12.30	12.95	14.11	22.11
2	13.11	28.11	33.83	39.11	44.58
3	15.50	24.86	24.85	23.67	20.59
4	15.86	14.35	14.58	11.24	7.80
5 >	46.85	20.38	13.79	11.87	4.92
Total	100	100	100	100	100

Table B.3. Distribution of size of children aged 15-24 by regions

Children Size	Centre	East	North	South	West
1	14.17	4.29	15.75	13.06	16.83
2	34.62	10.97	34.94	28.88	37.69
3	28.23	15.64	26.54	27.49	24.30
4	14.37	17.37	13.19	15.40	10.93
5 >	8.61	51.73	9.58	15.17	10.25
Total	100	100	100	100	100

Table B.4. Distribution of size of children aged 15-24 by place of residence

Children Size	Urban	Rural
1	13.06	12.07
2	31.63	24.12
3	24.01	15.06
4	13.14	9.62
5 >	18.16	39.13
Total	100	100

APPENDIX C: The Results of Ordered Probit Model by Controlling Number of Siblings

Table C.1. Ordered Probit Model Estimate Results for Final Grade Attainment

<i>Explanatory Variables</i>	BOYS	GIRLS
Parental Characteristics		
Mother with primary education	0.3198*** (15.86)	0.4893*** (23.26)
Mother with higher education	0.6439*** (14.03)	1.1327*** (20.75)
Father with primary education	0.4239*** (17.72)	0.4718*** (18.64)
Father with higher education	1.0257*** (32.12)	1.0046*** (31.01)
Mother working in agriculture	0.1291*** (3.24)	0.0115 (0.28)
Father working in agriculture	-0.0370 (-1.40)	-0.1029*** (-3.88)
Working mother	-0.1112*** (-3.48)	-0.0120 (-0.34)
Siblings' Characteristics		
Number of Brothers	-0.1004*** (-15.52)	-0.1617*** (-22.81)
Number of Sisters	-0.0721*** (-10.17)	-0.0974*** (-13.90)
Locative Characteristics		
Living in West	-0.0696** (-2.54)	-0.2394*** (-7.60)
Living in South	0.0251 (0.72)	-0.1301*** (-3.36)
Living in North	0.1396*** (3.90)	-0.0149 (-0.38)
Living in East	0.0394 (1.26)	-0.6665*** (-19.80)
Living in an urban area	0.1067*** (5.14)	0.2501*** (11.80)
Income per child	0.0001** (2.25)	0.0002*** (3.29)
cut1	-0.9713	-0.7281
cut2	-0.1775	0.0042
cut3	0.8388	0.8527
Sample Size	17.586	16.853

Note: The numbers in parenthesis are the t-ratios.

*** Significant at the 1% level.

** Significant at the 5% level

* Significant at the 10% level

Table C.2. Marginal Effects of the Ordered Probit Model for Final Grade Attainment

Gender	BOYS				GIRLS			
Explanatory Variables	No Degree	Primary School Degree	Middle School Degree	High School Degree	No Degree	Primary School Degree	Middle School Degree	High School Degree
Mother with primary education	-0.0420	-0.0576	-0.0213	0.1209	-0.1236	-0.0650	0.0291	0.1595
Mother with higher education	-0.0562	-0.1041	-0.0920	0.2522	-0.1723	-0.1737	-0.0782	0.4241
Father with primary education	-0.0612	-0.0762	-0.0190	0.1564	-0.1284	-0.0563	0.0390	0.1457
Father with higher education	-0.0913	-0.1593	-0.1412	0.3918	-0.1971	-0.1498	-0.0135	0.3604
Mother working in agriculture	-0.0160	-0.0233	-0.0102	0.0495				
Father working in agriculture					0.0277	0.0129	-0.0082	-0.0323
Working mother	0.0155	0.0202	0.0058	-0.0415				
Number of Brothers	0.0134	0.0183	0.0063	-0.0379	0.0424	0.0210	-0.0117	-0.0517
Number of Sisters	0.0096	0.0131	0.0045	-0.0273	0.0255	0.0127	-0.0070	-0.0311
Living in West	0.0094	0.0127	0.0042	-0.0262	0.0652	0.0292	-0.0201	-0.0743
Living in South					0.0357	0.0157	-0.0112	-0.0402
Living in North	-0.0172	-0.0251	-0.0113	0.0536				
Living in East					0.1887	0.0714	-0.0624	-0.1977
Living in an urban area	-0.0145	-0.0194	-0.0062	0.0401	-0.0666	-0.0316	0.0192	0.0790
Income per child	0.0000	0.0000	0.0000	0.0000	-0.0001	0.0000	0.0000	0.0001

ÖZGEÇMİŞ

Zeynep Gülçin KOÇ 1984 yılında Bursa’da doğdu. İlk, orta, lise öğrenimini Bursa’da tamamladı. 2002 yılında girdiği İstanbul Teknik Üniversitesi Elektrik-Elektronik Fakültesi Elektrik Mühendisliği Bölümü’nden 2006 yılında Elektirik Mühendisi olarak mezun oldu. 2006 yılında girdiği İstanbul Teknik Üniversitesi Sosyal Bilimler Enstitüsü İktisat bölümü Yüksek Lisans öğrenimini Haziran 2008’de tamamlayacaktır.