THE IMPACT OF THE EXTENSION OF COMPULSORY EDUCATION ON HIGH SCHOOL GRADE COMPLETION RATES IN TURKEY

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# ABSTRACT <br> THE IMPACT OF THE EXTENSION OF COMPULSORY EDUCATION ON HIGH SCHOOL GRADE COMPLETION RATES IN TURKEY 

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This study examines the effects of the 2012 education reform in Turkey, which extends the duration of compulsory education from eight to twelve years, on the schooling outcomes of individuals aged between 17-28. For this purpose, we utilize data from the 2018 wave of the Turkish Demographic Health Survey and adopt the Regression Discontinuity Design. We keep track of the changes in the high school attendance of individuals upon completing lower secondary education regardless of grade completion, and changes in the grade completion rates at the high school level. Moreover, the differential effect of the education reform on various subgroups is investigated. Overall, the results from the nonparametric estimation show that the reform significantly increases the fraction of individuals attending high school by $7.52 \%$ while the fraction of individuals completing grades $9,10,11$, and 12 significantly increases by $6.30 \%, 4.97 \%, 6.57 \%$, and $13.36 \%$ Furthermore, the education reform affects the high school outcomes of females (compared to males) and individuals born in subdistrict and village areas (compared to the individuals born in province/district center) more favorably.

Keywords: Compulsory Education, High School, Nonparametric Estimation, Regression Discontinuity Design, Turkey

## ÖZ

# ZORUNLU EĞiTiM SÜRESİNIN UZATILMASININ TÜRKİYE'DE LíSE SINIF TAMAMLAMA ORANLARINA ETKİSİ 

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Bu çalışma, Türkiye'de zorunlu eğitim süresini sekiz yıldan on iki yıla çıkaran 2012 eğitim reformunun 17-28 yaş arası bireylerin okullaşma çıktıları üzerindeki etkilerini incelemektedir. Bu amaçla 2018 Türkiye Demografik Sağlık Araştırması verisini kullanıyor ve Regresyon Süreksizlik Tasarımını benimsiyoruz. Sınıf tamamlamadan bağımsız olarak ortaokulu tamamlayan bireylerin liseye devam oranlarındaki değişiklikleri ve lise düzeyinde sınıf tamamlama oranlarındaki değişiklikleri takip ediyoruz. Dahası, eğitim reformunun çeşitli alt gruplar üzerindeki farklı etkisi araştırılmaktadır. Genel olarak, parametrik olmayan tahminden elde edilen sonuçlar, reformun liseye devam eden bireylerin oranını $\% 7,52$ oranında anlamlı ölçüde artırdığını, $9,10,11$ ve 12 . sınıfları tamamlayan bireylerin oranını ise $\% 6,30, \% 4,97$, \%6,57 oranında anlamlı ölçüde artırdığını göstermektedir. Ayrıca eğitim reformu, kızların (erkeklere göre) ve bucak/köyde doğanların (il/ilçe merkezinde doğanlara göre) lise sonuçlarını daha olumlu etkilemektedir.

Anahtar Kelimeler: Zorunlu Eğitim, Lise, Parametrik Olmayan Tahmin, Regresyon Süreksizliği Tasarımı, Türkiye

To My Beloved Mother

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## TABLE OF CONTENTS

PLAGIARISM ..... iii
ABSTRACT ..... iv
ÖZ ..... vi
DEDICATION ..... vii
ACKNOWLEDGMENTS. ..... viii
TABLE OF CONTENTS ..... ix
LIST OF TABLES ..... xii
LIST OF FIGURES ..... xiv
LIST OF ABBREVIATIONS ..... xvi
CHAPTERS

1. INTRODUCTION ..... 1
2. LITERATURE REVIEW ..... 7
2.1. Theoretical Literature ..... 7
2.1.1. The Theory of Human Capital ..... 7
2.1.2. Screening Hypothesis ..... 16
2.2. Literature on Early School Leaving ..... 19
2.3. Literature on Institutional Changes in Schooling. ..... 23
3. INSTITUTIONAL BACKGROUND ..... 32
3.1. A General Overview of the National Education System in Turkey ..... 32
3.1.1. The General Objectives and the Structure of the National Education System ..... 32
3.1.2. The Turkish National Education System Prior to 2012 ..... 36
3.1.3. The 2012 Education Reform: $4+4+4$ System ..... 40
3.1.3.1. The Impact of the 2012 Education Reform on The Budget of the Ministry of National Education ..... 51
3.1.3.2. The Impact of the 2012 Education Reform on the Indicators of the Quality of Upper Secondary Education ..... 52
3.1.3.3. Transportation of Students to Upper Secondary Schools. ..... 59
3.1.3.4. The Impact of the 2012 Education Reform on Schooling in Upper Secondary Education ..... 60
3.1.3.4.1. The Number of Students Enrolled and the Enrollment Ratios ..... 60
3.1.3.4.2. Upper Secondary Education Student Sex Ratio ..... 64
3.1.3.4.3. Enrollment in Upper Secondary Education by Settlement Type65
3.1.3.4.4. Upper Secondary Education Enrollment by Grade Levels ..... 67
3.1.3.4.5. Open Upper Secondary Education Enrollment ..... 73
3.1.3.4.6 Graduation from Upper Secondary Education ..... 75
3.1.3.4.7 Enrollment in Higher Education ..... 79
4. DATA AND METHODOLOGY ..... 83
4.1. Data and Descriptive Statistics ..... 83
4.1.1. The Description of the Data ..... 83
4.1.2. The Sample Restrictions ..... 86
4.1.3. Description of Variables ..... 87
4.1.3.1. The Outcome Variables ..... 87
4.1.3.2. Predetermined Control Variables ..... 91
4.1.4. The Descriptive Statistics of Variables ..... 93
4.1.5. The Descriptive Statistics of the Outcome Variables ..... 98
4.2. Identification Method ..... 101
4.2.1. Regression Discontiunity Design ..... 102
4.2.1.1. Treatment and Control Groups ..... 103
4.2.1.2. Validity of the Year of Birth as the Running Variable ..... 105
4.2.1.3. Continuity Assumption ..... 106
4.2.1.4. Estimation with the Regression Discontinuity Design. ..... 107
4.2.1.5. The Sharp Regression Discontinuity Design ..... 111
4.2.1.6. The Basic Regression Discontinuity Model ..... 112
4.2.2. Model Specification ..... 113
5. EMPIRICAL RESULTS ..... 117
5.1. Trends in the Outcome Variables ..... 117
5.2. Empirical Results ..... 125
5.2.1. Estimation Results using Parametric Strategy ..... 125
5.2.2. Estimation Results using Nonparametric Strategy. ..... 130
5.3. Checking the Internal Validity of the Regression Discontinuity Design ..... 138
6. CONCLUSION ..... 146
REFERENCES ..... 151
APPENDICES
A. TURKISH SUMMARY / TÜRKÇE ÖZET ..... 166
B. THESIS PERMISSION FORM / TEZ İZİN FORMU ..... 181

## LIST OF TABLES

Table 3.1: Illustration of the Elective Courses Offered by Different Levels for 2012/2013 School Year ..... 48
Table 4.1: Summary Statistics of the Highest Educational Level, and the Highest Grade Completed for the Individuals Aged Between 17-28 ..... 89
Table 4.2: Summary Statistics of Outcome Variables for the Individuals Aged Between 17-28 ..... 90
Table 4.3: Summary Statistics of Socioeconomic Characteristics for Individuals Aged 17-28 ..... 92
Table 4.4: Summary Statistics of Socioeconomic Characteristics by the Treatment Status ..... 93
Table 4.5: Descriptive Statistics of the Variables for All Individuals Aged 17-28 ..... 95
Table 4.6: Descriptive Statistics of the Variables by Sex for Individuals aged 17-28 ..... 96
Table 4.7: Descriptive Statistics of the Variables by the Type of Birthplace for Individuals aged 17-28 ..... 97
Table 4.8: Descriptive Statistics of the Outcome Variables for the Overall Sample ..... 100
Table 4.9: Descriptive Statistics of the Outcome Variables by Sex ..... 101
Table 4.10: Descriptive Statistics of the Outcome Variables by the Type of Birthplace ..... 101
Table 4.11: The Number of Observations in the Control and Treatment Group by the Year of Birth. ..... 104
Table 5.1: Estimation Results for the Overall Sample ..... 127
Table 5.2: Estimation Results by Sex ..... 128
Table 5.3: Estimation Results by the Type of Birthplace ..... 129
Table 5.4: Estimation Results for the Overall Sample ..... 132
Table 5.5: Estimation Results by Sex ..... 134
Table 5.6: Estimation Results by the Type of Birthplace ..... 136
Table 5.7: Estimation Results by OLS and LLR Techniques ................................. 137

## LIST OF FIGURES

Figure 3.1: Illustration of the Institutions in the Turkish National Education System ..... 34
Figure 3.2: Illustration of the ISCED Coding of the Levels of Education ..... 36
Figure 3.3: Illustration of the Gradual Transition to Compulsory Education and the Change in the Duration of Education Levels by years 1997, 2005 and 2012 ..... 39
Figure 3.4: Net Enrollment Ratios for Basic Education by the School Years ..... 40
Figure 3.5: Illustration of the Change in Preschool and Primary School Ages by 2012 Law ..... 44
Figure 3.6: The Changes in MONE's Budget (in TL and USD) and in the Percentage
Share of MONE's Budget in GDP between 2008 and 2016 ..... 52
Figure 3.7: The Number of Upper Secondary Schools and the Number of Students per Upper Secondary School ..... 54
Figure 3.8: The Total Number of Classrooms and the Number of Upper Secondary School Students per Classroom ..... 54
Figure 3.9: The Number of Teachers and the Number of Upper Secondary School
Students per Teacher ..... 55
Figure 3.10: The Ratio of the Number of Students per School, the Number of Students per Classroom, and the Number of Students per Teacher in Vocational and Technical Upper Secondary Schools to General Upper Secondary High Schools ..... 57
Figure 3.11: The Number of Students per School, the Number of Students per Teacher, and the Number of Students per Classroom for General Upper Secondary Education and for Vocational and Technical Upper Secondary Education ..... 58
Figure 3.12: The Number of Students Transported to the Central Schools ..... 60
Figure 3.13: The Total Number of Students Enrolled in Upper Secondary Education by Gender and by School Year ..... 61
Figure 3.14: Upper Secondary Education Gross Enrollment Rates (as \%) and the Net Enrollment Rates (as \%) by Genders and by School Years ..... 63
Figure 3.15: The Sex Ratio of the Students Enrolled in Upper Secondary Education ..... 64
Figure 3.16: The Total Number of Students Enrolled in Upper Secondary Education by City and Village ..... 66
Figure 3.17: The Total Number of Males and Females Enrolled in Upper Secondary Education by City and Village ..... 67
Figure 3.18: The Number Male and Female Students Enrolled in the Preparatory Class and in the Grade 1 of Upper Secondary Education ..... 71
Figure 3.19: The Number of Male and Female Students Enrolled in Grade 2, in Grade 3 and in Grade 4 of Upper Secondary Education ..... 72
Figure 3.20: The Number of Male and Female Students Enrolled and the Percentage of Students Enrolled in Open Upper Secondary School ..... 75
Figure 3.21: The Number of Males and Females Graduated, and the Percentage of the Fourth Grade Students Graduated from Upper Secondary Education at the End of Each School Year. ..... 78
Figure 3.22: Applications and Appointments of all Types and of the Senior Class Students to Higher Education Programs ..... 81
Figure 4.1: Density Distribution of the Running Variable for all Sample ..... 106
Figure 4.2: Illustration of the Sharp Regression Discontinuity Design ..... 108
Figure 5.1: Fraction of Students Completed Selected Grades for the Overall Sample ..... 119
Figure 5.2: Fraction of Students Completed Selected Grades by Sex ..... 121
Figure 5.3: Fraction of Students Completed Selected Grades by the Type of Birthplace ..... 123
Figure 5.4: Trends in the Covariates ..... 139
Figure 5.5: Fraction of Students Completed Selected Grades for the Overall Sample by Using a Placebo Cutoff ..... 142
Figure 5.6: Fraction of Students Completed Selected Grades by Sex, by Using a Placebo Cutoff. ..... 143
Figure 5.7: Fraction of Students Completed Selected Grades by the Type of Birthplace, by Using a Placebo Cutoff. ..... 144

## LIST OF ABBREVIATIONS

| CSL | Compulsory Schooling Law |
| :--- | :--- |
| DD | Difference in Differences |
| EU | European Union |
| Eurostat | European Union Statistical Office |
| DHS | Demographic and Health Surveys |
| ISCED | International Standard Classification of Education |
| ITT | Intention-to-Treat |
| IV | Instrumental Variables |
| LATE | Local Average Treatment Effect |
| LLR | Local Linear Regression |
| MONE | Ministry of National Education |
| MSE | Mean Squared Error |
| NUTS | Nomenclature Units for Territorial Statistics |
| OECD | Organization for Economic Cooperation and Development |
| OLS | Ordinary Least Squares |
| RDD | Regression Discontinuity Design |
| TDHS | Turkish Demographic Health Survey |
| TurkStat | Turkish Statistical Institute |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |

## CHAPTER 1

## INTRODUCTION

Improving the educational outcomes of individuals worldwide is among the Sustainable Development Goals adopted by the United Nations. Increasing individuals' educational attainment contributes to society's benefit by facilitating the adoption of new technologies, contributing the sustained economic growth and increasing welfare as well as it provides private benefits to individuals by improving labor productivity. In this regard, measures are taken by governments to provide accessible and equitable education opportunities which are of high quality since education has both social and private benefits (United Nations Educational Scientific and Cultural Organization, 2022).

The primary and lower secondary education levels promote individuals' basic numeracy and literacy skills and prepare them for upper secondary education. On the other hand, upper secondary education matters since it equips individuals with capabilities required for working life and higher education. In other words, it is the first level of education at which individuals attain crucial skills and obtain knowledge required for developing the manpower of economies as well as the welfare of societies (UNESCO Institute for Statistics, 2012).

Early school leaving is a prevalent problem that must be addressed in developed and developing economies. Although the personal and economic benefits of upper secondary education are evident, individuals might drop out of school due to many factors such as financial constraints, myopic decision making, principal agent
problems or unawareness of positive externalities of schooling at the individual level etc., and these are more binding constraints in developing or least developed countries (Kırdar et al. 2016). In 2012, the percentage of youth of high school age that is out of school is $61.1 \%$ in the Least Developed Countries, $58.1 \%$ in Sub-Saharan Africa, and $25.1 \%$ in Latin America and the Caribbean according to the World Bank classification of countries. Turkey, with a dropout rate of $24.8 \%$, is above the OECD average of $15.8 \%$ in the same year. Although progress has been made over the years, the proportion of individuals of upper secondary school ages that is out of school is still high for these countries and for Turkey, as a developing economy (World Bank, 2022).

High school dropouts are associated with lower lifetime spending, higher unemployment and underemployment, poor health, depression, and dissatisfaction with life (Oreopoulos, 2007). An individual without complete high school education is less likely to be employed, and earns lower level of income, and more likely to be arrested compared to those who have a high school education (Sum, Khatiwada and McLaughlin, 2009). In addition, children of school dropouts are more likely to be in poor health and lower economic and educational status, which means that school leaving causes adverse intergenerational outcomes (Bradley and Corwyn, 2002).

Governments make a considerable effort to prevent these undesired outcomes, particularly for the disadvantaged groups, with the motivation that the individuals with more schooling are better off than dropouts (Oreopoulos, 2007). Compulsory schooling policies are commonly implemented tools to improve the educational attainment of children and teenagers all around the world. These policies also have a desirable impact on many socioeconomic outcomes. The policies increase earnings (Angrist and Kruger, 1991; Mocan 2014; Aydemir and Kırdar, 2017; Torun 2018), reduce the incidence of child labor (Dayığlu 2005; Dayığlu and Kırdar, 2020), reduce teenage fertility (Black et al., 2008; DeCicca and Krashinsky, 2015; Kırdar et al., 2018), mortality (LIeras- Muney,2005) and criminal behavior (Lochner and Moretti,2004), contribute to the wellbeing of individuals (Dursun and Cesur, 2016).

Policymakers undertook a series of education reforms in Turkey. The duration of compulsory basic education was extended from five to eight years in 1997. Although the 1997 education reform was politically motivated, it managed to increase the net
enrollment rate in primary education by 18.55 percentage points in the seven years following the reform (Ministry of National Education, 2011). The first policy change related to upper secondary (high school) education in Turkey was the extension of the duration of non-compulsory education from three to four years, along with other changes in 2005. However, the education reform of 2012 in Turkey brought major changes in the education system. The new education policy extended the duration of compulsory education from eight to twelve years and restructured the education system as $4+4+4$, in addition to other substantial changes. This reform also includes several major changes related to the school starting age, the duration of the course hours, and curriculum.

The Ministry of National Education (MONE) also made infrastructure investments to increase the number of schools, classrooms, and teachers. (Ministry of National Education, 2021). In addition, bussing scheme was introduced for high school students living in sparsely populated rural regions with this reform. The reform is successful in increasing the net enrollment rate from $67.4 \%$ in the 2011-2012 school year to 79.8 \% in the 2015-2016 school year (Ministry of National Education, 2016, 2021).

In this thesis, we utilize the 2012 education reform in Turkey, to examine the effect of the increase in the duration of compulsory schooling on the educational attainment of individuals aged between 17-28. However, in addition to rendering high school education compulsory, several changes were brought about by the 2012 education reform simultaneously, such as the changes in the high school curriculum, investments made by government that might affect the quality of high school education, bussing students living in sparsely populated rural regions to the central schools. Therefore, it should be borne in mind that the estimates of the impact of the extension of the duration of high school also contain the impact of these changes as well. Specifically, we ask the following research questions:

- Does the 2012 education reform significantly increase the high school enrollment of individuals regardless of whether they complete any high school grade? If so, how much? Does the reform have a meaningful impact on individuals who would not continue high school education upon completing lower secondary school before the reform?
- What is the impact of the 2012 education reform on the completion rates of the newly mandated grade levels: the 9th, 10th, 11th, and 12th grades? In other words, how does the new policy affect the proportion of individuals completing these grades?

By considering the possible heterogenous impact of the policy on different demographic groups, we further investigate the differential impact of the education policy on several subgroups by asking the following question:

- How do the answers to the questions above change for males and females, for those born in province/district centers, and lastly, for those born in subdistrict/ village areas?

The schooling attainment of females and individuals living in rural regions might lag behind that of males and individuals living in the urban regions (Orazem and King, 2008; Kırdar et al. 2016), and that is why we explore the differential impact of the policy.

To answer these questions, we utilize nationally representative cross-sectional survey data, the 2018 wave of the Turkish Demographic Health Survey (TDHS). This survey is conducted by the Hacettepe University Institute of Population Studies every five years. The household questionnaire includes general information on the demographic and socioeconomic characteristics of the population. The main strength of the TDHS for the aim of our study is that it provides detailed information on the educational outcomes of individuals. For the purpose of our study, it includes information on the highest educational level attended, as well as the total completed grade at this education level, which allows us to make a grade by grade analysis.

The previous education reform that extended the duration of non-compulsory high school education in 2005 affected those born in 1991 and onwards. We restricted our sample to those born in 1991 and onwards to eliminate the impact of the previous education reform since our concern is to explore only the impact of the 2012 education reform. We consider individuals 17 years of age and older to make sure that they are old enough to complete high school. As a result, we use 1991-2001 birth cohorts for the empirical analyses.

The 2012 compulsory education reform was implemented in the 2012-2013 school year for the first time, and upper secondary education has become compulsory for those who graduated from lower secondary school in the 2011-2012 academic year, while it was non-compulsory before the reform. By considering the school starting age as six and the duration of basic education as eight years, the reform affected those born in 1998 and onwards.

In the empirical analyses, we exploit the exposure to the compulsory schooling policy to identify the impact of the policy on the schooling outcomes within the Regression Discontinuity Design (RDD). In estimating the model we constructed, we employ parametric and nonparametric strategies. We use the Ordinary Least Squares (OLS) technique for estimation within the context of the parametric approach. On the other hand, we utilize the Local Linear Regression (LLR) for the estimations within the nonparametric strategy.

This thesis contributes to the literature by exploring the impact of the recent education reform of 2012, which extends the duration of compulsory education to twelve years in Turkey, on the schooling outcomes of individuals. The previous studies investigate the effects of the 1997 education reform, while the outcomes of the recent 2012 education reform are scarcely studied in the literature. There exists only one paper examining the 2012 education reform in Turkey. Erten and Keskin (2019) assess the early effects of the 2012 education reform. They use data collected no more than three years after the reform. On the other hand, we make a grade-by-grade analysis of high school completion by using relatively recent dataset, 2018 TDHS.

The study consists of six chapters. Chapter 1 makes an introduction. Chapter 2 is on theoretical and empirical literature. Firstly, we present the theoretical literature that perceives education as an investment activity (Human Capital Theory) or as a tool signaling inherent skills (Screening Hypothesis). In addition, we present the empirical works, mainly focusing on the literature on the compulsory schooling policies in Turkey and on studies investigating the impacts of such institutional changes around the world. Chapter 3 discusses the institutional background of the Turkish National Education System by focusing on the 2012 education reform. In this context, the changes brought about by the 2012 education reform are presented by using Ministry
of National Education (MONE) data. The description of the data, descriptive statistics of the variables, and the identification strategy are included in Chapter 4. Chapter 5 presents the empirical results. Finally, Chapter 6 concludes.

## CHAPTER 2

## LITERATURE REVIEW

### 2.1. Theoretical Literature

The process of individual decision to invest in education has been on the research agenda of many scholars for years. The existing research on this process underlines the different approaches to the investment process. Education might be viewed as an investment improving the future productivity of individuals and increasing earnings in a perfectly competitive market setting, or it might be considered as a device signaling the inherent skills and productivity of individuals without adding to their capabilities. While the former point of view on education lays the foundations of the human capital theory, the latter refers to the screening hypothesis. The next sections present both approaches in detail.

### 2.1.1. The Theory of Human Capital

The economic value of education started to be appreciated during the late 1950s, during the post-World War II period. Education, as a quality improving investment in labor, was started to be seen as a source of economic growth and seen as an equalizing tool when needed by the policymakers (Teixeira,2000). The first pioneers of the human capital theory were mainly Chicago economists Theodore Schultz, Jacob Mincer, and Gary Becker. Their efforts contributed much to the development of the
modern human capital theory as a significant field of study, beginning in the late 1950s and 1960s.

The idea that certain kinds of activities can improve the abilities of people and as a result render them more productive can contribute to the economic performance gained importance with Schultz (1959). In his early work on investment in man, he criticizes the avoidance of modern economists of the systematic analysis of human wealth and presents his ideas on the importance of developing a comprehensive notion of capital including human capital as well as the usual concept of tangible capital.

The main concern of Schultz is to explain what he finds empirically for Western economies: the surprising growth of national income beyond the growth of the nonhuman capital and labor measured by man-hours. Human capital accumulation through investments on health, education, on the job training, migration sheds light on the unexplained growth of national income beyond the increase in the tangible capital and man hours. Differences in human capital stock can also explain the national income differences across the countries (Schultz, 1959,1960, 1961). As a source of economic growth, estimating additions to human capital stock matters in order to assess its contribution to the national income. In addition, the rate of return on these kinds of investments, especially the rate of return on education, is a question to be answered.

There are two kinds of approaches that can be used to estimate human capital investments: expenditure(cost) and return approaches. Schultz bases his explanation of these two approaches in the context of education investments. He highlights the investment value of education which is generally ignored in addition to its consumption value and claims that education is a form of investment in human capital since it contributes to national wealth by improving the productivity of individuals (Schultz,1960). The average earnings that a typical student forgo by investing in education instead of working and the direct costs arising from the provision of educational services constitute the total cost of education, while yield (return) to education approach considers wages and salaries that can be earned by investing in human capital (Schultz, 1960, 1961).

Although both are valid approaches, the expenditure approach can be problematic in estimating human capital formation because some expenditures are made with the intention of consumption and do not improve people's abilities, and as a result do not contribute to human capital. That is why additions to human capital stock can be better estimated with the increase in earnings stemming from the investments in humans (Schultz, 1961). Although Schultz underlines the economic benefits of investments in human capital and explains the approaches to estimate these investments, he is deprived of a theoretical framework. On the other hand, the studies of Mincer and Becker provide a theoretical framework for the investment in human capital though their main interest differs.

Mincer $(1957,1958)$ presents the link between investment in human capital, specifically training and education, as productivity increasing factors, and personal income distribution. Prior to Mincer's work, differences in wages were evaluated as a result of inequalities in educational opportunities, not a result of the labor heterogeneities arising from productivity differentials (Teixeira, 2011). In these papers, Mincer develops a schooling model to show the differences in personal earnings stemming from the differences in the training that people demand by employing the rational choice theory.

Mincer enlarges his schooling model by adopting a more comprehensive approach to education and training in his later work, Schooling, Experience, and Earnings (1974). Although the schooling model is successful in capturing the positive relationship between schooling and earnings (Mincer, 1957,1958), this model cannot explain all the variation in earnings since earnings arising from experience is not included in the model. Therefore, Mincer focuses on the role of lifetime investments in education, on the job training which represents experience gained in the labor market following the schooling phase of life, in explaining the earnings differentials in his later work (Mincer, 1974). He theorizes his approach by using the human capital earnings function which relates earnings and lifetime investment in human capital, which he is famous for.

Although Mincer's analysis of the human capital is in the context of the labor market, Becker laid the foundations of a general theory of human capital during his early career. His interest in human capital started with an empirical research project in which he tried to find the rates of return to different levels of education within the National Bureau of Economic Research in 1957 (Teixeira, 2005). However, his opus magnum, Human Capital (1964), includes both theoretical and empirical parts on investment in and returns to human capital. In his later works, he uses the theory of human capital as a starting point for understanding various social dimensions of human behavior as an economic agent (Teixeira, 2005).

The first step of Becker's opus magnum of 1964 was taken in 1962. In this study, he develops a brief theoretical framework that provides an explanation for empirical phenomena. To Becker, investment in human capital implies some specific activities affecting future real monetary and non-monetary income by improving abilities and productivity of individuals. The focus of the study is investments in on the job training, schooling, physical and mental health, migration, and knowledge. He is also interested in the age-earnings profiles and the personal income distribution on the basis of differences in human capital, being inspired by Mincer (Becker,1962).

Becker shapes his micro analysis of investment in human in the light of rational choice theory and in a competitive labor and goods market setup. In this regard, some simplifying assumptions are made. In fact, his understanding of rational choice is presented in his later works more comprehensively. In his 'economic approach to human behavior', people are utility maximizers who behave consistently and have a forward-looking stance, and human behavior is constrained by limited resources such as time, income and limitations in memory, calculation, and opportunities (Becker, 1976,1993).

Building his theory on the cost-benefit analysis, Becker analyzes the decision process of investment in human capital from the point of view of both firms and workers. He analyzes investments in on-the-job training firstly, and then presents the theoretical foundation of the schooling investments (Becker, 1962, 1964). Since our interest is the
schooling investments in this thesis, we will show Becker's formulation of the theoretical framework of schooling investment, in this part

Becker $(1962,1964)$ shapes his cost-benefit analysis of investment based on the assumption of perfectly competitive labor and goods markets. Since costs and returns are accrued in different periods of life, the analysis requires the use of the concept of present value, which enables the comparison of the cost and benefit flows in different periods (Borjas, 2013).

The basic idea behind the schooling investment is simplified in the set of equations 2.1. For $T$ years denoting the span of a lifetime and discount rate $r$, assume that an individual enrolls in a school for the duration of $m$, and spends the rest of her life just working. Individuals can combine work and educational activities, or they can prefer not to work at all during the first $m$ years of their life. An example of the former situation may be part-time working during formal schooling, while an example of the latter is attending full-time formal schooling without working at all. Whether individuals combine work and educational activities or do not work at all during the training period matters since the cost of investment changes accordingly. In the case of full-time formal schooling, it is assumed that there exist only direct costs, while in other situations, there is also an implicit cost associated with the foregone earnings during the schooling period $m$.

Let individuals not invest in themselves by enrolling in a school and spend their whole life working. Since there is no investment, there incurs no cost to workers in this situation. The present value of the lifetime net earnings flows without any education investment is denoted by $V_{N I}$ where yearly earnings is represented by $W_{t}$ in the first row of the set of equations 2.1.

If individuals demand any kind of education and invest in themselves, then they bear the cost of investment in the relatively near future, during the first $m$ years of their life, and seize the benefits in the form of higher wages in the relatively distant future since educational activities improves earnings of workers in the future. That is, the
productivity-related increase in earnings is possible only at a cost, otherwise the demand for human capital investments would be limitless.

Let individuals not prefer working at all during the first $m$ years of their lives and dedicate themselves to schooling. In this situation, only direct costs will accrue to individuals during these year. On the other hand, thanks to education investment in the earlier period of life, the marginal product of workers increases during the working life in which they dedicate themselves to work. That is, workers with schooling earn more than the workers with no schooling due to improved productivity in a perfectly competitive market. The higher level of yearly wage is denoted by $\mathrm{W}_{\mathrm{t}}{ }^{*}$. The present value of the lifetime net earnings with education investments, $V_{I}$, is shown in the second row of the set of equations 2.1. It is the difference between the present value of lifetime earnings flows and the present value of the lifetime yearly direct cost flows associated with schooling, where Ct represents the yearly direct cost associated with the investment period $m$ in the equation. For the first $m$ years of the life, direct schooling costs are borne by individuals, and from the year $m+1$ to $T$, they seize the returns in the form of higher wages $\left(W t^{*}\right)$.
$V_{N I}=\sum_{t=1}^{T} \frac{W t}{(1+r)^{t}}$
$V_{I}=\sum_{t=m+1}^{T} \frac{W t^{*}}{(1+r)^{t}}-\sum_{t=1}^{m} \frac{\mathrm{Ct}}{(1+r)^{t}} \quad, \mathrm{~W}_{\mathrm{t}}<\mathrm{W}_{\mathrm{t}}^{*}$
$\sum_{t=m+1}^{T} \frac{W t^{*}}{(1+r)^{t}}-\sum_{t=1}^{m} \frac{\mathrm{Ct}}{(1+r)^{t}}=\sum_{t=1}^{T} \frac{W t}{(1+r)^{t}}$
$\left(\sum_{t=m+1}^{T} \frac{W t^{*}}{(1+r)^{t}}-\sum_{t=1}^{m} \frac{\mathrm{Ct}}{(1+r)^{t}}\right)>\sum_{t=1}^{T} \frac{W t}{(1+r)^{t}}$
(Borjas, 2013)

For a rational individual who optimizes the present value of lifetime net earnings, the equilibrium condition is given in the third row of the set of equations above. Individuals will keep investing in education as long as the present value of the net earnings when they attend school during $m$ years of their life exceeds the present value of the lifetime earnings when they do not attend at all. In this way, they get the schooling level that maximizes the present value of lifetime net earnings (Borjas,
2013). This situation is shown in the last row of the set of equations above. As long as this inequality holds, people increase their lifetime net benefits by enrolling in school. For any kind of investment, monetary or not, as long as the present value of the net benefits with investment exceeds the present value of the net benefits without investment, an optimizing individual invests in herself.

Becker $(1962,1964)$ discusses the factors that affect people's incentive to invest in themselves by linking human capital investments with the concept of the rate of return, which is the profitability of the investment. An increase in the expected lifetime ( $T$ ) positively affects the rate of return expected and as a result the demand for the human capital investment. As the mortality rates decline, people are more willing to invest in themselves since they can reap the benefits from this investment over more years ( $T$ $m$ ). This also explains why the young are more eager to attend school, training, or any investment activities than the older, in addition to other motivations.

The frequency of switching between different activities, the degree of specialization, and accordingly the market size is also among the factors influencing people's incentive to invest in themselves since these determine the length of time that the returns of the investments are reaped ( $T-m$ ). Because women devote less of their time to the job market than men, they are more reluctant to invest in activities improving their job market performance. Similarly, people dealing with some temporary activities are less eager to invest in improving related skills. On the other hand, a person who specializes in any certain activity is more willing to invest in the skills related to this activity. Investing is profitable to her because she spends more time dealing with this activity. As the market gets larger, some degree of specialization is needed in order to increase efficiency. Therefore, the higher degree of specialization brought by the larger market size encourages people to invest more in themselves (Becker, 1962, 1964).

Absolute educational wage differential $\left(W_{t}{ }^{*}-W_{t}\right)$ also is a determinant of the differences in the amount of investment. Becker $(1962,1964)$ interprets the impact of wage differential from the supply side. As a result of some technological progress, the wage rates in occupations requiring different amounts of schooling ( $W_{t}{ }^{*}$ and $W_{t}$ ), and
the absolute wage differential $\left(W_{t}{ }^{*}-W_{t}\right)$ increase at the same rate in a perfectly competitive market. If the cost of investment is unchanged, then the relative rate of return on a higher level of schooling increases. Consequently, people become more willing to invest in themselves and the supply of skilled workers increases.

It is also possible to talk about a reverse causality between the absolute wage differences among different occupations requiring different levels of education and the schooling investment: schooling investments also affect earnings. Mincer (1974) has already shown that earnings are influenced by schooling and experience. However, the relationship between the degree of schooling and earnings is not linear but as the years of schooling increase, the profitability of schooling declines. In other words, earnings increase at a decreasing rate with the additional years of schooling (Borjas,2013). Psacharopoulos (1985) verifies the declining rate of return by the ascending levels of education. The empirical evidence in this paper suggests that the primary school has the highest private rate of return to education compared to secondary and higher education levels for different regions in the world ( such as Latin America, Asia, Africa, Intermediate and Advanced countries). The reason of the declining return is explained by the low cost of primary education compared to higher levels and the significant productivity gap between the primary school graduates and illiterate people (Psacharopoulos, 1985). In another study by Hanoch (1967), the marginal rate of return to adjacent school years for different race-region groups in America is estimated. The differences between the marginal rate of return of schooling to these groups differ due to ability, schooling quality disparities, and market discrimination The estimates are more reliable for the whites since the sample size is larger. It is found in this study that the estimated marginal rate of return to each adjacent school years for whites declines with the years of schooling when the age is held constant. The return to very low levels of education is very high due to negligible costs of schooling at these levels, while the marginal returns to last years of school is low due to higher forgone earnings (higher implicit costs) at these levels (Hanoch, 1967).

The other factors influencing the investment decision are the risk and liquidity associated with the human capital investments. For an individual to invest in herself,
the rate of return on these investments has to be large enough to compensate risk and illiquidity of human capital investments. Since capturing the benefits from an investment in schooling or any other kind of human capital investment requires a long time, there is always risk and uncertainty associated with the rate of return. Uncertainties related to the length of lifetime, knowledge on changing circumstances, and abilities have an influence on the expected profitability of investments and the amount invested (Becker, 1962, 1964). The analytical model developed by Levhari and Weiss (1974) suggests that uncertainty might cause human capital investment to surprisingly increase or as expected, decrease.

The direct costs associated with schooling $\left(C_{t}\right)$ influences the profitability of the investment and the enrollment decisions. An increase in the out of pocket costs of college education explains big part of the decline in college enrollment (Kane, 1994). Due to the obvious difficulty of financing the direct costs associated with intangible human capital investments, individuals generally underinvest in education. Therefore, schooling decision is influenced by the constraints in the capital markets. Borrowing constraints cause people to turn to their families for financing education. As the wealth of the family increases, it is easier for individuals to enroll in school (Becker, 1962, 1964). Except the family resources, the introduction of education policies to overcome financial constraints might result in the improvement in schooling. An improvement in the student aid increases the likelihood of attending college, especially by helping to finance fixed cost associated with the first grade (Dynarski, 2003).

Another likely determinant of the human capital investment is the knowledge on this kind of investment. The young are generally less aware of the investment opportunities surrounding them, the profitability of these investments, and their abilities compared to the old, and most parts of the human capital investments take place during youth. Due to the high risk associated with postponing this kind of investment, individuals invest in themselves generally with insufficient knowledge during their youth (Becker, 1962, 1964).

As noted earlier, the investment decision requires discounting the value of future benefit and cost flows, therefore the discount rate $(r)$, in other words, the time
preference, is an important determinant of the demand for human capital investments. The basic idea of discounting is that present and future utilities are valued differently even if the utility levels are the same (Böhm- Bawerk,1895: Fisher 1930). The less an individual values the future benefits, the smaller the present value of these benefits which is associated with the greater rate of discount $(r)$. Because the benefits of human capital investments are enjoyed in the future, having higher discount rate results in the lower human capital investments, such as less schooling enrollment. People who value the future less might prefer a lower level of schooling that will result in lower wages in the future especially if there exist borrowing constraints. However, the reverse causality also possible, the people with higher income are more patient than the poor. (Lawrance, 1991). The social background is a factor that influences the schooling choices via the discount rate channel. For instance, children of disadvantaged and poor families are affected by the liquidity and constraints and as a result they have higher discount rates (Lawrance, 1991; Oosterbeek and Van Ophem, 2000).

The endogeneity of the rate of time preference had been discussed in Becker and Mulligan (1997). They show that, people have different degrees of the valuation of the future due to some reasons such as the differences in schooling and wealth and other factors, which makes the discount rate endogenously determined. For example, schooling makes people more aware of the future or rich are more patient than the poor. Furthermore, a reduced discount rate by the channel of a higher degree of education can contribute to any kind of human capital investment. The experimental study by Fuchs (1982) suggests that schooling investments can improve even health investments by reducing discount rate of individuals.

### 2.1.2. Screening Hypothesis

An alternative to human capital theory is the screening hypothesis (or equivalently, signaling or filter hypothesis) or which challenged the human capital theory by its criticisms towards it during the 1970s (Teixeira, 2000). The concept of screening is defined as the identification of the qualifications of individuals by Stiglitz (1975), and the screening hypothesis is defined as "a label for the information problem" in the context of the labor market by Blaug (1985).

The basic idea behind the screening hypothesis is that the information structure in the labor market is asymmetric and incomplete. Information asymmetries arise from the unequal distribution of the information between the parties. In the labor market context, the employer possesses no exact information regarding the ability or productivity of the prospective employees while the employees have this information. Since employers find it difficult to detect the ability of the workers, they use some attributes such as sex, age, marital status, and educational qualifications in hiring employees (Blaug,1993).

Especially in a labor market marked by information asymmetries, the educational background of the candidates gives signals about their productivities or innate abilities. In the strong version of the screening approach, education level signals an individual's innate capabilities and attributes by a diploma obtained upon the completion of any level of education without improving productivity at all. This is the point where the screening hypothesis departs from the human capital theory. A diploma or certificate represents only the degree of the inherent ability of the individuals in the filter theory of education, while it gives an idea of the acquired capabilities in the human capital theory (Arrow, 1973). That is, education does not enhance the productivity of individuals but serves as a job sorting mechanism in the sense that it only signals their capabilities. In this context, the signal that an individual has depending on her educational certificate is likened to "sheepskin" by Blaug $(1985,1993)$. The sheepskin effect of education suggests that the certificate or diploma received upon completion of any education level is the main determinant of earnings rather than the years of schooling. Shabbir (1991) shows the evidence related to the existence of the significant sheepskin effects for males at several education levels in a developing country context. Similarly, Olfindo (2018) finds that a significant sheepskin effect remains for higher education diplomas for both males and females even after controlling for individual differences. On the other hand, Layard and Psacharopoulos (1974) reveals the failure of the sheepskin effect in explaining the earnings differentials by showing some evidence from the work of others. It is demonstrated that the return to uncompleted education might be as great as the return
to completed education by comparing the rate of return to uncompleted and completed degrees of B.A., M.A. and high school.

The theoretical framework of the screening hypothesis is presented by Spence (1973). He formulates hiring as an investment decision in an uncertain environment. The employer expects a marginal product from the job applicant based on indices, which are unchangeable attributes such as age and sex, and signals which are subject to the change by the individual such as education. Employees are offered a wage based on the expected marginal product the employee. The prospective employees are able to alter the signals by deciding how much education to acquire by bearing the signaling cost. Therefore, they will choose a signal, that maximizes the gap between the wages offered and costs.

The critical assumption of the screening theory is that as the innate productivity of the individual declines, it becomes more expensive to obtain the signal. Therefore, those who are more gifted will get more schooling and signal high productivity, while those who are less gifted will choose lower levels of education due to higher cost. By considering the wage offered by the employers and the signaling costs, the potential employees decide how much schooling to get (Spence, 1973). On the other hand, since employers have incomplete information about the prospective workers during the hiring process, the only determinant of the wage is education. (Arrow,1973). In other words, the more educated ones are offered higher wages as in the human capital theory. However, an increase in the earnings associated with education does not stem from the improvement in the productivity of workers but from the signals of innate abilities of the individuals (Spence, 1973: Stiglitz, 1975; Blaug, 1985, 1993).

The weak version of the screening hypothesis has been also suggested. Psacharopoulos (1979) distinguishes between the weak and the strong version of the screening hypothesis. These two approaches differ in the existence of wage adjustment after the employer hires the worker and collects some information about her by observing for a while. In the strong version, even if the employer collected some information regarding the capabilities of the worker by observing for a while, there exists no wage adjustment. The employer keeps paying the initial salary. On the contrary, the starting
salary is adjusted upon the observation of the worker for a while in the weak version. The weak version also proposes that the educational level is not the only contributor to the earnings differentials in contrast to the strong version of the hypothesis. Taubman and Wales (1973) finds that beside education, mental ability, personal characteristics, and the socioeconomic background also matter in explaining the earnings. Education, as a screening device explains approximately half of the differences in net earnings.

### 2.2. Literature on Early School Leaving

There exist studies related to dropout behavior in the literature, and understanding the factors causing this behavior is crucial for preventing dropout and improving schooling outcomes. However, identifying the causes of early school leaving is very difficult. Numerous factors contribute to early school leaving, and it is impossible to mention all. The dropout behavior might be associated with personal factors or institutional circumstances, including school, family, community, and peers (McDermott et al., 2019; Rumberger, 2020).

Doll et al. (2013) investigates the factors causing dropout behavior by the three concepts developed by Jordan et al. (1994), and Watt and Roessingh (1994): push, pull, and falling out factors. Push factors are related to adverse outcomes within the school, pull factors are associated with aspects related to students themselves, and falling out factors are related to apathy and despair of students towards school completion as a result of poor academic performance. School can push students out of education due to failure in exams, non-attendance, or discipline procedures; or some factors related to students themselves such as family needs or working, can attract or distract and pull students out of school. On the other hand, students can fall out of school unrelated to pull or push factors.

To put it briefly, a poor academic performance due to lack of ability or difficulty of courses, being suspended as a result of disciplinary punishment, the difficulty of transportation to school, inability to get along with peers and teachers, unsafety of the school environment are among the push factors causing dropout behavior. On the other
hand, pull factors include getting married or pregnant, preferring working, financial hardships at home, poor health, family obligations and home responsibilities, the adverse influence of dropout peers, etc. Furthermore, fall out factors includes disliking school, moving to another place, or changing school, the lack of parent's support, the lack of sense of belonging, expectations of low returns to education, etc. (Doll et al.,2013).

McDermott et al. (2019) also draws a theoretical background of the reasons for dropout behavior by using similar concepts. The factors causing dropouts such as grade retention, failure in tests, poor school attendance, indiscipline, and low teacher quality, are among the push-out factors related to school responsibilities and environment. In the family context, the lack of parental support in a child's education is a fall out factor, while family events such as incarceration or death of a parent and financial constraints are among the pull out factors. On the other hand, some demographic factors can explain school leaving. For example, school leaving is more prevalent among people who grew up in low-income families and among ethnic and racial minority groups (McFarland et al., 2016). These features change how people perceive education and the resources available to them in terms of the quality of education. Drawing a similar picture, Rumberger (2020) also explains the structural characteristics of schools, as an institutional factor associated with dropout behavior. The inferior quality of schools can cause dropout behavior.

Both human capital theory and screening hypothesis depict humans as rational decision-makers making optimal decisions. However, in the real-world, people might make suboptimal investment decisions. Besides the factors causing early school leaving explained above, some factors are causing suboptimal schooling decisions, and these factors constitute the main motivations behind compulsory education policies. Individuals make suboptimal schooling decisions due to many factors such as financial constraints, myopic decision-making of individuals, principal-agent problems, lack of information, etc., and these problems are more binding in the least developed or developing countries. In addition to these, there are also positive externalities associated with schooling that individuals are unaware of most of the time (Kırdar et al., 2016).

Oreopoulos (2007) finds considerable wealth gains as a result of extra years of schooling, and there also exist non-pecuniary benefits associated with improved education. However, individuals drop out of school despite the high monetary and nonmonetary benefits. Dropouts are generally unaware of the non-pecuniary benefits such as better health, increased life satisfaction, or low likelihood of unemployment.

The push out factors causing suboptimal schooling decisions are also shown by Oreopoulos (2007). He states that some non-pecuniary costs might serve as factors rendering schooling unattractive. For example, the stress caused by exams or adverse attitudes of the teachers might contribute to dropout behavior. Students who perform poorly in class and face unfavorable attitudes from teachers and friends are also more likely to drop out of school (Lee and Burkam, 2003). Peer relations may contribute to dropout decisions. High school pupils like to be accepted by classmates (Roderick, 1993; Akerlof and Kranton,2002).

As a fall out reason for dropout, although high school might not be stressful to some dropouts, it might be just boring (Bridgeland et al., 2006). Oreopoulos(2007) also explains the behavior of high school dropouts by a fall out factor, myopic approach to the future returns from schooling. His main conclusion is that the investment model of schooling may fail to explain dropout behavior due to substantially higher lifetime earnings associated with improved educational attainment. The main factor behind the dropout behavior of adolescents is that they discount the future benefits of schooling more heavily since they are myopic, in addition to high school aversion. As a result of their high time preference rate, they weigh the costs of schooling more heavily and future non-pecuniary benefits less heavily. A high level of uncertainty associated with schooling investments can serve as an additional non-pecuniary cost of education, while lower uncertainty renders schooling more attractive. Levhari and Weiss (1974) show the greater risk associated with university graduates' earnings than with high school graduates. And, for a risk-averse student, dropping out is a more attractive option if an extra year of schooling increases the risk in earnings (Oreopoulos, 2007).

Another fall out contributor to dropout behavior is cultural barriers to education. Adverse cultural norms against schooling or peer pressure on a higher level of education can contribute to abhorring school (Coleman,1961). Parents may devalue the girl's education more commonly as a result of cultural barriers against the education of girls. Parents receive lower utility from the education of a girl since cultural norms stand against that girls are more visible in the public sphere and labor market due to improved schooling. This situation causes a principal-agent problem since the interests of parents and their children conflict (Kırdar et al., 2016).

Lack of information on the students' future benefits of extra schooling, as a fall out factor, might explain the dropout behavior. Individual's prediction of gains from additional schooling is substantially below the gains predicted by the scientist. (Dominitz et al., 2001). Especially individuals from families with lower socioeconomic backgrounds underestimate returns to schooling, which is why they are more likely to drop out of school. Poor households are inclined to underestimate the benefits and overweight the costs of additional education, which might be the main factor behind the educational attainment gap between high and low-income households, in contrast to debt aversion (Oreopoulos, 2009). In addition, those living in poor communities are more likely to leave school, just like their dropout peers, which also signals a pull out factor (Rumberger, 2020).

Similarly, Jensen (2010) suggests that perceived returns to education have an influence on schooling decisions but not market returns by highlighting the inaccurate nature of these perceptions. Since students' information on the returns is inaccurate, a typical student makes her schooling decision based on this limited information. He finds that the perceived return to education is substantially below the measured returns in the Dominican Republic and points out the limited education as a factor contributing to the suboptimal schooling decisions besides credit constraints, poverty, and high discount rates. The dropouts generally occur in youth, a period when individuals have less information on returns to education, and the only information they have might be the earnings of people around them. Particularly individuals living in low-income or rural regions would have little and inaccurate information on urban
sector earnings or high-wage sectors. Similarly, Manski (1993) states that schooling decisions are affected by the perception of returns by students and their families.

As a lack of information, students generally do not consider positive externalities associated with schooling while making individual schooling decisions (Kırdar et al., 2016). The social returns to education might be higher than the private returns because there may be public good or spillover impacts of education (Jensen,2010).

Financial and liquidity constraints are pull out factors causing suboptimal schooling decisions, which are more binding in developing countries due to the underdevelopment of credit markets. For example, financial constraints might prevent students from continuing school if children need to take care of siblings while their parents are working (Fine and Zane, 1991). On the other hand, as the country develops, the liquidity constraints diminish (Orazem and King, 2008). The compulsory schooling policies might reduce the adverse impact of these constraints by providing free education (Kırdar et al., 2016). Orazem and King(2008) suggest that free compulsory education provided by the government can serve as a full subsidy and reduce the price of schooling.

### 2.3. Literature on Institutional Changes in Schooling

The factors causing suboptimal schooling decisions constitute the main motivations behind introducing policies targeted at improving schooling outcomes. Several policies are implemented worldwide, targeted at enhancing the schooling outcomes of individuals. The literature presented below includes studies on the effects of institutional changes in several countries. We also focus on the education reforms' differential impact across the sub-populations and the possible covariates controlled in the empirical analyses.

When the literature on institutional changes in schooling is reviewed, the studies which are more relevant to the research interest of this thesis are Kırdar et al. (2016), and Erten and Keskin (2019). The former research is noteworthy since it investigates the differential effect of the 1997 education reform in Turkey on the grade completion
rates of various subgroups. This thesis also explores the impact of education reform on grade completion rates by gender and the type of birth province, although our interest is the 2012 education reform. On the other hand, Erten and Keskin (2019) deserves particular attention since it is the only paper exploring the schooling and labor market outcomes of the recent 2012 education reform in Turkey, which is the research topic of this thesis.

Kirdar et al. (2016) studies the differential impact of the extension of compulsory schooling from 5 to 8 years in 1997, on the grade completion of various subgroups by gender, and the type of childhood place of residence by using the 2003 and 2008 waves of Turkish Demographic Health Survey (TDHS) and employing regression discontinuity design (RDD). They take the change in the sheepskin effect (as a benefit) and costs of education into account in explaining the differential results by these subgroups. The authors expect greater improvement in females' schooling outcomes (compared to males) and in the schooling outcomes of those raised in rural regions (compared to urban regions) for some reasons. The existence of some barriers to the optimal schooling decisions (such as monetary constraints, or underestimation of returns to education as a result of lack of knowledge, cultural barriers and norms) might be more pronounced in rural areas (mostly sub-district or villages) and for females. The benefit received by completing any grade, especially any education level (sheepskin effect) is higher for males than for females since they are more likely be participate in the labor market; and higher in urban areas (mostly province/district centers) since wage work is more prevalent in these regions. Higher psychic costs of education (due to strict social norms), and higher discount rate due to leaving home after marriage contribute to the lower schooling attainment of females, compared to males. On the other hand, higher opportunity cost of education due to the existence of wage employment as an alternative to unpaid employment, higher psychic costs arising from stricter cultural norms, higher monetary costs arising from the unavailability of schools, the lower cost of non-compliance and higher discount rates in rural are among the reasons of lower schooling attainment in rural areas, compared to urban regions. The reduction in the cost of schooling brought by the 1997 compulsory schooling policy affects rural girls more substantially, due to their higher price elasticity of schooling demand.

The study finds that the positive impact of the policy on the completion of grades 6-8 does not vary with gender in the urban regions. However, beyond the compulsory schooling grades, policy has a more substantial impact on urban males compared to urban females, which suggests a widening gender gap in these grades. Although the positive impact of the reform is pronounced for females in the rural regions, there exists no evidence of narrowing gender gap also in rural regions. The urban-rural schooling gap narrows for both males and females, with a greater effect for females, compared to males. In addition, the analyses of the completed years of schooling by age 15 and 17 find that completed years of schooling increases in both regions for both genders.

Only one paper, Erten and Keskin (2019), investigates the schooling outcomes of the 2012 education reform, which is the main research interest of this thesis. Along with many other changes, with the implementation of the 2012 education reform, Turkey adopted a structure of basic education including 4-years of primary, 4-years of lower secondary, and 4 -years of upper secondary school. In addition, the duration of the compulsory schooling was extended from eight to twelve years, and high school diploma is given to those who graduated from high school.

Erten and Keskin (2019) investigates the impact of the 2012 education reform on education and labor market outcomes of teenagers, by using 2015 Household Labor Force Survey as the data source. Their sample includes teenagers aged between 15-20 in the survey year, and they employ local linear regression within the context of fuzzy RDD estimation. The presence of parents in the household, the size of the household by gender and age, household size, birth month, and region fixed effects are among the control variables included in the model specifications. The authors find that compulsory education law increases high school attendance by 5.4 ppt . for the whole sample, while the increase is 2.9 and 5.0 ppt . for females and males, respectively, within the optimal bandwidth ( 54 months). The reduced form RD estimation results show that female and male employment significantly declines by 3.2 and 5 ppt , as a result of the new education law. The decline in paid employment is higher for males ( 4.1 ppt ) compared to females ( 1.8 ppt ), while there is no significant impact on unpaid
employment of males. The reform mainly affects the school attendance of the females who were not in employment, education, or training previously, while it mainly affects the school attendance of males who participates in paid employment, regardless of the regional poverty rates prior to the reform. Compulsory schooling reform significantly increases the high school attendance of females regardless of the household poverty rate. In addition, the reform positively affects the high school attendance of females only in conservative regions, while for males the impact of reform is significantly positive regardless of the degree of the region's conservatism. The positive impact of the reform on girls living in conservative regions might result from the higher barriers (cost) to females' education in these region prior to reform. Furthermore, the students prefer attending vocational high schools rather than academic ones.

Except for these two studies, which are the most related studies with our research, several studies investigate the effects of the change in compulsory schooling laws on educational attainment. Some of those studies explore the impact of the changes in the legal drop out age, while others study the effects of extending the duration of compulsory schooling. In addition, the effects of the government programs such as school construction programs (Duflo ,2001; Kazianga et al. ,2013) are studied in the literature.

To begin with the policies implemented in the advanced countries, Angrist and Kruger (1991) shows evidence from the U.S. The authors use the differences in men's birth quarter as a source of exogenous variation in educational attainment in the context of IV methodology to reveal the impact of educational attainment on earnings. Several waves of U.S. Public Use Census data are employed in line with this purpose. The compulsory schooling law requires individuals to stay in school until a certain age (16 or 17). Those born in earlier quarters reach the dropout age after receiving less education than those born in later quarters. The study finds that the later quarter of birth is associated with higher years of schooling after controlling for the trend in the educational attainment of different cohorts. The differences in the legal school leaving age across states enable using the difference in differences (DD) methodology. In the states with higher legal school leaving age (17 or 18), enrollment is higher by 4 percentage points after controlling for age and state effects, race, marital status, and
region of residence. Although the impact of educational attainment on earnings is small, both OLS and 2SLS estimates show very similar results: approximately $7.5 \%$ return to an extra year of schooling after controlling for trends in earnings related with age. Furthermore, the return to extra education is lower for black men, possibly due to the lower quality of education they receive.

The policies aimed at developing the infrastructure, such as school construction programs, can be used as a tool to improve educational outcomes and the labor market outcomes of youth substantially, especially in the underdeveloped world. Duflo (2001) investigates the effects of the extensive school construction program in Indonesia on schooling outcomes by utilizing the 1995 intercensal survey of Indonesia. The intensity of the program is identified by the variation in the number of schools built across regions. The timing of the program is used as an instrument to estimate the impact of education on the earnings of men by controlling for the birth cohorts and regions. The main finding is that $s$ that the year of schooling increases up to 0.19 on average for a newly constructed school per one thousand children, and wages increase up to $2.7 \%$ as a result of the new program.

Similar to Duflo (2001), Kazianga et al. (2013) show evidence from a school construction program in Burkina Faso. Using RDD design, Kazianga et al. (2013) investigates the influence of the government's school construction program targeted at especially girls living in villages. The construction of 'girl-friendly' schools leads to a rise in all children's primary school enrollment by 19 ppt , after controlling for household size, age, gender and education of the household head, relationship to head, gender and age of the child, and region fixed effects. The enrollment of girls improves 5 ppt . more than the enrollment of boys. The improvement in schooling attendance also leads to an improvement in test scores and a reduction in the children's engagement in various home chores. However, there is no gender difference in the improvement in test scores. The girl-friendly structure of these schools (such as separate latrines for each gender) is the driving force behind the improvement in enrollment and test scores. The results of the study confirm the findings of Duflo (2001).

Like Angrist and Kruger (1991), Oreopoulos (2007) explores the impact of a policy change in an advanced country. The paper utilizes the nationally representative U.S. data from the Current Population Survey (1979-2005) and the American Community Surveys (2000-2005) to explore the impact of the changes in the compulsory schooling laws. The author exploits the variation in the legal school leaving age across states that individuals face with when they are sixteen. The study finds that, after including the residence or birth state fixed effects, birth cohort fixed effects, and the year of survey fixed effects, the rise in the legal school dropout age beyond 16 increases the years of schooling by 0.13 years. Furthermore, it decreases dropout and increases enrollment in college and completion rates, although the impact is negligible. In addition, 2SLS estimation in the IV methodology suggests that the rise in the legal school leaving age beyond 16 reduces the probability of unemployment and leads to higher earnings. Therefore, it is concluded that policies aimed at lowering the dropout of the disadvantaged groups improve their labor market outcomes.

In the U.K. context, Harmon and Walker (1995) uses the pooled data on nine cohorts of men from the U.K. Family Expenditure Survey, in order to reveal the influence of the 1947 and 1973 reforms raising the minimum school leaving age from 14 to 15 on returns to education for men by controlling for age (experience), year and region. However, the secular time trend in the birth cohorts' schooling is not controlled in this study. The authors employ OLS, IV methodology, and alternatively ordered probit for the first stage of the 2SLS since schooling leaving age is discrete. The reform increases the years of schooling significantly, and both OLS and IV method reveals that the logarithm of earnings increase with an additional year of schooling, with a higher increase in the IV compared to the OLS methodology.

Brunello et al. (2009) pools data from different sources related to 12 European countries and exploits the variation in the minimum school leaving age across countries and over time within the IV approach mainly to reveal the influence of these changes on schooling outcomes and the distribution of earnings. As a result of the increased minimum compulsory school leaving age ranging from 1 to 4 years across 12 European countries, educational attainment increases by 0.3 years, with little difference among countries, after controlling for individual age, country effects, cross-
country macroeconomic differences in GDP per capita and unemployment, and labor force participation specific to genders. Especially for the group with the lowest ability, an extra one-year increase in compulsory schooling increases female educational attainment by 0.4 years and male educational attainment by 0.3 years, and this increase is only 0.10 years for the group with median ability. On the other hand, the impact of improvement in the years of schooling on wages is heterogenous: for some countries, there is zero return, while in some countries, it goes up to $20 \%$. The contribution of an additional year of schooling is higher for females ( 2.4 percentage points) than males (2 percentage points). Furthermore, an additional year of schooling decreases wage inequality.

Evidence from developing countries, Taiwan, China, Egypt, and Turkey, also confirm that changes in compulsory schooling policies are effective in increasing the schooling attainment of children. Clark and Hsieh (2000) analyzes the impacts of the 1968 education reform on education and returns to education in Taiwan, which extends the duration of compulsory basic education from 6 to 9 years, by focusing on the variation in the expansion of the number of junior high schools across regions, and the timing of the reform. Manpower Utilization Survey, 1990 Population Census, and the Survey of Personal Income Distribution are utilized as data sources. By exploiting the differences in exposure to the new program due to the birth date (similar to the regression discontinuity design) and by controlling for region, age, and the year of survey for some datasets, the authors find that children aged between 6-11 are 0.4 to 0.6 years more educated. By utilizing the regional differences in the number of schools built in difference in differences (DD) methodology, it is also revealed that the children of the same age group are 0.6 years more educated. And lastly, by using instrumental variable (IV) and ordinary least squares (OLS) methodology, it is shown that labor force participation does not vary across different cohorts while the wages of men increase with exposure to the education reform.

Tsai et al. (2009) investigates the schooling and labor market outcomes of the extension of the duration of free compulsory basic education from six to nine years within the scope of the same education reform by using the data from the 1980 and 1990 national Population Censuses. The authors exploit the cohort variations in
exposure to the reform. The first stage of the two-stage least square (2SLS) methodology finds that the educational attainment of males and females (aged between $25-34$ ) increase by 1.53 years ( $15 \%$ ) and 2.14 years ( $23 \%$ ) as a result of the new policy, by controlling for some background characteristics such as employment status by age and the dependency status of spouse, and other local economic factors. This result suggests a decline in the gender gap in schooling. Furthermore, 2SLS results suggest that an extra year of schooling decreases the probability of male employment by $2 \%$ and increases female employment by $4 \%$, increasing the likelihood of both males and females moving from agriculture to the modern sector. The regression results show that the narrowing gender gap in schooling attainment translates into the narrowing gender gap in the probability of labor market participation.

Fang et al. (2012) estimates the effects of the compulsory education reform of 1986, which render nine years of basic education mandatory, on the schooling outcomes of various subgroups and the returns to education in China. The study employs data from the several waves of the China Health and Nutrition Survey and exploits the difference in the timing of the implementation of the reform in different provinces as a source of variation within the IV methodology. The first stage OLS estimates suggest that the education reform improved the years of schooling for all subgroups investigated. The impact of the reform is more substantial for girls ( 1.17 years) than for boys ( 0.4 years) since the girls are more likely to be affected due to lower pre-reform participation. The positive impact of the reform on schooling is also slightly more visible in coastal and rural regions than in inland and urban regions. The stronger impact in rural arises from that more children are on the edge of dropping out in the rural regions, prior to the reform. In comparison, the vigorous impact in coastal regions results from the higher quality of schools and stronger law enforcement in there. Furthermore, 2SLS estimates suggest that the effect of the extra one more year of schooling on the earnings is higher for males than for females, for rural than for urban, and for coastal than for inland areas

Elsayed (2019) presents evidence from Egypt by using the 2014 Survey of Young People as data and by performing the RDD methodology. The paper finds that the extension of the duration of compulsory primary education from eight to nine years in

Egypt leads the total years of schooling to increase by up to 0.8 years. In contrast to the finding of Fang et al. (2012), a more remarkable improvement in males' educational attainment of males' than females' is found in the article. This result translates into an exacerbating gender gap in enrollment by 0.3 to 0.48 years in favor of males. One possible contributor to the widening gender gap is the existence of families do not value female education together with the non-strict enforcement of the law in developing countries. The study finds no significant effect on labor market outcomes, literacy skills including writing, reading and mathematical skills, or schooling beyond compulsory education, which suggests that the quality of the education also matters. In contrast, an extended period of compulsory education has a favorable influence on the writing skills of males.

To sum up, numerous studies are presenting that the institutional changes in schooling may generate beneficial impacts on schooling outcomes as well as on many socioeconomic outcomes. The studies examining Turkey generally focus on the impacts of the 1997 education reform, while the outcomes of the recent 2012 education reform are scarcely studied in the literature. We contribute to this limited literature by exploring the impact of the recent education reform of 2012, which extends the duration of compulsory education to twelve years in Turkey, on the schooling outcomes of individuals. Erten and Keskin (2019) makes an early assessment of the 2012 education reform by using data collected no more than three years after the reform. On the other hand, we are able to make a grade-by-grade analysis of high school completion by using relatively recent data (2018 TDHS), which was collected six years after the first implementation of the reform.

## CHAPTER 3

## INSTITUTIONAL BACKGROUND

### 3.1. A General Overview of the National Education System in Turkey

### 3.1.1. The General Objectives and the Structure of the National Education

 SystemThe main purposes and principles regulating the Turkish National Education System are included in the Basic Law of National Education (Law no. 1739), and the Ministry of National Education (MONE) is the responsible institution for the provision of educational services in Turkey. As stated in the second article of the law, there are three main aims of the National Education. The first of these is to raise citizens who are loyal to Atatürk's principles and reforms as an individual who has a consciousness of citizenship and who adopts and improves the values of the Turkish nation. The second objective is to help citizens being creative and productive individuals who have a balanced character, a broad worldview and a sense of social responsibility respecting human rights and who reason independently and scientifically. And the last one is that by helping citizens in developing their interests, skills, and abilities, to ensure that citizens are prepared for life and that they have knowledge and skills required for the profession which would contribute to their own happiness, and as a result to the welfare of society. In this way, welfare and the happiness of Turkish citizens and society would be increased, and social, cultural, and economic development would be supported with national unity.

The Turkish National Education System is constructed on two main pillars: formal and non-formal education (Law no.1739). Formal education is aimed at educating certain age groups of the same level gradually, within schools or in institutions that have the characteristics of the school, and it has regular programs prepared for certain purposes. Students are entitled to receive a diploma at the end of the process. Formal education contains pre-school education, primary and secondary education, and higher education, and might include open education institutions as well. On the other hand, non-formal education includes all educational activities that are complementary or independent of formal education activities. It is aimed at educating individuals who have never entered formal education or who were dropped out for some reason, or individuals who are at any level of formal education, in accordance with the purposes of Turkish National Education. Specifically, teaching reading and writing to those who are illiterate and providing opportunities for completing education, providing training that will enable people to acquire a profession or supporting people to improve themselves if they already have a job are among the purposes of non-formal education. In this way, non-formal education facilitates people's social, cultural, economic, and scientific development (Ministry of National Education, 2021). It is not for certain age groups, generally optional and it includes short-term and certified training in contrast to formal education.

Figure 3.1 shows the formal and non-formal education institutions in detail. It should be noted that pre-school education institutions can be opened as independent kindergartens, as practice classes within vocational and technical education institutions delivering child development and education, and as nursery classes within education institutions. On the other hand, mobile classrooms are for 36-66 months of children of families living in sparsely populated areas that have no preschool institutions.

Figure 3.1. shows the current institutional structure of the Turkish National Education System. Primary(basic) education institutions separated as primary school and lowersecondary school after 2012 education reform, while it was not institutionally separated before this date. Lower-secondary school institutions currently consist of


Notes: Light colored boxes under the title of Formal Education indicate open education. Open education is included under the coverage of formal education according to National Education Statistics Formal Education 2020/'21. Non-Formal education institutions are Vocational Training Center, Girls Mature Technical Institute, Public Training Center, Science and Art Center, Counseling and Research Center, Vocational Courses, Adults Technical Education Center, Special Education Courses, Motor Vehicles Drivers Course, Various Courses, Special Education and Rehabilitation Center, and Private Special Education School (Non-Formal Education).

Source: Ministry of National Education, 2021

Figure 3.1: Illustration of the Institutions in the Turkish National Education System
three kinds of institutions, as seen in Figure 3.1. Among these, open education institutions enable only the individuals who are over 13 years old to complete their lower secondary school if they could not attend for some reason before.

As illustrated in Figure 3.1., upper-secondary education (high school education) institutions consist of General Upper Secondary Schools and Vocational and Technical Upper Secondary Schools as well as the open education institutions. General Upper Secondary Schools aims at preparing individuals for the future and for higher education while Vocational and Technical Upper Secondary Schools prepares for higher education, occupations, and jobs. On the other hand, Open Upper Secondary High Schools are for students who cannot attend formal face-to-face education.

Higher Education Institutions consists of universities, faculties, institutes, colleges, conservatories, vocational colleges, center for practice and research, and open education faculties. And lastly, non-formal education institutions can be briefly summarized under general education and occupational and technical education institutions (Figure 3.1)

As seen in Figure 3.1, the general structure of formal education in Turkey is consistent with the 2011 International Standard Classification of Education (ISCED). ISCED is officially accepted by the General Conference of UNESCO Member States to categorize educational activities as well as to compile and compare the education statistics across nations and over time. Levels of education are constructed as an ordered set in ISCED. Figure 3.2. shows the ISCED coding scheme and corresponding education levels for the first four levels. The first level of ISCED begins with ISCED 0 , preschool (early childhood) education. It is followed by primary, lower secondary, and upper secondary education. The non-formal education in Turkey is also consistent with the defining characteristics of the ISCED. It is defined as both a complement and an alternative to formal education in ISCED and it covers programs for literacy, education of the individuals who are out of school, programs targeted at improving work skills, as well as the programs aimed at social and cultural development (UNESCO Institute for Statistics, 2012).


Source: UNESCO Institute for Statistics,2012

Figure 3.2: Illustration of the ISCED Coding of the Levels of Education

### 3.1.2. The Turkish National Education System Prior to 2012

The education level of the population is a significant determinant of the development of society and economic growth. In the Turkish Education System, various steps regarding the educational institutions, duration and curriculum of the education levels, and the status of compulsory education have been taken from the past to the present to make progress in education. It is possible to talk about three dates as turning points: education reforms of 1997, 2006 and 2012.

The evolution of the Turkish National Education system since 1997 is illustrated in Figure 3.3. For comparison, the pre-1997 structure is also presented. Eight-year compulsory education was passed into law, by the National Education Basic Law No. 1739, of June 1973. The law formulated the basic education as five-year primary school plus three years junior secondary school, covering the ages from six to fourteen. Although it was tried, the eight-year compulsory education failed since it could not be implemented for the secondary school part, it was implemented only for the five-year primary school part (Akyüz, 2006). Therefore, the lower secondary school remained optional in practice until 1997 as shown in Figure 3.3. Pre-school education and upper secondary school were also optional. For lower or upper secondary school levels, students were free to choose among secular schools as well as religious Imam-Hatip schools and vocational schools prior to this date.

The eight-year continuous compulsory basic education enacted by the Law No 4306, the Basic Education Law, in August 1997 and implemented in 1997-1998 school year
for the first time. Primary school and lower secondary school were merged under primary school education and the compulsory schooling was extended to cover lower secondary school thanks to this law. (Resmi Gazete, no: 23084, dated August 16, 1997). The law affected the children who were born before or in 1987 since it states that children must start school in the September of the year that they complete age six. On the other hand, children who have already a primary school diploma at the beginning of 1997-1998 school year were exempt from the compulsory lower secondary school. Prior to 1997, children who completed five years primary school were qualified for a basic education diploma. However, the law changed the requirement for getting basic education diploma. Students were able to get a diploma upon the completion of eight years of compulsory education, after 1997.

Figure 3.4. shows the success of the 1997 Compulsory Schooling Law (CSL) in terms of the improvement in the net enrollment ratio. Net enrollment ratio for basic education is the ratio of the number of students in the age group of 6-13 enrolled in basic education level to the total population within the 6-13 age group (Ministry of National Education, 2011). It increases from $71.11 \%$ in the 1996-1997 school year to $84.74 \%$ in the 1997-1998 school year. Schooling in basic education keeps increasing in the three years following the 1997-1998 academic year when the lower secondary school became compulsory for the first time. Although the net schooling ratio declines nearly by five percent from the 2000-2001 school year to the 2004-2005 school year, the eventual impact of the 1997 Compulsory Schooling law is an 18.55 percentage points increase in the net schooling ratio in the eight years following the 1996-1997 school year.

Despite the reform's success in increasing schooling, it was criticized by the conservative circles since the other motivation of the then secular government was to restrict religious education. The reform eliminated religious schools in lower secondary school level because religious education (İmam-Hatip schools) became available only upon completion of lower secondary school. The other question was how to maintain the quality of education with increasing number of students. However, the rise in the MONE's share in public investment budget from 1997 to 2000, increase
in the number of classes in the existing schools, constructing new schools, hiring more teachers have prevented the quality of education from falling (Kırdar et al., 2016).

The other important reform in the Turkish education system was in June 2005. Within the scope of this reform, the first step was the extension of the duration of high school (upper secondary school) from three to four years. The Minister of National Education, Hüseyin Çelik, declared the justification of the extension to four years as making the Turkish upper secondary education equivalent with the EU education perspective as a part of the EU negotiation process. (Yeni öğrenciye lise 4 yll, 2005). In the same speech, Çelik stated that students who currently continue any grade of upper secondary education or in the preparatory class in the previous school year would be exempt from the reform. The education reform affected students who started their upper secondary education for the first time in the 2005-2006 school year. Considering that the school starting age is six or older and basic education lasts for eight years, the 2005 education reform affected the generations born in 1991 and after. It must be noted that upper secondary school was still non-compulsory after the 2005 education reform as seen in Figure 3.3. However, many other changes were made in addition to the extension of the duration of non-compulsory high school with this reform. The decision (no.184) of the Turkish Education Board, dated June 7, 2005, reorganized the duration of the upper secondary schools with preparatory class as 4 years (Ministry of Education, 2005). Only schools with special status were allowed to include an optional preparatory class, followed by a four-year high school education. The changes in the curriculum included an increase in the number of foreign language courses in the high school and involving Common Skills, Computer and Orientation and Guidance courses in the General, and Vocational and Technical High Schools curriculum. The curriculums of some high schools were restructured by considering their own status. And lastly, Anatolia High Schools and Foreign Language Intensive Highs Schools are merged.

The 2012 reform, which constitutes the third turning point in the Turkish Education System, includes several major changes related to the school starting age, the duration of the education levels as well as the duration of the course hours, extension of the duration of compulsory education, and curriculum.


Notes: Each box states the duration of education and the situation of being compulsory or not by education levels.

Figure 3.3: Illustration of the Gradual Transition to Compulsory Education and the Change in the Duration of Education Levels by years 1997, 2005 and 2012

Figure 3.3. shows the changes related to the duration of the education levels. While basic education had an eight-year continuous structure prior to 2012, the structure of basic education has changed as discrete four-year primary school plus four-year lower secondary school in 2012. In addition, high school education has become compulsory starting the 2012-2013 academic year while it was non-compulsory prior to this date. Since 2012 education reform constitutes the main concern of this study, the next section investigates this reform in more detail.


Notes: Net Enrollment Ratios before the 1997-1998 school year were calculated by taking the average of Net Enrollment Ratio for primary school and for junior high school, since the basic education statistics distinguishes between these two different education levels before this date. Beginning from the 1997-1998 school year, Net Enrollment Ratio shows the total schooling for basic education, covering schooling for basic education and for junior high school education. Net Enrollment Ratios for the year 1997 and onwards are based on the General Population Census of 2000.

Source: Ministry of National Education, 2011

Figure 3.4: Net Enrollment Ratios for Basic Education by the School Years

### 3.1.3. The 2012 Education Reform: 4+4+4 System

In April 2012, the Turkish education system has undergone quite radical and comprehensive change. Law. No. 6287 was passed to make amendments to the Basic Education and Education Law (No. 222) and to some other laws. This law was known as $4+4+4$ by the public and extended the duration of compulsory schooling to 12 years along with many other changes (Resmi Gazete, no: 28261, dated April 11, 2012).

The Minister of National Education, Ömer Dinçer, explains that the reform has two main aims (Ministry of National Education, 2012). To Dinçer, basic education is not sufficient in the international arena and the population should have at least high school education in the $21^{\text {st }}$ century. Accordingly, one of the main aims of this law is to raise the average years of education of the society by rendering the high school education compulsory, and as a result, to eliminate the regional differences in enrollment rates. In addition, instead of organizing the basic education as a continuous process, basic
education is divided into levels based on the age groups considering physical characteristics, around the world. The second aim of the new law is to reorganize the education system so that it allows flexibility required by the interests, needs and the abilities of the individuals since the eight-year continuous education fails to consider individual differences. With the 2012 education reform, the basic education process is divided into three parts: 4-year primary school, 4-year lower secondary school, and 4year upper secondary school. Thus, a more flexible education system that allows for switching between different programs and includes elective courses is adopted.

While the main reasons are explained in this way, the new law was highly linked to the political mindset of the government of the time. In an interview, Dinçer remarks that the education reform is a "paradigm shift", on a critical question about the conversion of a primary school into an Imam-Hatip school (4+4+4 Eylül'de Uygulamada, 2012). Similarly, in a speech after the acceptance of the law in the Turkish Grand National Assembly, Prime Minister Recep Tayyip Erdogan expresses his thanks to the members of the Justice and Development Party (JDP) parliaments because they go against the secular status quo. He also adds that it is the duty of the state to provide the option of religious education to families who choose to send their children to Imam-Hatip school (Erdoğan'dan 4+4+4 Teşekkürü, 2012). In fact, the 2012 reform is aimed at reviving religious education, which had constrained by the 1997 education reform.

Although the reform is known for increasing compulsory education to interrupted 12 years, the new law brought along many controversial changes. Law No. 6287 includes the following changes which are also in line with the political conjuncture at that time:

1) The compulsory basic education age has been changed to be cover the ages 6-13 while it had covered the ages 6-14 previously. Since children start basic education when they complete age 5 instead of 6 with this law, they are expected to graduate when they complete age 13 and turn 14 .
2) The eight-year continuous basic education which had been brought by the 1997 education reform came to an end. It has been restructured to include 4 -year compulsory primary schools and 4-year compulsory lower secondary schools. The

Lower Secondary Schools Allowing Between Different Programs and Imam-Hatip Lower Secondary Schools have been included among the lower secondary school institutions with this law. Students have been allowed to choose among these lower secondary school institutions.
3) It has become essential to establish primary school and lower secondary schools as independent schools. However, it is stated in the law that lower secondary schools could also be established together with primary schools or with high schools, depending on the conditions.
4) Elective courses have been added to the curriculum of lower secondary schools and Imam-Hatip lower secondary schools. The Quran and the Life of Prophet have been added to the curriculum of the lower and the upper secondary schools as optional electives. It has also been decided that the other elective courses to be taught in these schools and the programs of Imam-Hatip lower secondary schools and other secondary schools are to be determined by the Ministry.
5) It has been decided that those who are enrolled at the $5^{\text {th }}, 6^{\text {th }}, 7^{\text {th }}$ and the $8^{\text {th }}$ grades of the primary school institutions at the time of the publication of the law to complete their education in these institutions.
6) Compulsory education has been extended to cover upper secondary school, to 12 years. It is stated in the law that compulsory upper secondary education consists of the formal education institutions and the non-formal institutions which covers general and vocational and technical education institutions. Students who graduate from these schools are given secondary education diploma.
7) The first implementation of the compulsory upper secondary education has been determined to be started in 2012-2013 school year (Resmi Gazete, no: 28261, dated April 11, 2012).

The other regulations brought by the new law are related to the use of the revenues by the Provincial Private Administrations for secondary education services, admission and placement in higher education institutions, the arrangement on the purchase of goods and services to be made within the scope of the FATIH project, and the name changes of some universities.

Figure 3.5 shows the regulation related to preschool and primary school age. Before 2012, the compulsory primary school covered the age group of $6-14$, as mentioned above. It was essential that children must be enrolled in the first grade of primary school at the end of the September of the year in which they complete 72 months (age six), in other words, when they complete 69 months as of September. Yet, the Law No. 6782 states that the primary school age covers the ages 6-13. Although there is no concrete change related to the starting age, the definition of the age was changed in the law. With the new law, it is stated that the compulsory primary-school-age starts at the end of the September of the year in which children complete age 5 ( 60 months), and this period ends at the end of the school year in which children complete 13 years old and turn 14 years old (Resmi Gazete, no: 28261, dated April 11, 2012). Nevertheless, considering the public debates, demands, and the evaluation of the MONE, it was decided that children who complete 66 months as of September 30, 2012, must enroll in the first grade of primary school, beginning from 2012-2013 school year. The registration of the children who was born on March 31, 2007, or earlier was made automatically in 2012-2013 school year via e-okul (e-school) system (Ministry of National Education, 2012). In this way, the school starting age is reduced to age 5.5. Furthermore, 60-66-month-old children can be accepted to primary school if they are psychologically and physically ready for school, conditional on their parent's written consent (Ministry of National Education, Private Secretariat, 2012).

The rationale for the regulation of the school starting age has been announced as enabling individuals to start life one year earlier, like practices around the world, by the MONE (2012). In fact, the reduction in the school-starting age is criticized by prospective teachers since the children of play age would start school before they reach enough mental maturity and muscular development, and this would cause a feeling of failure. Also, teaching different age groups in the same class makes the teacher's job difficult (Ersöz \& Kasa, 2016). Parents from different circles state their concerns regarding the inappropriateness of lowering school-starting age although some parents see starting school earlier as a positive aspect (Nartgün \& Özen, 2014).

In fact, formal education starts with preschool education in Turkey although it is not compulsory, and preschool education covers the education of the children aged 3-5.

The reduction in the school-starting age to 66 months (age 5.5) has naturally affected the non-compulsory preschool-age interval. As shown in Figure 3.5, preschool education had covered the children of 37-72 months prior to the law. With the new law, this period covers 37-66 months-old children although the non-compulsory status of the early childhood education was not changed. While there existed a $100 \%$ preschool enrollment target for the group of 61-72 months prior to the new law, the target age group has been updated as the age group of 48-66 month. (Ministry of National Education, 2012). It should be noted that the pre-primary gross enrollment rate for the official age group of 3-6 is approximately $29 \%$ as of 2011 in Turkey, which is well below the target of $100 \%$, while the 2011 averages are $49 \%$ and $79.1 \%$ for the World and for Organization for Economic Cooperation and Development (OECD) member countries, respectively (The World Bank).


Source: Ministry of National Education, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018

Figure 3.5: Illustration of the Change in Preschool and Primary School Ages by 2012 Law

As mentioned before, another controversial change that has been brought by the 2012 education reform is the restructuring of the education system as 4-year primary school, 4 -year lower secondary school, and 4-year upper secondary school. The eight- year uninterrupted education practice that came with the 1997 education reform was put on the shelf with the new law. It has been decided that students those who continued and
successfully completed the 4th grade of the primary school in 2011-2012 school year to be automatically enrolled in the $1^{\text {st }}$ grade of an independent lower secondary school for the next school year, via e-school (e-devlet) system. However, those who continue the $5^{\text {th }}, 6^{\text {th }}, 7^{\text {th }}$ and the 8 th grades of the primary school institutions would complete their education in these school buildings (Ministry of National Education, 2012).

The rationale for the separation of the education levels exactly in the form of $4+4+4$ has not been explained clearly. Yet, the discrete education process has been justified by pointing out similar education practices around the world. Furthermore, two features of the $4+4+4$ education system have been highlighted: the separation of the school buildings and the flexibility it offers (Ministry of National Education, 2012).

One of the changes that complement the interrupted $(4+4+4)$ education practice is that it has become essential to educate primary school students and lower secondary school students in separate buildings if the physical conditions are convenient. In the previous education system, students of different levels had been using the same building. However, the new system allows for the education of different age groups in separate buildings and in this way prevents the abuse of the younger students by the older. (Ministry of National Education, 2012). It has also been stated that in case the conditions are not suitable for the separation of school buildings, the students of the different levels can use the same building with some measures such as separating the common areas or arranging the school time as a double shift for different levels (Ministry of National Education, Private Secretariat, 2012). Prospective teachers state their positive opinions on the separation of school buildings since it prevents the bad influence of the older children on younger ones (Ersöz \& Kasa, 2016). In another study, the school administrators interpret the separation of the school buildings as an improvement in a pedagogical sense. However, they express their concerns related to the lack of infrastructure and planning mistakes because of the sudden implementation of the new system (İsmetoğlu \& Memişoğlu, 2013).

The most prominent feature of the new $4+4+4$ system has been described as the flexibility it offers. MONE remarks that in line with the democratic state, students are given chance to become free individuals with the introduction of the new structure
(Ministry of National Education, 2012). The flexibility of the new structure stems from two main features: new elective courses and Vocational Lower Secondary Schools (including only Imam-Hatips).The new electives added to the curriculum of lower and upper secondary schools have been aimed at supporting skills, developments, and the interests. Students have also been given the opportunity to attend the Lower Secondary Schools Allowing between Different Programs and Imam-Hatip Lower Secondary Schools with the new law (Resmi Gazete, no: 28261, dated April 11, 2012). What is meant by lower secondary schools that allow between different programs is that students had the opportunity to continue different programs upon completing lower secondary school, thanks to the flexibility offered by the new system (Ministry of National Education, 2012).

In fact, the religious (Imam-Hatip) lower secondary schools have brought heated debates related to vocational guidance at early ages. The new education system has allowed students to attend religious (Imam-Hatip) lower secondary schools or the lower secondary schools allowing between different programs upon completing the $4^{\text {th }}$ grade. Together with the lowering of the school starting age, this arrangement means 9-10 years old children can choose or be guided to vocational (religious) education.

Early ages are not appropriate for the vocational guidance according to educators. It is pointed out that families will have an impact on the child's choice since a child at these ages cannot make their own choices in a healthy way. Moreover, since the child's personality is not fully shaped at these ages, it is not possible for parents to make the right choice on behalf of the child (Başkan and Gün, 2013). In a descriptive study compiling the opinions related to the new education system, the concerns of the various educational institutions related to the early vocational guidance dimension of the new $4+4+4$ system is shown. The universities state their concerns regarding the potential harms of the making decision with life-long consequences before puberty in this study (Odabaşı, 2014).

Another controversial dimension of early vocational education is the favoritism towards religious schools among vocational lower secondary schools. Law No. 6287 states that The Lower Secondary Schools Allowing Between Different Programs and

Imam-Hatip Lower Secondary Schools would have been included among the lower secondary school institutions. However, Başkan and Gün (2013) criticizes that only the İmam-Hatip schools have been opened as institutions delivering vocational education and underlines the biased attitude of the circulars and regulations in this matter. The number of Imams and Preachers Lower Secondary Schools in the 20122013 school year was 1099 , and it increased to 3437, in the seven years following the education reform of 2012 (The Ministry of National Education, 2013, 2020).

As a response to the criticisms regarding early vocational education, the MONE has declared that no lower secondary school other than Imam-Hatip schools offers vocational education at 9 years old, and strictly emphasized that the vocational education starts at the $9^{\text {th }}$ grade. In addition, it has remarked that the only difference between the general and religious lower secondary schools is the additional electives in the curriculum of the religious schools (Ministry of National Education, 2012). It should be accepted that the concern of "providing flexibility", which is the starting point of this change, only for the people who want to receive religious education during the lower secondary school age. And still, parents will make choices on behalf of the children.

Adding new elective courses to the curriculum of lower secondary schools and ImamHatip lower secondary schools is the second step towards nurturing a more flexible understanding of education. The Quran and the Life of Prophet have been added to the curriculum of the lower secondary schools and high schools as optional electives (Resmi Gazete, no: 28261, dated April 11, 2012). Although the names of other elective courses are not mentioned in the new law explicitly, many other elective courses would be offered in the curriculum of lower and upper secondary schools, as shown in Table 3.1. However, it has been stated that the elective course would be offered if at least ten students choose the same course. And lower secondary school students would be able to choose up to 8 hours a week, while religious school students can choose among these elective courses up to 4 hours a week. (Ministry of National Education, General Directorate of Basic Education, 2012).

The special emphasis of the new law on the Qur'an and the Life of the Prophet as elective courses has been viewed with displeasure by some people (Başkan and Gün, 2013). In the first year of the implementation of the law, schools were able to offer a very limited number of elective courses due to physical limitations and a limited number of teachers (ERG, 2012). The MONE has underlined that the societal demands of the other sects would be satisfied by the Basic Religious Studies elective course (Ministry of National Education, 2012). Yet, limitations have caused non-Muslim students and students from other sects to be forced to select Islamic elective courses in schools that offer only these courses as electives (Başkan and Gün, 2013).

Table 3.1: Illustration of the Elective Courses Offered by Different Levels for 2012/2013 School Year

| Lower Secondary Schools | Imam-Hatip Lower Secondary Schools | Upper Secondary School |
| :--- | :--- | :--- |
| The Holy Quran | Reading skills | The Holy Quran |
| Prophet's Life | Authorship and Writing Skills | Prophet's Life |
| Basic Religious Knowledge | Living Languages and Dialects | Basic Religious Knowledge |
| Reading skills | Foreign language | Epistemology |
| Authorship and Writing Skills | science Applications | Democracy and Human Rights |
| Living Languages and Dialects | math applications | Social Activity |
| Foreign language | Information Technologies and software | Project Preperation |
| Science Applications | Visual arts | Information and Communication Technology |
| Math Applications | Music | Business |
| Information Technologies and software | Sports and Physical Activities | Economy |
| Visual arts | Drama | Entrepreneurship |
| Music | Intelligence games | Astronomy and Space Sciences |
| Sports and Physical Activities |  | International Eelations |
| Drama |  | Management Science |
| Intelligence Games |  | Diction and Oratory |
|  | History of Art |  |
|  | German Literature |  |
|  | English Literature |  |

Source: Ministry of National Education, General Directorate of Basic Education, 2012.

The last major change that the new law brings is the extension of compulsory education from 8 to 12 years, and the inclusion of upper secondary schools within the scope of compulsory education is the main change that constitutes the subject of this study. The compulsory upper secondary education has been decided to be implemented in the 2012-2013 school year for the first time (Resmi Gazete, no: 28261, dated April 11, 2012). It covers the students who completed the $8^{\text {th }}$ grade in the 20112012 school year, these students must enroll in high school in the 2012 autumn term. The compulsory education reform affects those who were born in or after January 1998, since these individuals are more probably to be the $8^{\text {th }}$ graders in the 2011-2012
school year. On the other hand, students who completed $8^{\text {th }}$ grade before the 20112012 school year are free to drop out upon the completion of basic education. That means, individuals who were born before January 1998 are not obliged to complete high school.

As a result of the extension of compulsory schooling to 12 years in the form of $4+4+4$, the requirement to obtain a diploma has been also changed. With this regulation, students would be awarded an upper secondary education diploma at the end of the 12 years of compulsory education and there would not be any other diploma for the completion of primary school or lower secondary school (Ministry of National Education, Private Secretariat, 2012).

The only regulation that has been made about high school education is not that it has become compulsory. Although it is compulsory, individuals are given the flexibility that they can continue their formal high school education in open high school institutions if they wish. Moreover, as mentioned before, the Law no. 6287 (Resmi Gazete, no: 28261, dated April 11, 2012) states that compulsory high school education has started to cover non-formal education institutions in addition to formal education institutions. What is meant here by non-formal education is Vocational Training Centers. After completing their lower secondary education, individuals can continue their education in Vocational Training Centers, provided they complete their compulsory education with open high school education (Ministry of National Education, 2012).

The articulation of open high schools to compulsory high school education had been met with concern. Nartgün and Özen (2014) reveals parent's negative opinions on open high schools. In a descriptive study compiling the opinions in the press, it has been revealed the perception that the existence of non-formal education as an option within the scope of compulsory schooling does not really extend the compulsory education to 12 years (Günkör and Demir, 2017). Similarly, educational institutions have remarked that the existence of the option of non-formal education within the scope of compulsory high school does not conform with the idea of compulsory basic education since non-formal education is for those who are out of formal education.

Moreover, they have drawn attention to the problem of socioeconomic inequalities. There exists a danger that boys and especially girls from low socioeconomic status might be excluded from formal education due to the alternatives of open education and distant education (Odabaşı,2014). Even though the duration of the compulsory education has been increased, open education practice within the compulsory education approach may cause especially girls not to go to school. Moreover, it may cause the incidences of child brides and child labor to increase (Başkan and Gün, 2013). On the other hand, the Ministry of National Education claims that it is impossible that the new arrangement will cause such a situation since administrators will monitor the students and ensure that they continue their compulsory education. When we look at the number of students enrolled in open education, the total number of students in open high school is 423,901 for males and 354,312 for females in the 2010-2011 school year (The Ministry of National Education,2011). One year after the first implementation of the new reform, in the 2013-2014 school year, these numbers have increased to 721,737 and 585,257 for males and females, respectively (The Ministry of National Education,2014).

As mentioned before, the rationale behind the extension of compulsory schooling to 12 years is the aim of increasing the average years of education of the society and to eliminate the differences in enrollment rates. Prior to the education reform of 2012, there was a gap between the male and female upper secondary school net enrollment rates. In 2011, the total upper secondary school net enrollment rate is $80.5 \%$ in Turkey. While females stay below this level with the net enrollment rate of $76.9 \%$, males stay above this level with the net enrolment rate of 84.1 \% (The World Bank,). The report of the Education Reform Initiative presents that the extension of compulsory education to upper secondary school may improve access to education and may be successful in increasing schooling. However, it seems that the new law does not give much importance to the quality of education and reducing inequality (Education Monitoring Report, 2012). The same report states that there exist gender differences in upper secondary education enrollment across provinces, and this difference is larger where the enrollment rates are low (Ministry of National Education, 2012).

The changes brought about by the 2012 reform are summarized above. With Law No. 6287, major changes have been made in primary school, lower secondary school, and upper secondary school levels of the Turkish education system. Since the main interest of this study is to investigate the extension of compulsory education to be cover upper secondary education, the next sections show the impact of this change on the investment expenditures and as a reflection of this, the impact on some indicators of the quality of upper secondary school education. Furthermore, the impact of the extension of the duration of compulsory schooling on the schooling outcomes at upper secondary education level is shown in detail.

### 3.1.3.1. The Impact of the 2012 Education Reform on The Budget of the Ministry of National Education

One of the debates about the 2012 education reform has been the sudden implementation of the reform without the necessary planning (Başkan and Gün, 2013). This situation has brought about concerns related to financing and the quality of educational services. Since it has been expected that the number of students will increase as a result of the reform, uncertainties related to the physical capacity of the existing schools have entailed the risk of deterioration of the quality of education (Education Monitoring Report, 2012). In other words, an extension of the duration of compulsory education requires the necessary investments to avoid a decrease in the quality of education. It has been envisaged that the 12 years of compulsory education require an investment of 13 billion TL only in the upper secondary education level to keep the quality of education at the current level (Özenç and Memiş, 2012).

The Ministry of National Education is the main institution that is responsible for the provision of educational services in Turkey. The budget of the MONE might give a clue about the investments on the upper secondary education although it also covers expenditures on the other levels of education as well as non-formal education and open education. Figure 3.6 demonstrates the MONE's budget and its share in the Gross Domestic Product (GDP), covering 4 years prior to and after the 2012 education reform. There exists a continuing increase in the budget of MONE. It has increased more than three times by rising from 22.92 billion Turkish Lira (TL) in 2008 to 76.35 billion TL in 2016. However, the budget of the MONE in US dollars does not show a
similar increase across years. Although it increases from 21.8 billion US dollars (USD) in 2012 to 24.95 USD during the first year of the reform, it fluctuates nearly around the same levels. On the other hand, the share of MONE's budget in GDP shows more fluctuation. Prior to the 2012 reform, there is a peak in 2009, which results from the investments brought by the 2005 education reform (Karabilgin, 2020). It rises from 2.76 percent of the GDP in 2012 to 3.03 percent in 2013. In 2014, it reaches 3.19 percent of the GDP although this share declines in the following year.


Notes: The US dollar correspondence of the MONE's budget was calculated by using an average of the dollar ask and bid price for each year.

Source: Ministry of National Education, 2021; the Central Bank of the Republic of Turkey

Figure 3.6: The Changes in MONE's Budget (in TL and USD) and in the Percentage Share of MONE's Budget in GDP between 2008 and 2016

### 3.1.3.2. The Impact of the 2012 Education Reform on the Indicators of the Quality of Upper Secondary Education

As mentioned before, the budget of MONE does not provide a direct information about the expenditures on upper secondary education since it also includes expenditures on other levels of education. At this point, some indicators of the investments made in the upper secondary education are useful in evaluating the change in the quality of
upper secondary education across years. The number of students per school, class, and teacher are among the indicators of the quality of upper secondary education.

Figure 3.7. indicates that there exists a continuing increase in the number of upper secondary schools until the 2011-2012 school year. The increase in the number of upper secondary schools is visible during the first year of the implementation, in 20122013 school year, compared to previous school year. Furthermore, the average number of schools increased from approximately 9289 in the three years before the education reform to approximately 10,145 in the three years following the reform. However, this increase turned into a decline in the 2014-2015 school year and then to an increase in the following year, which is abnormal. The increase in the number of classrooms in the 2014-2015 school year in Figure 3.8 supports the possibility of a discrepancy between the actual number of schools and the number of that the data shows in Figure 3.7 shows.

In fact, the number of schools alone may not be sufficient in understanding the change in the quality of upper secondary education. The number of students per school might be a better indicator since it shows the average number of students in a school. The change in the number of students per school is also displayed in Figure 3.7. In the school year immediately after the reform, in 2012-2013, there is only a little improvement since the number of students per school drops by 12 . However, in the three years following the 2012-2013 school year, it even rises above pre-reform levels, which may suggest a deterioration in the quality of the upper secondary school education.

Another indicator of the quality of upper secondary education is the number of students per classroom. The number of students per classroom is found by dividing the total number of students by the total number of classrooms and a decline in the number of students per classroom implies an improvement in the quality of upper secondary education The smaller the number of students per classroom, the better the quality of education. It might be a better indicator of the quality of education than the average number of students per school since it is the main unit where educational activities take place.


Notes: The open upper secondary education students are also included. The number of upper secondary schools are equal to the sum of the number of General Upper Secondary schools and the number Vocational and Technical Upper Secondary schools.

Source: Ministry of National Education, 2021.

Figure 3.7: The Number of Upper Secondary Schools and the Number of Students per Upper Secondary School


Notes: The open upper secondary education students are also included. The number of upper secondary schools are equal to the sum of the number of General Upper Secondary schools and the number Vocational and Technical Upper Secondary schools.
Source: Ministry of National Education,2010, 2014, 2017.

Figure 3.8: The Total Number of Classrooms and the Number of Upper Secondary School Students per Classroom

For the school years covering 2008-2016, the number of upper secondary school students per classroom is shown in Figure 3.8. There exists a steady increase in the number of classrooms across years while the number of students per classroom fluctuates around 30 until the 2011-2012 school year. Despite a very little deterioration in 2013-2014, the number of students per classroom has declined approximately by 5 during the four years following the 2011-2012 school year. In contrast to the deterioration in terms of the students per school, the number of students per classroom points out an improvement in the quality of upper secondary education.

The last indicator of the quality of upper secondary education to be investigated in this section is the number of students per teacher. It is the ratio of the total number of students to the total number of teachers in the upper secondary education level.


Notes: The open upper secondary education students are also included. The number of upper secondary schools are equal to the sum of the number of General Upper Secondary schools and the number Vocational and Technical Upper Secondary schools. Total number of teachers is the sum of contractual and permanent teachers.
Source: Ministry of National Education, 2021

Figure 3.9: The Number of Teachers and the Number of Upper Secondary School Students per Teacher

As demonstrated in Figure 3.9, the number of teachers exhibits an increasing trend over the years. It increases by 21,481 in the first year of the implementation of the new law compared to the previous year. Consistent with this improvement, the studentteacher ratio keeps declining during the years after the 2011-2012 school year while it fluctuates around 19 and 20 prior to this date. Similar to the improvement in the number of students per classroom, an improvement in the student-teacher ratio is observed beginning from the first implementation of the reform, 2012-2013 school year.

The figures shown above exhibit the changes in the total number of schools, classrooms, and teachers for upper secondary education without considering the types of schools. Nevertheless, upper secondary school institutions consist of General Upper Secondary School and Vocational and Technical Upper Secondary Schools. Figure 3.10 exhibits the comparative change in the number of students per school, the number of students per classroom, and the number of teachers per classroom between 2008 and 2016.The vertical axis shows the ratio of the value of the relevant indicator for Vocational Upper Secondary Schools to the value of the relevant indicator for General Upper Secondary Schools. An increase in the ratio of two indicators implies that there is a relative improvement in the value of the indicator in question in favor of General Upper Secondary Education, in other words, a relative deterioration for Vocational and Technical Upper Secondary Education.

Prior to the 2011-2012 school year, the ratio of the number students per school, the number students per teacher and the number of students per classroom display almost an unchanging trend. Nevertheless, during the four years following this school year, the relative value of the number of students per school increases from 0.59 to 0.92 , which means a relative improvement in the quality of General Upper Secondary Education This increase might be resulting from an increase in the student-school ratio for Vocational and Technical Upper Secondary Education or from a decline of this ratio for General Upper Secondary Education, or both. Panel (a) of Figure 3.11 reveals that both circumstances are present simultaneously.


Notes: The open upper secondary education students are also included. Total number of teachers is the sum of contractual and permanent teachers.

Source: Ministry of National Education,2010, 2014, 2017,2021

Figure 3.10: The Ratio of the Number of Students per School, the Number of Students per Classroom, and the Number of Students per Teacher in Vocational and Technical Upper Secondary Schools to General Upper Secondary High Schools

Again, because the classroom is the main unit where educational activities take place, it makes sense the look at the change in this indicator, to be able to evaluate the change in the relative quality of the upper secondary education. The relative value of the number of students per classroom declines from 0.86 in the 2011-2012 school year to 0.66 in the 2015-2016 school year. In contrast to the change in the relative value of the number of students per school, the ratio of the number of students per classroom improves in favor of Vocational and Technical Upper Secondary Education (Figure 3.10). The improvement stems from the fact that the decline in the student- classroom ratio for General Upper Secondary Education lags behind the decline in the studentclassroom ratio for Vocational and Technical Upper Secondary Education (Panel (c) of Figure 3.11).


Notes: The open upper secondary education students are also included. Total number of teachers is the sum of contractual and permanent teachers. (The numbers are rounded in all graphs).
Source: Ministry of National Education,2010, 2014, 2017.

Figure 3.11: The Number of Students per School, the Number of Students per Teacher, and the Number of Students per Classroom for General Upper Secondary Education and for Vocational and Technical Upper Secondary Education

The number of students per classroom is almost unchanged for General Upper Secondary Education, between the 2011-2012 school year and the 2015-2016 school year. Like the change in the relative value of the students per classroom, the relative value of the number of students per teacher improves in favor of Vocational and Technical Upper Secondary Education. It declines by 0.11 during the four years following 2011-2012 school year (Figure 3.10). Although the student-teacher ratio declines a bit both for General Upper Secondary Education and for Vocational and Technical Upper Secondary Education, the improvement in Vocational and Technical Upper Secondary Education dominates (Panel (b) of Figure 3.11).

### 3.1.3.3. Transportation of Students to Upper Secondary Schools

Bussed education is the education provided by the daily transportation of students to larger and densely populated settlements, such as provinces or districts, from small and sparsely populated regions such as villages or subdistricts. With the introduction of the compulsory schooling reform, also upper secondary school students started to be transported to the central schools. After the placement of students who lives in settlements that are not feasible for bussed education to boarding schools, the remaining students are covered by the practice of bussed education. Only the primary education students had been bussed before the education reform. On the other hand, the bussed education had been implemented in the 2010-2011 school year for the first time for the 9th graders, and in the 2011-2012 school year, for the second time for 9th and 10th graders (Ministry of National Education General Directorate of Support Services, 2012). With the implementation of the bussed education, it was targeted to provide access to schools for students who have problems in accessing upper secondary education for various reasons and to provide lunch to these students ( MEB'den taşımalı öğretim genelgesi, 2012).

Figure 3.12 shows the number of students transported to central schools. In the 20122013 school year, the first year of the implementation of the reform, the number of students transported increases from 157.6 thousand to 376.6 thousand. Furthermore, the total number of students transported to central schools grew by $14.92 \%$, from the

2012-2013 school year to the 2017-2018 school year. It is noteworthy that the number of females bussed is above the number of males bussed.


Notes: The italic numbers represent males, the bold numbers represent total, and the remaining numbers represent females.
Source: Ministry of National Education, 2012, 2013, 2014,2015,2016, 2017,2018

Figure 3.12: The Number of Students Transported to the Central Schools

### 3.1.3.4. The Impact of the 2012 Education Reform on Schooling in Upper

 Secondary Education
### 3.1.3.4.1. The Number of Students Enrolled and the Enrollment Ratios

The total number of students enrolled in formal upper secondary education and the gender composition of students enrolled are shown in Figure 3.13. The number of students enrolled in formal upper secondary education exhibits an increasing trend for both genders across years. Although high school education is not compulsory before the 2012-2013 school year, the total number of students increases from 3.84 million in the 2008-2009 school year to 4.76 million in the 2011-2012 school year. Furthermore, with the introduction of the 2012 compulsory schooling law, the total number of students in upper secondary education has naturally risen to 5 million in the 2012-2013
school year and has kept increasing across years. Both males and females are affected positively from the extension of the duration of compulsory schooling in terms of the


Notes: Students who are enrolled in open education are also included in the numbers.
Source: Ministry of National Education, 2016, 2021.

Figure 3.13: The Total Number of Students Enrolled in Upper Secondary Education by Gender and by School Year
school enrollment. However, the gap between the number of males and females enrolled almost is not changed with the reform and stays nearly constant in the four years following the reform.

The increase in the total number of enrollment in the 2012-2013 school year stems from the increase in enrollment only in the first grade of upper secondary education. On the other hand, the full impact of the reform on total enrollment can be seen in the 2015-2016 school year, the school year in which the reform is fully implemented. The total number of students enrolled in all grades increased from 4.76 million in the 20112012 school year to 5.81 million in the 2015-2016 school year.

The number of students enrolled in upper secondary education may fail to capture the real impact of the reform in terms of schooling since it also includes the influence of
the population dynamics. The increase in the number of students enrolled in upper secondary education might be a natural result of the growth of the population of upper secondary school age. However, the share of the number of students enrolled, in the population of upper secondary school age is more important to be able to assess the schooling outcomes of the new law.

There are two indicators of schooling besides the number of students enrolled. One of them is the gross enrollment rate and the other one is the net enrollment rate. The gross enrollment rate is defined as the ratio of the total number of students enrolled in upper secondary education to the population in that official age group. The official age group for upper secondary education is stated as 14-17 by the MONE (2012). While the gross enrollment rate considers the total number of students in upper secondary education, the net enrollment rate takes the official age group for the upper secondary education into account. The net enrollment ratio is the ratio of the total number of students in the age group of 14-17 enrolled in the upper secondary education to the population in that official age group.

The change in upper secondary education gross enrollment rates for the school years between 2008-2009 and 2015-2006 are demonstrated in Figure 3.14. There exists a steady increase in upper secondary education total gross enrollment rate between these years. The gross enrollment rate of males is above the gross enrollment rate of females before and after the education reform, which implies a persistent gender gap in the gross enrollment rate. Although not a sharp increase is observed in the 2012-2013 school year, the gross enrollment rate in the fourth year after the reform is realized as 112.28 percent for men, 107.29 percent for women, and 109.85 percent for the total. This is a significant increase compared to the gross enrollment rate in the 2011-2012 school year. In fact, since the gross enrollment rate considers the education levels instead of the official age group it also covers students enrolled later or earlier than their cohort due to some reasons such as grade repetition. The net enrollment rate gives a more direct information on the impact of the new compulsory schooling law on schooling since it excludes over-age and under-age students. Net enrollment rate is the share of the students aged 14-17 and enrolled in upper secondary education in the total
population aged 14-17, and the change in the net enrollment rate is also shown in Figure 3.14.


Notes: Students who are enrolled in open education are also included. The calculation of the enrollment rates is based on the Population Census of Address-Based Population Register System. The gross enrollment rates greater than 100 percent is because of the grade repetition, or the inclusion of the students who enrolls in upper secondary education earlier or later. The italic numbers represent the net enrollment rate of males, the bold numbers represent the total net enrollment rate, and the remaining numbers represent the net enrollment of females in the second graph.

Source: Ministry of National Education, 2016, 2021

Figure 3.14: Upper Secondary Education Gross Enrollment Rates (as \%) and the Net Enrollment Rates (as \%) by Genders and by School Years

Like the gross enrollment rate, the net enrollment rate also shows an increasing trend across years for both genders although the numbers are far below the gross enrollment rate. The gap between the net enrollment rate of males and females already diminishes over time, prior to the 2011-2012 school year. In the first year of the implementation of the compulsory schooling law, the gender gap almost disappears in contrast to the gender gap in the gross enrollment rates, and it is close to total net enrollment rate of 70.06 percent for both genders. In addition, a sharper increase of almost 7 percentage points in the net enrollment rate is observed from the 2012-2013 school year to the next year, compared to the smooth rise in the previous year. Eventually, the net enrollment rates are around 80 percent in the 2014-2015 school year and the net enrollment rate of females are above the net enrollment rate of males for the first time.

### 3.1.3.4.2. Upper Secondary Education Student Sex Ratio

In Turkey, the disadvantaged position of women compared to men in terms of upper secondary school enrollment is disappearing over time, as shown above. The sex ratio is an important indicator of gender parity in upper secondary enrollment.


Source: Ministry of National Education, 2021

Figure 3.15: The Sex Ratio of the Students Enrolled in Upper Secondary Education

For upper secondary education, it shows the ratio of female gross enrollment rate to the male gross enrollment rate, as a percentage.

The improvement in the sex ratio is exhibited in Figure 3.15. Just before the 20102011 school year, it has increased by 3.6 percentage points and reached 93.29 percent in the 2011-2012 school year. However, in the first year of the implementation of compulsory high school education, there has been no significant increase in the sex ratio, and after the 2012-2013 school year, very smooth increases followed the relatively significant increase prior to the 2011-2012 school year. However, if we look at the averages of the sex ratios four years before and after the reform, the average sex ratio increases from 90.15 percent to 94.93 percent, which suggests an improvement in female gross enrollment rate.

### 3.1.3.4.3. Enrollment in Upper Secondary Education by Settlement Type

Since villages are less populated than cities, the number of students enrolled in upper secondary education in villages is far below the number of students in cities in Turkey. Figure 3.16 shows the total number of students by the place of settlement. In the first year of the implementation of the compulsory upper secondary education, the total number of students enrolled in upper secondary education grew by 5.08 percent and 3.61 percent compared to the previous school year, in cities and in villages respectively. The number of students in upper secondary education in cities has kept increasing in the four years following the 2011-2012 school year, while the positive influence of the education reform on schooling in villages has disappeared beginning from 2014. However, these numbers must be interpreted with caution. Turkish Statistical Institute (TurkStat) revised the definition of rural and urban in March 2014. ${ }^{1}$ Before this date, urban and rural areas were defined according to population. Many villages are incorporated into neighborhoods, and towns are decided to be included under the municipality of the district to which it belongs, beginning in 2014. That is, villages were transformed into cities with Law No. 6360, and TurkStat adopted this approach in 2014. Since the definition was changed, the data points are shown with a discontinuity in 2014 in Figures 3.15 and 3.16.

[^0]

Notes: Students who are enrolled in open education are included in the numbers.
Source: Ministry of National Education, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018

Figure 3.16: The Total Number of Students Enrolled in Upper Secondary Education by City and Village

If we examine the number of students in upper secondary education for city and village settlements, we see that in both settlement type males are in a more advantageous position than females in terms of schooling (Figure 3.17). In the first year of the compulsory education reform, the number of both male and female students has increased and the difference between the number of male and female students has declined from 273.9 thousand in the 2011-2012 school year to 269.6 thousand in this year ( 1.6 percent decline). Nevertheless, there has been a persistent gender gap in enrollment against females, even after the education reform of 2012. When the enrollment of the students in the village is considered, it is seen that there exists a decline in the difference between the number of male and female students, from 22.7 thousand in the 2011-2012 school year to 21.6 thousand in the 2012-2013 school year (4.7 percent decline). Therefore, it can be concluded that the equalizing effect of compulsory education on the schooling of the genders is stronger in the village settlement than in the city, in the first year of the implementation.


Notes: Students who are enrolled in open education are included in the numbers. The italic numbers represent the number of males, the bold numbers represent the total number of students, and the remaining numbers represent the number of females in the graphs.

Source: Ministry of National Education, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018

Figure 3.17: The Total Number of Males and Females Enrolled in Upper Secondary Education by City and Village

### 3.1.3.4.4. Upper Secondary Education Enrollment by Grade Levels

As shown before, the total number of students enrolled in upper secondary education increased to 5 million with the extension of the duration of compulsory schooling to 12 years (Figure 3.13) and it has continued to increase over the years. However, the impact of the reform on enrollment in various grades of upper secondary education might not be homogenous and might affect males and females differently. Figure 3.18
and Figure 3.19 show the number of males and females enrolled in different grades of upper secondary education.

Due to the 2005 education reform, only a limited number of schools with special status have been allowed to include a five-year curriculum, covering the preparatory class. Therefore, the number of students in this grade is very low in each year relative to the number of students in other grades of upper secondary education and was almost unaffected by the 2012 compulsory schooling law. The number of students enrolled in the preparatory classes is demonstrated in Figure 3.18. There had existed no remarkable gender disparity in the preparatory class enrollment until the 2014-2015 school year. However, in the 2014-2015 school year, the total number of students in the preparatory class has surprisingly risen by 8.48 thousand. This increase might be associated with the increase in the number of private education institutions that usually offer preparatory class from 1007 in the 2013-2014 school year to 1174 in the 20142015 school year (Ministry of National Education, 2014, 2015) . Simultaneously, the difference between the number of male and female students in this grade jumped to 2.94 thousand, with the number of females exceeding the number of males.

Thanks to the introduction of compulsory high school education, the number of students enrolled in the first grade of upper secondary education, which had declined just before the 2011-2012 school year, increased by 85.1 thousand in the 2012-2013 school year compared to the previous school year (Figure 3.18). Nevertheless, the declining trend in upper secondary education enrollment continued even after rendering high school education compulsory, although the difference between the number of males and females tends to shrink after this year.

As previously stated, the first cohort that is affected by the extension of compulsory schooling comprises those who started their high school education in the 2012-2013 school year. Therefore, it is expected that the impact of the compulsory schooling law on the enrollment in the second grade of upper secondary education to be seen in the next school year. It is demonstrated in Figure 3.19 that, the total number of students in grade two remarkably rose by 68.6 thousand in the 2013-2014 school year. It is notable that before the education reform, there is not as much gender difference in enrollment
in grade two as that seen at the first grade. Moreover, the existing gender imparity in enrollment in grade two reverses and almost disappears in the 2013-2014 school year.

The students who successfully completed the second grade of upper secondary education in the 2013-2014 school year are expected to enroll in third grade in the next school year. Figure 3.19 presents the consistent increase in enrollment in the third grade. 68.4 thousand more students have enrolled in the third grade of upper secondary education in the 2014-2015 school year, compared to previous school year. The difference between the number of male and female students enrolled had already reversed in favor of females just before this school year, and the number of female students has continued to be above the number of male students also after the 20132014 school year.

When enrollment in grade four is considered, we observe a steady increase over the years. Besides, in the 2015-2016 school year, the year in which a sharp increase in the enrollment in grade four is expected since this is the fourth year of the implementation of the education reform, the total enrollment in grade four increased by 74.89 thousand. Furthermore, in the next school year, it increased by 34.74 thousand, which is a smoother increase compared to the previous school year (Figure 3.19). When the gender gap in enrollment in grade four is examined, Figure 3.19 shows that there is not a big gender difference over the years as in the enrollment in grade one. The difference between the male and female enrollment had begun to improve in favor of females beginning from the 2011-2012 school year. The number of females enrolled in grade four exceeded the number of males enrolled by 20.9 thousand in the fourth year of the reform and this difference declined to 0.7 thousand in the next school year.

If we investigate the total number of students in each grade, it is seen that there is a decline in the number of students enrolled in the successive grades across consecutive years. In the 2012-2013 school year, the total enrollment in grade one is 1443.8 thousand. Those who successfully complete grade one in this school year are expected to enroll in grade two in the next school year. However, the number of students enrolled in grade two in the 2013-2014 school year drops to 997.5 thousand. When the total number of students in grade one and two is examined by the consecutive school
years, the number of students in grade one in any school year is above the number of students enrolled in grade two in the next school year. We can say that this is due to the weak transition from the first grade to the second grade, but in this case, first grade enrollments would be expected to increase over the years. However, the first-year enrollment has been declining. Therefore, it is unlikely that there is a grade repetition in grade one. Possible contributors to this situation might be the dropouts in grade one, or students might have been transferred to open high school after completing grade one. At this point, it has also to be considered that there might be students repeating grade two. When we take this possibility into account, it can be said that the transition from grade one to two is even weaker than what is seen, and student leakages from the first grade might be arising from dropouts or transition to open education. On the other hand, it may not be correct to make a definite judgment on this matter since the decline in enrollment in the first grade after the reform may also be due simply to the decline of the freshman-age population over the years. That is, the decline in population might be overshadowing the grade repetition in the first year of the upper secondary education.

The similar situation is valid also for the transition from grade two to grade three. The number of students in grade two is above the number of students in grade three in the next school year. Of the 997.5 thousand students enrolled in the second grade in the 2013-2014 school year, only 937.2 thousand were able to move on to the third grade. Since the enrollment in the second grade shows an increasing trend over the years, it can be said that the failure in the transition to the third grade might be stemming from the high repetition of the second grade. Similarly, the total number of students in the third grade in the 2014-2015 school year and in the fourth grade in 2015-2016 school year are 937.2 thousand and 914.6 thousand, respectively. When the population growth is ignored, it can be concluded that students could not progress to grade four between these school years.

Approximately, only 63.3 percent of those who were enrolled in upper secondary education in the 2012-2013 school year achieved enrolling in grade four in the 20152016 school year. This situation is likely to be arising from high school dropouts, transitions to open education or grade repetition. In contrast to grade one, enrollment
in grades two, three, and four increase in the years after the reform, which supports the idea of the existence of possible grade repetition in grades two and three as a reason for the failure of attaining the fourth grade. Furthermore, even if students attain the fourth grade, there is an accumulation in the number of fourth-graders over the years, which suggests a high grade repetition in grade four.


Notes: Open education students are not included. The italic numbers represent the number of males, the bold numbers represent the total number of students, and the remaining numbers represent the number of females in the graphs.
Source: Ministry of National Education, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018.

Figure 3.18: The Number Male and Female Students Enrolled in the Preparatory Class and in the Grade 1 of Upper Secondary Education


Notes: Students who are enrolled in open education are not included. The italic numbers represent the number of males, the bold numbers represent the total number of students, and the remaining numbers represent the number of females in the graphs.

Source: Ministry of National Education, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018.

Figure 3.19: The Number of Male and Female Students Enrolled in Grade 2, in Grade 3 and in Grade 4 of Upper Secondary Education

Although the difference between the male and female enrollment in the preparatory class has become visible after the 2013-2014 school year, there has been a remarkable and persistent gender gap in enrollment in the first grade both before and after the education reform of 2012. The number of male students is greater than the number of females in the first grade. When the enrollment of those who started upper secondary education in the 2012-2013 school year is examined by the consecutive periods, it is seen that the large gender gap in grade one shrinks and reverses in favor of females shortly after the first grade. Roughly 74.13 percent of females who are enrolled in high school education in 2012-2013 school year were able to move on the grade four in the 2015-2016 school year while this ratio is 54.97 for male students. From this, we can conclude that women are more successful than men in progressing to the next grades. This is also valid not only for those who started upper secondary education in 2012 but also for those who started in the next school year.

### 3.1.3.4.5. Open Upper Secondary Education Enrollment

Prior to the 2012-2013 school year, although it was not compulsory individuals were able to continue with open upper secondary education upon the completion of uninterrupted compulsory eight-year basic education. Nevertheless, upper secondary education became compulsory, with the option of enrolling in open upper secondary education in 2012 as noted before. That means, beginning from the 2012-2013 school year, open education is within the scope of compulsory high school education.

Enrollment of open high school students is separately exhibited in Figure 3.20. The total enrollment in open upper secondary education is naturally higher than enrollment in any grade since it covers all grades, and it shows an increasing trend over the years. Those who are placed in any high school with the high school entrance exams are registered automatically by e-okul system. Furthermore, those who could not be placed in any high school with these exams are placed and registered in appropriate schools also automatically (Ministry of National Education, 2012). Therefore, it is not possible to enroll in open high school immediately in the first year of the implementation. However, in the 2013-2014 school year, those who failed grade one in the previous school year or those who complete the first grade and attain the second grade can enroll in open high school. Thence, we expect a striking increase in enrollment in open upper
secondary schools not in the first year of the implementation of the reform but in the 2013-2014 school year.

The number of students in open upper secondary school is 1014.4 thousand and 1307 thousand in the 2012-2013 school year and in the 2013-2014school year respectively, suggesting a sharp increase of 292.6 thousand students in open upper secondary school between these year (Figure 3.19). Besides these, it is worth noting that an increase in the open upper secondary education enrollment may be resulting from the increase in enrollment in any grade because the enrollment in open high school is not known by grades.

When we look at the number of male and female students separately, Figure 3.20 shows that existing difference in male and female enrollment increases over the years, beginning from the 2013-1024 school year. While the number of male students exceeds the number of female students by 90.62 thousand in the first year of the implementation of the reform, this difference increased to 136.48 thousand in the year that enrollments sharply increased (2013-2014). Moreover, in the school year in which we see the full impact of the reform on open high school registrations (in 2016-2017 school year) the difference between male and female enrollment was jumped to 249.31 thousand.

The second graph in Figure 3.21 illustrates the ratio of open upper secondary school students to all students as a percentage. As it is shown, the share of open upper secondary education students in all students enrolled in upper secondary education also increased since the 2013-2014 school year and this increase is more pronounced for males. That means, the composition of upper secondary education has shifted to open education with a greater shift for males in years.


Notes: The italic numbers represent the number of males, the bold numbers represent the total number of students, and the remaining numbers represent the number of females in the graph.
Source: Ministry of National Education, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018

Figure 3.20: The Number of Male and Female Students Enrolled and the Percentage of Students Enrolled in Open Upper Secondary School

### 3.1.3.4.6 Graduation from Upper Secondary Education

The impact of the 2012 compulsory education law on graduation from upper secondary education is expected to be seen in the 2015-2016 school year for the first time because this is the year in which the first cohort affected by the reform is expected to complete
high school. However, there was already a considerable increase in the number of upper secondary education graduates at the end of the 2013-2014 school year, which is irrelevant to the direct impact of the 2012 education reform, as illustrated in Figure 3.21. The number of upper secondary education graduates at the end of this school year increased by 129 thousand compared to the number of graduates in previous school year.

A possible factor causing this sharp increase is the MONE's target of preventing high school dropouts and increasing grade passing rate to increase student's success in upper secondary education by the end of 2014. In addition, an arrangement was made for the 2013-2014 school year. The arrangement covered the fourth grade students who passed university entrance exam but failed to graduate from high school. MONE granted students the right to take resit exams for all the courses they have failed, and students who exceed the legal period of absenteeism were pardoned. At the end of the 2014-2015 school year, the number of upper secondary school graduates increased by 93 thousand (Figure 3.21). Again, this increase is relatively high. The explanation behind the unexpected increase in the number of graduates in the 2014-2015 school year is similar to the one in the previous school year. An amnesty was granted to students who were in their senior year. With this arrangement, students who failed due to absenteeism or a failed course were given additional rights to graduate and move on to higher education, as in the previous school year.

In line with the target of preventing high school dropouts and increasing the grade completion rate, MONE continued granting amnesty to final year students who exceed the total absenteeism period despite being successful in all courses also in 2015-2016, 2016-2017, and 2017-2018 school years.

It is obvious that the number of graduates cannot be thought independent from the number of the fourth-grade students because the fourth grade students constitute the prospective graduates. The percentage of the fourth grade students who graduated at the end of each school year is exhibited in the second graph in Figure 3.21. What is surprising in this graph is that the percentage of the fourth grade students graduated is greater than 100 percent in some years. If we compare the fourth grade enrollment
(Figure 3.19) and the number students graduated (Figure 3.21), it is seen that the total number of fourth graders are below the number of graduates in some years. This situation stems from the open upper secondary education students. They are included in the number of upper secondary school graduates while the number of the fourth grade students excludes them. Therefore, we observe graduate/fourth grader ratios which is greater than 100 percent in some years. If the number of the fourth grade students would also include the number of open high school students enrolled in grade four, we could obtain a more accurate picture. But unfortunately, the number of open upper secondary school students by grades are not known and we have only the total number of students in open upper secondary education covering all grades.

Figure 3.21 also shows the unexpected rise in the percentage of the fourth grade students who graduated at the end of the 2013-2014 and the 2014-2015 school year, which is likely to be associated with the reasons explained above. However, in the years following the 2014-2015 school year the total graduation rates remained below the 2014-2015 school year's graduation rate of 113.2 percent. One possible explanation behind relatively low graduation rates in these years may be that MONE did not grant additional re-sit examinations for unsuccessful students and granted only absenteeism amnesty after the 2014-2015 school year. In the 2015-2016 school year the ratio of graduates to the fourth grade students dropped. The decline in graduation ratio may be stemming from the relatively rapid increase of the number of fourth grade students in this year due to the 2012 education reform (Figure 3.19). Moreover, the number of open upper secondary school students enrolled increased at a lower rate in this year compared to previous two years (Figure 3.20). Since the number of graduates includes the open education graduates, possible decline in the share of the fourth grade students in open education might explain the relatively lower graduation rate in the 2015-2016 school year. Continuing decline of graduation rate in the ensuing school year also may be explained by very low increase in the number of open education students and moderate increase in the number of fourth grade students. On the other hand, a slight increase in graduation rate in the 2017-2018 school year may be stemming from quite low increase in the number of fourth-year students compared to the previous year.


Notes: The italic numbers represent the number (or percentage) of males, the bold numbers represent the total number (or percentage) of students, and the remaining numbers represent the number(percentage) of females in the graphs. Open upper secondary school students are included in the number of graduates in the first and in the second graph. However, the number of fourth grade students excludes the number of open upper secondary school students enrolled in grade four in the second graph. Sources: Ministry of National Education, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2021

Figure 3.21: The Number of Males and Females Graduated, and the Percentage of the Fourth Grade Students Graduated from Upper Secondary Education at the End of Each School Year

When we compare the number of male and female graduates, it is seen that the number of females exceeds the number of males in most of the years though the difference is not high (Figure 3.21). However, in order to compare upper secondary education graduation performance of males and females, the number of prospective graduates have to be considered. The second graph in Figure 3.21 also shows the percentage of male and female fourth-grade students who graduated, separately. As seen in the graph, females are more successful than males in transition from the last grade of upper secondary education to graduation, in most of the years.

### 3.1.3.4.7 Enrollment in Higher Education

Completing high school education and obtaining an upper secondary education diploma is a prerequisite for enrollment in higher (tertiary) education in Turkey. Therefore, rendering high school education compulsory may have created a positive externality in enrollment in higher education considering that there will be more high school graduates.

The first graph in Figure 3.22 shows the number of applicants and placements of seniors in high school by years. When we look at the applications of only senior class students, we observe a sharp increase of 296 thousand in the number of applicants from 2008 to 2009. It is associated with the relatively low number of prospective graduates in 2008, as a result of the 2005 education reform. Only those who were enrolled in preparatory class or enrolled in a school with 4 year program in the 20042005 school year or started high school education before the 2005-2006 school year but repeated a grade level are expected to be graduated in the 2007-2008 school year (Karabilgin, 2020). In addition, those who enrolled in the first grade of high school education are expected to be graduated after four years, that is in the 2008-2009 school year instead of the 2007-2008 school year as a result of the reform. Due to the low number of seniors in the 2007-2008 school year compared to the next school year, there seems to be a sharp increase in applications to higher education from 2008 to 2009. The number of senior students who applied to higher education increases since 2009. However, the growth rate of applications, which tended to decrease before 2013 started to increase by 2013. In 2014, the number seniors who applied to higher education increased by 40 thousand. This makes sense since this is the start of the years
that MONE granted amnesties for the last grade students. The amnesties, which was granted for the first time in the 2013-2014 school year, started to be implemented every year as of this school year.

The second graph in Figure 3.22 shows the total number of applicants to tertiary education programs including undergraduate programs, associate programs (two year university programs), and open education programs. The graph includes all kinds of applicants (those who are in senior class of upper secondary education, applicants who graduated but not appointed before, applicants who graduated from a higher education program before, and those who were appointed before) in contrast to the first graph. As the graph shows, the total number of tertiary education applications increases in years, except in 2009. The decline in applications in 2009 might be arising from the decline in the number of applicants other than the senior students.

It is obvious that there is a growing interest in higher education which might be resulting from the increase in high school attendance and high school graduates in between 2009 and 2018. On the other hand, not all applicants have been placed in higher education and the number of applicants who could not be placed in any higher education program increases over the years. The number of applicants placed in a higher education program has not been parallel to the number of applicants. This arises from the fact that the placement in higher education also depends on other factors such as supply constraints.

The impact of the 2012 education reform on higher education applications is expected to be seen in 2016 for the first time. Those who are in their senior year in high school in the 2015-2016 school year graduated in the 2016 spring term and applied and were placed in a higher education program in this year. The higher education applications increased by 59 thousand in this year, which is a relatively sharp increase compared to the previous four years.

In this thesis, we utilize the 2012 education reform explained above to find the impact of extended compulsory education on the schooling attainment of individuals.

However, extending the length of compulsory education was not the only change. As noted above, the 2012 education reform brought about many changes simultaneously.


Notes: The first graph includes applications of the ones who are in senior class of upper secondary education, applicants who graduated but not appointed before, applicants who graduated from a higher education program before, and those who were appointed before, while the second graph includes only the applicants who are in the senior class of upper secondary education.
Source: Ministry of National Education, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, retrieved from Assessment, Selection and Placement Centre.

Figure 3.22: Applications and Appointments of all Types and of the Senior Class Students to Higher Education Programs

At the high school level, articulation of the new elective courses to the curriculum is one of the changes. Furthermore, although it is essential to establish schools separately, lower secondary schools could also be established together with high schools with this reform. These changes may affect the quality of high school education. Also, the government made some investments that affect the quality of high school education, Basically, these investments included increasing the number of schools, classrooms, and teachers at the high school level and, most importantly, bussing high school students living in sparsely populated rural regions to the central schools. These changes also affect the quality of high school education and high school access. Although we aim to find the impact of the extension of the duration of compulsory schooling on individuals' educational attainment, it is impossible to exclude the influence of these simultaneous changes. Therefore, it should not be forgotten that the estimates of the impact of the extension of compulsory education contain the influence of these changes as well.

## CHAPTER 4

## DATA AND METHODOLOGY

### 4.1. Data and Descriptive Statistics

### 4.1.1. The Description of the Data

The primary data source employed in this study comes from the 2018 wave of the Turkish Demographic and Health Surveys (TDHS). The Demographic and Health Survey Series, as nation-wide field surveys, have been conducted within the Hacettepe University Institute of Population Studies every five years, the first of which was in 1968. These nationally- representative household surveys provide comprehensive data on family planning, fertility, child and maternal health, and population. Although they were implemented under different names until 1993, the Demographic and Health Surveys (DHS) Program standards were adopted starting from 1993. The DHS Program collects information mainly on population, nutrition, and health indicators as well as the information on women's empowerment, domestic violence, and marriage history in more than ninety countries all over the world. In addition, the collection of the cross-sectional data quinquennially enables comparison over time (DHS Program, 2022).

The 2018 wave of TDHS aims to provide up-to-date information associated with the demographic characteristics and health of the population in order to assist policymakers in the related decisions. The 2018 project consists of two kinds of questionnaires as in previous surveys, one for collecting general information on the
household and the individual characteristics of household members and two for collecting detailed and comprehensive demographic information on eligible women in these households. The Household Questionnaire aims to gather information on all de jure and de facto members of the household. Those who usually live in the selected household constitute the de jure residents whereas those who stayed in the selected household the night before the interview constitutes the de facto residents.

The data collected in the first part of the Household Questionnaire includes sex, completed age, relationship to the household head, citizenship, the place of birth, parent's survival status, literacy, school attendance, a detailed information on educational attainment, employment, and income status, marital status, and information on the eligibility for the individual female interview. One of the aims of the first part of the Household Questionnaire is to identify women in the selected households eligible for the Individual Questionnaire. In the second part of this questionnaire, the information associated with the household characteristics such as ownership of a house, the source of water for different uses, toilet and heating facilities, the number of rooms and floor material, ownership of consumer durables, insurance status, and the degree of financial satisfaction was collected.

All of the de facto women residents of reproductive ages (15-49) in the selected households are eligible for the Women's Questionnaire in 2013 and 2018 TDHS whereas only the ever-married women are eligible in the previous TDHS series. The questions collect detailed information on the respondent's demographic background, migration, marriage and employment history, pregnancy, fertility and preferences associated with these as well as the complete birth history, the use and knowledge of contraceptive methods, maternal and child health, vaccination of children, early childhood development, background characteristics of the husband, women's status, empowerment and lastly the anthropometric information on women and their children (Hacettepe University Institute of Population Studies, 2019).

The 2018 TDHS employs a multi-stage, stratified cluster sampling design. The sample selection is performed by using National Address Database provided by Turkish Statistical Institute (TurkStat). For data to represent all regions of Turkey, the country
is stratified into various levels by 5 regions $^{2}$, by 12 regions according to the level- 1 Nomenclature Units for Territorial Statistics (NUTS-1) ${ }^{3}$, and by the type of place of residence ${ }^{4}$. The households close to each other, as clusters, are selected in order to reduce the cost of data collection. The 2018 TDHS includes 754 clusters. From each cluster, a predetermined number of households (approximately 21) were selected by using systematic random sampling method. Although 15,775 households were selected for the interview in the 2018 TDHS, 11,056 households were interviewed with success (Hacettepe University Institute of Population Studies, 2019).

The data collected in 2018 TDHS has a hierarchical structure. 11,056 households were visited, and information on 39,914 residents was collected thanks to the Household Questionnaires. Of these 39,914 household members, 7,346 women were interviewed in the Individual Questionnaire. These women were the de facto residents in their reproductive ages of 15-49. Interviewed women were also asked questions related to their birth history and the health of their children.

For the empirical analyses in this thesis, the Household Questionnaire of the 2018 TDHS is used, which is cross-sectional data. The main strength of the TDHS for the aim of our study is that it provides detailed information on the educational outcomes of individuals. It includes information on the highest educational level attended, as well as the total completed grade at this education level. This allows us to reveal the changes in high school attainment stemming from the 2012 compulsory schooling law in Turkey, by making a grade-by-grade analysis of the attainment at the high school level. The TDHS also includes information on some predetermined characteristics such as age and the sex of respondent, the type of birthplace and the province of birthplace. This allows us to control for covariates that might affect the educational outcomes in the empirical analysis. Furthermore, thanks to information on the type of

[^1]birthplace and sex, we are able to analyze the grade completion in high school level comparatively by sex and by the type of birthplace.

Besides its advantages, there are also some limitations of the data source that should be taken into consideration. One potential drawback is that it collects data mainly on women's reproductive behavior and health, maternal and child health, women's marriage history and empowerment status. The information gathered on men is not as detailed as the information gathered on women. For example, the information on the month of birth is collected only for women, and we have only the year of birth information for men. The month of birth information is more useful for our methodology, the Regression Discontinuity Design (RDD), since it allows us to compare subjects closer to the cutoff. However, our analysis includes both men and women, and we use the year of birth information as we have the data on year of birth jointly for men and women.

### 4.1.2. The Sample Restrictions

We imposed some restrictions in order to prepare the sample for the empirical analysis. Our sample consists of 39,914 individuals without imposing any restriction. First of all, 411 individuals who were born in Syria were dropped from the sample. These individuals migrated from Syria to Turkey, most probably during the massive migration wave that started in 2011. They have gone to school in Syria so we dropped them from analysis.

Secondly, 54 observations with missing age information were dropped from the sample since the age information is required for generating the year of birth variable used in the empirical analyses. In the next step, 22,239 observations who were born before 1991 were dropped since these individuals are not affected by the 2005 education reform, which extends the duration of high school education to four years. By eliminating the impact of 2005 education reform, we ensure the comparability of the educational outcomes of those who are affected and not affected, by the 2012 education reform.

The main interest of our study is to find the impact of the 2012 education reform on the high school attainment of individuals. As mentioned before, individuals who were born in 1998 and onwards are affected by the 2012 reform, and the treatment group consists of people who completed high school ages. To ensure the comparability of the educational outcomes of the control and treatment groups, we preferred that the individuals in the control group are old enough to complete high school. Since those who are 17 years or older are more likely to complete high school, we restricted our sample to those 17 years old or older by dropping 10,545 observations who were born before 2001. As a result, there remained 1991-2001 birth cohorts that include 6,665 observations.

### 4.1.3. Description of Variables

### 4.1.3.1. The Outcome Variables

In the 2018 TDHS household questionnaire, responders are asked about household members' and their own school attendance and education status. Firstly, they are asked whether the household member in question ever attended school. For those who ever attended school, the school attendance (level of the school attended and the grade attended at this level) in the current and previous school year is investigated by the follow-up questions. Regardless of the school attendance status in the current or previous school years, responders are also asked about the household member's highest educational level and the highest grade completed at this level. The highest educational level is presented under seven categories: no education at all, incomplete primary, complete primary, incomplete secondary, complete secondary, incomplete high school, and complete high school or higher. The last category includes individuals who completed undergraduate or graduate levels, in addition to those who completed high school.

Table 4.1 shows the summary statistics of the highest educational level for individuals aged 17-28, after dropping observations with missing variables and observations whose highest educational level unknown. As it can be seen in the table, more than half of the individuals ( $65 \%$ ) completed high school education or a higher level of
education. The percentage of the observations with incomplete primary and incomplete secondary education is the lowest, $0.9 \%$ and $1.8 \%$ respectively.

Table 4.1 also shows the summary statistics of the highest total completed grade. This variable is obtained by summing the highest grade levels completed in primary school, secondary school, high school, undergraduate, and graduate school. 3.4\% of observations completed only the fifth grade, while $17.81 \%$ of observations completed only the eighth grade, which corresponds to the basic education level prior to the 2012 education reform. On the other hand, $24.20 \%$ of observations did not continue their education after completing 12 years of high school level.

Using the highest total completed grade, dummy variables are defined according to the research interest of this thesis. Our purpose is to analyze the impact of the 2012 education reform on the grade completion in high school. Therefore, to be able to make grade-by-grade analysis, we defined four dummy variables: a dummy variable for at least the $9^{\text {th }}$ grade completion, a dummy variable for at least the $10^{\text {th }}$ grade completion, a dummy variable for at least the $11^{\text {th }}$ grade completion, and a dummy variable for at least the $12^{\text {th }}$ grade completion. These dummy variables take the value of 1 if an individual completed the high school grade in question or completed a higher grade, zero otherwise. For example, if the highest total grade completed is 11 for an individual, dummy variables for at least the $9^{\text {th }}$, the $10^{\text {th }}$ and the $11^{\text {th }}$ grade completion takes the value of 1 while the dummy variable for at least the $12^{\text {th }}$ completion takes the value of 0 .

In addition to these four dummy variables, a dummy variable is defined for at least some high school attendance. This variable takes the value of 1 if the highest education level is incomplete high school, complete high school or higher, and 0 otherwise. As a difference from the dummy variable for at least the $9^{\text {th }}$ grade completion, this variable takes the value of 1 also for those who enrolled in high school but did not complete any grade of it. This variable is generated to distinguish those who did not enroll in high school at all, and to track the changes in individuals' transition to high school from lower secondary school regardless of the completion of any grade.

Table 4.1: Summary Statistics of the Highest Educational Level, and the Highest Grade Completed for the Individuals Aged Between 17-28

| Variable | Number of Observations | \% of Obs. |
| :--- | :--- | :--- |
|  |  |  |
| Highest Educational Level |  |  |
|  |  | 2.3 |
| No education (0) | 153 | 0.9 |
| Incomplete primary (1) | 60 | 3.6 |
| Complete primary (2) | 241 | 1.8 |
| Incomplete secondary (3) | 118 | 13.9 |
| Complete secondary (4) | 926 | 12.5 |
| Incomplete high school (5) | 830 | 65.0 |
| Complete high school / higher (6) | 4321 | $\mathbf{1 0 0}$ |
| Total | $\mathbf{6 , 6 5 0}$ |  |
|  |  |  |
| Highest Grade Completed |  |  |
|  |  | 0.05 |
| 0 | 3 | 0.19 |
| 1 | 12 | 0.29 |
| 2 | 19 | 0.36 |
| 3 | 23 | 0.33 |
| 4 | 21 | 3.44 |
| 5 | 222 | 0.50 |
| 6 | 32 | 1.36 |
| 7 | 87 | 17.81 |
| 8 | 1146 | 4.48 |
| 9 | 288 | 4.22 |
| 10 | 272 | 9.60 |
| 11 | 618 | 24.20 |
| 12 | 1557 | 7.36 |
| 13 | 474 | 10.56 |
| 14 | 680 | 4.27 |
| 15 | 274 | 9.77 |
| 16 | 629 | 0.73 |
| 17 | 47 | 0.43 |
| 18 | 28 | 0.04 |
| 19 | 3 | $\mathbf{1 0 0}$ |
| Total | $\mathbf{6 , 4 3 5}$ |  |
|  |  |  |

Notes: The sample weights are considered.
Source: Own calculations, using 2018 TDHS.

As illustrated in Table 4.2 77.5\% of the observations ever attended high school, even though some of them might not be completed any grade of high school education. The percentage of observations that completed at least the $9^{\text {th }}$ grade is $75.7 \%$. As the grade level increases, the percentage of observations completing the related grade level declines. The percentage of observations completing at least the $12^{\text {th }}$ grade is $57.4 \%$.

Table 4.2: Summary Statistics of Outcome Variables for the Individuals Aged Between 17-28

| Outcome Variable (Dummy) | Number of Observations | \% of Obs. |
| :--- | :--- | :--- |
| High School Attendance |  |  |
| Not Attended | 1499 | 22.5 |
| Attended | 5151 | 77.5 |
| Total | $\mathbf{6 6 5 0}$ | $\mathbf{1 0 0 . 0}$ |
|  |  |  |
| Grade 9 | 1566 | 24.3 |
| Not Completed | 4869 | 75.7 |
| Completed | $\mathbf{6 4 3 5}$ | $\mathbf{1 0 0 . 0}$ |
| Total |  |  |
|  | 1854 | 71.2 |
| Grade 10 | 4581 | $\mathbf{1 0 0 . 0}$ |
| Not Completed | $\mathbf{6 4 3 5}$ |  |
| Completed |  | 33.0 |
| Total | 2126 | 67.0 |
| Grade 11 | 4309 | $\mathbf{1 0 0 . 0}$ |
| Not Completed | $\mathbf{6 4 3 5}$ |  |
| Completed |  | 42.6 |
| Total | 2744 | 57.4 |
| Grade 12 | $\mathbf{3 6 9 1}$ | $\mathbf{1 0 0 . 0}$ |
| Not Completed |  |  |
| Completed |  |  |
| Total |  |  |

Notes: The sample weights are considered.
Source: Own calculations, using 2018 TDHS.

### 4.1.3.2. Predetermined Control Variables

As independent variables, a set of control variables related to socioeconomic characteristics of household members are employed: sex of household member, the NUTS-1 region of birthplace, and the type of birthplace (province center, district center and subdistrict/village), which are pre-determined variables. The sex and the type of birthplace are also used for the sex and the region-specific estimations. On the other hand, the age of the household member is used to derive the year of birth of the individual, and to identify the policy treatment status of individuals.

The new education policy affects those aged between 17-20 years old at the time of the survey, which corresponds to the individuals born between 1998-2001. As it is presented in Table 4.3, the individuals in this age range constitute approximately $40 \%$ of the whole sample. On the other hand, $60 \%$ of the observations are not affected by the education reform of 2012. At each age, the number of individuals is balanced around $8-10 \%$ of the whole sample, except for the number of observations at age 28. The number of observations of both sexes is also balanced. A dummy variable is defined for males, taking the value of 1 if the individual is male, and 0 otherwise.

The information on the birth province of individuals is given in the data. By using this information, we generated the NUTS-1 category of the birthplace since it represents the major socioeconomic regions, as noted before. The majority of the individuals were born in Southeast Anatolia (15,1\%), in Istanbul Region (13.4\%), and in the Mediterranean region (12.4\%). We defined dummy variables for the birth regions, that takes the value of 1 if the individual was born in the NUTS-1 region in question, and zero otherwise.

Lastly, the type of birthplace is considered in the empirical analysis. This variable includes three categories: province center, district center, and sub-district or village. Approximately $35-36 \%$ of individuals were born in the province center or district center. The dummy variables are derived from the variable of the type of birthplace, which takes the value of 1 if the individual was born in the related type of birthplace and zero otherwise.

Table 4. 3: Summary Statistics of Socioeconomic Characteristics for Individuals Aged 17-28

| Variable | Number of Observations | \% of Obs. |
| :---: | :---: | :---: |
| Age |  |  |
| 17 | 704 | 10.56 |
| 18 | 718 | 10.77 |
| 19 | 581 | 8.72 |
| 20 | 638 | 9.57 |
| 21 | 548 | 8.22 |
| 22 | 567 | 8.51 |
| 23 | 606 | 9.1 |
| 24 | 596 | 8.94 |
| 25 | 591 | 8.86 |
| 26 | 525 | 7.87 |
| 27 | 580 | 8.7 |
| 28 | 12 | 0.18 |
| Total | 6665 | 100 |
| Sex |  |  |
| Male | 3348 | 50.24 |
| Female | 3317 | 49.76 |
| Total | 6665 | 100 |
| Region of Birthplace (NUTS-1) |  |  |
| Istanbul | 883 | 13.39 |
| West Marmara | 213 | 3.24 |
| Aegean | 681 | 10.33 |
| East Marmara | 510 | 7.74 |
| West Anatolia | 514 | 7.8 |
| Mediterranean | 815 | 12.37 |
| Central Anatolia | 399 | 6.06 |
| West Black Sea | 470 | 7.14 |
| East Black Sea | 240 | 3.65 |
| Northeast Anatolia | 330 | 5 |
| Central East Anatolia | 537 | 8.14 |
| Southeast Anatolia | 998 | 15.14 |
| Total | 6590 | 100 |
| Type of Birtplace |  |  |
| Province center | 2402 | 36.39 |
| District center | 2322 | 35.19 |
| Sub-district/village | 1876 | 28.43 |
| Total | 6600 | 100 |

Notes: The sample weights are considered.
Source: Own calculations, using 2018 TDHS.

Table 4.4: Summary Statistics of Socioeconomic Characteristics by the Treatment Status

| Variable | Not Treated |  | Treated |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Number of Observations \% of Obs |  | Number of Observations \% of Obs |  |
| Sex |  |  |  |  |
| Male | 2020.00 | 50.9 | 1328.00 | 49.3 |
| Female | 1951.00 | 49.1 | 1366.00 | 50.7 |
| Total | 3971.00 | 100.0 | 2694.00 | 100.0 |
| Region of Birthplace (NUTS-1) |  |  |  |  |
| Istanbul | 503.00 | 12.8 | 380.00 | 14.2 |
| West Marmara | 116.00 | 3.0 | 97.00 | 3.6 |
| Aegean | 401.00 | 10.2 | 280.00 | 10.5 |
| East Marmara | 297.00 | 7.6 | 214.00 | 8.0 |
| West Anatolia | 299.00 | 7.6 | 216.00 | 8.1 |
| Mediterranean | 495.00 | 12.6 | 319.00 | 12.0 |
| Centrel Anatolia | 254.00 | 6.5 | 145.00 | 5.4 |
| West Black Sea | 285.00 | 7.3 | 185.00 | 6.9 |
| East Black Sea | 151.00 | 3.9 | 89.00 | 3.3 |
| Northeast Anatolia | 194.00 | 4.9 | 136.00 | 5.1 |
| Central East Anatolia | 334.00 | 8.5 | 202.00 | 7.6 |
| Southeast Anatolia | 591.00 | 15.1 | 407.00 | 15.3 |
| Total | 3920.00 | 100.0 | 2670.00 | 100.0 |
| Type of Birthplace |  |  |  |  |
| Province center | 1404.00 | 35.8 | 999.00 | 37.3 |
| District center | 1388.00 | 35.4 | 934.00 | 34.9 |
| Sub-district/village | 1132.00 | 28.9 | 743.00 | 27.8 |
| Total | 3924.00 | 100.0 | 2676.00 | 100.0 |

Notes: The sample weights are considered. Not treated group consists of individuals born in 1991-1997 and treated group consists of individuals born in 1998-2001.
Source: Own calculations, using 2018 TDHS.

Table 4.4 shows the socioeconomic characteristics of individuals by the treatment status. The number of observations of both sexes is also balanced in the untreated and treated groups. The distribution of individuals across region of birthplace and the type of birthplace are also very similar in these groups. Therefore, it can be said that the treated and untreated groups are very similar in terms of socioeconomic characteristics, making them comparable in outcome variables.

### 4.1.4. The Descriptive Statistics of Variables

The basic features of the variables related to high school education and socioeconomic characteristics are presented in Table 4.5. for the overall sample. Since we carry out
our analysis by choosing subsamples from the overall sample, the descriptive statistics are also presented by the sex and by the type of birthplace, in Table 4.6. and 4.7., respectively. We have four subsamples in addition to overall sample: male sample that includes only males, female sample that includes only females, province/district sample that consists of only those who born only in these regions, and subdistrict/village sample that consists of only those who born there.

The highest educational level includes seven categories, as noted before. Therefore, the percentage of observations in each category is presented for this variable. As seen in Table 4.5, $65 \%$ of individuals completed high school education or a higher level of education in the overall sample, whereas $12.5 \%$ of the observations are with incomplete high school education for the overall sample. The percentage of males and females completing high school or higher is similar, $64.1 \%$ and $65.9 \%$, respectively. On the other hand, $16.4 \%$ of the male sample drops out of high school, whereas only $8.6 \%$ of the females had incomplete high school education (Table 4.6) Anyway, there is not a big difference between the highest grade completed by males females and males (Table 4.6).

If we compare the highest educational level of those born in the province/district center and subdistrict/village, $72.1 \%$ of the observations in the province/district center completed high school or a higher level, while only $47.3 \%$ of observations in the subdistrict/province center completed these levels. The proportion of high school dropouts in the subdistrict/village sample (14.4 \%) is higher than that of the province/district center sample (11.7 \%) (Table 4.7).

The highest grade completed can be any grade level in between 0 and 19. The average grade attainment is 11.39 for the overall sample, while female's average grade completion is a bit higher than the males. However, there exists 1.65 years difference in the grade completion of those who were born in subdistrict/village, and in province/district centers (Table 4.7). The adverse cultural norms toward education, and generally the higher distance to schools increases the psychic and monetary costs in sub-district regions or in villages, which are mostly rural areas.

Table 4. 5: Descriptive Statistics of the Variables for All Individuals Aged 17-28

| Variable | Obs | \% of Obs |
| :---: | :---: | :---: |
| Highest Educational Level |  |  |
| No education (0) | 153 | 2.3 |
| Incomplete primary (1) | 60 | 0.9 |
| Complete primary (2) | 241 | 3.6 |
| Incomplete secondary (3) | 118 | 1.8 |
| Complete secondary (4) | 926 | 13.9 |
| Incomplete high school (5) | 830 | 12.5 |
| Complete high school / higher (6) | 4321 | 65.0 |
| Total | 6,650 | 100 |
| Variable | Obs | Mean |
| Highest Grade Completed | 6435.00 | 11.39 |
|  |  | 3.04 |
| Age | 6665.00 | 21.80 |
|  |  | 3.21 |
| Male | 6665.00 | 0.50 |
|  |  | 0.50 |
| Istanbul | 6590.00 | 0.13 |
|  |  | 0.34 |
| West Marmara | 6590.00 | 0.03 |
|  |  | 0.18 |
| Aegean | 6590.00 | 0.10 |
|  |  | 0.30 |
| East Marmara | 6590.00 | 0.08 |
|  |  | 0.27 |
| West Anatolia | 6590.00 | 0.08 |
|  |  | 0.27 |
| Mediterranean | 6590.00 | 0.12 |
|  |  | 0.33 |
| Central Anatolia | 6590.00 | 0.06 |
|  |  | 0.24 |
| West Black Sea | 6590.00 | 0.07 |
|  |  | 0.26 |
| East Black Sea | 6590.00 | 0.04 |
|  |  | 0.19 |
| Northeast Anatolia | 6590.00 | 0.05 |
|  |  | 0.22 |
| Central East Anatolia | 6590.00 | 0.08 |
|  |  | 0.27 |
| Southeast Anatolia | 6590.00 | 0.15 |
|  |  | 0.36 |
| Province center | 6600.00 | 0.36 |
|  |  | 0.48 |
| District center | 6600.00 | 0.35 |
|  |  | 0.48 |
| Sub-district/village | 6600.00 | 0.28 |
|  |  | 0.45 |

Notes: The sample weights are considered. Standard deviations are below the mean values.
Source: Own calculations, using 2018 TDHS.

Table 4. 6: Descriptive Statistics of the Variables by Sex for Individuals aged 17-28

| Variable | Male |  | Female |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Obs | \% of Obs | Obs | \% of Obs |
| Highest Educational Level |  |  |  |  |
| No education (0) | 50 | 1.5 | 104 | 3.1 |
| Incomplete primary (1) | 20 | 0.6 | 40 | 1.2 |
| Complete primary (2) | 89 | 2.7 | 152 | 4.6 |
| Incomplete secondary (3) | 54 | 1.6 | 64 | 1.9 |
| Complete secondary (4) | 438 | 13.2 | 489 | 14.7 |
| Incomplete high school (5) | 544 | 16.4 | 285 | 8.6 |
| Complete high school / higher (6) | 2135 | 64.1 | 2187 | 65.9 |
| Total | 3330 | 100 | 3320 | 100 |
| Variable | Obs | Mean | Obs | Mean |
| Highest Grade Completed | 3250 | 11.36 | 3185 | 11.41 |
|  |  | 2.90 |  | 3.18 |
| Age | 3339 | 21.86 | 3326 | 21.74 |
|  |  | 3.21 |  | 3.21 |
| Istanbul | 3299 | 0.13 | 3291 | 0.13 |
|  |  | 0.34 |  | 0.34 |
| West Marmara | 3299 | 0.03 | 3291 | 0.03 |
|  |  | 0.18 |  | 0.18 |
| Aegean | 3299 | 0.11 | 3291 | 0.10 |
|  |  | 0.31 |  | 0.30 |
| East Marmara | 3299 | 0.08 | 3291 | 0.08 |
|  |  | 0.27 |  | 0.27 |
| West Anatolia | 3299 | 0.08 | 3291 | 0.08 |
|  |  | 0.27 |  | 0.27 |
| Mediterranean | 3299 | 0.12 | 3291 | 0.12 |
|  |  | 0.33 |  | 0.33 |
| Central Anatolia | 3299 | 0.06 | 3291 | 0.06 |
|  |  | 0.24 |  | 0.24 |
| West Black Sea | 3299 | 0.07 | 3291 | 0.07 |
|  |  | 0.25 |  | 0.26 |
| East Black Sea | 3299 | 0.04 | 3291 | 0.03 |
|  |  | 0.19 |  | 0.18 |
| Northeast Anatolia | 3299 | 0.05 | 3291 | 0.05 |
|  |  | 0.22 |  | 0.22 |
| Central East Anatolia | 3299 | 0.08 | 3291 | 0.08 |
|  |  | 0.27 |  | 0.28 |
| Southeast Anatolia | 3299 | 0.15 | 3291 | 0.16 |
|  |  | 0.35 |  | 0.36 |
| Province center | 3306 | 0.35 | 3294 | 0.37 |
|  |  | 0.48 |  | 0.48 |
| District center | 3306 | 0.35 | 3294 | 0.35 |
|  |  | 0.48 |  | 0.48 |
| Sub-district/village | 3306 | 0.29 | 3294 | 0.28 |
|  |  | 0.45 |  | 0.45 |

Notes: The sample weights are considered. Standard deviations are below the mean values.
Source: Own calculations, using 2018 TDHS

Table 4.7: Descriptive Statistics of the Variables by the Type of Birthplace for Individuals aged 17-28

| Variable | Province/ District Center |  | Sub-district/ Village |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Obs | \% of Obs | Obs | \% of Obs |
| Highest Educational Level |  |  |  |  |
| No education (0) | 56 | 1.3 | 106 | 4.9 |
| Incomplete primary (1) | 28 | 0.6 | 35 | 1.6 |
| Complete primary (2) | 95 | 2.1 | 160 | 7.4 |
| Incomplete secondary (3) | 63 | 1.4 | 54 | 2.5 |
| Complete secondary (4) | 479 | 10.8 | 470 | 21.8 |
| Incomplete high school (5) | 517 | 11.7 | 311 | 14.4 |
| Complete high school / higher (6) | 3191 | 72.1 | 1022 | 47.3 |
| Total | 4428 | 100 | 2158 | 100 |
| Variable | Obs | Mean | Obs | Mean |
| Highest Grade Completed | 4341 | 11.84 | 2037 | 10.19 |
|  |  | 2.88 |  | 3.12 |
| Age | 4435 | 21.77 | 2165 | 21.84 |
|  |  | 3.21 |  | 3.21 |
| Male | 4435 | 0.49 | 2165 | 0.51 |
|  |  | 0.50 |  | 0.50 |
| Istanbul | 4429 | 0.18 | 2161 | 0.02 |
|  |  | 0.38 |  | 0.13 |
| West Marmara | 4429 | 0.03 | 2161 | 0.03 |
|  |  | 0.18 |  | 0.18 |
| Aegean | 4429 | 0.11 | 2161 | 0.08 |
|  |  | 0.32 |  | 0.27 |
| East Marmara | 4429 | 0.09 | 2161 | 0.04 |
|  |  | 0.29 |  | 0.20 |
| West Anatolia | 4429 | 0.10 | 2161 | 0.03 |
|  |  | 0.29 |  | 0.18 |
| Mediterranean | 4429 | 0.12 | 2161 | 0.13 |
|  |  | 0.33 |  | 0.33 |
| Central Anatolia | 4429 | 0.06 | 2161 | 0.06 |
|  |  | 0.24 |  | 0.24 |
| West Black Sea | 4429 | 0.06 | 2161 | 0.10 |
|  |  | 0.24 |  | 0.29 |
| East Black Sea | 4429 | 0.03 | 2161 | 0.05 |
|  |  | 0.17 |  | 0.22 |
| Northeast Anatolia | 4429 | 0.03 | 2161 | 0.09 |
|  |  | 0.18 |  | 0.29 |
| Central East Anatolia | 4429 | 0.06 | 2161 | 0.14 |
|  |  | 0.24 |  | 0.34 |
| Southeast Anatolia | 4429 | 0.12 | 2161 | 0.23 |
|  |  | 0.33 |  | 0.42 |

Notes: The sample weights are considered. Standard deviations are below the mean values.
Source: Own calculations, using 2018 TDHS.

The average age is approximately 22 in the overall sample and in other sample specifications. The number of males and females is balanced in the overall sample. In addition, for those born in subdistrict/villages and in province/district centers, the number of males and females is also balanced. If we look at the distribution of observations across the region of birthplaces, most observations were born in Southeast Anatolia or Central East Anatolia, provided that individuals were born in subdistricts/villages. If those who were born in Province/District Centers are considered, most of the observations were born in the İstanbul region or in Southeast Anatolia. Lastly, it is shown that most of the observations were born in the province or district center in the overall sample in the male sample and in the female sample (Table 4.5 and 4.6).

### 4.1.5. The Descriptive Statistics of the Outcome Variables

Since we aim to track the changes in the educational outcomes stemming from the 2012 education reform, the descriptive statistics of these variables will be discussed in detail in this section. In line with this purpose, we will make a grade-by-grade comparison of treated and untreated persons.

As noted in section 4.1.3.1, five dummy variables are defined for the empirical analysis: four dummy variables for at least the $9^{\text {th }}$ grade completion, the $10^{\text {th }}$ grade completion, the $11^{\text {th }}$ grade completion, the $12^{\text {th }}$ grade completion, and a dummy variable for at least some high school attendance.

We expect an increase in the average rate of high school attendance after exposure to the compulsory schooling policy (treatment). Since high school education was made compulsory, those who prefer dropping out upon the completion of lower secondary school would have to continue high school education after the reform. As a result, at least individuals' transition to the high school from lower secondary school will improve although they do not complete any grade of high school. Moreover, we expect an increase in the average grade completion rates after compulsory schooling policy (treatment), although the impact of the policy might decline as individuals progress to the higher grades.

We expect a greater improvement in females' schooling outcomes (compared to males) and in the schooling outcomes of those born in sub-district/villages (compared to those born in province/district centers). Compulsory schooling policies can be used to reduce both the monetary and non-monetary costs of schooling attainment. However, the cost reduction affects the schooling attainment of females and of those born in subdistrict/village centers since the price elasticity of schooling demand is higher for these groups (Orazem and King, 2008). The next chapter will explain why the 2012 compulsory education policy reduces the costs of high school attainment by using empirical results from the model.

Table 4.8, 4.9 and 4.10. shows the descriptive statistics of outcome variables. The average rate of at least some high school attendance, regardless of the grade completion is higher for the treatment group than for the control(untreated) group, across all sample specifications. The impact of the reform is greater for females (from 0.68 to 0.84 ) than for males (from 0.77 to 0.86 ); and for those with subdistrict/village birthplace (from 0.53 to 0.75 ) than for those with province/district center birthplace (from 0.80 to 0.89 ).

The average rate of at least the $9^{\text {th }}, 10^{\text {th }}$ and $11^{\text {th }}$ grade completion is higher for the treatment group than for the control group in the overall sample and in all other sample specifications, except the male sample. There is a small deterioration in the average rate of $11^{\text {th }}$ grade completion in the male subsample after the education reform, which might be resulting from grade repetition or dropouts from high school. Besides, the improvement in the grade completion rates declines from the $9^{\text {th }}$ through the $11^{\text {th }}$ grade for males, again suggests the possibility of grade repetition.

The average rate of at least the $12^{\text {th }}$ grade completion is lower for the treatment group than for the untreated group in the overall sample and in all other sample specifications, except the sub-district/village sample. The lower high school completion may be due to the fact that the treatment group is younger than the control group. Class repetition may delay graduation beyond age 17. Furthermore, older individuals (the control group) may finish high school by taking an external graduation exam. That the $12^{\text {th }}$ grade completion drops so drastically for the treatment group as
compared to the control group from grade 11 to grade 12 supports our claim that the lower completion is possible due to the age difference between the two groups.

The impact of the reform on grade completion rates is most visible for females, and for those who were born in subdistrict/village regions. Especially in the subdistrict/village sample, the increase in the average values from untreated to treated ones is substantial, partly due to the lower pre-reform averages, even though there is no difference in the $12^{\text {th }}$ grade completion rates.

Overall, the descriptive statistics of the schooling outcomes suggest that the education reform might be a beneficial tool in increasing at least high school attendance after lower secondary school, or it might improve the average grade completion rates, except the $12^{\text {th }}$ grade or higher grade completion. However, looking only the mean values might be misleading. The impact of the 2012 education reform on the schooling outcomes of the individuals will be examined by using more sophisticated methodologies in the next chapter.

Table 4. 8: Descriptive Statistics of the Outcome Variables for the Overall Sample

| Variable | Overall |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Not Treated |  | Treated |  |
|  | Obs | Mean | Obs | Mean |
| High School Attendance | 3959 | 0.73 | 2691 | 0.85 |
|  |  | 0.45 |  | 0.36 |
| Grade 9 | 3804 | 0.71 | 2631 | 0.82 |
|  |  | 0.45 |  | 0.38 |
| Grade 10 | 3804 | 0.67 | 2631 | 0.77 |
|  |  | 0.47 |  | 0.42 |
| Grade 11 | 3804 | 0.65 | 2631 | 0.70 |
|  |  | 0.48 |  | 0.46 |
| Grade 12 | 3804 | 0.62 | 2631 | 0.50 |
|  |  | 0.49 |  | 0.50 |

Notes: The sample weights are considered. Standard deviations are below the mean values.
Source: Own calculations, using 2018 TDHS.

Table 4. 9: Descriptive Statistics of the Outcome Variables by Sex

| Variable | Male |  |  |  | Female |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Not Treated |  | Treated |  | Not Treated |  | Treated |  |
|  | Obs | Mean | Obs | Mean | Obs | Mean | Obs | Mean |
| At least Some High School Attendancr 2013 |  | 0.77 | 1317 | 0.86 | 1946 | 0.68 | 1374 | 0.84 |
|  |  | 0.42 |  | 0.35 |  | 0.47 |  | 0.36 |
| 9th Grade Completion | 1967 | 0.73 | 1283 | 0.81 | 1837 | 0.69 | 1348 | 0.84 |
|  |  | 0.44 |  | 0.39 |  | 0.46 |  | 0.37 |
| 10th Grade Completion | 1967 | 0.68 | 1283 | 0.75 | 1837 | 0.66 | 1348 | 0.80 |
|  |  | 0.46 |  | 0.44 |  | 0.48 |  | 0.40 |
| 11th Grade Completion | 1967 | 0.66 | 1283 | 0.65 | 1837 | 0.64 | 1348 | 0.74 |
|  |  | 0.47 |  | 0.48 |  | 0.48 |  | 0.44 |
| 12th Grade Completion | 1967 | 0.62 | 1283 | 0.47 | 1837 | 0.62 | 1348 | 0.54 |
|  |  | 0.48 |  | 0.50 |  | 0.49 |  | 0.50 |

Notes: The sample weights are considered. Standard deviations are below the mean values.
Source: Own calculations, using 2018 TDHS.

Table 4. 10: Descriptive Statistics of the Outcome Variables by the Type of Birthplace

| Variable | Province/ District Center |  |  |  | Sub-district/ Village |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Not Treated |  | Treated |  | Not Treated |  | Treated |  |
|  | Obs | Mean | Obs | Mean | Obs | Mean | Obs | Mean |
| At least Some High School Attendance | 2637 | 0.80 | 1791 | 0.89 | 1276 | 0.53 | 882 | 0.75 |
|  |  | 0.40 |  | 0.31 |  | 0.50 |  | 0.43 |
| 9th Grade Completion | 2579 | 0.78 | 1762 | 0.86 | 1183 | 0.52 | 854 | 0.73 |
|  |  | 0.41 |  | 0.34 |  | 0.50 |  | 0.45 |
| 10th Grade Completion | 2579 | 0.75 | 1762 | 0.82 | 1183 | 0.46 | 854 | 0.67 |
|  |  | 0.43 |  | 0.39 |  | 0.50 |  | 0.47 |
| 11th Grade Completion | 2579 | 0.73 | 1762 | 0.74 | 1183 | 0.44 | 854 | 0.59 |
|  |  | 0.44 |  | 0.44 |  | 0.50 |  | 0.49 |
| 12th Grade Completion | 2579 | 0.70 | 1762 | 0.54 | 1183 | 0.42 | 854 | 0.42 |
|  |  | 0.46 |  | 0.50 |  | 0.49 |  | 0.49 |

Notes: The sample weights are considered. Standard deviations are below the mean values.
Source: Own calculations, using 2018 TDHS.

### 4.2. Identification Method

The impact assessment methods allow for measuring the impact of programs and policies implemented. The primary purpose of these methods is to assess the effect of a policy change or a new program. These methods are also used specifically to understand the success of public policies in reaching the target outcomes. Therefore, the use of these methods conforms with the primary aim of this thesis since our aim is
to understand the impact of the change in the compulsory schooling policy on schooling outcomes related to high school.

The post-policy impact assessment methods include both randomized trials and natural experiments. In controlled randomized trials, the impact of an intervention is measured by comparing the control and treatment groups. The control group constitutes individuals who do not receive any intervention, while the treatment group constitutes individuals who are affected by the policy or program implemented. An ideal control group successfully represents the treatment group as a counterfactual. Furthermore, the random assignment of individuals to the treatment and control groups eliminates the lack of comparability between the groups by eliminating the selection bias in the randomized trials. In this way, the average causal effect of an intervention is identified (Angrist and Pischke, 2014).

However, since the experimental methods are costly to implement or sometimes it is impossible to assign subjects to the treatment randomly, the use of natural experiments is preferred over the use of randomized trials among the post-policy impact assessment methods. In the controlled randomized experiments, researchers are able to identify the effect of a specific intervention by isolating the impact of events that are unrelated to the intervention in question. However, in natural experiments, a group of individuals is affected by an intervention that is beyond the control and the intention of the researcher while the other group is not affected. This is the main difference between natural experiments and controlled randomized experiments. Natural experiments use the readily available observational data, and they resemble the randomized trials in the sense that there is some degree of random assignment and some controls (DiNardo, 2010).

### 4.2.1. Regression Discontiunity Design

As a quasi-experimental microeconomic method, the Regression Discontinuity Design $(R D D)$ is one of the most commonly used methods in identifying the effect of a policy. The RDD is defined as a nonexperimental tool of estimating the treatment effect when the treatment status is determined by an observable running variable (Thistlethwaite
and Campell, 1960). The power of the RDD comes from the fact that when the necessary conditions are met, the results are as successful as results from a randomized experiment in evaluating the impact of any policy since individuals are assigned to the treatment almost randomly (Angrist and Pischke, 2014). Since the interest of the empirical analysis in this thesis is to assess the impact of the change in the compulsory schooling policy in 2012 on the schooling outcomes of high school students, we can employ the RDD methodology.

The main idea behind the RDD is that the treatment status is a deterministic and discontinuous function of an observed and predetermined running variable (equivalently, assignment variable or forcing variable). The running variable is a variable determining whether an individual is treated or not, based on a predetermined cutoff (threshold) value (Lee and Lemieux, 2010). Individuals are divided into two groups as control and treatment groups according to the cutoff value. Generally, individuals who are above the cutoff get the treatment, while those who are below the cutoff serve as a control group. Therefore, the cutoff value must be known in order to identify these groups since treatment status is assigned based on a cutoff.

### 4.2.1.1. Treatment and Control Groups

In our research setting, individuals are assigned to the treatment and to the control groups based on their birth years. Students who completed the $8^{\text {th }}$ grade in the 20112012 school year had to enroll in high school in the fall of the 2012-2013 school year as a result of the new compulsory schooling law. By assuming that the school starting age is six and by considering that the duration of the basic education is eight years, it is concluded that the compulsory education reform affected those who were born in 1998 and onwards. Therefore, while the running variable is the birth year, the cutoff value in our RD analysis is the year 1998.
$\mathrm{D}_{\mathrm{i}}=\left\{\begin{array}{l}0 \text { if birth year }<1998 \\ 1 \text { if birth year } \geq 1998\end{array} \quad\right.$ or equivalently
$\mathrm{D}_{\mathrm{i}}=\left\{\begin{array}{l}0 \text { if }(\text { birth year }-1998)<0 \\ 1 \text { if }(\text { birth year }-1998) \geq 0\end{array}\right.$

Let $D_{i}$ denotes the dichotomous treatment status for an individual $i$. It takes the value of zero if the individual was born before 1998 (the control group) and takes the value of 1 if was born in 1998 and onwards (the treatment group). Equivalently, to normalize the cutoff value at zero, the difference between birth year and the cutoff (i.e., 1998) can be used as the running variable.

As noted earlier, policy treatment status, $D_{i}$, has to be a deterministic and discontinuous function of the running variable, in our case the year of birth. Namely, if we know the year of birth, we know the treatment status $D_{i,}$; the treatment status $D_{i}$ switches from 0 to 1 only at the cutoff point since the treatment is assigned discontinuously based on the cutoff. No change in treatment status must be observed except for the cutoff value.

Table 4. 11: The Number of Observations in the Control and Treatment Group by the Year of Birth

| Policy |  |  |  |
| :---: | :---: | :---: | :---: |
| Birth Year | $D=0$ | $\mathrm{D}=1$ |  |
| 1991 | 560 | 0 |  |
| 1992 | 522 | 0 |  |
| 1993 | 590 | 0 |  |
| 1994 | 576 | 0 |  |
| 1995 | 593 | 0 |  |
| 1996 | 576 | 0 |  |
| 1997 | 554 | 0 |  |
| 1998 | 0 | 637 |  |
| 1999 | 0 | 579 |  |
| 2000 | 0 | 729 |  |
| 2001 | 0 | 749 |  |
| Total | 3,971 | 2,694 | 6,665 |

Source: Own calculations, using 2018 TDHS.

The information on the age of respondents (for both men and women) is given in the household questionnaire. We can reach the information on the respondents' year of birth by subtracting the respondent's age from the year of the survey. Hence, we have a running variable that can be used to reveal the impact of the new compulsory
schooling policy. We have four birth cohorts (1998-2001) that are affected by the education reform, and seven cohorts (1991-1997) that are not affected. In addition, while 3791 observations are not affected by the reform, 2694 observations are affected (Table 4.11).

### 4.2.1.2. Validity of the Year of Birth as the Running Variable

For the running variable to be valid, the existence of a treatment variable that is discontinuously determined by the running variable is not sufficient, and other conditions must be met to use RDD. For example, individuals must not be able to exactly choose their running variable, and as a result their treatment status (Lee and Lemieux, 2010). Similarly, the authority determining the cutoff value must not be able to decide upon the cutoff by looking at the value of the running variable of each individual. That means, the cutoff value should be independent of the running variable. If individuals can exactly manipulate their treatment status, or researchers can manipulate the value of the cutoff value, then individuals are not randomly assigned to the treatment effectively (Huntington-Klein, 2021).

In our case, the birth year is determined before the implementation of the policy, and individuals are not able to manipulate (change) their own birth year to get or not to get the treatment. Furthermore, the timing of the new compulsory schooling policy depends on the political developments and the ideological understanding of the time. As mentioned in Chapter 3, the 2012 reform is aimed at reviving religious education, which had constrained by the 1997 education reform.

The manipulation of the running variable can be visually tested by the density plot of the running variable (the centered year of birth), as shown in Figure 4.1. There seems no discontinuity or heaping in the distribution, around the threshold, which means there is no manipulation. In addition to visual test, formal test can be used. The result of the formal test of the manipulation that uses local polynomial density estimation reveals that the null hypothesis that there exists manipulation is rejected at the $95 \%$ significance level. Therefore, using the birth date as the running variable is a valid
approach for the RDD, and the existence of a running variable that cannot be manipulated takes us to the continuity assumption.

$\mathrm{p}=0.6198$

Notes: The cutoff value is centered at zero. p-value from formal manipulation test is calculated as 0.6198.

Source: Own calculations, using 2018 TDHS.

Figure 4.1: Density Distribution of the Running Variable for all Sample

### 4.2.1.3. Continuity Assumption

As noted earlier, the strength of the RDD approach over other natural experiment strategies comes from that individuals are assigned to the treatment almost randomly. This is an inevitable consequence of the assumption that individuals cannot exactly control the value of their own running variable around the cutoff. As a result, although the assignment to a treatment is not randomized as good as in a natural experiment, the RDD methodology gives estimates similar to the randomized experiments in explaining the impact of a policy change or a new program (Lee, 2008).

The crux of the RDD is the assumption of smoothness of the outcome at the cutoff. That means, nothing must change at the cutoff, except the treatment status. The
continuity assumption suggests that all other factors that might affect the outcome must be continuous with respect to the running variable (Hahn et al., 2001). That means, if there would not be any treatment, then there would be no jump at the cutoff if the continuity assumption holds. If this assumption is satisfied, the outcomes for the individuals in the control group serve as a valid counterfactual for those who are affected by a policy change. And in this way, we can attribute the discontinuous change, the jump, in the outcome near the cutoff to the treatment (Huntington-Klein, 2021). On the other hand, if other variables also change at the cutoff, then the RDD estimates would be biased (Lee and Lemieux, 2010). The visual test for the continuity assumption are provided in the next chapter.

### 4.2.1.4. Estimation with the Regression Discontinuity Design

The problem with identifying the impact of a treatment is that individuals are either affected or not affected by a policy change. That is, it is impossible to observe the same individual at both situations at the same time (Hahn et al., 2001). The RDD enables the estimation of the impact of any intervention by focusing on the discontinuity of the outcome variable near the cutoff. The impact of the treatment is directly measured by the "direction and magnitude" of the jump at the outcome variable for individuals who are close to the cutoff. By focusing on a small interval (a bandwidth) around cutoff, the RDD ensures that the differences between the individuals who are just below and just above the threshold are random. Because confounding factors are eliminated within this bandwidth, individuals are assumed to be identical on average, except for the treatment status (Jacob et.al, 2012). The advantage of the RDD is that the control and the treatment groups are very similar in terms of other factors that might affect the outcome of interest, apart from the policy. That is, RDD estimates also consider the unobserved differences between the individuals.

Nonetheless, we also controlled for some characteristics of the respondents, such as sex, the region of the birthplace, and the type of birthplace, to make sure that we eliminated the confounding factors and rendered the individuals who are to the right and to the left of the cutoff comparable. Although the RDD approach, by nature,
ensures the comparability of individuals, adding controls improves the precision of the estimates by shrinking residuals (Huntington-Klein, 2021).

Figure 4.2. illustrates the main idea behind the RDD design in a hypothetical situation. The horizontal axis shows the value of the running variable, while the vertical line is the cutoff line passing through the cutoff value. On the other hand, the vertical axis shows the outcome variable $(Y)$ that we want to assess the impact of the treatment on. As mentioned before, $D i$ is a dummy variable taking the value of 1 if the individual $i$ is affected by the treatment (at the right side of the cutoff line), and 0 otherwise (at the left side of the cutoff line).

The impact of any intervention is estimated by the Average Treatment Effect (ATE). The theoretical framework of the ATE is explained in Angrist and Pischke (2014). Suppose for individual $i$, there exists two potential outcomes: $\mathrm{Y}_{0, \mathrm{i}}$ showing the outcome if she is not treated and $\mathrm{Y}_{1, \mathrm{i}}$, showing the outcome if she is treated. Then, the impact of the treatment is shown by:
$\left[\mathrm{Y}_{1, \mathrm{i}-}-\mathrm{Y}_{0, \mathrm{i}}\right]$ for individual $i$.


Source: Drawn by employing random data by following Marcelo Perraillon procedure (Cunningham, 2021).

Figure 4.2: Illustration of the Sharp Regression Discontinuity Design

However, we cannot observe the outcome $\mathrm{Y}_{0, \mathrm{i}}$ and $\mathrm{Y}_{1, \mathrm{i}}$ at the same time since the individual $i$ is either treated or not. Because it is not possible to find the impact of treatment at the individual level, the Average Treatment Effect (ATE) is employed in the evaluation of the impact of policies. For those who affected by the policy, the average outcome $E\left[Y_{1, i} / D_{i}=1\right]$ is observed at the right side of the cutoff while for those who are not affected, the average outcome $\mathrm{E}\left[\mathrm{Y}_{0, \mathrm{i}} / \mathrm{D}_{\mathrm{i}}=0\right]$ is observed at the left side of the cutoff (Figure 4.2). And the ATE is found by the difference between the average outcomes in the treatment group and in the control group, which is:
$\mathrm{E}\left[\mathrm{Y}_{1, \mathrm{i}} / \mathrm{D}_{\mathrm{i}}=1\right]-\mathrm{E}\left[\mathrm{Y}_{0, \mathrm{i}} / \mathrm{D}_{\mathrm{i}}=0\right]$

If the average causal impact of the policy $(p)$ is constant for everybody in the treatment group, then it is expected that for those who are treated:

$$
\begin{equation*}
\mathrm{Y}_{1, \mathrm{i}}=\mathrm{Y}_{0, \mathrm{i}}+p \text {, and } \mathrm{E}\left[\mathrm{Y}_{1, \mathrm{i}} / \mathrm{D}_{\mathrm{i}}=1\right]=\mathrm{E}\left[\mathrm{Y}_{0, \mathrm{i}} / \mathrm{D}_{\mathrm{i}}=1\right]+p \tag{4.3}
\end{equation*}
$$

where $p$ denotes the average treatment effect (ATE) of the policy. Then the difference between the average outcomes in the treatment group and in the control group is:
$\mathrm{E}\left[\mathrm{Y}_{1, \mathrm{i}} / \mathrm{D}_{\mathrm{i}}=1\right]-\mathrm{E}\left[\mathrm{Y}_{0, \mathrm{i}} / \mathrm{D}_{\mathrm{i}}=0\right]=\mathrm{E}\left[\mathrm{Y}_{0, \mathrm{i}} / \mathrm{D}_{\mathrm{i}}=1\right]-\mathrm{E}\left[\mathrm{Y}_{0, \mathrm{i}} / \mathrm{D}_{\mathrm{i}}=0\right]+p$

Since the treatment status $D_{i}$ is almost randomly assigned around the cutoff in the RDD, the average outcome for treatment group if it were not treated (counterfactual) , $\mathrm{E}\left[\mathrm{Y}_{0, i} / \mathrm{D}_{\mathrm{i}}=1\right]$, is assumed to be equal to the observed average outcome for the control group, $E\left[Y_{0, i} / D_{i}=0\right]$. That means, the control group is a valid counterfactual for the treatment group and the selection bias is eliminated:

Selection bias: $E\left[Y_{0, i} / D_{i}=1\right]-E\left[Y_{0, i} / D_{i}=0\right]=0$

Then, $\operatorname{ATE}(p)$ is found as the difference between the average outcomes in the treatment group and in the control group:
$\operatorname{ATE}=\mathrm{E}\left[\mathrm{Y}_{1, \mathrm{i}} / \mathrm{D}_{\mathrm{i}}=1\right]-\mathrm{E}\left[\mathrm{Y}_{0, \mathrm{i}} / \mathrm{D}_{\mathrm{i}}=0\right]=p$
(Angrist and Pischke, 2014).

ATE estimates the effect of receiving treatment for everybody. To identify ATE, those assigned to the treatment group must be treated, and those assigned to the control group must be really untreated. Another important concept that is related to the concept of ATE is the Local Average Treatment Effect (LATE). Basically, it is the effect of receiving treatment for compliers. In other words, the ATE for only compliers (Angrist and Imbens, 1994). It is estimated for a certain sub-population and weighted ATE for those close to the cutoff value (Huntington-Klein, 2021).

In our research setting, there might be imperfect compliance with the new education law due to starting school later or earlier than age six, or grade repetition. This situation prevents us from identifying ATE as an estimator. Furthermore, the purpose of our research is to find the impact of 2012 education reform on schooling outcomes, regardless of the compliance with the law. In this situation, since we do not consider the possibility of imperfect compliance and we look at the impact of treatment assignment, Intention-to-Treat (ITT) estimator is a more feasible option.

In case of imperfect compliance with the policy, the treatment assignment and treatment received by the subject differ from each other. Therefore, the policy effect that we estimate is the ITT effect. ITT measures the impact of treatment assignment regardless of compliance (Angrist and Pischke, 2014). It consists of each subject randomized to the treatment assignment and ignores what happens after randomization (Gupta, 2011). Wertz (1995) states many reasons for using the ITT principle: it ensures prognostic balance provided by randomization, preserves sample size, and works in environments where defining compliance is difficult. In our research setting, the ITT is advantageous since it preserves the sample size and provides more generalizable results since some people would not comply with the law in usual circumstances.

On the other hand, since the ITT does not consider noncompliance and measures the effect of assignment, it is smaller than the average causal effect of treatment on compliers (LATE). That means it underestimates the magnitude of the treatment effect on compliers, although it is an unbiased estimator since it preserves the prognostic balance provided by randomization (McCoy, 2017). In fact, while the treatment assignment is random, noncompliance might not be. For this reason, comparing those actually treated with untreated may deliver biased results, which causes uncontrolled comparisons. On the other hand, ITT overcomes this and provides unbiased estimators.

The estimate of the treatment effect is represented by the jump from point A to B, that is, B-A (Figure 4.2.) The discontinuous increase at the cutoff is attributed to the impact of the treatment since individuals within a specific bandwidth are assumed to be identical on average, except for the treatment status in the RDD.

### 4.2.1.5. The Sharp Regression Discontinuity Design

The regression discontinuity design can be characterized in two forms: fuzzy design and sharp design. If the cutoff value is the only factor determining the treatment status, then the sharp RDD can be used. The treatment status is a deterministic function of the observable and predetermined running variable in sharp RDD (Angrist and Pischke, 2014). In figure 4.2., it is seen that the probability of being treated jumps from zero to one sharply at the cutoff. On the other hand, the treatment status is a stochastic function of the running variable in fuzzy RDD. That is, the probability of being treated changes between zero and one at the cutoff and the treatment status only partially changes at the cutoff (Jacob et.al, 2012). Therefore, one cannot clearly identify the treatment status of individuals only by looking at the running variable. In this case, an appropriate instrumental variable can be used to estimate the binary treatment variable. For an instrumental variable to be valid, it must have a strong correlation with the binary treatment variable. After estimating the treatment status, the outcome of interest is regressed on the estimated treatment variable. This two-step strategy is called two- Stages Least Squares (2SLS).

In this thesis, we exploit the fact that individuals who were born in 1998 and onwards are exposed to the extension of compulsory schooling. In fact, individuals may have started school later or earlier or may have repeated a grade level, and therefore the year of birth might not be the only factor determining compulsory high school attendance. However, those born in 1998 or later are more likely to be subject to the treatment and we can use this breakpoint to assign individuals to the treatment and control group by employing sharp RDD methodology.

### 4.2.1.6. The Basic Regression Discontinuity Model

Equation 4.7 shows the basic linear RD model in order to predict the outcome variable. Suppose that $Y_{i \text { measures }}$ the outcome of interest for individual $i$. Suppose further that $X_{i}$ is the value of the running variable for individual $i$ while $X_{0}$ is the value of the running variable at the threshold. So, ( $X_{i}-X_{0}$ ) represents the difference between the running variable and the cutoff value. As noted before, $D_{i}$ is the treatment status for each individual, taking the value of zero for those who are not treated and the value of one for those who are treated (affected by the change in compulsory schooling policy). $\varepsilon_{i}$ represents the error term. Then the basic regression discontinuity model is:
$\mathrm{Y}_{\mathrm{i}}=\alpha_{0}+\alpha_{1}\left(\mathrm{X}_{\mathrm{i}}-\mathrm{X}_{0}\right)+\alpha_{2} \mathrm{D}_{\mathrm{i}}+\alpha_{3}\left(\mathrm{X}_{\mathrm{i}}-\mathrm{X}_{0}\right) \mathrm{D}_{\mathrm{i}}+\varepsilon_{\mathrm{i}}$
where $D_{i}=\left\{\begin{array}{l}0 \text { if birth year }<1998 \\ 1 \text { if birth year } \geq 1998\end{array}\right.$

At the left side of the cutoff, we have a line with an intercept of $\alpha_{0}$ and slope of $\alpha_{1}$, since $D_{i}$ is equal to zero. On the other hand, at the right side of the cutoff we have a line with an intercept of $\alpha_{0}+\alpha_{2}$ and slope of $\alpha_{1}+\alpha_{3}$, since $D_{i}$ is equal to one. As shown in Figure 4.2, the RDD estimate of the policy impact is represented by the change in the intercept of the lines from the left to the right side of the cutoff, which is $\left(\alpha_{0}+\alpha_{2}\right)$ $-\alpha_{0}=\alpha_{2}$ (or B-A, equivalently).

### 4.2.2. Model Specification

The basic linear model presented in the previous section is modified by adding covariates to the equation. We included sex, the type of birthplace (province/district center or subdistrict/village) and the NUTS-1 region of the birthplace as the covariates in order to improve efficiency. These variables are predetermined variables that cannot change with the education policy. The following equation is utilized to reveal the impact of the 2012 education reform:
$\mathrm{Y}_{\mathrm{i}}=\alpha_{0}+\alpha_{1}\left(\mathrm{X}_{\mathrm{i}}-\mathrm{X}_{0}\right)+\alpha_{2} \mathrm{D}_{\mathrm{i}}+\alpha_{3}\left(\mathrm{X}_{\mathrm{i}}-\mathrm{X}_{0}\right) \times \mathrm{D}_{\mathrm{i}}+\alpha_{4} \mathrm{Zi}+\varepsilon_{\mathrm{i}}$

The explanations of the variables in the model are shown below:

- $\quad \mathrm{Y}_{\mathrm{i}}$ stands for the outcome variable of interest for individual $i$. It is a dummy variable denoting at least the $9^{\text {th }}$ grade completion, at least the $10^{\text {th }}$ grade completion at least the $11^{\text {th }}$ grade completion, at least the $12^{\text {th }}$ grade completion or a dummy variable denoting at least some high school attendance status of the individual.
- $X_{i}$ is the birth year of individual $i$, that is the running variable. It takes values from 1991 to 2001 since we restricted our sample to these birth years, where $X_{0}$ is the cutoff value which is equal to 1998. $\left(X_{i}-X_{0}\right)$ is the difference of the birth year of the individual $i$ from 1998, in other words the centered running variable. The centered running variable might be positive or negative.
- $D_{i}$ is the policy dummy variable (or treatment status) for individual $i$. It takes the value of 1 if individual was born in 1998 or later, and 0 otherwise.
- ( $\left.X_{i}-X_{0}\right) . D_{i}$ is the interaction of the policy dummy with the centered running variable. It is included in the model since the policy might change not only the intercept but also the slope of the regression line.
- $Z_{i}$ is a vector of socioeconomic variables. It includes dummy variables of sex, the type of birthplace dummies, and the dummy variables for NUTS-1 region of the birthplace of individual $i$.
- $\varepsilon_{i}$ is the error term.

The impact of the 2012 education reform is denoted by $\alpha_{2}$, which reflects the jump in the regression line at the cutoff value. We make five sets of estimations to reveal the impact of the policy, $\alpha_{2}$, on schooling outcomes of different groups: regressions for the overall sample, for the female sample, for the male sample, for the province/district sample, and for the subdistrict/village sample. The five outcome variables are regressed on the dependent variables for each sample separately.

One limitation of our model specification is that we are not able to use month of birth as a running variable because it is not collected for men. We are therefore, forced to use birth year as the running variable. Hence, we are comparing distant birth cohorts The problem with such a specification is that in the absence of multiple years, we may not be able to distinguish secular time trends from the impact of the 2012 education reform. This limitation should be considered while interpreting the results.

As mentioned before, the main challenge of using the non-experimental approaches is the danger of selection bias. RDD generates unbiased estimator of the average policy effect at the cutoff value, if the functional form of the relationship between the outcome and the running variable is correctly specified (Jacob et.al, 2012). There exist two strategies to cope with the issue of specification that are based on two characterization of the RDD. The RD analysis can be viewed as "discontinuity at the cut point" (Hahn et al. 1999) or as "local randomization" (Lee, 2008). The former is called "parametric strategy" while the latter is called "nonparametric strategy" (Jacob et al, 2012).

In the parametric strategy, every observation in the given sample is used to make estimation. On the other hand, in the nonparametric strategy, the estimation is restricted with the observations close to the cutoff value. In the parametric strategy, the correct model is chosen to fit all of the given data, while in the non-parametric
approach, the correct data set is chosen in order to fit the given model. The RDD generally employs local linear regression, which is the most commonly used estimation strategy in nonparametric approach. The basic idea behind the local linear regression is that it finds the optimal data range so that the basic linear regression generates consistent estimators (Jacob et al, 2012). It involves selecting a small bandwidth around the cutoff point and using only this data range to make estimation. The local linear regression allows the relationship between the outcome and the running variable to vary within a subset of data (within a bandwidth) by weighting observations close to the cutoff value more heavily. The most commonly used form of weighting in RDD is the triangular kernel (Huntington- Klein, 2021). Triangular kernel function gives full weight to the observations at the threshold while the weight linearly declines as observations move away from the threshold. The weight becomes equal to zero at the edges of the bandwidth. On the other hand, in the parametric estimation strategy, all observations around the cutoff are weighted equally, which introduces some bias. We use triangular kernel function in the nonparametric estimations.

One must consider the bias-precision trade-off while choosing between the parametric and nonparametric strategies. The parametric estimation employs all data and therefore generally suggests higher precision than the nonparametric approach. However, it delivers more biased estimates than the nonparametric strategy since it is difficult to ensure the accuracy of the functional form in a wide range of data. In addition, since the observations in the whole sample are weighted equally, it introduces the loss of control that might introduce the danger of bias. On the other hand, since nonparametric approach uses a weighted function and employs a subset of data within a bandwidth, it reduces the probability of bias. However, since only a subset of data is used in this approach, it has less statistical precision than the parametric strategy.

Finding an optimal bandwidth might be difficult due to the precision-bias tradeoff. As the bandwidth gets larger, the estimates become more precise but also more biased.

We utilize the mean squared error (MSE) approach that measures the bias-precision tradeoff, in determining the optimal bandwidth in the analyses. ${ }^{5}$

Within the RDD approach, discontinuity or the shape of the fitted line might also demonstrate heteroscedasticity. In addition, since the covariate that determines the treatment status is (the year of birth) is discrete, the true functional form of the relationship between the running variable and the outcome variable becomes difficult to choose, which leads a specification problem. In this case, the use of clustered standard errors increases the reliability of the estimation since it considers potential of the imperfect fit (Lee and Card,2008). In order to consider the specification error, we cluster standard errors at the year of birth level in our empirical analyses. While estimating equations, we employ both non-parametric and parametric estimation strategies. As noted, before, parametric strategy uses all available data in the given sample. The robustness of the results is tested by employing different functional specifications and by gradually narrowing the bandwidth in the parametric strategy (Gelman and Imbens , 2019). Narrowing the bandwidth around the cutoff and giving zero weight to the observations outside this data range in parametric strategy resembles to the nonparametric strategy (Lee and Lemieux,2010). And similarly, the nonparametric strategy with very large bandwidth is similar to the parametric strategy.

Since we have only four birth cohorts to the right to the cutoff, it is not feasible to test the results by using higher order functional forms or by narrowing the bandwidth in the parametric strategy. We employ both parametric and nonparametric strategy that utilizes exactly the same optimal bandwidths for each outcome variable. We use ordinary least squares estimation technique in the empirical analyzes.

[^2]
## CHAPTER 5

## EMPIRICAL RESULTS

This chapter presents the estimation results of the model constructed in Chapter 4. We provide a graphical illustration of the evidence on the relationship between the outcome variables and the year of birth within the RDD methodology before moving on to empirical results. In the next section, we present empirical results from the parametric strategy. In addition, the empirical results from the nonparametric estimation strategy are shown. In both strategies, estimations are carried out for the overall sample, for males, for females, for province/district center, and for subdistrict/village birthplaces separately. And lastly, the internal validity of the identification strategy is checked.

### 5.1. Trends in the Outcome Variables

The graphical illustration of the relationship between the outcome and the running variable provides a visual evidence on whether the outcome variable jumps at the cutoff value of the running variable. It is difficult to find a significant treatment effect by using more sophisticated methods in case the graphical illustration does not show evidence of the discontinuity at the cutoff. In addition, visual illustration gives a clue about the functional form of the relationship between the outcome and the running variable to be used in formal regression models. Furthermore, by looking at the graphs, one can check the presence of discontinuity at points apart from the cutoff. If there
exists such evidence, it is likely that factors other than the intervention affect the relationship between the outcome and the running variable. The existence of confounders casts a doubt on the internal validity of the RDD (Jacob et al., 2012).

The average of outcomes is plotted against the running variable in the left and the right side of the cutoff value by using a particular polynomial order within the RDD setup. The birth cohorts to the left side of the threshold (the year 1998) are not affected by the intervention (education reform), while birth cohorts to the right side of the threshold are affected. We expect a jump in the outcome variables at the cutoff value of the birth year 1998, as a result of the education reform.

In order to plot the link between the outcome and the running variable (the birth year in our setup), one must determine the bin width. The bin size should be sufficiently narrow to see the discontinuity at the cutoff, and it should be sufficiently wide to see the relationship between the outcome and the running variable clearly. Both formal and informal tests can be utilized to determine the bin size (Jacob et al., 2012). Due to data limitations, we have only the year of birth information that can be used as the running variable. Furthermore, there are only seven cohorts to the left and only four cohorts to the right of the cutoff. Therefore, we are not given many options for choosing the bin width or bandwidth. As a result, we use the narrowest bin width currently available, which is one year. Using a wider bin size would cause us to lose data points around the cutoff that are already scarce. Also, we utilize all available data while plotting graphs. Finally, we employed a first-order polynomial function to plot the relationship between the outcome and the running variable.

We plotted the average value of each outcome variable against the centered year of birth for the overall sample in Figure 5.1. We also fitted linear lines before and after the policy intervention to capture the time trends in the completion of the selected grades. In all panels in Figure 5.1, outcome variables are binary variables and therefore represents the fraction of people who have the relevant status. For our case, the vertical axis shows the fraction of people who completed the relevant grades (grades 9,10,11 and 12) in panels B through E, whereas it shows the fraction of people who at least have some high school education regardless of the completion status in panel A.


Notes: We fit the linear polynomials to the right and to the left of the cutoff with confidence interval of $95 \%$ level. The centered running variable (birth year) is used. The birth cohorts to the right of the threshold (the birth year 1998) are affected by the 2012 education reform, while the birth cohorts to the left of the threshold are not affected. data

Source: Own calculations, using 2018 TDHS.

Figure 5.1: Fraction of Students Completed Selected Grades for the Overall Sample

If there were no education reform, the fraction of individuals with some high school education, and the fraction of individuals who completed any grade of high school
would likely be lower compared to the situation after the reform. We can attribute any jump at the cutoff value to the policy change. In panel A , it is seen that the fraction of people that have some high school education regardless of the completion of any grade jumps up with the education reform. Similarly, the essential feature of all graphs in panels $B$ through $E$ is the salient jump in the share of individuals completing grade 9 , grade 10, grade 11 , and grade 12 . These jumps at the cutoff point can be attributed to the impact of the 2012 education reform. As the reform renders high school compulsory, more individuals are transited from lower secondary school to high school even if they did not complete any grade level, or we expect grade completion rates to rise.

Another remarkable feature is the time trends before and after the policy. The increasing trend in the fraction attended high school before the education reform also continues after the policy intervention (panel A). In contrast, the increasing trend in grade completion reverses in the post-reform period (panel B-E).

Figure 5.2 shows the trends in the same five binary outcome variables for female (panels A1-E1) and male (panels A2 -E2) samples. The positive jump at the cutoff point is visible for both sexes. Before the reform, the fraction of females attending some high school or completing any grade level was generally lower than that of males. For instance, fraction of females completing grade 9 or 10 is generally lower than that of males, before the intervention. It makes sense since the benefit received by completing any education level is lower for females compared to males, due to their lower labor force participation. In addition, the psychic costs of educational attainment might be higher for females due to cultural barriers to female education. Furthermore, the future returns might be discounted more heavily for females, since they leave home after marriage (Kırdar et. Al., 2016) . On the other hand, the fraction of females completing grade 9 gets close to that of males, after the reform.

For the whole sample, we observe a reversing trend in the outcome variables after the reform, except for the fraction of people attending some high school. For the male sample, there exists a downward trend in each outcome variable after the reform,
whereas for females upward trend continues for some high school attendance and grade 9 completion after the reform.


Notes: We fit the linear polynomials to the right and to the left of the cutoff with confidence interval of $95 \%$ level. The centered running variable (birth year) is used. The birth cohorts to the right of the threshold (the birth year 1998) are affected by the 2012 education reform, while the birth cohorts to the left of the threshold are not affected.

Source: Own calculations, using 2018 TDHS.

Figure 5.2: Fraction of Students Completed Selected Grades by Sex


Figure 5.2: Fraction of Students Completed Selected Grades by Sex (Cont'd)

Similarly, the trends in the same five binary outcome variables are also shown by the type of birthplace, for the province/district center (panels A1-E1) and subdistrict/village (panels A2-E2) in Figure 5.3. In all panels, the upward jump at the cutoff point suggests that the 2012 education reform is successful at increasing the fraction of people that have some high school education regardless of the completion of any grade or increasing the grade completion rates of individuals. Before exposure to the reform, the grade completion rates of those who were born in subdistrict/ village areas are much lower than that of the grade completion rates of those who were born in province/district centers. This is reasonable if we consider the lower benefits and higher costs associated with the educational attainment in sub-district/ village, which are mostly rural regions. The benefit received from schooling attainment is lower in subdistrict/ village regions, due to the less prevalent wage work in these regions. As Kırdar et al.(2016) suggests there are many factors contributing to the low schooling demand in rural regions. First of all, the cost of schooling attainment is higher due to cultural barriers to education. The opportunity cost of schooling attainment is also higher due to the prevalence of generally unpaid family works, especially in
agriculture. The monetary costs of schooling are also higher in rural regions. As a result of the insufficiency or lack of educational services (such as school buildings) in these regions, individuals generally have to travel long distances to go to school. In rural regions, the cost of non-compliance with the law is lower since it is harder to enforce the law strictly. And in these regions, the future benefits of education would be discounted more heavily since the households living in rural regions are generally low-income in Turkey, and individuals from low income groups have a lower preference for schooling (Oosterbeek and Van Ophem, 2000, Kırdar et al., 2016). As Figure 5.3 shows, compulsory schooling policy increases the average educational outcomes of those born in subdistrict/village areas.


Notes: We fit the linear polynomials to the right and to the left of the cutoff with confidence interval of $95 \%$ level.The centered running variable (birth year) is used. The birth cohorts to the right of the threshold (the birth year 1998) are affected by the 2012 education reform, while the birth cohorts to the left of the threshold are not affected.

Source: Own calculations, using 2018 TDHS.

Figure 5.3: Fraction of Students Completed Selected Grades by the Type of Birthplace


Figure 5.3: Fraction of Students Completed Selected Grades by the Type of Birthplace (Cont'd)

To conclude, the graphical representations of the trends in average outcomes demonstrate an important upward shift at the cutoff value for the overall sample and other sample specifications. The fraction of individuals attending some high school or completing any grade increases with exposure to the new education law. The discontinuity at the cutoff point gives a clue about the possible positive impact of the 2012 education reform on the high school attendance of individuals, regardless of the completion of any grade, and on grade completion rates. Therefore, we can expect an
improvement in the related outcomes as a result of the 2012 education policy by looking at the visual evidence. In the next section, more sophisticated and credible methods are utilized to determine the reform's impact, and estimation results for our model are presented.

### 5.2. Empirical Results

The estimation results of the model constructed in the previous chapter are presented in this section using parametric and nonparametric strategies. Our model is run for individuals aged between 17-28 to capture the policy effect. Different sub-samples are used for each outcome variable and for each sample, depending on the estimated optimal bandwidths. We regress five binary outcome variables on the policy dummy, the running variable, and their interaction in all estimations. We added some baseline characteristics as covariates to improve the precision of the estimates. However, the covariates included differs depending on the sample specification.

In the estimations for the overall sample, covariates include the type of birthplace dummies and the dummy variables for the NUTS-1 region of birthplace. In the regressions run for male and female samples, the covariates are the type of birthplace dummies and dummy variables for the NUTS-1 region of birthplace. Lastly, in the regressions for the province/district center sample and subdistrict/village sample, we included dummy variables for the NUTS-1 region of birthplace and a dummy variable for the sex of the individual as the covariates. We clustered standard errors at the year of birth level.

### 5.2.1. Estimation Results using Parametric Strategy

We begin our estimations with parametric strategy. As mentioned in the previous chapter, every observation available in the sample is used to make estimation in the parametric strategy, while only observations close to the cutoff value are used in the nonparametric approach. Usually, to test the robustness of the results from the parametric strategy, the estimations are carried out by narrowing the bandwidth around the cutoff gradually and the estimates from different specifications are compared.

Also, the sensitivity of the results is checked by including different functional specifications, generally up to the second order polynomial degree, as Gelman and Imbens (2019) suggests. However, because we have only four birth cohorts that were affected by the policy intervention, it is not very feasible to check the robustness of the results by narrowing the bandwidth around the cutoff or by specifying a secondorder model. Therefore, instead of using all available data and gradually narrowing the bandwidth, we directly use the optimal bandwidths estimated by mean square error (MSE) approach that measures the bias-precision tradeoff, and we estimate a linear model based on the visual evidence presented in the previous section. We employ ordinary least square (OLS) technique to estimate the model in this section.

Table 5.1 shows the estimation results for the overall sample. As the results show, the 2012 education reform, which extends the duration of compulsory education to 12 years, leads to an increase in the fraction of individuals attending high school by 5.9 percentage points (ppt.) regardless of the completion status. This corresponds to a change of $8.14 \%{ }^{6}$. When we look at the students who continue high school education upon completing impact of the education reform on the grade completion rates, we see that the share of individuals completing grade 9 and grade 10 increases by 5 ppt . ( $7.03 \%$ ) and 3.7 ppt ( $5.52 \%$ ), respectively. These effects are statistically significant at $1 \%$ and $5 \%$ levels. The positive impact of the education reform on grade completion rate declines from 5 to 3.7 ppt . from $9^{\text {th }}$ to $10^{\text {th }}$ grade. Furthermore, the positive influence of the new education policy on the grade completion rates disappears beyond grade 10. While extension in the duration of compulsory schooling increases the transition to high school, it only significantly improves the $9^{\text {th }}$ and $10^{\text {th }}$ grade completion rates.

It is worth noting that the estimated optimal bandwidth for the grade 12 completion is too large for our sample since we have only 4 birth cohorts that are affected by the new education policy. When the bandwidth is 7, treated individuals who are relatively closer to the cutoff are compared with untreated individuals seven years farther from

[^3]the threshold, to determine the treatment effect. This might introduce some bias within the context of parametric estimation and the results should be interpreted with caution. In the case of $11^{\text {th }}$ grade completion, the optimal bandwidth is only slightly larger on the right side of the cut-off than the maximum 4 birth cohorts we have. The estimated policy effect ( 3.82 ppt ) is similar to the effect found for $10^{\text {th }}$ grade completion. So although the effect size is similar, we lack statistical significance due to much larger standard error for grade 11 than grade 10.

Table 5. 1: Estimation Results for the Overall Sample

| VARIABLES | Some H.S. <br> Attendance | Grade 9 | Grade 10 | Grade 11 | Grade 12 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Policy | $0.0593^{* * *}$ | $0.0503^{* * *}$ | $0.0376^{* *}$ | 0.0382 | 0.101 |
|  | $(0.00776)$ | $(0.0106)$ | $(0.00970)$ | $(0.0474)$ | $(0.0903)$ |
| Bandwidth | 2.317 | 2.464 | 2.634 | 4.302 | 7.000 |
| Observations | 3,037 | 2,958 | 2,958 | 4,812 | 6,370 |

Notes: Estimated optimal bandwidths are shown. The estimated bandwidths are equal to the values shown in the table on each side of the cutoff. . Standard errors are clustered at the year of birth level and robust standard errors are given in parentheses. Significance levels are denoted by ${ }^{* * *}$ for $1 \%$ level , ** for $5 \%$ level, and * for $10 \%$ level.

Source: Own calculations, using 2018 TDHS.

Table 5.2 presents the heterogenous effect of the education policy on males and females. Separate estimations are carried out for males and females. The results show that there is no significant effect of the education reform on males' high school outcomes at all. On the other hand, the $9^{\text {th }}$ grade and $11^{\text {th }}$ grade completion rates rise by 10.8 ppt . ( $15.70 \%$ ) and 8.5 ppt . ( $13.25 \%$ ) for females, respectively. We can conclude that, the education reform favorably affects the grade completion rates of females, although at some grade levels. Note that optimal bandwidths increase when we separate the sample by gender. In the case of women, some of the optimal bandwidths is beyond our data and therefore, the results should be interpreted with caution.

Table 5. 2: Estimation Results by Sex
(A) Female Sample

| VARIABLES | Some H.S. <br> Attendance | Grade 9 | Grade 10 | Grade 11 | Grade 12 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Policy | 0.0312 | $0.108^{* * *}$ | 0.0455 | $0.0851^{*}$ | 0.142 |
|  | $(0.0371)$ | $(0.0120)$ | $(0.0282)$ | $(0.0431)$ | $(0.109)$ |
| Bandwidth | 4.075 | 3.311 | 5.523 | 6.445 | 4.024 |
| Observations | 2,468 | 2,135 | 2,672 | 2,919 | 2,399 |


| (B) Male Sample |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| VARIABLES | Some H.S. <br> Attendance | Grade 9 | Grade 10 | Grade 11 | Grade 12 |
| Policy | 0.00811 | -0.0269 | -0.0312 | -0.000679 | 0.0339 |
|  | $(0.0138)$ | $(0.0172)$ | $(0.0151)$ | $(0.0510)$ | $(0.0816)$ |
| Bandwidth | 2.492 | 2.434 | 2.683 | 3.347 | 3.931 |
| Observations | 1,514 | 1,482 | 1,482 | 2,124 | 2,124 |


#### Abstract

Notes: Estimated optimal bandwidths are shown. The estimated bandwidths are equal to the values shown in the table on each side of the cutoff. . Standard errors are clustered at the year of birth level and robust standard errors are given in parentheses. Significance levels are denoted by ${ }^{* * *}$ for $1 \%$ level , ** for $5 \%$ level , and * for $10 \%$ level.


Source: Own calculations, using 2018 TDHS.

The results from the parametric strategy may not be credible since the observations around the cutoff are weighted equally in OLS estimation. On the other hand, in the non-parametric strategy, which employs local linear regression, observations close to the cutoff value are weighted more heavily by using a weighted function. As noted, before, the triangular kernel gives full weight to the observations at the threshold. Their weight declines linearly, as observations move away from the threshold and becomes zero beyond the bandwidth. Therefore, the non-parametric strategy provides stronger control over both observable and unobservable factors that might confound the results, compared to parametric strategy. Because it almost eliminates bias, using a
nonparametric strategy gives more reliable estimates. In the next section, we provide results from non-parametric estimation.

Table 5. 3: Estimation Results by the Type of Birthplace
(A) Province/District Center Sample

| VARIABLES | Some H.S. <br> Attendance | Grade 9 | Grade 10 | Grade 11 | Grade 12 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Policy | 0.00917 | 0.00756 | -0.00866 | 0.0299 | 0.0956 |
|  | $(0.00565)$ | $(0.0217)$ | $(0.0125)$ | $(0.0428)$ | $(0.0974)$ |
| Bandwidth | 2.494 | 5.345 | 3.834 | 4.266 | 4.381 |
| Observations | 2,039 | 3,640 | 2,886 | 3,265 | 3,265 |

(B) Subdistrict/Village Sample

| VARIABLES | Some H.S. <br> Attendance | Grade 9 | Grade 10 | Grade 11 | Grade 12 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Policy | $0.167^{* * *}$ | 0.0571 | $0.136^{* * *}$ | $0.171^{* * *}$ | $0.174^{* * *}$ |
|  | $(0.0116)$ | $(0.0436)$ | $(0.0112)$ | $(0.0181)$ | $(0.0360)$ |
| Bandwidth | 2.184 | 7.000 | 2.388 | 2.361 | 2.864 |
| Observations | 998 | 2,035 | 955 | 955 | 955 |

Notes: Estimated optimal bandwidths are shown. The estimated bandwidths are equal to the values shown in the table on each side of the cutoff. . Standard errors are clustered at the year of birth level and robust standard errors are given in parentheses. Significance levels are denoted by ${ }^{* * *}$ for $1 \%$ level, ${ }^{* *}$ for $5 \%$ level, and $*$ for $10 \%$ level.

Source: Own calculations, using 2018 TDHS.

Similarly, Table 5.3 shows the heterogenous impact of the education reform for those who were born in province/district center and subdistrict/village areas. As for males, the estimation results suggest no significant treatment effect of the education policy on those who were born in province/district center. On the other hand, the most substantial impact of the policy emerges for those who were born in subdistrict/village areas. Except for grade 9, the reform significantly increases the grade completion rates as well as the fraction of individuals who attended high school for some time. There
exists strong evidence that the fraction of individuals completing grade 10,11 and 12 significantly increases by $13.6 \mathrm{ppt}(29.26 \%)$, 17.1 ppt . ( $38.66 \%$ ) and 17.4 ppt . (41.61\%), respectively. The estimated optimal bandwidth for the grade 9 completion is too large for our sample since we have only 4 birth cohorts that are affected by the intervention. As a result, we are comparing distant birth cohorts, and the likelihood of obtaining a biased result increases within the context of parametric strategy. Therefore, the result for grade 9 completion should be interpreted with caution.

### 5.2.2. Estimation Results using Nonparametric Strategy

In the non-parametric strategy, we employ the optimal bandwidths estimated by mean square error (MSE) approach that measures the bias-precision tradeoff, and to estimate the linear model. We utilize local linear regression as an estimation strategy. One assumption of the RDD is that observations around the cutoff are very similar with respect to other factors that might confound the relationship between the outcome variable and the intervention. That means, the closer the observations to the cutoff at each side of the cutoff, the more similar they are. Thanks to this assumption, any change at the cutoff is attributed to the impact of the intervention. As explained above, the main advantage of the local linear regression is that it provides stronger control over the observable and unobservable factors since it weights observations closer to the cutoff more heavily.

Table 5.4. illustrates the empirical results for the overall sample. The estimates from local linear regressions suggest a positive effect of the policy for all outcome variables. The fraction of people attending high school for some time increases by 5.45 ppt . ( $7.52 \%$ ) due to the education reform. Furthermore, there is strong evidence that the proportion of individuals completing grades 9,10 , and 11 significantly increases by 4.48 ppt. ( $6.30 \%$ ), 3.33 ppt. ( $4.97 \%$ ), and 4.28 ppt. ( $6.57 \%$ ), respectively. Besides, there exists evidence at the $5 \%$ significance level that the $12^{\text {th }}$ grade completion rate increases by 8.29 ppt. ( $13.36 \%$ ). Since the $12^{\text {th }}$ grade is the last grade of high school, the fraction of individuals graduating from high school increases with the reform. However, again note that this may not be a reliable estimate even with non-parametric estimation since the optimal bandwidth is much wider than our data can support.

The increase in high school attainment is expected since there are additional benefits from getting the higher levels of schooling. First of all, it increases productivity in the future (Becker, 1976). We do not expect benefits of schooling to change since the quality of schools did not improve substantially, as explained in chapter 3. However, if we consider the general equilibrium effects, returns to high school education might decline as more graduates enter the labor market in the long run the. However, we probably do not observe this since the policy change is very recent.

Secondly, completion of any educational level signals the ability of individuals, which is called the sheepskin effect (Jaeger and Page, 1996; Schady,2003). As mentioned in chapter 3, students would be awarded an upper secondary education diploma at the end of the 12 years of compulsory education, and there would not be any other diploma for the completion of eight years of primary education (Ministry of National Education, Private Secretariat, 2012). As a result, the sheepskin effects are changed due to these arrangements. The sheepskin effect of completing lower secondary education disappeared, and the sheepskin effect of high school completion declined with the policy. That means the benefits from both lower secondary school and high school completion decline with the policy. It should be noted that lower and upper secondary school graduation benefits reduce more for males and those living in urban regions because they are more likely to be employed.

Apart from benefits, the impact of the compulsory education reform on school attainment operates via the decline in the costs of high school education. As explained in chapter 3, the budget of the Ministry of National Education (in TL) increased after the 2012 education reform. Overall, the number of schools, classrooms, and teachers at the high school level went up during the three years following the reform. Most importantly, to ensure that the disadvantaged groups can access high school education, MONE extended the coverage of bussed education to high school. Individuals living in sparsely populated small areas, such as subdistricts and villages, are placed in schools with boarding schools if the bussed education is not feasible for the settlements they live in (Ministry of National Education General Directorate of Support Services, 2012). In the first year of the implementation of the reform, a total of 376.6 thousand
students were bussed to central schools. This number rose to 432.8 thousand in the sixth year of the reform. The number of females bussed is greater than the number of males in the six years following the reform, which suggests females benefit from the bussed education more (Ministry of National Education, 2012, 2013, 2014,2015,2016, 2017,2018). Bussing rural individuals to nearby high schools and placing them in the schools with boarding houses substantially reduces the monetary costs of high school attainment because access to high school education were limited in these regions, prior to the policy. Females, as a disadvantaged group benefits from the bussed education more.

The cost of non-attendance also increases due to monetary penalties for noncompliance with the 2012 compulsory schooling law. Furthermore, compulsory schooling policies also reduce the possible negative influence of the adverse cultural norms on the schooling attainment of individuals, particularly of females. All of these contribute to improving schooling outcomes, which we clearly see in Table 5.4.

Table 5. 4: Estimation Results for the Overall Sample

| VARIABLES | Some H.S. <br> Attendance | Grade 9 | Grade 10 | Grade 11 | Grade 12 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Conventional | $0.0545^{* * *}$ <br> $(0.00738)$ | $0.0448^{* * *}$ <br> $(0.0111)$ | $0.0333^{* * *}$ <br> $(0.00328)$ | $0.0428^{* * *}$ <br> $(0.000327)$ | $0.0829 * *$ <br> $(0.0292)$ |
| P value | $[0.000]$ | $[0.000]$ | $[0.000]$ | $[0.000]$ | $[0.002]$ |
| Bandwidth | 2.317 | 2.464 | 2.634 | 4.302 | 7.000 |
| Observations | 3,037 | 2,958 | 2,958 | 4,812 | 5,843 |

[^4]Source: Own calculations, using 2018 TDHS.

The compulsory education reform might have a heterogenous effect on males and females. We estimated the outcomes for male and female samples, separately, and
results are shown in Table 5.5. The 2012 education reform significantly improves the fraction of females attending any grade in high school by 8.79 ppt ( $12.99 \%$ ), while there is no significant impact on males' attendance. It means that females who would not enroll in high school upon completing the lower secondary school before the reform attended high school with the reform, and received high school education for a while, even if they did not complete any level. The positive effect of the reform on females ( $12.99 \%$ ) is above the impact estimated for the overall sample (7.52\%).That means, the main driver of the overall improvement is females.

The proportion of females completing the $9^{\text {th }}, 10^{\text {th }}, 11^{\text {th }}$ and the $12^{\text {th }}$ grades significantly increases by 11.2 ppt. ( $16.28 \%$ ) , 5.47 ppt ( $8.34 \%$ ) , 7.93 ppt. ( $12.37 \%$ ), and 14.7 ppt. ( $23.83 \%$ ) respectively, with exposure to the compulsory schooling policy. On the other hand, there exists no significant effect of reform on the fraction of males completing $9^{\text {th }}$ and $10^{\text {th }}$ grades. We observe a 1.68 ppt .( $2.54 \%$ ) decline in the share of males completing the $11^{\text {th }}$ grade, which is an unexpected result. The decline in the $11^{\text {th }}$ grade completion rate of males might be arising from the grade repetition or dropouts at this level. As explained in chapter 3, the Ministry of National Education data shows that women are more successful than men in progressing to the consecutive grades. On the other hand, the share of males completing the $12^{\text {th }}$ grade increases by 0.592 ppt. ( $0.95 \%$ ), which is a rather small effect size.

As noted in section 5.1, female's average schooling attainment is generally lower than that of males, prior to the 2012 education reform due to lower benefits received and higher costs of high school attainment. With the reform, thanks to the bussed education and placement of individuals in schools with boarding houses the direct monetary costs of schooling declines for both sexes, especially for individuals living in rural regions, and for females since they benefit from the bussed education more. The psychic costs of educational attainment arising from the cultural norms also decline with the reform for both sexes. However, since cultural barriers to education is traditionally more binding for females, the compulsory schooling policy may generate a more favorable effect on females by reducing psychic costs of educational attainment. On the other hand, the price elasticity of schooling demand might be higher for females than males, as Orazem and King (2008) suggest. As a result, the decline in schooling costs cause
a more substantial increase in the schooling attainment of females. Additionally, the reduction in the sheepskin effect of high school education with the law is less important for females compared to males, and that is why females are affected more favorably.

Table 5. 5: Estimation Results by $S e x$
(A) Female Sample

| (A) Female Sample |  |  |  | Grade 10 | Grade 11 |
| :--- | :--- | :--- | :--- | :--- | :--- | Grade 12

(B) Male Sample

| VARIABLES | Some H.S. <br> Attendance | Grade 9 | Grade 10 | Grade 11 | Grade 12 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Conventional | 0.00526 <br> $(0.0302)$ | -0.0306 <br> $(0.0339)$ | -0.0339 <br> P value | $[0.373]$ | $[0.827]$ |

Notes: Estimated optimal bandwidths are shown. The estimated bandwidths are equal to the values shown in the table on each side of the cutoff. . Standard errors are clustered at the year of birth level and robust standard errors are given in parentheses. Significance levels are denoted by ${ }^{* * *}$ for $1 \%$ level, ** for $5 \%$ level, and * for $10 \%$ level.

Source: Own calculations, using 2018 TDHS.

Table 5.6. shows the estimation results by the type of birthplace. The fraction of individuals attending high school increases by 0.64 ppt. ( $0.80 \%$ ) and 15.7 ppt.( $29.53 \%$ ) in the province/district center sample and in the subdistrict/village sample, respectively. When we look at the grade completion rate, we see that the
fraction of individuals completing grade 11 and 12 significantly increases by 2.08 ppt . ( $2.85 \%$ ) and 5.65 ppt. ( $8.09 \%$ ), whereas there is no significant impact on grade 9 and grade 10 completion rates for those who were born in province/district centers. On the other hand, we see a significant increase in the proportion of people completing grade 10,11 and 12 by 13.2 ppt. ( $28.40 \%$ ) 16.3 ppt. (36.85) and 16.3 ppt. ( $38.98 \%$ ), respectively for those who were born in the subdistrict/village areas. For the grade 9 completion, there is no significant impact of education reform. However, as explained before the result must be interpreted with caution due to the large size of bandwidth.

As shown in chapter 4 and in section 5.1., the average schooling attainment is lower for those who were born in subdistrict/village areas than that of those who born in province/district centers, prior to the reform. It is noted in section 5.1 that, the high school attainment of those born in subdistrict/village regions are lower than that of those who born in province/district centers, prior to the 2012 education reform due to lower benefits received and higher costs of high school attainment for them. It should be noted that subdistrict areas or villages areas are generally rural regions, and province and district centers are urban regions. With the reform, the direct monetary costs of high school attainment substantially decline in rural regions, as a result of the bussed education and placement of individuals in the schools with boarding houses. The psychic costs of educational attainment arising from the cultural norms also decline with the reform in the rural regions. However, since cultural norms against education is traditionally more binding in the rural regions, the compulsory schooling policy may generate a more favorable effect in subdistrict/village areas by reducing psychic costs of educational attainment. Besides these, as Orazem and King (2008) suggest, the price elasticity of educational attainment is higher in rural regions. Therefore, the 2012 compulsory schooling policy creates a more substantial improvement on the schooling outcomes of those who were born in subdistrict/ village regions compared to that of those who were born in province/district centers, by reducing the cost of schooling. Moreover, the decline in the benefit (the sheepskin effect) of high school education is less important for those who live in rural regions, and this might also explain why those born in subdistrict/ village regions are affected more favorably.

Table 5.6: Estimation Results by the Type of Birthplace
(A) Province/District Center Sample

| VARIABLES | Some H.S. <br> Attendance | Grade 9 | Grade 10 | Grade 11 | Grade 12 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Conventional | $0.0064^{* * *}$     <br> $(0.00203)$ -0.0155 -0.0116 $0.0208^{* * *}$ $0.0565^{* * *}$ <br> P value $[0.000]$ $[0.858]$ $[0.324]$ $[0.002]$ |  |  |  |  |
| Bandwidth | 2.494 | 5.345 | 3.834 | 4.266 | $[0.001]$ |
| Observations | 2,039 | 3,640 | 2,886 | 3,265 | 3,265 |

(B) Subdistrict/Village Sample

| VARIABLES | Some H.S. <br> Attendance | Grade 9 | Grade 10 | Grade 11 | Grade 12 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Conventional | $0.157 * * *$ <br> $(0.00188)$ | 0.0520 <br> P value | 0.000 | 0.354 | $0.132 * * *$ |
| Bandwidth | 2.184 | 7.000 | 0.000 | $0.163^{* * *}$ | $0.163^{* * *}$ |
| Observations | 998 | 1,870 | 2.388 | 2.361 | $(0.000937)$ |

Notes: Estimated optimal bandwidths are shown. The estimated bandwidths are equal to the values shown in the table on each side of the cutoff. Standard errors are clustered at the year of birth level and robust standard errors are given in parentheses. Significance levels are denoted by ${ }^{* * *}$ for $1 \%$ level , ** for $5 \%$ level , and $*$ for $10 \%$ level.

Source: Own calculations, using 2018 TDHS.

The results from both parametric and nonparametric strategies are compared in Table 5.7. It is seen that the frequency of the statistically significant estimates obtained from the local linear regression is higher than that we obtain from the ordinary least square estimation. Furthermore, an estimate from the parametric strategy is significant if and only if an estimate from the nonparametric approach is statistically significant. On the other hand, if a statistically significant effect is found by the OLS technique than the

Table 5.7: Estimation Results by OLS and LLR Techniques

| VARIABLES | Some H.S. <br> Attendance | Grade 9 | Grade 10 | Grade 11 | Grade 12 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Overall |  |  |  |  |  |
| OLS | 0.0593*** | 0.0503*** | 0.0376** | 0.0382 | 0.101 |
|  | (0.00776) | (0.0106) | (0.00970) | (0.0474) | (0.0903) |
| LLR | $\begin{aligned} & 0.0545^{* * *} \\ & (0.00738) \end{aligned}$ | $\begin{aligned} & 0.0448 * * * \\ & (0.0111) \end{aligned}$ | $\begin{aligned} & 0.0333^{* * *} \\ & (0.00328) \end{aligned}$ | $\begin{aligned} & 0.0428 * * * \\ & (0.000327) \end{aligned}$ | $\begin{aligned} & 0.0829^{* *} \\ & (0.0292) \end{aligned}$ |
| Female |  |  |  |  |  |
| OLS | 0.0312 | 0.108*** | 0.0455 | 0.0851* | 0.142 |
|  | (0.0371) | (0.0120) | (0.0282) | (0.0431) | (0.109) |
| LLR | $\begin{aligned} & 0.0879 * * * \\ & (0.00677) \end{aligned}$ | $\begin{aligned} & 0.112 * * * \\ & (0.00122) \end{aligned}$ | $\begin{aligned} & 0.0547^{* * *} \\ & (0.0284) \end{aligned}$ | $\begin{aligned} & 0.0793^{* *} \\ & (0.0273) \end{aligned}$ | $\begin{aligned} & 0.147^{* * *} \\ & (0.00794) \end{aligned}$ |
| Male |  |  |  |  |  |
| OLS | 0.00811 | -0.0269 | -0.0312 | -0.000679 | 0.0339 |
|  | (0.0138) | (0.0172) | (0.0151) | (0.0510) | (0.0816) |
| LLR | $\begin{aligned} & 0.00526 \\ & (0.0302) \end{aligned}$ | $\begin{aligned} & -0.0306 \\ & (0.0339) \end{aligned}$ | $\begin{aligned} & -0.0339 \\ & (0.0246) \end{aligned}$ | $\begin{aligned} & -0.0168^{* * *} \\ & (0.000626) \end{aligned}$ | $\begin{aligned} & 0.00592 * * * \\ & (0.00261) \end{aligned}$ |
| Province District |  |  |  |  |  |
| OLS | 0.00917 <br> (0.00565) | $\begin{aligned} & 0.00756 \\ & (0.0217) \end{aligned}$ | $\begin{aligned} & -0.00866 \\ & (0.0125) \end{aligned}$ | $\begin{aligned} & 0.0299 \\ & (0.0428) \end{aligned}$ | $\begin{aligned} & 0.0956 \\ & (0.0974) \end{aligned}$ |
| LLR | $\begin{aligned} & 0.00639^{* * *} \\ & (0.00203) \end{aligned}$ | $\begin{aligned} & -0.0155 \\ & (0.0125) \end{aligned}$ | $\begin{aligned} & -0.0116 \\ & (0.00158) \end{aligned}$ | $\begin{aligned} & 0.0208 * * * \\ & (0.00823) \end{aligned}$ | $\begin{aligned} & 0.0565^{* * *} \\ & (0.0109) \end{aligned}$ |
| $\begin{aligned} & \text { Subdistrict } \\ & \hline \text { /Village } \end{aligned}$ |  |  |  |  |  |
| OLS | $\begin{aligned} & 0.167^{* * *} \\ & (0.0116) \end{aligned}$ | $\begin{aligned} & 0.0571 \\ & (0.0436) \end{aligned}$ | $\begin{aligned} & 0.136^{* * *} \\ & (0.0112) \end{aligned}$ | $\begin{aligned} & 0.171^{* * *} \\ & (0.0181) \end{aligned}$ | $\begin{aligned} & 0.174^{* * *} \\ & (0.0360) \end{aligned}$ |
| LLR | $\begin{aligned} & 0.157 * * * \\ & (0.00188) \end{aligned}$ | $\begin{aligned} & 0.0520 \\ & (0.0661) \end{aligned}$ | $\begin{aligned} & 0.132 * * * \\ & (0.00862) \end{aligned}$ | $\begin{aligned} & 0.163^{* * *} \\ & (0.000937) \end{aligned}$ | $\begin{aligned} & 0.163^{* * *} \\ & (0.00124) \end{aligned}$ |

Notes: OLS means Ordinary Least Square and LLR means Local Linear Regression. Same bandwidths are used in calculations with OLS and LLR for each outcome variable.

Source: Own calculations, using 2018 TDHS.
policy effect found by the OLS is generally greater than that of found by the LLR.

As mentioned before, local linear regression employs a weighted function, a kernel function in our setting, which weights observations closer to the cutoff more heavily in estimations. Therefore, it provides a better control over both observable and unobservable confounders. In line with this, the likelihood of finding biased estimates is smaller in the nonparametric strategy, compared to the parametric one. For this reason, for the models estimated within the same bandwidth, nonparametric strategy suggests more reliable results.

One should bear in mind that the results might be sensitive to the choice of bandwidth, the functional form of the relationship between the birth cohort trends and the outcome variable or to the type of kernel function preferred in weighting observations. As noted earlier, we cannot perform robustness checks by showing results from the higher-order specifications or different bandwidths due to data limitations. We have only four birth cohorts at the right side of the cutoff, which restricts us from running robustness tests since using higher-order specifications or several bandwidths requires a higher number of birth cohorts.

If we compare our results with Erten and Keskin (2019), the study finds that compulsory education law significantly increases high school attendance by 5.4 ppt . for the whole sample, while we find a similar significant improvement by using LLR, which is 5.45 ppt . On the other hand, the study finds a 2.9 ppt . increase in high school attendance of females and 5.0 ppt . increase in the high school attendance of males. In contrast to this finding, we find a greater impact on females. A more considerable significant increase of 8.79 ppt . exists in the fraction of females enrolling in high school, with an insignificant effect on male high school attendance.

### 5.3. Checking the Internal Validity of the Regression Discontinuity Design

The credibility of the RDD strategy can be checked by conducting some tests. One of them is to look at the density distribution of the running variable, as we have shown
earlier. The formal test and the visual test suggest that there is no evidence of a manipulation of the running variable. The other tests are performing placebo tests. These tests can be performed either by checking the covariate balance or by repeating the analyses by using a placebo cutoff (Cunningham, 2021).






Source: Own calculations, using 2018 TDHS.

Figure 5.4: Trends in the Covariates


Figure 5.4: Trends in the Covariates (Cont'd)

To attribute any jump in the outcome variables of interest at the cutoff to the impact of the education policy, other covariates need to be balanced around the cutoff. We investigate whether other predetermined characteristics we control in the estimations are continuous at the discontinuity. Figure 5.4 illustrates the average outcomes of the binary covariates plotted against the centered birth year, which is the running variable. The predetermined characteristics consist of the sex of the individual, the type of birthplace (province center, district center, subdistrict/village), and the NUTS-1 region of the home (İstanbul, West Marmara, Aegean, East Marmara, West Anatolia,

Mediterranean, Central Anatolia, West Black Sea, East Black Sea, Northeast Anatolia, Central East Anatolia, and Southeast Anatolia). We had created a set of dummy variables for these characteristics. When we plot the average value of these variables against our running variable, the predetermined variables seem to be continuous at the cutoff. Any small jump is just by coincidence, and it is impossible for individuals to manipulate these variables since they are innate characteristics.

Just as there must not be any discontinuity in the predetermined variables at the cutoff, there must not be any discontinuity on the average outcome at an arbitrarily chosen cutoff (Cunningham, 2021). That means the relationship between the running variable and the outcome variable must be continuous except at the cutoff point. By checking whether any jump exists at a fake cutoff, we ensure that the discontinuity in the outcome variable stems only from the policy change. In choosing the placebo cutoff, we shift the cutoff to the left of the real cutoff (the birth year 1998) since we have only three birth cohorts to the right of 1998. The birth year 1996 is chosen as the placebo cutoff so that there are equal number of birth cohorts to the left and to the right of the new cutoff value. The average of the outcome variables are plotted against the running variable by employing the year 1996 as the placebo cutoff, for the overall sample and for each subsample. Figure 5.5, 5.6 and 5.7 show the graphical illustration of the trends in the outcome variables for the overall sample, by sex and by the type of birthplace. Generally, there seems no significant discontinuity at the placebo cutoff for the outcome variables of high school attendance, grade 9 completion and grade 10 completion and grade 11 completion. That means, the upward jump at the real cutoff (1998) is not resulting from the relationship between age and outcome variables but is a result of the education reform.



Notes: We fit the linear polynomials to the right and to the left of the cutoff. The placebo cutoff value (1996) is used. Outcome variables are plotted with confidence interval of $95 \%$ level.

Source: Own calculations, using 2018 TDHS.

Figure 5.5: Fraction of Students Completed Selected Grades for the Overall Sample by Using a Placebo Cutoff


Notes: We fit the linear polynomials to the right and to the left of the cutoff. The placebo cutoff value (1996) is used. Outcome variables are plotted with confidence interval of $95 \%$ level.

Source: Own calculations, using 2018 TDHS.

Figure 5.6: Fraction of Students Completed Selected Grades by Sex, by Using a Placebo Cutoff


Figure 5.6: Fraction of Students Completed Selected Grades by Sex, by Using a Placebo Cutoff (Cont'd)


Notes: We fit the linear polynomials to the right and to the left of the cutoff. The placebo cutoff value (1996) is used. Outcome variables are plotted with confidence interval of $95 \%$ level.

Source: Own calculations, using 2018 TDHS.

Figure 5.7: Fraction of Students Completed Selected Grades by the Type of Birthplace, by Using a Placebo Cutoff


Figure 5.7: Fraction of Students Completed Selected Grades by the Type of Birthplace, by Using a Placebo Cutoff (Cont'd)

## CHAPTER 6

## CONCLUSION

High school education differs from primary and lower secondary education levels as it prepares individuals directly for the labor market or higher education, and this is where its importance comes from. In this regard, apart from its personal benefits, it is the level of education that substantially impacts the quality of a country's labor force, which in turn affects the performance of economies and the welfare of societies. By considering its substantial benefits on many socioeconomic outcomes, governments all over the world implement policies to prevent dropouts from high school.

The Turkish government introduced an education reform in 2012, which extends the duration of compulsory education to cover high school education. Considering improvements in several socioeconomic outcomes brought by improvement in the educational attainment of individuals, it is important to explore whether the reform is successful in enhancing high school attendance. In this study, our purpose is to shed light on the impacts of the 2012 compulsory education law on the schooling outcomes of individuals aged between 17-28. In line with this aim, we kept track of the changes in the high school attendance of individuals upon completing lower secondary education regardless of grade completion, and changes in the grade completion rates in high school. Furthermore, we investigate the reform's overall impact and its impact on various subgroups. We carried out our analyses separately for males, females, individuals born in province/district centers, and individuals born in subdistrict/village regions to determine the likely heterogenous effect.

For the empirical analyses, we utilize the 2018 wave of Turkish Demographic Health Survey (TDHS), which is a nationally representative survey. The visual evidence shows a positive impact of the education policy of 2012 on the schooling outcomes of our interest. We have also made use of more sophisticated methods to determine the policy effect, based on the visual evidence. We employ Sharp Regression Discontinuity methodology to estimate the effect of the policy. Both parametric and nonparametric strategies are utilized while conducting the estimations. We applied ordinary least squares (OLS) technique in estimations within the parametric strategy and we use a triangular kernel function in estimations within the non-parametric strategy. The policy impact that we estimate is intention-to-treat (ITT) effect.

The visual evidence shows the evident upward jump in the outcome variables at the threshold, which is the birth year 1998 for the overall sample and for all subsamples. The results from parametric strategy suggest that reform increases the fraction of individuals attending high school by 5.9 percentage points (8.14\%) regardless of the completion status, for the overall sample. By using the same strategy, we find that the share of individuals completing grade 9 and grade 10 significantly increases by 5 ppt. ( $7.03 \%$ ) and 3.7 ppt. ( $5.52 \%$ ), respectively, with a disappearing impact beyond grade 10. On the other hand, estimates from the nonparametric strategy suggest a positive effect of the policy on all outcome variables. The fraction of people attending high school for some time increases by 5.45 ppt ( $7.52 \%$ ), whereas the proportion of individuals completing grades $9,10,11$, and 12 significantly increases by 4.48 ppt . (6.30\%), 3.33 ppt ( $4.97 \%$ ) , 4.28 ppt ( $6.47 \%$ ), and 8.29 ppt ( $13.36 \%$ ), respectively. We observe that the results from these two strategies are generally consistent, though the policy effects found by using the OLS technique are a bit higher than the effects found by the LLR. Overall, the high school attainment increases with the policy as we expected, since both monetary and nonmonetary costs of educational attainment declines with the policy.

When we look at the differential impact of the policy by sex, the OLS estimation suggests a significant increase in the fraction of females completing grade 9 and grade 11 by 10.8 ppt. ( $10.70 \%$ ) and 8.51 ppt. ( $13.27 \%$ ) However, when we repeat the estimation by using a different strategy, the nonparametric approach, LLR results
suggests a positive improvement in all education outcomes of females. The 2012 education reform significantly improves the fraction of females attending any grade in high school by 8.79 ppt. ( $12.99 \%$ ), and the fraction of females completing the $9^{\text {th }}, 10^{\text {th }}$, $11^{\text {th }}$ and the $12^{\text {th }}$ grades significantly increases by 11.2 ppt ( $16.28 \%$ ), 5.47 ppt . ( $8.24 \%$ ), 7.93 ppt. ( $12.37 \%$ ) and 14.7 ppt.(23.83\%) Again, the results from OLS and LLR estimates are consistent though there exist small differences in the magnitudes of the effects.

When we look at the policy impact on males, none of the OLS estimates are statistically significant for any outcome variable. On the other hand, the LLR estimation finds a negative effect at grade 11 , the fraction of males completing grade 11 declines by a negligible amount of 1.68 ppt . ( $2.54 \%$ ), which is an unexpected result. This decline might be due the age difference between the treatment and control groups, treatment group is younger than the control group. Class repetition may delay graduation beyond age 17 in the treatment group.

When we consider the lower pre-reform average schooling attainment of females compared to males, the policy is successful at improving the high school attainment of the disadvantaged group, which is females. They are affected more favorably from the reductions in the monetary and nonmonetary costs of high school attainment compared to men, as we expected, as a result of their higher price elasticity of schooling demand. In addition, the sheepskin effect of high school diploma declines with the 2012 education reform, since students are awarded a single upper secondary education diploma upon high school completion, and now it is more difficult for them to distinguish themselves, they must complete an education level beyond high school. Since the decline in the sheepskin effect of high school diploma is less critical for females, they are affected more favorably by the reform compared to males.

We also investigate the heterogenous effect of the policy by the type of birthplace. Those born in the subdistrict/ village regions constitute the disadvantaged group in terms of schooling attainment prior to the reform since in these areas educational services might not be readily available. Furthermore, the households living in these
rural regions are generally low-income families in Turkey, and accordingly financial constraints are more binding for them.

The OLS estimations suggest no statistically significant impact on any outcome variables for those born in the province/district centers. On the other hand, the LLR results shows a significant increase in the fraction of individuals attending any grade of high school by 0.64 ppt . $(0.80 \%)$, and in the fraction of individuals completing grade 11 and 12 by 2.08 ppt. ( $2.85 \%$ ) and 5.65 ppt. ( $8.09 \%$ ), respectively. When we look at the impact of the education policy for those who born in subdistrict/village areas, the OLS estimates show that the reform increases the fraction of individuals attending high school for a while by 16.7 ppt. ( $31.41 \%$ ), and it increases the fraction of individuals completing grade 10,11 and 12 by 13.6 ppt. (29.26\%), 17.1 ppt. ( $38.66 \%$ ), and 17.4 ppt. (41.61\%), respectively. Consistently, the LLR estimation suggests 15.7 ppt . (29.53\%), 13.2 ppt. (28.40\%), 16.3 ppt. ( $36.85 \%$ ), and 16.3 ppt. ( $38.98 \%$ ) increase in the fraction of individuals attending any high school grade, and in the fraction completing grade 10,11 and 12 , respectively. The policy effects found by OLS technique is above the effects found by the LLR.

The results show that the positive impact of the education reform of 2012 is more substantial for those born in rural regions, that is in subdistrict/ village. That means, the reform is successful at increasing the high school attainment of those who traditionally lag behind. The reduction in the costs of high school attainment bought by the new education reform affects those born in the subdistrict/village regions more favorably, as a result of their higher price elasticity of demand. Moreover, the reduction in the benefits of high school education is less significant for those born in subdistrict/village regions, and that might be another factor contributing to the more favorable impact of reform on this group.

The significant finding of this study is that the 2012 education reform successfully increases the high school attainment of the disadvantaged groups: of females' and of those born in subdistrict/village areas. As a result of lower levels of the high school attainment of these groups before the reform, and their higher price elasticity of schooling demand, the education reform affects these individuals more substantially.

The improvement in the educational attainment of the disadvantaged groups is crucial when the private and social benefits from improved schooling outcomes are considered.

The improvement in the high school attainment of the groups who lag behind has significant implications for the policymakers within a developing country context. The factors causing suboptimal schooling decisions might be more binding in these countries, particularly for disadvantaged groups. The policy instruments, the free bussing scheme, and the placement of disadvantaged individuals in boarding schools could also help reduce the psychic costs of school attendance by facilitating access to schools in distant places. In this regard, the compulsory education policies coupled with investments reducing the monetary and nonmonetary costs of school attainment can effectively improve the educational outcomes of those who lag behind and might help reduce the regional and gender gaps in schooling attainment.

Although it is not discussed in this thesis, there might also be spillover effects to higher levels of education, which means that the benefit of compulsory education is beyond what is estimated. Furthermore, though the likely causal benefits of the improved high school attainment on other socioeconomic outcomes is beyond the scope of this thesis, this study establishes the groundwork for future research, by exploring the favorable effect of the 2012 education reform on the high school attainment of individuals.

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## APPENDICES

## A. TURKISH SUMMARY / TÜRKÇE ÖZET

## ZORUNLU EĞİTİM SÜRESİNİN UZATILMASININ TÜRKİYE'DE LİSE SINIF TAMAMLAMA ORANLARINA ETKİSİ

## Giris

Dünya genelinde bireylerin eğitim çıktılarının iyileştirilmesi, Birleşmiş Milletler tarafından kabul edilen Sürdürülebilir Kalkınma Hedefleri arasında yer almaktadır. Eğitimin hem toplumsal hem de özel yararları olduğu için erişilebilir ve eşitlikçi, kaliteli eğitim fırsatlarının sağlanması için hükümetler tarafından önlemler alınmaktadır (Birleşmiş Milletler Eğitim, Bilim ve Kültür Örgütü, 2022).

İlk ve alt orta öğretim seviyeleri, bireylerin temel matematik ve okuryazarlık becerilerini geliştirir ve onları üst orta öğretime hazırlar. Öte yandan lise eğitimi, bireyleri çalı̧̧ma hayatı ve yüksek öğrenim için gerekli yeteneklerle donattığı için önemlidir. Diğer bir deyişle, lise eğitimi bireylerin ekonomilerin insan gücünü ve toplumların refahını geliştirmek için gerekli olan önemli becerileri ve bilgileri edindiği ilk eğitim düzeyidir (UNESCO İstatistik Enstitüsü, 2012).

Okul terki, gelişmiş ve gelişmekte olan ekonomilerde ele alınması gereken yaygın bir sorundur. Üst orta öğretimin kişisel ve ekonomik faydaları açık olmasına rağmen, bireyler finansal kısıtlamalar, miyop bakış açısıyla karar verme, bilgi eksikliği, asilvekil sorunları veya bireysel düzeyde okullaşmanın olumlu dışsallıklarının farkında
olmama gibi birçok faktör nedeniyle okulu bırakabilirler ve bunlar gelişmekte olan veya en az gelişmiş ülkelerde daha bağlayıcı kısıtlamalardır (Kırdar ve diğerleri 2016).

Lise terkleri, daha düşük yaşam boyu harcama, daha yüksek işsizlik ve eksik istihdam, kötü sağlık, depresyon ve yaşam memnuniyetsizliği ile ilişkilidir (Oreopoulos, 2007). Lise eğitimini tamamlamamış bir kişinin lise mezunu olanlara göre istihdam edilme olasılığı daha azdır, daha düşük gelir elde eder, ve tutuklanma olasıllğı daha fazladır (Sum, Khatiwada ve McLaughlin, 2009). Ayrıca, okulu bırakanların çocuklarının kötü sağlığa sahip olma ve daha düşük ekonomik ve eğitim durumuna sahip olması daha olasıdır, bu da okul terkinin olumsuz nesiller arası sonuçlara neden olduğu anlamına gelir (Bradley ve Corwyn, 2002).

Hükümetler, özellikle dezavantajlı gruplar için bu istenmeyen sonuçları önlemek için önemli bir çaba göstermektedir (Oreopoulos, 2007). Zorunlu eğitim politikaları, tüm dünyada çocukların ve gençlerin eğitim kazanımlarını iyileştirmek için yaygın olarak uygulanan araçlardır. Bu politikaların aynı zamanda birçok sosyoekonomik sonuç üzerinde arzu edilen etkileri vardır. Politikalar kazancı artırır (Angrist ve Kruger, 1991; Mocan 2014; Aydemir ve Kırdar, 2017; Torun 2018), çocuk işçiliği oranını azaltır (Dayığlu 2005; Dayıoğlu ve Kırdar, 2020), adölesan doğurganlığı azaltır (Black ve diğerleri, 2008; DeCicca ve Krashinsky, 2015; Kırdar ve diğerleri, 2018), ölümlülüğü azaltır (LIeras-Muney,2005) , suç davranışını azaltır (Lochner ve Moretti, 2004), bireylerin refahına katkıda bulunur (Dursun ve Cesur, 2016). 2012 eğitim politikası, zorunlu eğitimin süresini sekiz yıldan on iki yıla çıkarmış ve diğer önemli değişikliklerin yanı sıra eğitim sistemini $4+4+4$ olarak yeniden yapılandırmıştır. Bu reform aynı zamanda okula başlama yaşı, ders saatlerinin süresi ve müfredatla ilgili bazı önemli değişiklikleri de içermektedir.

Milli Eğitim Bakanlığı (MEB) reformla birlikte okul, derslik ve öğretmen sayısını artırmak için altyapı yatırımları yaptı. (Milli Eğitim Bakanlığı, 2021). Ayrıca, bu reformla seyrek nüfuslu kırsal bölgelerde yaşayan lise öğrencileri için taşımalı eğitim uygulaması getirilmiştir. Reform, 2011-2012 öğretim yılında \%67,4 olan net okullaşma oranını 2015-2016 öğretim yılında \%79,8'e çıkararak başarılı olmuştur (Milli Eğitim Bakanlığı, 2016, 2021).

Bu tezde, zorunlu eğitim süresindeki artışın 17-28 yaş arası bireylerin eğitim kazanımları üzerindeki etkisini incelemek için Türkiye'deki 2012 eğitim reformunu kullanıyoruz. Ancak 2012 eğitim reformu ile lise eğitiminin zorunlu hale getirilmesinin yanı sıra eş zamanlı olarak lise müfredatında yapılan değişiklikler, devlet tarafından yapılan ve lise eğitiminin kalitesini etkileyebilecek yatırımlar, taşımalı eğitimin gibi birçok değişiklik yapılmıştır. Bu nedenle lise süresinin uzatılmasının etkisine ilişkin analiz tahminlerinin, bu değişikliklerin etkisini içerdiği unutulmamalıdır. Spesifik olarak, aşağıdaki araştırma sorularını soruyoruz:

- 2012 eğitim reformu, herhangi bir lise sınıfını bitirip bitirmediklerine bakmaksızın bireylerin liseye kaydolma oranını önemli ölçüde artırıyor mu? Eğer öyleyse, ne kadar? Reformun, reformdan önce ortaokulu bitirdikten sonra lise eğitimine devam etmeyecek olan bireyler üzerinde anlamlı bir etkisi var $\mathrm{mı}$ ?
- 2012 eğitim reformunun zorunlu kilınan 9., 10., 11. ve 12. sinıfları tamamlanma oranları üzerindeki etkisi nedir? Başka bir deyişle, yeni politika bu sınıfları tamamlayan bireylerin oranını nasıl etkiliyor?

Politikanın farklı demografik gruplar üzerindeki olası heterojen etkisini göz önünde bulunduruyor ve aşağıdaki soruyu sorarak eğitim politikasının çeşitli alt gruplar üzerindeki farklı etkilerini de araştırıyoruz:

- Yukarıdaki soruların cevapları kadın ve erkek, il/ilçe merkezlerinde doğanlar ve bucak/köy doğumlular için nasıl değişiyor?

Kırsal bölgelerde bireylerin ve kadınların okullaşma düzeyi, kentsel bölgelerde yaşayanların ve erkeklerin okullaşma düzeyinin gerisinde kalabilir (Orazem ve King, 2008; Kırdar ve diğerleri, 2016), ve bu nedenle politikanın farklı etkilerini araştırıyoruz.

## Literatür Taraması

Eğitime yatırımına ilişkin bireysel karar alma süreci, yıllardır birçok bilim insanının araştırma gündeminde olmuştur. Bu süreçle ilgili mevcut araştırmalar, yatırım sürecine farklı yaklaşımların altını çizmektedir. Eğitim, tam rekabetçi bir piyasa ortamında bireylerin gelecekteki üretkenliğini iyileştiren ve kazançlarını artıran bir yatırım olarak görülebilir veya yeteneklerine katkıda bulunmadan bireylerin içsel becerilerini ve üretkenliğini işaret eden bir araç olarak düşünülebilir. Eğitime ilişkin ilk bakış açısı beşerî sermaye teorisinin temellerini atarken, ikincisi eleme hipotezine işaret eder.

Beşeri sermaye teorisin temelleri Schultz $(1960,1961)$, Mincer (1957-1958) ve Becker'n $(1964,1976,1993)$ işbirlikçi çalışmalarıyla atılmışsa da teorinin temellerini Becker atmıştır. Becker, insanlara yapılan yatırımın mikro analizini rasyonel seçim teorisi işığında ve rekabetçi bir emek ve mal piyasası kurulumunda şekillendiriyor. Bu bağlamda, bazı basitleştirici varsayımlar yapılmıştır. İnsanlar tutarlı davranan ve ileriye görüşlü fayda maksimize edicileridir ve insan davranışı, zaman, gelir, hafıza, hesaplama ve fırsatlar tarafından kısıtlanır (Becker, 1976,1993). Teorik çerçevede beşeri sermayeye yatırım kararları maliyet-fayda analizini içerir. Beklenen yaşam süresi, eğitimin maliyeti, eğitim sonucu ücretlerde meydana gelen artış, risk ve likidite, bilgi, iskonto oranı, farklı faaliyetler arasında geçiş sıklığı ve uzmanlaşma derecesi, bireyin eğitim yatırımı kararını etkileyen faktörlerdir.

Öte yandan, eleme hipotezinin arkasındaki temel fikir, işgücü piyasasındaki bilgi yapısının asimetrik ve eksik olmasıdır. Teorinin temelleri Spence (1973) tarafından atılmıştır. Bu bağlamda, adayların eğitim geçmişi, üretkenlikleri veya doğuştan gelen yetenekleri hakkında sinyaller verir. İnsan sermayesi teorisinden farklı olarak, eğitim bireylerin üretkenliğini artırmaz, yalnızca yeteneklerini işaret eden bir mekanizma görevi üstlenir (Blaug 1985, 1993)

Literatürde okul terki davranışı ile ilgili çalışmalar bulunmaktadır ve bu davranışa neden olan faktörlerin anlaşılması, terkin önlenmesi ve okullaşma sonuçlarının iyileştirilmesi için çok önemlidir. Çok sayıda faktör okulu erken terk etmeye katkıda
bulunur ve hepsinden bahsetmek imkansız olsa da okul terki davranışı, kişisel faktörler veya okul, aile, topluluk ve akranlar dahil olmak üzere kurumsal koşullar ile ilişkili olabilir (McDermott ve diğerleri, 2019; Rumberger, 2020).

Doll ve diğerleri (2013), McDermott ve diğerleri (2019), ve Rumberger (2020) erken okul terkine sebep olan faktörleri araştırmaktadır. Doll ve diğerleri (2013), terk davranışına neden olan faktörleri Jordan ve diğerleri (1994), ve Watt ve Roessingh (1994) tarafından geliştirilen üç kavramla araştırmaktadır: itme, çekme ve düşme faktörleri. İtici faktörler okulda ilişkin olumsuz sonuçlarla, çekici faktörler öğrencilerin kendilerine ilişkin sebeplerle, düşme faktörleri ise öğrencilerin zayıf akademik performansın bir sonucu olarak okulu bitirmeye yönelik ilgisizlik ve umutsuzluğa kapılması ile ilgilidir. Okul, öğrencileri sınavlarda başarısızlık, sınıf tekrarı devamsızlık, disiplin suçları, okula ulaşımdaki zorluklar, düşük eğitim kalitesi, öğretmen ve akranlarla anlaşamama gibi sebeplerle okul dışına itebilir. Ailevi sorumluluklar, evlilik veya hamilelik, finansal zorluklar, para kazanma isteği, kötü sağlık durumu, okulu terk etmiş akranların olumsuz etkileri, ailevi meseleler gibi sebepler öğrencilerin dikkatini dağıtarak ve onları cezbederek okul dışına çekebilir. Öte yandan, öğrenciler itici ve çekici faktörlerden bağımsız olarak, okulu sevmedikleri için, taşındıkları için, ebeveyn desteği ve okula aidiyet hissinin olmaması veya eğitime düşük getiri beklentileri gibi faktörlerden dolayı eğitim sisteminden düşebilirler ( Doll ve diğerleri ,2013;McDermott ve diğerleri, 2019;Rumberger ,2020) Bununla birlikte okulu terki, düşük gelirli ailelerde yetişen kişiler ile etnik ve ırksal azınlık grupları arasında daha yaygındır (McFarland ve diğerleri, 2016). Bunlar insanların eğitimi nasıl algıladıklarını ve eğitimin kalitesi belirleyen kendilerine sunulan kaynakları etkiler. Benzer bir tablo çizen Rumberger (2020), okulların yapısal özelliklerini de okul terk davranışıyla ilişkili kurumsal bir faktör olarak açıklamaktadır. Okulların kalitesiz olması okul terk davranışına neden olabilir.

Hem insan sermayesi teorisi hem de tarama hipotezi, insanları optimal kararlar veren rasyonel karar vericiler olarak tasvir eder. Ancak, gerçek dünyada insanlar optimal olmayan yatırım kararları verebilir. Yukarıda açıklanan erken okul terkine neden olan faktörlerin yanı sıra, bireyler finansal kısıtlar, miyop bakış açısıyla karar verme, asilvekil sorunları, bilgi eksiklikleri veya okullaşmanın olumlu dışsallıklarının farkında
olmama vb. gibi birçok faktörden dolayı optimal seviyenin altında eğitim almaktadırlar. Bu sorunlar en az gelişmiş veya gelişmekte olan ülkelerde daha bağlayıcıdır.

Oreopoulos (2007), maddi ve manevi faydaların yüksek olmasına rağmen bireylerin okulu terk ettiğine işaret etmiştir. Bazı manevi maliyetlerin okulu itici kıldığını belirtir. Örneğin, sınavlardan kaynaklanan stres ya da öğretmenlerin olumsuz tutumları okulu bırakma davranışına katkıda bulunabilir. Liseden kaçınmanın yanı sıra miyop bakış açısıyla eğitimin gelecekteki yararlarını daha fazla küçümseme ise bireylerin okuldan düşme nedeni olarak gösterilebilir. Dahası, okul yatırımlarına ilişkin yüksek düzeyde bir belirsizlik, eğitimin ek bir manevi maliyeti olarak hizmet edebilirken, daha düşük belirsizlik okullaşmayı daha çekici hale getirir. Levhari ve Weiss (1974), üniversite mezunlarının kazançlarıyla ilgili riskin lise mezunlarına göre daha fazla olduğunu göstermektedir.

Okuldan düşmeye katkıda bulunan bir diğer faktör, kültürel engellerdir ve bilgi eksikliğidir. Okullaşmaya karşı olumsuz kültürel normlar veya daha yüksek bir eğitim seviyesi üzerindeki akran baskısı, okuldan nefret edilmesine katkıda bulunabilir (Coleman, 1961). Ebeveynler, kız çocuklarının eğitiminin önündeki kültürel engellerin bir sonucu olarak, kız çocuklarının eğitimini değersizleştirebilir. Bu durum, ebeveynler ile çocuklarının çıkarları çatıştığı için bir asil-vekil sorununa neden olmaktadır (Kırdar vd., 2016).

Öğrencilerin okulu bırakma davranışını, eğitimin gelecekteki getirileri hakkında bilgi sahibi olmamaları veya getiriyi yanlış algılamaları da açıklayabilir (Jensen ,2010). Bireyin elde edeceği kazanımlara ilişkin tahmini genellikle olması gerekenden daha düşüktür (Dominitz ve diğerleri, 2001). Sosyoekonomik düzeyi düşük ailelerde bireyler okullaşmanın getirisini olduğundan daha az tahmin etmektedir, bu nedenle okulu bırakma olasılıkları daha yüksektir. (Oreopoulos, 2009). Ek olarak, yoksul topluluklarda yaşayanların, okulu bırakan akranlarını izleyerek okulu bırakma olasılıkları daha yüksektir ve bu da bir çekici faktöre işaret etmektedir (Rumberger, 2020). Terkler genellikle, bireylerin eğitime getirisine ilişkin daha az bilgiye sahip oldukları ve sadece çevrelerindeki insanların kazançlarına yönelik bilgiyle
çevrelendikleri gençlik döneminde meydana gelmektedir. Özellikle düşük gelirli veya kırsal bölgelerde yaşayan bireyler, kentsel sektör kazançları veya yüksek ücretli sektörler hakkında çok az veya yanlış bilgiye sahip olacaktır. Manski (1993), okullaşma kararlarının, öğrencilerin ve ailelerinin eğitimin getirisine yönelik algılarından etkilendiğini belirtmektedir.

Bir bilgi eksikliği olarak, öğrenciler de bireysel okullaşma kararları verirken genellikle okullaşmayla ilgili olumlu dışsallıkları dikkate almazlar (Kırdar vd., 2016). Eğitimin sosyal getirileri özel getirilerden daha yüksek olabilir çünkü eğitimin kamu yararı veya yayılma etkileri olabilir (Jensen,2010). Ayrıca, bir bilgi eksikliği olarak, öğrenciler bireysel okullaşma kararları verirken genellikle okullaşma ile ilgili olumlu dışsallıkları dikkate almazlar (Kırdar vd., 2016).

Finansal ve likidite kısıtları, kredi piyasalarının az gelişmiş olması nedeniyle gelişmekte olan ülkelerde daha bağlayıcı olmakla birlikte itici faktörler arasındadır. Örneğin, çocukların ailelerini desteklemeleri gerekiyorsa finansal kısıtlamalar öğrencilerin okula devam etmelerini engelleyebilir (Fine ve Zane, 1991). Öte yandan, ülke geliştikçe likidite kısıtları azalmaktadır (Orazem ve King, 2008). Zorunlu eğitim politikaları, ücretsiz eğitim sağlayarak bu kısıtların olumsuz etkilerini azaltabilir (Kırdar ve diğerleri, 2016). Orazem ve King (2008), hükümet tarafindan sağlanan ücretsiz zorunlu eğitimin bir sübvansiyon işlevi görebileceğini ve okullaşma maliyetini azaltabileceğini öne sürüyor.

Yukarda sayılan faktörlerin bir sonucu olarak, dünya çapında, bireylerin okullaşma sonuçlarını iyileştirmeyi hedefleyen çeşitli politikalar uygulanmaktadır. Okullaşmadaki kurumsal değişimlerle ilgili literatür incelendiğinde Kırdar ve diğerleri (2016), Türkiye'de 1997 eğitim reformunun çeşitli alt grupların sınıf tamamlama oranları üzerindeki farklı etkisini araştırmaktadır. Bu tez ayrıca, ilgi alanımız 2012 eğitim reformu olmasına rağmen, eğitim reformunun cinsiyete ve doğum il türüne göre sınıf tamamlama oranları üzerindeki etkisini araştırmaktadır. Çalışma, reformun ortaokul seviyesinde okullaşmayı incelenen tüm gruplarda olumlu etkilediğini bulmuştur. Olumlu etki kırsal bölgelerdeki kadınlar için belirgin olsa da, ne kentte ne de kırda cinsiyetler arası farkın azaldığına dair bir kanıt bulunmamaktadır. Ancak,

Kent-kır okullaşma farkı hem erkekler hem de kadınlar için daralmaktadır. Öte yandan, Erten ve Keskin (2019), bu tezin araştırma konusu olan, Türkiye'de 2012 eğitim reformunun okullaşma ve işgücü piyasası sonuçlarını araştıran tek makale olması nedeniyle özel ilgiyi hak etmektedir. Bu çalışmada zorunlu eğitim yasasının liseye devamı artırdığını bulmuştur.

Bu iki çalışma dışında, zorunlu eğitim yasalarındaki değişikliğin eğitim kazanımı üzerindeki etkilerini araştıran birçok çalışma bulunmaktadır. Gelişmiş ülkelerde bu tarz politikalar okullaşma üzerinde olumlu bir etkiye sahiptir (Angrist and Kruger, 1991; Harmon and Walker, 1995; Oreopoulos , 2007; Brunello et al., 2009). Ayrica az gelişmiş veya gelişmekte olan ülkelerden elde edilen kanıtlar, zorunlu eğitim politikalarının okullaşma üzerinde pozitif etkiye sahip olduğunu göstermektedir (Clark and Hsieh, 2000; Tsai et al., 2009; Fang et al., 2012; Elsayed, 2019). Buna ek olarak, okul inşaa programları da okullaşma sonuçlarını olumlu etkilemektedir (Duflo ,2001; Kazianga ve diğerleri ,2013).

2012 eğitim reformunun sonuçları literatürde çok az çalışılmaktadır. Türkiye'de zorunlu eğitimin süresini on iki yıla çıkaran 2012 eğitim reformunun bireylerin okullaşma çıktıları üzerindeki etkisini araştırarak bu sınırlı literatüre katkıda bulunuyoruz. Öte yandan, bu çalışmada reformun ilk uygulamasından altı yıl sonra toplanan nispeten yeni verileri (2018 TNSA) kullanarak lise bitirmenin sınıf bazında analizini yapıyoruz.

## Kurumsal Arka Plan

Türk Eğitim Sisteminde geçmişten günümüze eğitimde ilerleme sağlamak için eğitim kurumları, eğitim kademelerinin süresi ve müfredat ve eğitim kademesinin zorunluluk statüsü ile ilgili çeşitli adımlar atılmıştır. Dönüm noktaları olarak üç tarihten bahsetmek mümkündür: 1997, 2006 ve 2012 eğitim reformları. 1997 eğitim reformuyla, ilkokul ve ortaokul, ilkokul eğitimi adı altında birleştirildi ve bu kanunla sekiz yıl eğitim zorunlu oldu (Resmi Gazete, no: 23084, 16 Ağustos 1997). 2005 eğitim reformu ise zorunlu olmayan lise eğitimi süresini üç yıldan dörde çıkardı. Dahası,
hazırlık sınıfı özel statüdeki az sayıda okul dışında kaldırıldı ve lise müfredatında birçok değişiklik yapıldı.

Bu tezin çalışma konusu olan 2012 eğitim reformu ise okula başlama yaşı, eğitim kademelerinin süresi, ders saatlerinin süresi, müfredat, zorunlu eğitim süresinin uzatılması ile ilgili birçok önemli değişikliği içermektedir. 2012 yılı öncesinde temel eğitim sekiz yıllık sürekli bir yapıya sahipken, 2012 yılında temel eğitimin yapısı dört yıllık ilkokul, dört yıllık ortaokul ve dört yıl lise eğitimini kapsayacak şekilde değişmiştir. Ayrıca 2012 yılından itibaren lise eğitimi zorunlu hale getirilmiştir ve ortaokul diploması kaldırılarak liseden mezun olanlara tek bir lise diploması verilmesine karar verilmiştir. Bu yasayla ilkokula başlama yaşı 66 aya indirilmiş, İmam-Hatip okulları ortaokullar arasında katılmış, ortaokulların ve liselerin müfredatına Kur'an ve Hz. Peygamber'in Hayatı seçmeli ders olarak eklenmiştir. Yasayla, ilkokul ve ortaokulların bağımsız okullar olarak kurulması zorunlu hale gelmiştir. Ancak, şartlara bağlı olarak ortaokulların da ilkokullarla veya liselerle birlikte açılabileceği kanunda belirtilmiştir. Ayrıca zorunlu ortaöğretimin ilk uygulamasına 2012-2013 öğretim yılında başlanacağı belirtilmiştir (Resmi Gazete, no: 28261, 11 Nisan 2012).

Yeni eğitim yasasıyla birlikte zamanın hükümeti lise seviyesinde okul, sınıf ve öğretmen sayılarını artırmaya yönelik yatırımlar yapmış, kırsal ve seyrek nüfuslu yerlerde yaşayan lise öğrencileri merkez okullara taşınmaya başlanmıştır. Taşımalı eğitime elverişli olmayan yerleşim yerlerinde yaşayan öğrenciler ise yatılı okullara yerleştirilmiştir. Reform uygulamasının ilk yılı olan 2012-2013 eğitim öğretim yılında taşınan öğrenci sayısı 157,6 binden 376,6 bine yükselmektedir. 2012-2013 eğitim öğretim yılından 2017-2018 eğitim öğretim yılına kadar merkez okullara taşınan toplam öğrenci sayısı $\% 14,92$ oranında artmıştır. Kadınlar, taşımalı eğitimden erkeklere göre daha fazla etkilenmiştir ( MEB'den taşımalı öğretim genelgesi, 2012; Milli Eğitim Bakanlığı, 2012, 2013, 2014,2015,2016, 2017,2018). Reform, 2011-2012 öğretim yılında \%67,4 olan net okullaşma oranını 2015-2016 öğretim yılında \%79,8'e çıkarmıştır (Milli Eğitim Bakanlığı, 2016, 2021).

## Veri ve Method

Bu çalışmada kullanılan birincil veri kaynağı, Türkiye Nüfus ve Sağlık Araştırmaları'nın (TNSA) 2018 dalgasından gelmektedir. Hacettepe Üniversitesi Nüfus Etütleri Enstitüsü bünyesinde ilki 1968 yılında olmak üzere, ülke çapında bir alan araştırması olan Nüfus ve Sağlık Araştırmaları Serisi beş yılda bir gerçekleştirilmiştir. 2018 TNSA , politika yapıcılara ilgili kararlarda yardımcı olmak için nüfusun demografik özellikleri ve sağlğ̆ ile ilgili güncel bilgiler sağlamayı amaçlamaktadır. 2018 projesi, önceki anketlerde olduğu gibi, birincisi hanehalkı ve hanehalkı üyelerinin bireysel özellikleri hakkında genel bilgi toplamaya yönelik ikincisi ise bu hanelerdeki uygun kadınlar hakkında ayrıntılı ve kapsamlı demografik bilgi toplamaya yönelik iki tür anketten oluşmaktadır.

Çalışmamızda ilk kısımda toplanan verileri, Hanehalkı Anketi verilerini kullanmaktayız. Bu anket cinsiyet, tamamlanmış yaş, hane reisine yakınlık, vatandaşlık, doğum yeri, ebeveynin hayatta olma durumu, okuryazarlık, okula devam durumu, eğitim durumu, istihdam ve gelir durumu, ve medeni durum hakkında ayrıntılı bilgiler içermektedir. TNSA'nın çalışmamızın amacı açısından avantajlı yanı, tamamlanan en yüksek eğitim düzeyi, ve bu eğitim düzeyinde tamamlanan sınıf, katılımcının yaşı ve cinsiyeti, doğum yerinin türü ve doğum ili gibi önceden belirlenmiş bazı özelliklere ilişkin bilgileri içermesidir. Potansiyel bir dezavantaj ise doğum ayı bilgisinin sadece kadınlar için toplanmasıdır. Kullandığımız örneklemi 1728 yaş (1991-2001 yıllarında doğanlar) arası Suriyeli olmayan bireyler ile sinırlandirıyoruz.

Analizimizde, anketteki değişkenleri kullanarak tanımladığımız beş kukla değişkeni sonuç değişkeni olarak kullanıyoruz. Bu değişkenler herhangi bir sınıfı tamamlamadan bağımsız olarak ortaokulu tamamladıktan sonra en azından liseye geçme, en az 9.sınıfı tamamlama, en az 10. sınıfi tamamlama, en az 11. sınıfı tamamlama ve en az 12. sınıfı tamamlama için 1 değerini alırken bu durumlar sağlanmadığında 0 değerini almaktadır. Örneklemin $\% 77,5$ 'i liseye gitmiştir. En az 9. sınıfı tamamlayan gözlemlerin yüzdesi se $\% 75.7$ 'dir. Sınıf düzeyi yükseldikçe ilgili sınıf düzeyini tamamlayan gözlemlerin yüzdesi azalmaktadır. En az 12. sınıfı tamamlayan gözlemlerin oranı \%57,4'tür. Bağımsız değişkenler olarak ise, hanehalkı üyelerinin
önceden belirlenmiş sosyoekonomik özellikleriyle ilgili bir dizi kontrol değişkeni kullanılmıştır: hanehalkı üyesinin cinsiyeti, doğum yeri ( NUTS-1 kategorisine göre)ve doğum yerinin türü (il merkezi,/ilçe merkezi ve bucak/köy) .

Etki değerlendirme yöntemleri, uygulanan programların ve politikaların etkisinin ölçülmesine olanak tanır. Bu yöntemlerin birincil amacı, bir politika değişikliğinin veya yeni bir programın etkisini değerlendirmektir. Yarı deneysel bir yöntem olarak Regresyon Süreksizlik Tasarımı (RDD), bir politikanın etkisini belirlemede en yaygın kullanılan yöntemlerden biridir. RDD'nin avantajı, gerekli koşullar sağlandığında, bireylerin tedaviye neredeyse rastgele atanması nedeniyle, sonuçların herhangi bir politikanın etkisini değerlendirmede rastgele bir deneyden elde edilen sonuçlar kadar başarılı olmasından kaynaklanmaktadır (Angrist ve Pischke, 2014). Bu tezdeki ampirik analizin amacı, 2012 yılında zorunlu eğitim politikasındaki değişikliğin lise öğrencilerinin okullaşma sonuçları üzerindeki etkisini değerlendirmek olduğundan, keskin RDD metodolojisini kullanıyoruz. Yeni yasayla bireyler doğum yıllarına göre tedavi ve kontrol gruplarına atanmaktadır. 2011-2012 eğitim-öğretim yılında 8. sınıfı bitiren öğrenciler, yeni zorunlu eğitim yasası gereği 2012-2013 eğitim-öğretim yılında liseye kayıt yaptırmak zorunda kaldılar. Okula başlama yaşının altı olduğu varsayılarak ve temel eğitim süresinin sekiz yıl olduğu dikkate alınarak, zorunlu eğitim reformunun 1998 ve sonrasında doğanları etkilediği sonucuna varılmıştır. Bu nedenle, marj değişkenimiz doğum yılı iken, RDD analizimizdeki eşik değeri 1998 yılıdır. Doğum yıll, bireyler tarafindan manipüle edilemeyen önceden belirlenmiş bir değişken olduğundan geçerli bir marj değişkenidir. RDD metodolojisinin temel varsayımı, tedavi durumu dışında eşik değerinde başka hiçbir şeyin değişmediğini ifade eden süreklilik varsayımıdır. Bireylerin kontrol ettiğimiz özelliklerinin eşik değerinde sürekli olduğu çalışmamızda gösterilmiştir.

Bireyler okula altı yaştan farklı bir yaşta başlamak ya da sınıf tekrarı yapmak gibi sebeplerle yasaya tam olarak uymuyor olabilir. Bu durum, ortalama tedavi etkisini (ATE) tahmin edici olarak tanımlamamızı engellemektedir. Araştırmamızda yasaya uymama olasılığını dikkate almadığımız ve tedavi değil, tedavi atamasının etkisini araştırdığımız için, tahmin ettiğimiz politika etkisi niyetlenen etkidir (intention-totreat effect). Bu etkiyi tüm örneklem için, kadın örneklemi, erkek örneklemi, il/ilçe
merkezinde doğanlardan oluşan örneklem ve bucak/köylerde doğanlardan oluşan örneklem için ayrı ayrı tahmin ediyoruz.

Modelimizde marj değişkeni ve sonuç değişkeni arasındaki ilişkiyi lineer kabul etmekle birlikte, ekonometrik tahminleri hem parametrik hem de parametrik olmayan stratejiyi kullanarak yapıyoruz. İki yaklaşımda da ortalama karesel hata (MSE) yaklaşımını kullanarak hesapladığımız optimal bant genişliklerini kullanıyoruz. Parametrik olmayan stratejide ağırlıklandırmada üçgen çekirdek fonksiyonu kullanıyoruz. Böylelikle, eşik değerine yakın olan gözlemlere daha fazla, uzak olan gözlemlere daha az ağırlık verildiğinden parametrik olmayan strateji, parametrik stratejiye göre sonucu etkileme olasılığı olan faktörler üzerinde daha yüksek bir kontrol sağlamaktadır. Bu sebeple, aynı bant genişliğinde yapılan tahminlerde parametrik olmayan strateji daha yansız ve güvenilir sonuçlar vermektedir.

Her bir analizde beş kukla değişkeninkinden herhangi birini bağımlı değişken olarak kullanıyor, politika kuklası, marj değişkeni ve bunların etkileşimlerini bağımsız değişken olarak kullanıyoruz. Ayrıca tahminlerin kesinliğini artırmak için bireylerin bazı temel özelliklerini kontrol değişkeni olarak ekliyoruz. Ancak, dahil edilen ortak değişkenler, model tanımlamasına bağlı olarak farklılık göstermektedir.

## Ampirik Analiz Sonuçları

Regresyon analizine geçmeden önce yaptığımız grafik analizleri neticesinde, tüm örneklem ve alt örneklemlerde eşik değerinde sonuç değişkeninin ortalama değerinde yukarı bşir sıçrama görüyoruz. Bu süreksizlik, eğitim politikasındaki değişikliğin incelediğimiz eğitim çıktıları üzerindeki olumlu etkisine ilişkin bir ipucu vermektedir.

Parametrik stratejiden elde edilen bulgular, reformun tüm örneklemde tamamlama durumuna bakılmaksızın liseye devam eden bireylerin oranını yüzde 5,9 (\%8,14) artırdığını göstermektedir. 9. ve 10. sınıfı tamamlayan bireylerin oranı önemli ölçüde, sırasıyla 5 puan (\%7.03) ve 3.7 puan (\%5.52) artmışsır, ancak politika etkisi 10. sınıfın ötesinde kaybolmaktadır. Öte yandan, parametrik olmayan stratejiden elde edilen tahminler, politikanın tüm sonuç değişkenleri üzerinde olumlu bir etkisi olduğunu göstermektedir. Liseye devam edenlerin oranı 5,45 puan (\%7.52), 9, 10, 11 ve 12. sınıfları tamamlayanların oranı ise sırasıyla 4,48 puan (\%6,30), 3,33 puan (\%4.97),
4.28 puan (\%6.47) ve 8.29 puan (\%13.36), artmaktadır. OLS tekniği kullanılarak bulunan politika etkileri, LLR ile bulunanlardan biraz daha yüksek olsa da, bu iki stratejiden elde edilen sonuçların genel olarak tutarlı olduğunu gözlemliyoruz.

Politikanın cinsiyete göre etkilerine baktığımızda, OLS tahmini 9. ve 11. sınıfı tamamlayan kadınların oranında 10,8 puan ( $\% 10.70$ ) ve 8.51 puan (\%13.27) anlamlı bir artış göstermektedir. Ancak parametrik olmayan stratejiyi kullandığımızda, 2012 eğitim reformu, lisede herhangi bir sınıfa devam eden kadınların oranını 8,79 (\%12.99); 9., 10., 11. ve 12. sınıfları tamamlayan kadınların oranını ise sırası ile 11,2 puan. ( $\% 16.28$ ), 5.47 puan ( $\% 8.24$ ), 7.93 puan $(\% 12,37)$ ve 14,7 puan $(\% 23,83)$ artırmaktadır. Erkekler üzerindeki politika etkisine baktığımızda, OLS tahminlerinin hiçbir sonuç değişkeni için istatistiksel olarak anlamlı olmadığını görüyoruz. Öte yandan, 11. sınıfı tamamlayan erkeklerin oranı beklenmeyen bir şekilde 1.68 puan (\%2.54) düşmektedir. Bu düşüş, tedavi grubunun kontrol grubundan daha genç olmasından kaynaklanıyor olabilir. Dahası, tedavi grubunda sınıf tekrarı mezuniyeti 17 yaşından sonra geciktirebilir.

Ayrıca, doğum yeri türüne göre politikanın heterojen etkisini de araştırıyoruz. OLS tahminleri, il/ilçe merkezlerinde doğanlar için herhangi bir sonuç değişkeni üzerinde istatistiksel olarak anlamlı bir etki göstermemektedir. Öte yandan, LLR sonuçları, liseye devam eden bireylerin oranında 0.64 puan ( $\% 0.80$ ) ile önemli bir artış olduğunu göstermektedir. 11. ve 12. Sınıfı tamamlayanların oranında sırasıyla 2.08 puan ( $\% 2.85$ ) ve 5.65 puanlık ( $\% 8.09$ ) bir artı̧̧ gözlenmektedir. Bucak/köy bölgelerinde doğanlar için eğitim politikasının etkisine baktığımızda, OLS tahminleri, reformun liseye devam eden bireylerin oranı 16,7 puan. ( $\% 31.41$ ) artarken, 10,11 ve 12 . sınıfları tamamlayanların oranını sırasıyla 13,6 puan (\%29.26), 17,1 puan ( $\% 38.66$ ) ve 17,4 puan (\%41.61) artmaktadır. Tutarlı bir şekilde, LLR analizinden elde edilen bulgular liseye devam eden, 10., 11., ve 12 . sınıfi bitirenlerin oranında sırasıyla 15.7 puan $(\% 29,53), 13,2$ puan ( $\% 28.40$ ), 16,3 puan $(\% 36.85)$ ve 16.3 puanlık $(\% 38,98)$ bir artışa işaret etmektedir.

## Sonuç

Bu çalışmada amacımız 2012 zorunlu eğitim yasasının 17-28 yaş arası bireylerin okullaşma çıktıları üzerindeki etkilerine ışık tutmaktır. Ampirik analizler için, ulusal düzeyde temsili bir anket olan 2018Türkiye Nüfus Sağlık Araştırması'nı (TNSA) kullanıyoruz. Politikanın etkisini tahmin etmek için Keskin Regresyon Süreksizlik metodolojisini kullanıyoruz. Tahminler yapılırken hem parametrik hem de parametrik olmayan stratejiler kullanılmaktadır. Tahminler sonucunda bulduğumuz politika etkisi ise niyetlenen etkidir (intention-to-treat effect).

Kadınların reform öncesi ortalama okullaşma düzeylerinin erkeklere göre daha düşük olduğunu göz önüne aldığımızda, politika dezavantajlı grup olan kadınların lise başarısını artırmada başarılıdır. Okullaşma talebinin fiyat esnekliği kadınlar için daha yüksek olduğundan, lise eğitiminin parasal ve parasal olmayan maliyetlerinde reformla meydana gelen düşüş, erkeklere göre kadınları daha olumlu etkilemektedir. Ayrıca reformla birlikte lise diplomasının koyun postu etkisindeki azalma kadınlar için daha az kritik olduğu için, reformdan erkeklere göre daha olumlu etkilenmektedir.

Sonuçlar, 2012 eğitim reformunun olumlu etkisinin kırsal bölgelerde, yani bucak/köyde doğanlar için daha önemli olduğunu göstermektedir. Yani, reformun geleneksel olarak dezavantajlı olan grubun lise seviyesinde okullaşmasını artırmada başarılı olduğu söylenebilir. Bu bölgelerde doğanlar için talebin fiyat esnekliği daha yüksek olduğundan, reformun lise eğitiminin maliyetinde meydana getirdiği düşüş, bucak/köyde doğanları il/ ilçe merkezinde doğanlara göre daha olumlu etkilemektedir. Ayrıca, lise eğitiminin koyun postu etkisindeki azalma bucak/köy bölgelerinde doğanlar için daha az kritiktir. Bu durum, il/ilçe merkezinde doğanlarla karşılaştırıldığında reformun bu grubu daha olumlu etkilemesine neden olmuştur.

2012 reformunun sonucu olarak geleneksel olarak dezavantajlı grupların lise düzeyinde okullaşmasındaki gelişme, gelişmekte olan bir ülke olan Türkiye bağlamında politika yapıcılar için önemli çıkarımlar içermektedir. Optimal düzeyin altında okullaşma düzeyine yol açan faktörler, özellikle dezavantajlı gruplar için bu ülkelerde daha bağlayıcı olabilir Ücretsiz taşımalı eğitim ve dezavantajı bireylerin yatılı okullara yerleştirilmesini içeren politika araçları, uzak bölgelerdeki eğitim
hizmetlerine ve okullara erişimi kolaylaştrarak okula devam etmenin psikolojik maliyetlerini azaltmaya yardımcı olabilir. Bu bağlamda, zorunlu eğitim politikaları, okula devamın parasal ve parasal olmayan maliyetlerini azaltan yatırımlarla birleştiğinde, dezavantajlı grupların okullaşmasını etkili bir şekilde iyileştirebilir ve okullaşmadaki bölgesel ve cinsiyet farklılıklarının azaltılmasına yardımcı olabilir.

Bu tezde tartışılmamasına rağmen, lise düzeyinde okullaşmadaki iyileşmenin olumlu etkisi, daha yüksek eğitim seviyelerine yayılabilir, bu da zorunlu eğitimin faydalarının tahmin edilenin ötesinde olduğu anlamına gelir. Ayrıca bu tezin kapsamı dışında olsa da, bu çalışma lise düzeyinde okullaşmadaki iyileşmelerin diğer sosyoekonomik çıktılar üzerindeki olası nedensel etkilerini araştıracak çalışmalara zemin hazırlamaktadır.

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[^0]:    ${ }^{1}$ For more information, visit https://www.resmiistatistik.gov.tr/detail/subject/kir-kent-tanimininrevizyonu/.

[^1]:    ${ }^{2}$ These five regions are the North, South, East, West and the Central.
    ${ }^{3}$ As a candidate of European Union, NUTS are defined by Turkey and Eurostat. NUTS-1 major socioeconomic regions include İstanbul, West Marmara, Aegean, East Marmara, West Anatolia, Mediterranean, Central Anatolia, West Black Sea, East Black Sea, Northeast Anatolia, Central East Anatolia, and Southeast Anatolia (Eurostat, 2020).
    4 By type of place of residence, rural-urban stratification is meant. The conventional urban-rural stratification was not used due to the change of the definition in 2012. The rural/urban distinction in the data is based on each cluster's size of the population and the former administrative status (Hacettepe University Institute of Population Studies, 2019).

[^2]:    ${ }^{5}$ For more information, see Calonico, Cattaneo and Titinuik (2014) and Calonico, Cattaneo and Farrell (2020).

[^3]:    ${ }^{6}$ While calculating the percentage changes, the percentage point change that is found in estimations is divided by the pre-policy mean of the relevant outcome for the control group (pre-policy mean of outcome variable).

[^4]:    Notes: Estimated optimal bandwidths are shown. The estimated bandwidths are equal to the values shown in the table on each side of the cutoff. Standard errors are clustered at the year of birth level and robust standard errors are given in parentheses. Significance levels are denoted by ${ }^{* * *}$ for $1 \%$ level, ** for $5 \%$ level, and $*$ for $10 \%$ level.

