ESSAYS ON NON-MARKET RETURNS TO EDUCATION: EVIDENCE FROM A NATURAL EXPERIMENT IN TURKEY

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Declaration

Whilst registered as a candidate for the above degree, I have not been registered for any other research award. The results and conclusions embodied in this thesis are the work of the named candidate and have not been submitted for any other academic award.

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Mustafa Ozer

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Abstract

As a result of the political events in the mid-1990s, the compulsory schooling in Turkey was extended to 8 from 5 years. Cohorts who were at the fourth grade or lower had to continue 8 years of compulsory education. This reform generated a natural experiment, and therefore, enables researchers to obtain endogeneity-robust estimates of market and non-market returns of education. In this thesis, I used this reform to investigate some non-market returns of education.

Chapter 2 is the first study to investigate the causal impact of maternal schooling on childhood immunisation rates. I used the exposure to the Compulsory Education Law (CEL), enacted in Turkey in 1997, by date of birth and the differentiation in its implementation across regions as an instrument for the schooling of young mothers. CEL generated an exogenous change in compulsory education from 5 to 8 years for women born after 1986. Using the CEL as an instrument, this chapter finds that an increase in the education of mothers significantly increases the coverage of the third (full) dose of DPT and Hepatitis B for their children. Furthermore, the chapter investigates the causality between maternal education and a range of channels affecting immunisation rates suggested in the literature. I find that education increases the age of first marriage and birth, changes women`s and their spouse`s labour market status and significantly affects women`s attitude towards spousal violence against women and gender discrimination in a manner that empowers women.

Chapter 3 provides empirical evidence regarding the causality between education and mental health in the context of a large emerging economy, Turkey. I exploit differentiation in the exposure to the Compulsory Education Law (CEL) change by the

date of birth as an instrument for schooling of young women. When the CEL is used as an instrument for schooling of women, I find that schooling increases the incidence of some mental health disorders. These findings seem quite robust to alterations in the regression definitions and to the inclusion of additional individual-level control variables such as having one`s own income, employment status, marital status, occupation, domestic abuse history in the family, and rural/urban status. I also find a heterogeneous effect of the CEL on educational attainment of women depending on residence status and whether their birth mother had been abused by her partner. Moreover, heterogeneous effect tests also indicate that the effect of education differs by personal income and labour market status of women.

Chapter 4 is the first study to investigate the causal effect of the husband`s education on violent and abusive behaviour against their wife. To do this, I use a natural experiment, an education reform increasing compulsory schooling from five to eight years in Turkey, as an instrument to obtain endogeneity-robust estimates. I find that the husband`s education lowers the probability of suffering physical, emotional and economic violence as well as experiencing socially unacceptable behaviour. The only aspect of violence not affected by the spouse`s education is sexual violence. I also find that women whose mothers or whose husbands' mothers experienced domestic violence are more likely to suffer violence themselves.

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1. Introduction

*"Education is the most powerful weapon which you can use to change the world"-**Nelson Mandela***

1.1 Theoretical and empirical background

One of 17 sustainable development goals of the United Nations (UN) is to *"ensure inclusive and quality education for all and promote lifelong learning"*. The UN also see education as an accelerator to reach other sustainable development goals, such as health, growth, employment, production, and so on.

The hypothesis of Grossman with respect to education can be an explanation as to why the UN consider education as a significant factor to accomplish remaining development aims. According to Grossman, education is a crucial determinant of human capital as the knowledge gained through education is embedded in a person and comes with him wherever he goes, which is, therefore, likely to affect decisions made at and outside work (Grossman 2006). Therefore, if it has the ability to have an impact on our decisions, then governments should take education into account while developing such policies.

Table 1.1 is constructed by Mingat and Tan (1996) and details possible costs and benefits of schooling. Return to education for individual shows increases in market productivity and private non-market effects. It also has quite important benefits to the society. These are spillover effects in labour productivity, enhancements in technological possibilities and community non-market effects. On the other hand, individuals suffer from direct costs and forgone production, whereas the disadvantage of schooling to the society is the public subsidy.

Table 1.1 Generic education costs and benefits and their accrual to individuals and the rest of society

	INDIVIDUALS	SOCIETY
COSTS	C1. Direct costs (including school fees)	C3. Public subsidy net of cost recovery and adjusted for possible deadweight losses of tax-financed public spending)
	C2. Forgone production Lost earnings or other production)	B3. Spillover effects in worker productivity (as when a person's education enhances the work productivity of his or her co-workers)
BENEFITS	B1. Increased market productivity as reflected in earnings or other work outputs)	B4. Expanded technological possibilities (such as those arising from the discovery, adaptation and use of new knowledge in science, medicine, industry, and elsewhere)
	B2. Private non-market effects (better personal health, expanded capacity to enjoy leisure, increased efficiency in job search and other personal choices)	B5. Community non-market effects (greater social equity, more cohesive communities, stronger sense of nationhood, slower population growth and related alleviation of environmental stress, reduced risks from infectious diseases, crime reduction, and so on)

Source: Mingat and Tan (1996)

Having a closer look into Table 1.1 shows that education has a significant number of potential benefits not only for individuals but also societies. Then, one can be curious about how it got on the agenda of economists. It was the earlier works of Becker (1962; 1965; 1975) and Mincer (1958; 1962; 1974), which constructed the modern theory of Human Capital. After their earlier theoretical contributions, economists have begun to consider education as a fundamental component of human capital and conducted empirical analysis on the correlation between schooling and its market returns, such as wages and productivity (see literature reviews Psacharopoulos, 1994; Psacharopoulos & Patrinos, 2004; Willis, 1986). Later, in 1972, Grossman wrote an influential article, specifically on health returns of education which brought economists to investigate non-market returns of education (Grossman, 1972). He argues that there are two theoretical explanations for the relationship between education and health. To begin with, early theoretical and empirical studies that emerged after Becker (1962) and Mincer (1958) suggest that less educated people have lower productivity at the labour market. Grossman shows that they are also unproductive users of medical care services compared to the people with higher schooling. This means that with given fixed amount of health inputs, education increases the possibility of producing improved health outcomes. This is known as the *productive efficiency* of schooling. Also, the usage of inputs in the production of health varies with education: less educated people are more inclined to expose risky and unhealthy habits including smoking and drinking as they are less concerned about their harmful impacts than more educated people. In another word, schooling helps one notice the information concerning what is healthy, and/or makes the use of the information to prevent health disorders. This has been stated to as the *allocative efficiency of schooling*. A considerable amount of literature has been published on non-market returns of

education (see literature reviews by Grossman (2006) and Psacharopoulos and Patrinos, (2004)).

However, an observed positive correlation between schooling and its market and non-market effects does not have to be causal. None of the aforementioned studies address the endogeneity of schooling. Estimates that do not correct for this endogeneity may be biased. To begin with, schooling could directly increase wages (e.g. Devereux & Hart, 2010; Meghir & Palme, 2005; Oreopoulos, 2006), which in turn enhances the accessibility of medical care (Behrman & Rosenzweig, 2002). Also, the observed positive link between schooling and its benefits might stem from omitted variables (e.g. genes, inherited ability and individuals' time preferences) (Fuchs, 1982; Grossman, 2006). For instance, women with higher abilities not only would be inclined to complete longer years of schooling, but also marry a more educated partner, and raise healthier children (Behrman and Rosenzweig, 2002). Also, there might be a reverse causality problem between education and its benefits: for example, the route of the impacts could be from its benefits to education or the opposite. Cornaglia, Crivellaro, and McNally (2015) support this proposition and find that, for instance, mental health disorders show a drop in school attendance. The schooling of women might be endogenously determined by their fertility choice (Angrist & Evans, 1998). For example, Jensen and Thornton, 2003 find that teen pregnancies, early childbearing, dropping out of school, and inferior status of women among household members are adverse results of early marriage in most of the developing world. Overall, the evidence presented supports the idea that there is a reverse causality issue between education and its benefits, and these examples can be also extended for other benefits of education. Due to this endogeneity problem, the OLS estimator will be biased, so that the accuracy of it is limited. Hence, in order to obtain

reliable estimates, the estimation technique must be correct for the aforementioned problems.

For this reason, the direction of the academic attention has been shifted to provide evidence on the causal effects of education on its benefits. In order to address the endogeneity of education, economists have used political interventions in education that has exogenously changed schooling of some individuals but not of others.

Angrist and Krueger's (1991) proposition to use the mandatory age of formal education, varying with respect to the quarter of birth and state of birth (in the US) is the first one of these types of studies. Cohorts born at the start of each academic year reach the age at which they are permitted to drop out of school earlier than those born in subsequent quarters. Therefore, the birth quarter could be exploited as an instrument for schooling to obtain endogeneity robust estimates regarding the causal impact of education on earning. By using an analogous instrument, Adams (2002) found a support for health effects of schooling for self-reported health measures. However, subsequent reasons highlight the weakness of quarter of birth as an instrument: (i) there is a link between the birth season and proxies for developments in early (pre-school) childhood, and (ii) the association among the birth quarter and schooling is generally weak (Bound, Jaeger, & Baker, 1995; Staiger & Stock, 1997).

As a consequence of these issues, some researchers have used mandatory schooling reforms as an instrument. The identification assumption is that education reform is a naturally occurring event causing some sort of natural assignment of cohorts into treatment and control groups by the variation in exposure to the program with respect to

birth year. In particular, cohorts that would drop out of school are forced to continue to receive longer years of schooling.

Because of their practicality, mandatory schooling reforms have been a popular instrument amongst education and labor economists to obtain endogeneity robust estimates with respect to the monetary and non-monetary returns to schooling. The benefits of using these reforms is that such a reform is like a natural experiment, which allows academics to exploit post-policy evaluation techniques, such as Instrumental Variable (IV) and Regression Discontinuity Design (RDD). These techniques produce robust estimates of the causal impact of schooling on its benefits under different assumptions.

1.2 Method

Turkey`s Education System

The fundamental principles of modern Turkish education system can be explained as follows. Firstly, education is centralized, and, therefore, like the provision of other public goods, including health and security, the state in Turkey provides the inspection and governance of education. The Ministry of National Education (MONE) is responsible for these duties on behalf of the state. Employment of teachers, principals, and other administrative staff, as well as the distribution of their tasks, payment of their salaries, investments in schooling equipment, and their maintenance are administrated by the MONE.

Secondly, education is provided free of charge in all the stages of the education by the state. This is important as the share of private schools in the provision of basic education is quite low. National education statistics of MONE show that public institutions provide

90.6 percent of the pre-primary education, 97.2 percent of the primary education and 96.4 percent of senior high school (MONE, 2012). However, these figures are quite high compared to OECD averages of 2010. For example, the 2010 average of OECD countries shows that public schools constitute 62 percent at the pre-primary level, 91.1 percent at the primary level and 80.5 percent at the senior high school (OECD, 2012).

Before the amendment of the Compulsory Education Law (CEL) in August 1997, the education system of Turkey could be divided into 5 categories. Children aged from 36 to 72 months can continue at pre-primary education, having said that it is not compulsory. Grade 1 to 5 (i.e. primary education) was compulsory and consists of 5 years of schooling for the children aged between 6 and 10. Following completion of the compulsory primary education, children could continue at lower secondary school for three years (grade 6-8). This is followed by the senior high school for 3 more years (grade 9-11). Then, higher education is provided at universities for the period of minimum 2 to 4 years.

Also, different tracks could be followed after graduating from primary education. In addition to continuing a general junior high school, in which the curriculum highly depends on math, science, Turkish literature, history and geography, a child could start religious or vocational training schools. The curriculum of a religious high school includes additional courses on religion as well as the subjects taught in general junior high school. Moreover, there are various types of vocational training schools. These are schools teaching additional subjects in electricity, health and tourism, as well as other technical subjects.

Similar to junior high schools, senior high schools are also divided into general, religious and technical tracks. This means similar tracks can be followed in senior high schools

after finishing a lower secondary school. In particular, children who complete any type of junior high school could continue any type of senior high school. After completing senior high school, students who pass the national exam can continue at universities or higher technology institutes. These can be classified as faculties, vocational post-secondary education schools, and graduate schools. The undergraduate education is given by the faculties in the field of social science, medicine, science and so on for a period of minimum 4 years whereas vocational higher education gives vocational programs for a period of 2 years. Additionally, graduate education in the subjects of medicine, science and social science and so on are given by graduate schools.

Education Reform

The True Path (Dogru Yol) Party and Islamic Welfare (Refah) Party came to power as a coalition government on July 8, 1996. The head of the coalition was the Refah Party. Some of the decisions and actions of the head of the coalition were seen as a potential threat for the secular Turkish Republic by the military. As a result of this, on Feb 28, 1997, the National Security Council declared 18 serious recommendations to the government to not lose track of the secular line of the Turkish Republic. Also, on the same day, armed soldiers and battle tanks marched towards parliament as to show the power of the military to the government. The army insisted Necmettin Erbakan, the leader of the Refah Party to change his policies encouraging Islamic ideology in state businesses. The pressure of the military increased on Prime Minister Necmettin Erbakan day to day. Following these actions, the military was successful in forcing the government to resign and in 1998, the parliament closed down the Refah Party and banned its leader, Necmettin Erbakan, from participating in any type of political activity. Later, the clash between the political party and military was named as “postmodern coup”.

One of the recommendations of the National Security Council was to increase compulsory years of education from 5 to 8 years. Therefore, consequent to the approval of the Basic Education Law No. 4306 by the Turkish Parliament in August 1997, compulsory education in Turkey increased from 5 to 8 years. The law amendment was done to prevent the spread of religious education, and schooling law was enacted by the voters of the secular government, which came to the office just before the amendment of the schooling law. This was thought as a crucial step in the fight against the expansion of religious thinking in the country since this enabled the closing down of the lower secondary (6-8 grades) part of religious schools. Additionally, another amendment in education law was to restrict the free choice of university for those who had graduated from technique and religious senior high schools. Specifically, after the amendment, people who graduated from a religious school could only go to a university department related to religion.

Following the change in the Compulsory Education Law in 1997, there was a massive influence on gross enrolment rates to six grades for both genders. For instance, the number of students enrolled in grade six increased from 866 thousand in the 1996-97 base year to 1.227 million in the 1997-98 academic year, signalling growth of more than 30 % (Dulger, 2004). Due to the reform's strong effect on enrolment rates, and because the reform was unexpected, it can be used as a natural experiment to study the effect of an exogenous change in education. The time difference between the amendment in the law and the political processes that led to the change in compulsory education was too short (less than 5 months) for students to anticipate the potential benefits of extra years of education. There would be an anticipation effect if it had been known for a long time that the government was planning to change compulsory years of education. In particular, if the intention of the law change had been known for a long time, it would be possible to

see potential benefits of having longer years of education by students and, therefore, students would probably change their education decisions to obtain extra years of education.

At this point, it is necessary to give more details regarding the compulsory education law. Until the approval of compulsory education law in August 1997, compulsory education was 5 years in Turkey. The law extended mandatory education from 5 to 8 years. By doing this, primary schools and junior high schools were combined. The mandatory school starting age law indicates that "A child who has completed 72 months by the end of the calendar year can be registered to the first degree of primary school".[1] According to the rule, children who started fifth grade in September 1997 were born in 1987 (i.e. 10 years old) were forced to stay at school for three years more formal education. However, compulsory education reform was not compulsory for the cohorts who completed fifth grade until September 1997. In another word, cohorts who were born in 1986 (i.e. aged 11) were not subject to the law change.

In short, individuals who were born in and before 1986 (i.e. aged 11 or older in September 1997) were not subject to the reform, whereas younger individuals who were born in 1987 or later were affected. The law change as a natural experiment assigned older people who were not affected by the reform into a control group and younger people into a treatment group. On the other hand, the application of the age cut off was not firm. Individuals who were born in late 1986 might begin primary education in September 1993. As a result of this, some of the individuals who were born in 1986 (i.e. 11 years old in September 1997) might have been affected by the schooling reform. Therefore, everybody born in or before

[1] Issue No. 21308, Official Newspaper of Turkish Republic, 7 August 1992.

1985 was unaffected and everybody born in or after 1987 was affected, but it is difficult to tell whether somebody born in 1986 was affected due to above reason.

Regression Discontinuity Design (RDD)

Compulsory educational reforms usually lead to an arbitrary sharp alteration in schooling for affected cohorts, which makes it a natural candidate for RDD. For instance, cohorts who were born just after 31st December 1986 in Turkey were subject to 8 years of compulsory schooling even though it was only 5 years for older cohorts. This is significantly important for the justification of identification assumption of the method. It assumes that the probability of being treated is a discontinuous function of a treatment or forcing a variable, namely the birth date, in this study (Imbens & Lemieux, 2008; Lee & Lemieux, 2010). However, as explained before, some of the students who were born in 1986 might have been exposed to the compulsory education reform. This violates the identification assumption of RDD.

The regression discontinuity design assumes that the difference between people, who are affected or not affected by educational reform, is only because of their exposure to the policy change (Hahn, Todd, & Van der Klaauw, 2001; Imbens & Lemieux, 2008; Lee & Lemieux, 2010). Therefore, a comparison between education and outcome of interest for individuals, who are closely located on both sides of the threshold, should be made. This implies that in order to obtain robust estimates with RDD, one should keep the distance between cohorts located on two sides of the threshold narrow. This requires a large sample size at the threshold level in order to obtain robust estimates. In the case of this study, the birth year difference between cohorts at each side of the threshold must be close enough to obtain robust estimates. Over all, this whole discussion explains some assumptions that

the RDD method is based on and why these assumptions might not be satisfied by the data.

Instrumental Variable (IV)

In this study, I use the three-year exogenous variation in schooling across individuals caused by the timing of the mandatory schooling law amendment as an instrument for schooling in the IV technique. One of the assumptions of a valid instrument is that it should not have any impact on dependent variable other than its influence through schooling. I am confident that the schooling law alteration as an instrument meets this condition. First, political events at the time of the law change in 1997 induced a reform in compulsory years of schooling, so that it has no link with the dependent variables employed in this thesis. Specifically, the reform implemented to prevent the spread of religious education, and schooling law was enacted by the voters of the secular government, which came to the office just before the amendment of the schooling law. Second, reasons triggering endogeneity of the education and reverse causality issues, such as ability bias and other background features, are unlikely to be correlated to the year of birth. To conclude, these reasons justify using IV as an estimation technique in this thesis.

Main data sources

The study has three main empirical chapters, which uses many cross sectional surveys at individual level (See Table 1.2). To begin with, the data source of Chapter 2 mainly comes from two rounds of Turkey Demographic Health Survey (TDHS-2003 and TDHS-2008). In Chapter 3, the data is collected from 2008 and 2014 waves of the National Survey on Domestic Violence against Women (NSDVW-2008 and NSDVW-2014).

Lastly, Chapter 4 uses the 2014 wave of NSDVW. In Chapter 2 and 3, the cross sectional surveys are pooled to investigate the impacts women`s education on various non-market returns of education. However, in Chapter 4, I use the cross section of NSDVW to investigate the causal non-market return of male education.

I also use various regional level administrative data sets throughout the thesis. The detailed features of the individual level surveys explained briefly in this sub-section. However, each chapter's administrative and individual survey data will be discussed in detail in each chapter's data section.

1.3 Relevant literature addressing endogeneity of education

According to the subject of this research, the literature related to this thesis can be divided into four main areas. Firstly, to date, several published types of research identified a positive causal association among schooling and its market returns including earning (e.g. Devereux & Hart, 2010; Meghir & Palme, 2005; Oreopoulos, 2006). The second area is related to adult health. However, the literature on the effects of schooling on adult health is quite contradictory. Some studies have identified a significant causal effect of schooling on the certain type of health measures (Fletcher, 2015; Kemptner, Jurges, & Reinhold, 2011; Lleras-Muney, 2005; Oreopoulos, 2006; Silles, 2009). On the other hand, others have observed no or insignificant effects of schooling on health (Albouy & Lequien, 2009; Breakman, 2011; Clark & Roayer, 2013; Gathmann, Jurges & Reinhold, 2015; Mazumder, 2008; Xie & Mo, 2014). Overall, this heterogeneity in findings indicates that there is an obvious requirement to improve understanding regarding the previously noted connection between schooling and health. Also, so far the research

Table 1.2 Data sources

Chapter	Survey	Survey waves	Data type	Observation
Chapter 2	The Demographic Health Survey of Turkey (TDHS)	2003, 2008	Pooled cross section	3331-3382
Chapter 3	The National Survey on Domestic Violence against Women (NSDVW)	2008, 2014	Pooled cross section	3540-3748
Chapter 4	The National Survey on Domestic Violence against Women (NSDVW)	2014	Cross section	1270-1303

Sources: Authors own calculation based on the TDHS-2003, TDHS-2008, NSDVW-2008, NSDVW-2014

concentrates on the certain type of health measures, such as mortality rates, self-reported health status and health behaviours, and ignored mental health of adults.

To the best of my knowledge, there is no published study analysing the causal link between schooling and mental health disorders of adults.[2]The third area is related to child health. In the context of the US, Currie and Moretti (2003) find that mother`s schooling not only positively influences her child's health and prenatal care usage, but also drops smoking and enhances fertility. On the other hand, Lindeboom, Llena-Nozal, and van Der Klaauw (2009) use an additional year completed at school due to mandatory schooling law alteration in the UK in 1947 as an instrument for parents schooling separately. Compared to Currie and Moretti (2003), their findings show a negligible influence of parents' schooling on several health measures related to their children and their parents (e.g. weight, smoking, chronic, acute conditions, malnutrition and body mass index of child and parents).

Similar to the second chapter of the thesis, existing literature also uses the experience to schooling reform by birth date and the variation in the intensity of its implementation across regions as an instrument for schooling of mothers (Breierova & Duflo, 2004; Chou et al., 2010; Dinçer, Kaushal, and Grossman, 2014; Güneş, 2015; Osili & Long, 2008). In their research, Chou, Liu, Grossman, and Joyce (2010), Breierova and Duflo (2004) and Osili and Long (2008) in Taiwan, Indonesia and Nigeria respectively identify a crucial causal link among the schooling of mothers, fertility and child health measures. In the context of Turkey, Güneş (2015) uses the differentiation in the number of classrooms built across regions, while Dinçer et al. (2014) exploits the differentiation in

[2] See literature review in Chapter 3 for a detailed discussion.

the number of teachers recruited across regions following the increase in the compulsory schooling year in Turkey in 1997 as a measure of the reform intensity. They also find a causal impact of mother`s schooling on certain child health measures, such as mortality, birth weight, height and weight for age and prenatal care utilization. Although above studies explored causality between maternal schooling and certain child health measures, there is no existing research investigating the causal link between maternal schooling and completion of childhood immunization rates.

The fourth area is related to the empowerment of women. Mocan and Connanier (2012) in Sierra Leone and Dinçer et al. (2014) in Turkey exploit the differentiation in the intensity of education reform across regions and variation in exposure to the education program generated by the birth date in Sierra Leone and Turkey respectively. Their findings indicate that education alters the attitudes that empower women including a reduction in their tolerance of violence against them that threat a woman`s wellbeing. On the other hand, Mocan and Connaier (2012) find that on the contrary to the female schooling, male schooling has no effect on his attitude towards women`s wellbeing. Moreover, in the context of Indonesia, Samarakoon and Pariduri (2015) use exogenous variation in schooling due to an extended schooling year in Indonesia in 1978 to obtain endogeneity robust estimates regarding the effects of women`s education on their empowerment with a fuzzy regression discontinuity design. On the other hand, their results have indicated no causal association between women`s schooling and their authority in decision-making (except savings), ownership of the possessions (with the exception of owning jewellery and household appliances) and involvement in the society (except visiting community-weighing post).

Studies exploring the impact of women`s schooling on spousal violence against women exploiting valid instruments are also infrequent. Erten and Keskin (2016) is the only unpublished study addressing the endogeneity of schooling for women to investigate effects of women`s education on domestic abuse against women. Similar to the current thesis, they exploit the same schooling reform in Turkey with an earlier version of the same survey exploited in Chapter 4 with a Regression Discontinuity (RD) Design. Their findings show that women`s education has no influence on decisions regarding marriage and payment of bride money. On the other hand, no previous research has investigated the causal link between husband`s education and exposure of women to domestic violence.

Considering the insufficiency of adult health, child health and empowerment literature, further research is necessary in order to improve our understanding regarding the relationship between education and its non-market returns. These findings might suggest crucial insights for education policy and assist public authorities to accomplish the effective distribution of scarce public funds for the compulsory investments in order to enhance the welfare of the society.

1.4 Importance of Turkey as a case study

Due to the education reform and uniqueness of the datasets used in this thesis, Turkey is a suitable case for studying the causal association between schooling and its non-market outcomes, which were not examined before in the literature. Since it caused an exogenous increase in mandatory years of schooling by three years, and had a tremendous effect on gross enrolment rates to sixth grades for both genders. The exogenous increase in the years completed mandatorily at school was greater than the increase in those countries

exposed to similar education reforms: one (in the UK, US, Germany, and France) or two (Denmark from 7 to 9 years in 1975). As mentioned before, the reform produced a considerable increase in gross enrolment rates in sixth grades. In particular, 866 thousand students in sixth grade in the 1996-97 academic year increased to 1.227 million students in the 1997-98 academic year, which equals a 30 % growth in the number of students enrolled in sixth grade (Dulger, 2004). Additionally, in 1997-1998, the enrolment rates for girls in the sixth grades in provinces with the highest gender inequalities, which are generally more conservative places, was 162 percent greater than in the 1996 base year (Dulger, 2004).

Also, the datasets used in this study provide information that people do not usually have in their datasets. For example, participant's responses to questions about immunization status of their children and their health status, in particular, mental health in Chapter 2 and 3 respectively allow me to examine the causal impact of education on these outcome measures. Moreover, in Chapter 4, thanks to the uniqueness of my dataset, I am able to investigate the link between wives' and husbands' characteristics as an estimate of the causal impact of husbands` schooling on his abusive and violent behaviors against his wife. To the best of my knowledge, there is no existing study addressed to these questions to evaluate the causal effects of education.

Moreover, Turkey is an emerging developing country. It is also one of the largest upper middle-income countries. The country has experienced a sustained growth in its economy since 2002. This economic performance generated an increase in the national income per person, reaching $10,800 in 2013 from $3470 in 2002 (in current dollars). Additionally, the country overview of the World Bank shows that there is a significant drop in the percentage of people living in moderate poverty, from 13 to 4.5 percentage and extreme

poverty, from 13 to 4.5 percent in the same period. As a result of these improvements in the overall economy, the less affluent section of the Turkish society benefited more from the increase in access to healthcare services, education, and urban life. Overall, on the basis of above-given evidence, Turkey becomes an important case study to investigate the causal link between education and its benefits.

1.5 Summary of Empirical Chapters:

Chapter 2. Does Maternal Education Affect Childhood Immunization Rates? Evidence from Turkey.

Chapter 2 is the first study to examine the causal effect of maternal education on childhood immunization rates. I used the exposure to the Compulsory Education Law (CEL), enacted in Turkey in 1997, by date of birth and the differentiation in the intensity of its implementation across regions as an instrument for the schooling of young mothers.[3] This chapter also suggests a new variable measuring the intensity of the schooling reform defined as the additional regional government spending on building classrooms per 1000 children, calculated as the difference between 1997 and 1996 government expenses.

The CEL generated an exogenous increase in the compulsory years of schooling from 5 to 8 years for the women born after 1986. Using the CEL as an instrument, this chapter finds that an increase in the education of mothers improves coverage of the third (full) dose of DPT and Hepatitis B for their children. Furthermore, the chapter investigates the causality between maternal education and a range of channels affecting immunization

[3] In remaining chapters, I only use the exposure to the Compulsory Education Reform (CER) by the birth date as an instrument for schooling. I selected the instrument set so according to what works best with the available data for each chapter. I have carried several tests to assess optimality and strength of instruments. I included some of these tests in Chapter 2, 3, 4 but did not give the results of these tests in the introductory chapter that should be non-technical.

rates suggested in the literature. I find that education increases the age of first marriage and birth, changes women`s and their spouse`s labour market status and significantly affects women`s attitude towards spousal violence against women and gender discrimination in a manner that empowers women.

The effects of channels affected by education on childhood immunization rates cannot be tested directly by the estimation technique of this chapter. On the other hand, it is still likely to draw some inferences from previously mentioned findings with respect to channels. Hence, with the help of the available evidence, it seems rational to propose that the enhancements in childhood immunization rates may partly depend on the alterations in women`s behaviour towards violence against women, gender discrimination, marriage and fertility ages, and the change in employment status of spouses that empower women.

Chapter 3. The Effect of Education on Mental Health: Evidence from Turkey.

In Chapter 3, I examine the causal link between schooling and certain health measures, in particular, mental health in the context of a large emerging economy, Turkey. I used the variation in the exposure to the Compulsory Education Reform (CER) by the birth date as an instrument for schooling. To the best of my knowledge, the causal effect of education on mental health is investigated for the first time in this chapter. To detect the causal association between education and health, in particular, mental health, I exploit data from the 2008 and 2014 waves of the Turkey`s National Survey on Domestic Violence against Women (NSDVW). With Ordinary Least Square (OLS), I conclude that schooling significantly enhances self-reported health, drops the possibility of reporting severe or extreme pain and the occurrence of certain mental health measures.

On the other hand, when CER is exploited as an instrument for the education of women, previously observed effects with OLS disappear; schooling even increases the probability of reporting some of the mental health disorders employed in the dataset. All in all, findings of this chapter indicate little evidence of a causal association between female schooling and health with the exclusion of experiencing pain and some of the mental health disorders. These findings seem quite robust to alterations in regression definitions and inclusion of additional individual-level control variables such as having one`s own income, employment status, marital status, occupation, domestic abuse history in the family, and rural/urban status.

I also observe a heterogeneous impact of the schooling reform on the schooling of women dependent on urban/rural and the survey participants' maternal abuse status. Additionally, heterogeneous effect tests show that schooling effect on the outcome of interest varies by whether the female has her own earning or not and labour market status of women.

One rational explanation for the lack of impact of schooling on self-reported overall health status of women is that the respondents affected by the reform are still young and therefore unlikely to experience ill health. In contrast, due to the fact that women with longer years of schooling are more likely to report mental health disorders, this can be attributed to the reality that having more schooling assists them with better understanding of such problems and notice their symptoms. This can have crucial advantages, as the realization of mental health disorders is a requirement to their efficient treatment.

Chapter 4. The Impacts of Husband`s Education on Violence against Women: Evidence from Turkey

To the best of my knowledge, this is the first empirical investigation of the causal effect of male education on the incidence of abusive and violent behaviour against a woman. To obtain endogeneity-robust estimates, I use a natural experiment, an education reform increasing compulsory schooling from five to eight years in Turkey, in 1997. Also, to identify the influence of a husband`s education on violent and abusive behavior against their wives, I use data from the 2014 wave of the Turkey`s National Survey on Domestic Violence against Women (NSDVW).

I find that husband`s education lowers the probability of suffering physical, emotional and economic violence as well as experiencing socially unacceptable behaviour. The only aspect of violence not affected by spouse`s education is sexual violence. Schooling also dropped the incidence of marriage that was organized against the woman`s will and it turns men less inclined to involve in socially unacceptable behaviours such as drinking, gambling, drug abuse and alike, although this result is somewhat less precisely estimated.

I also find that women whose mothers or whose husbands' mothers experienced domestic violence are more likely to suffer violence themselves. This is an evidence for the cycle of violence hypothesis, therefore, lowering abuse of women today can lead to enhancements both contemporaneously and in the future.

Chapter 2. Does Maternal Education Affect Childhood Immunization Rates? Evidence from Turkey

2.1 Introduction

Vaccination can save millions of lives. According to a report by World Health Organization (WHO) and the United Nations Children's Funds (UNICEF)[4], 17 percent of some 8 million deaths of children under five in 2008 could have been prevented if the children were vaccinated. The same report estimates that two to three million possible deaths from measles and diphtheria, pertussis (whooping cough) and tetanus (DPT3) are being prevented by vaccinations each year. Furthermore, figures from WHO indicate that 240 million people currently suffer from Hepatitis B and 780 thousand people die annually because of this disease.[5] Children aged under 6 are most likely to develop chronic infections when they are infected by the virus. These deaths and complications can be easily prevented by timely vaccination.

In the last decade, the percentage of children fully vaccinated in Turkey increased from 46 percent in 1998 to 81 percent in 2008 (Table 2.1). The likelihood that a child will be vaccinated closely correlated with the mother's level of education. Although the gap between children's vaccination rates between uneducated and educated mothers decreased in 2008 compared with previous years, the gap persists. The results of the 2008 Turkey Demographic and Health Survey (TDHS) indicate that the percentage of children who are fully immunised varies from 65 percent among children whose mothers have no

[4] World Health Organization and UNICEF: Global Immunization Data; July 2014. Accessible at http://www.who.int/immunization/monitoring_surveillance/global_immunization_data.pdf [cited on 24/07/2015].
[5] See http://www.who.int/mediacentre/factsheets/fs204/en/

or primary incomplete education to 88 percent of children whose mothers have completed the secondary school or have attained higher education.

Table 2.1 Trend of full vaccination in Turkey

Mother's education	1998	2003	2008
No education/Primary incomplete	28.5	26.1	64.9
Primary school/First level	48.0	60.9	81.6
Primary school/Second level	64.0	61.2	84.4
Secondary and higher school		68.5	87.8
Total	45.7	54.2	80.5

Source: Author`s own calculation based on TDHS-1998, TDHS-2003, TDHS-2008

The role of maternal education is an important determinant of the complete vaccination status of babies has been highlighted in the previous literature.[6] However, all of these studies ignore the endogeneity of maternal education, and any estimation not correcting it, is likely to be biased.[7] The instrumental variable method can be used to overcome the endogeneity of schooling due to omitted variables bias when assessing the market and nonmarket returns of education including child health (e.g. Breierova & Duflo, 2004; Chou et al., 2010; Currie & Moretti, 2003; Dinçer, Kaushal, & Grossman, 2014; Güneş, 2015). Since many developing countries have expanded either their compulsory years of schooling or the coverage of primary education, changes in education policies of less developed countries have become a popular instrument for the endogeneity of education.[8]

Turkey expanded its compulsory education from 5 to 8 years in 1996-97. In accordance with this reform, children aged ten or less in 1996-97 are bound to complete 8 years of compulsory education. The introduction of the education program generated an urgent need for the construction of new classrooms and employment of new teachers. All of this

[6] See 2.2 Literature review for the discussion.
[7] 2.4.3 Empirical strategy section presents the entire discussion about the choice of the estimation method.
[8] See 2.2 Literature section for the discussion.

was done by raising the government budget. In comparison to the 1996 education budget, for example, the reform increased the budget for primary school construction by 30 percent in 1997 (see Figure 2.1).[9,10] With this additional budget, 58 thousand new classrooms were opened between the academic years 1996-97 and 1997-98 (Güneş, 2015). She indicates that this nearly equals to a 30 percent increase in the overall number of classrooms.[11] Therefore, by exploiting the difference in the compulsory education reform exposure by additional budget distribution across regions for classroom construction and the birth cohorts, this chapter employs the method of instrumental variable (IV) to estimate the returns to schooling of young mothers.

Overall, this study contributes to the vaccination literature in several respects. Firstly, to the best of the author's knowledge, this is the first study exploring the causal relationship between maternal education and childhood vaccination rates, specifically the intake of a full dose of Hepatitis B3 and DPT3 vaccines for their children. Secondly, education might have an impact on vaccination through different channels, and existing articles examining these channels are limited. This study explores a number of causal pathways affecting the childhood immunization as suggested by vaccination literature: mother's age at first birth, age at marriage, employment status of mother and her husband, household size, wealth, health knowledge, autonomy of women, and women`s attitude towards gender inequality and spouse violence against women. Moreover, in comparison to the other studies in the non-market return to education literature, such as Dinçer et al. (2014) and Mocan and

[9] The detailed figures are calculated from the Ministry of Development's Investment Program statistics for 1996 and 1997 years.
[10] Figures for the 1996 and 1997 education budget were not initially adjusted for inflation. Therefore, inflation adjustment has been done according to 1998 prices.
[11] More detailed information on Compulsory Education Reform is given in 2.3 1996-1997 Education Reform Section.

Cannonier (2012) who used variables about attitudes towards gender norms[12] separately, this chapter uses two separate indexes to measure the attitude of women towards gender norms. Finally, this study proposes a new variable measuring the intensity of the education reform defined as the additional regional public spending on classroom construction per 1000 children, computed as the difference between 1997 and 1996 expenditures.

The findings suggest that an exogenous rise in maternal education measured both by years of education, and completing 8 years of compulsory education due to schooling reform significantly improves the take-up of the last dose of Hepatitis B and DPT immunisation, even after controlling for gender and birth order dummies of the children. It is also found that education increases the age at marriage and first birth, and has a statistically significant effect on women`s attitudes towards spouse violence against women and gender discrimination, and working status of women and their husbands.

Even though the methodology of this study does not allow testing the impact of various channels on vaccination outcomes, it is still possible to draw some inferences. On the basis of the evidence currently available, it seems fair to suggest that, to some extent, the enhancements in the childhood immunization rates might be partly owing to the changes in women`s age of first marriage and birth, women` and their husbands` employment status and attitude of women towards domestic violence against women from their

[12] Two dependent variables are used to measure attitude towards gender norms, (i) attitude towards gender inequality, and (ii) attitude towards spouse violence against women.

spouses and gender inequality: all of these changes empower women which in turn has a positive impact on their children vaccination rates.[13]

It is also worth noting that even though the previous studies on Turkey use similar methodology for identification, the instruments they used are weak when used to explain years of education (continuous variable), and therefore they restricted their analysis to the impact of completing 8 years of education (categorical variable) on the dependent variables of interest (see Dinçer et al., 2014; Güneş, 2015). However, this study obtains estimates for both categorical and continuous education variables.[14]

The next section provides a discussion of the previous literature. Section 2.3 gives a brief background to the 1996-1997 Education Reform. Section 2.4 is concerned with the data and empirical strategy used for this study. Section 2.5 presents the findings of the research and gives a detailed discussion of them. Finally, section 2.6 gives a summary of the findings.

2.2 Literature Review

Earlier studies show that maternal education has a positive correlation with the mothers` wellbeing and the health of their children alike (see Frost, Forste, & Haas, 2005; Glewwe, 1999; Grossman, 2006; Muthayya, 2009; Schultz, 2002; Vaahtera et al., 2001). A number of recent studies find maternal education to be positively associated with the complete vaccination status of infants, even after controlling for various individual- and community-level variables (e.g. age of mother, income, ethnicity, socioeconomic status,

[13] Mocan and Cannonier (2012) claim that if women take a position to defend their own wellbeing, such as altering her attitude and saying that violence against women from their husband cannot be justifiable, they suggest this as an indicator for empowerment.
[14] See section 2.5.3.2 for the detailed discussion.

parity, residence and religion) (Abuya, Onsomu, Kimani, & Moore, 2011; Altınkaynak, Ertekin, Güraksın, & Kılıç, 2004; Fatiregun & Okoro, 2012; Schoeps et al., 2013; Singh et al., 2013; Vikram, Vanneman, & Desai, 2012). This result is important because there is well-documented evidence supporting the importance of vaccination as the most cost-effective and efficient way to reduce child mortality and morbidity (Breiman et al., 2004; Maurice & Davey, 2009; Rainey et al., 2011). Another strand of literature investigates the channels (e.g. knowledge, labour force participation of women and their husband, family size, autonomy, attitude of women towards justification of domestic violence against women and gender inequality, the age of first marriage and birth and wealth of the family) affecting children's health and vaccination status indirectly through mothers' formal schooling (e.g. Adler & Newman, 2002; Mistry, Galal, & Lu, 2009; Streatfield, Singarimbun, & Diamond, 1990; Vikram et al., 2012).

Starting with knowledge as a potential channel, a study conducted in two Indonesian villages, in which advantages of immunisation are well known, found that mothers' knowledge regarding the benefits of specific vaccinations positively correlated with formal education (Streatfield et al., 1990). Children of more educated women, in turn, benefited slightly more from immunisation programs.

Previous research also suggests that the formal education of mothers increases age at first birth, their autonomy, and changes their attitude towards gender inequality and violence against women, which ultimately increases their well-being and that of their children (leading to better health outcomes and promoting longer years of schooling for their children) and, finally, decreases the chance of death at birth for themselves and their baby (UNICEF, 2006). Similarly, Kritz and Makinwa-Adebusoye (1999) find that formal education shapes women's decision-making autonomy. These findings are important

because, when the mother rather than the father is in control of the household budget, more of it tends to go towards family health, in particular, children's health (Thomas, 1990). In a longitudinal randomised controlled trial in rural India by Shroff et al. (2011), it is found that improving maternal autonomy is positively correlated with child feeding and growth outcomes. Mistry et al. (2009), similarly, find a significant correlation between mothers' autonomy and the use of preventive health measures for their children during and after the period of pregnancy. Furthermore, when women adopt disapproving attitudes towards gender equality and see their autonomy increased, this has also been shown to have a positive correlation with the complete vaccination status of babies (Babalola, 2009; Singh et al., 2013; Vikram et al., 2012).

Education also has a host of other potential benefits besides the positive correlation with the take-up of vaccination. Education, as one of the fundamental determinants of the socioeconomic status of individuals (alongside family wealth, husband's education) improves child and maternal health significantly (Adler & Newman, 2002; Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010). Behrman and Rosenzweig (2002) find that a woman's formal education is positively correlated with her chances of earning higher income, marrying a more educated husband, and a husband with a higher income level. Educated women are inclined to have a lower fertility preference because of the quality and quantity trade-off, and, therefore, usually have fewer children with a raised level of wellbeing and health per child (Becker & Lewis, 1973). This is crucial because studies suggest that the mortality rate for children aged less than five is almost 50 percent higher for mothers without primary school education than those who completed primary school (UNICEF, 2006).

Although above mentioned studies find that improved maternal education is positively correlated with the improvements in childhood vaccination rates, this relationship is not necessarily causal. All of these studies do not address the endogeneity of maternal education, and any estimation not correcting for it is likely to be biased. Firstly, both maternal education and vaccination take up might be driven by (household) income: women from affluent backgrounds have better access to education and to health inputs e.g. medical care alike (Behrman & Rosenzweig, 2002). Secondly, the relationship between education and any outcome of interest may be distorted by the 'ability bias` (Griliches, 1977; Card, 1999). Behrman and Rosenzweig (2002) argue that a woman with higher abilities not only would tend to complete more years of formal education, but also marry a more educated husband, and raises healthier children. Thirdly, a reverse causality problem might also exist between education and fertility choice because a woman`s education might be endogenously determined by their fertility choice (Angrist & Evans, 1998). For instance, the prevalence of teen pregnancies, early childbearing, and termination of education, and low status and position of a woman among household members are negative consequences of early marriage in most of the developing world (Jensen & Thornton, 2003).

The research on the causal influences of education on child health, fertility choices, and the usage of prenatal health services begins with Currie and Moretti (2003). They investigate the causal effect of female education on birth weight and factors affecting birth weight including prenatal care, marriage and fertility and smoking decisions among US white females. They find that maternal education not only positively influences children's health and prenatal care usage but also decreases smoking and improves

fertility. To construct an instrument for mothers' schooling, the availability of two-year and four-year colleges in the US state where women lived at the age of 17 are used.[15]

On the other hand, Lindeboom et al., (2009) use an extra year spent at school due to the compulsory schooling law (CSL) change in the UK in 1947 as an instrument for paternal and maternal education separately. Interestingly, in contrast to Currie and Moretti (2003), their results indicate a small impact of parents' education on various child and parental health measures (e.g. weight, smoking, chronic, mental and acute conditions, malnutrition and body mass index of child and parents). Furthermore, in the US context, McCrary and Royer (2011) exploit compulsory school age entry policies as an instrument to predict the causal relationship between mother`s schooling and various infant health measures (e.g. birth weight, infant mortality), and maternal behaviours (e.g. fertility choice, smoking and drinking during pregnancy, prenatal care visits). Similarly, they also find that the role of education on fertility and infant health is limited whereas it is insignificant for prenatal health behaviours.

Like the current chapter, the existing literature also uses the exposure to education reform by date of birth and the differentiation in its implementation across regions as an instrument for schooling of mothers (Breierova & Duflo, 2004; Chou et al., 2010; Dinçer et al., 2014; Güneş, 2015; Osili & Long, 2008). To begin with, Breierova and Duflo (2004) in Indonesia and Chou et al. (2010) in Taiwan find a negative correlation between maternal education and fertility and child health (e.g. mortality rates).[16] These two studies use the number of schools constructed in each state as a measure of the intensity of the

[15] However, there are two reasons for the weakness of their instrument: i) Non-random opening of colleges. ii) Migration of women to attend a college.

[16] However, in Chou et al. (2010) standard errors of mother's education in IV increased by 12 percentage points which casts doubt on the validity of their results.

education reform. On the other hand, Osili and Long (2008) use the difference in the government spending distributed to each state for primary school construction after the Universal Primary Education (UPE) program, introduced in Nigeria in 1976, as a measure of program intensity. Consistent with the previous literature, their findings suggest that an additional year of female education decreases fertility. In the context of Turkey, Güneş (2015) exploits the variation in the number of classrooms constructed across regions, whereas Dinçer et al. (2014) use the variation in the number of teachers recruited after the change in compulsory education year in Turkey in 1997 as the measure of program intensity.[17] They confirm a causal impact of maternal education on observed child health measures, such as mortality, birth weight, height and weight for age, prenatal care utilisation.[18]

As mentioned above, there are also studies analysing the causal link between education and the remaining possible channels (e.g. health knowledge and empowerment of women). In the context of health knowledge, Dinçer et al. (2014) find that education increases women`s knowledge of the ovulation cycle. In the UK context, Johnston, Lordan, Shields, and Suziedelyte (2015) use the UK`s compulsory education reforms, which changed the school dropout age from 14 to 15 in 1947 and 15 to 16 in 1972 to examine the causal effect of education on the knowledge regarding determinants of common health problems, such as stomach ulcers, migraine, stroke, depression, high blood pressure. Unlike Dinçer, it is found that education does not have a significant impact on health knowledge variables considered.

[17] Even though this chapter used a similar identification strategy to construct the instrument with these papers, a different measure of the regional intensity of compulsory education reform was used in this study (See 2.4.3. Empirical Strategy section for detailed explanation)

[18] Besides, Güneş (2015) found no causal correlation among education and employment status of women and their partners.

To determine the causal impact of education on some empowerment measures, Mocan and Connanier (2012) also exploit the variation in program intensity across regions and variation in exposure to the education program generated by date of birth in Sierra Leone to construct an instrument for schooling. They find that exogenous increase in education of women improves women`s awareness of risky health behaviour and spouse violence against women in a manner that empowers women. Similarly, Dinçer et al. (2014) in Turkey find a causal effect of education on women`s attitude towards spouse violence against women. Samarakoon and Pariduri (2015) use exogenous variation in education due to a longer education year in Indonesia in 1978 to deal with the endogeneity of schooling and estimate the effects of education on the empowerment of women with a fuzzy regression discontinuity design. Even though a variety of variables related to empowerment of women are considered in their study, they find no causal relationship between women`s education and their decision-making power (except saving), ownership of the assets (except jewellery and household appliances) and participation in the community (except visiting community-weighing post).

2.3 1996-1997 Education Reform

After the meeting of the National Security Council on 28 February 1997, the incumbent Turkish government was forced by the military to resign. The reason behind this was that the military saw the government's religious attitude as a potential threat to the Turkish Republic and democracy. In the wake of this move, the National Security Council recommended an increase in compulsory education from 5 to 8 years.

Therefore, consequent to the approval of the Basic Education Law No. 4306 by the Turkish Parliament in August 1997, compulsory education in Turkey increased from 5 to

8 years. This was thought as an important step in the fight against the expansion of religious thinking because this enabled the closing down of the lower secondary (6-8 grades) part of religious schools. Additionally, the free choice of university was restricted in technical and religious schools. For instance, a person who graduated from a religious school could only go to a university department related to religion.

As a result of the legislative change, the Turkish Government urgently needed to allocate a significant amount of resources for investment in schooling facilities, such as new classroom construction and the employment of new teachers. To be more precise, through the partnership of the government and the private sector, the Ministry of National Education of Turkey constructed 81,500 new classrooms for primary education between 1997 and 2002 which corresponds to an almost 40 percent increase in the capacity of primary school education (World Bank, 2005). In addition to this, the reform required the employment of 70 thousand new teachers (Dulger, 2004). Lastly, the government sought to equalise the enrolment rates between rural and urban areas. To this effect, it consolidated village schools, opened new boarding schools and used school buses to carry children from villages to city centres.

All of these practices were achieved by increasing the government's education budget in 1997. A World Bank report published in 2005 states that yearly public spending on education because of the compulsory education reform (CER) in 1997 was estimated at 3 billion US dollars per year in Turkey (World Bank, 2005). More specifically, as shown in Figure 2.1, the reform increased the budget for primary school construction by 30 percent between 1996 and 1997.[19]

[19] Statistics were gathered from the yearbook of the Ministry of Development of Turkey's Government Investment Program from 1994 to 2002.

Education reform lead to a substantial increase in overall enrolment rates in sixth grades.[20] For instance, the number of students enrolled in grade six increased from 866 thousand in the 1996-97 base year to 1.227 million in the 1997-98 academic year, signalling growth of more than 30 % (Dulger, 2004). Moreover, in 1997-1998, the enrolment rates for girls in the sixth grades in provinces with the highest gender inequalities, which are generally more conservative places, was 162 percent greater than in 1996-67 (Dulger, 2004).

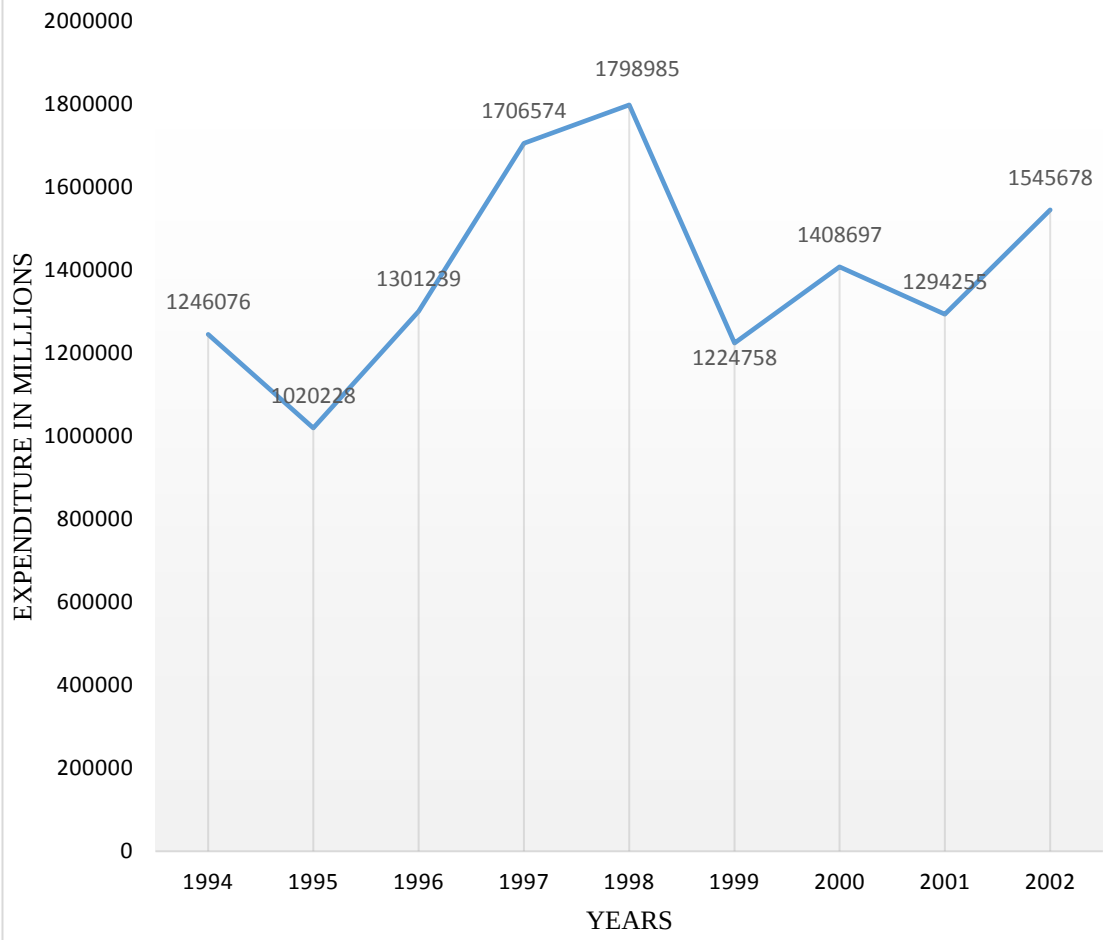
2.4 Data and Empirical Framework

The study's data mainly comes from the last two rounds of Turkey Demographic and Health Survey (TDHS-2003 and TDHS-2008). The survey aims to provide information on trends and levels of fertility, infant and child mortality, family planning, maternal and child health including preventive health measures (e.g. the childhood vaccination status) during and after the pregnancy period of ever-married women.[21] In addition to detailed information on the vaccination status of children, TDHS-2003 and TDHS-2008 include a wide range of high-quality information on women's socioeconomic characteristics, such as education (completed years of schooling and level of education), parents' education, working status, ethnicity, women's status in the family etc. The survey also features demographic questions including age, gender, type of birth place (rural/urban), a region of birth, region of residence during childhood.

[20] It is also worth noting that the main goal of CER was to increase enrolment rates and hence, there was almost no change in the curriculums or in other rules aimed at improving the quality of education (Dulger, 2004).

[21] The TDHS collects data on maternal health care utilisation from mothers who gave birth in the five years before the interview date. However, for the information regarding the vaccination status of their babies, mothers who gave birth in the three years before the interview date is used.

Figure 2.1 The Trend in the Public Expenditure on classroom construction in millions (1997 Prices) in Turkey



Source: Author's calculation from the Turkish Republic`s Ministry of Development`s Statistical Yearbook on Public Expenditure from 1994 to 2002.

Women`s region of residence until the age of 12 is an important variable for this study because it allows me to identify the impact of the compulsory schooling reform on education of women, as this variable links the respondent's individual data to regional administrative data (i.e. individual variables to regional variables). Another two regional variables are instrumental for the analysis. The first one is the increase in regional government investments in primary school construction for per 1000 relevant school-aged children (i.e. aged 6-13) between 1996 and 1997.[22] The statistics regarding public expenditure were collected from the Turkish Ministry of Development`s 1996 and 1997 statistics yearbook on public expenditure. The Turkish Statistical Institute's 1990 and 2000 census statistics were used to estimate the population aged 6-13 in 1996 and 1997.[23]

The second one is the regional variable of gross enrolment rate for junior high school.[24] The number of students registered in junior high school, i.e. grades 6 to 8 in the 1996 academic year was obtained from the Ministry of National Education's National Education Statistics (MONE). The calculation of relevant school-aged population, i.e. 11 to13 in 1996 was again based on the censuses conducted by the Turkish Statistical Institute in 1990 and 2000.

[22] To calculate the regional government spending on classroom construction per 1000 children = (the amount of regional spending of 1996 or 1997 years/population of relevant school-aged children (i.e. aged 6-13) in that year *1000. Then, the difference of 1997 and 1996 spending per 1000 children was taken as a final step for calculation of the variable.

[23] To estimate the missing data for the population in 1996 and 1997 years for both regional data, exponential function method was used.

[24] Gross enrolment rate in junior high school (JHS), i.e. grade 6-8, is calculated by dividing the number of children who are enrolled in JHS in 1996 in the childhood region of children by the population of school-age children aged 11-13 in the same region and year.

As childbearing outside of marriage is uncommon in Turkey,[25] therefore, this study only examines married women from the TDHS.[26] Moreover, for identification purposes, our final sample consists only of young mothers between the ages between 18 and 29 in the 2003 and 2008 TDHS.[27] The mothers aged from 18 to 21 form the treatment group and those aged 22 to 29 are the control group[28]. After all these adjustments, our final dataset has 3331 to 3382 observations.[29]

2.4.1 Dependent variables

Two dichotomous variables indicate the complete immunisation status of children aged over six months[30], taking the value of one, if the children received the third and final dose of DPT (diphtheria, pertussis and tetanus) and Hepatitis B vaccines.

In addition to variables indicating the vaccination status of children, channels influencing the vaccination status of children by empowering women were measured using the following dichotomous variables. To begin with, three variables were constructed to measure the autonomy of women: (i) whether she is responsible for planning and controlling the household budget, (ii) whether she pays the bills and does other official

[25] Hacettepe University Institute of Population Studies, 2008 Demographic and Health Survey of Turkey, TDHS- 2008: http://www.hips.hacettepe.edu.tr/eng/tdhs08/

[26] If education causes births and teenage marriage to fall, using only ever-married woman may lead to sample selection bias. However, Kirdar, Tayfur, and Koç (2011) found that while CER reduced childbearing and marriage for women aged 17 and less, no effect was observed for women aged 18 and over. These results make sense because with CER, the school exit age rises from 11 to 14. I also test the impact of CER, increasing the school exit age from 14 to 17, on secondary school completion rates, and the results indicate that CER caused a very modest increase in high school graduation rates by 2.5 percentage points. The result is also statistically insignificant. Overall, these indicate a modest bias in the results due to sample selection bias.

[27] It will be discussed in greater detail in 2.4.3 empirical strategy section.

[28] The justification of the treatment and control groups is given in section "2.5.2 Validation of treatment and control groups".

[29] See descriptive statistics in Table 2.2 for summary statistics and a brief definition of the whole dependent variables and selected independent variables considered in this study.

[30] A baby is counted as fully immunized for DPT or Hepatitis B if he or she receives the third dose these vaccinations. Also, a baby should be vaccinated for these vaccines until she or he reaches six months old.

work, and (iii) whether she can choose her husband with complete freedom, or whether other family members selected her husband. If a woman responds that she performs such works, or freely chose her husband, she is considered autonomous for the purposes of this study.

Next, two indexes were constructed to measure women`s attitude towards gender norms. The choice of the index was not arbitrary. By constructing the indexes in this way, I estimate the effects of education on the attitude of woman towards the intensity of gender inequality and domestic violence acceptance rates. The first one consisted of five survey questions whether spousal violence against women was justified if a woman: (i) wastes money, (ii) neglects children, (iii) refuses sex, (iv) burns food, and (v) argues with her husband. A 0 to 1 index was used, with 1 justifying violence against women by their husbands in all 5 situations and zero does not accept it in any situation. Four questions are used to construct 0 to 1 gender inequality index. To do this, the questions related to the position of women within the household were used: (i) family decisions should be made by men, (ii) men are wiser, (iii) women should not argue or speak their mind, and (iv) educating men is more important than educating women. A woman who agreed with all the opinions is classified as being in favour of gender inequality in all situations and obtains the score of 1 whereas if she says no to all of them, she obtains the score of zero, which means that she is against gender inequality in all cases. If women were against gender inequality or violence against women, it is assumed that they are empowered.

In addition to the definition of above-mentioned variables, the age at marriage and first birth, household size, wealth index of the family[31] and the remaining dichotomous

[31] This index was already calculated through principal component analysis in 2003 and 2008 TDHS data sets by using the household's ownership of various assets, such as a television, a car as well as housing

variables are explained in descriptive statistics table (See Table 2.2). In short, if a woman answered yes to the expression above for the remaining dichotomous variables, they were coded one otherwise zero. The solely exception is that if she answered correctly to the question regarding the knowledge of the ovulation cycle, she is coded one otherwise zero.

2.4.2. Independent Variables

There are two education variables. The first one is the years of education, which is a continuous variable.[32] The second one is a dummy variable capturing whether the woman completed 8 years of schooling or not. Descriptive statistics regarding education variables point out some important findings (see Table 2.2). For instance, in contrast with negligible difference in mean years of schooling (i.e. 0, 3 years) and completion of at least 8 years of schooling (5 percentage points) of the control groups in 2003 and 2008, Table 2.2 clearly indicates that the treatment group in 2008 TDHS obtained significantly more education than the treatment group in the 2003 sample (by 1.5 years).

Also, the proportion of those with 8 years of formal education is 30 percentage points higher among the treatment group in the 2008 sample than the treatment group in 2003.[33] Other important independent variables were also included in the model. To control the

characteristics, including facilities for sanitation, drinking water sources and flooring material types (see page 38 from TDHS 2008 main report from the link http://www.hips.hacettepe.edu.tr/eng/tdhs08/TDHS-2008_Main_Report.pdf).

[32] The women in our sample no longer remain in education. This means educational data obtained from TDHS represents the final education level of women.

[33] Having said that it is important to notice that the descriptive statistics only reveal some basic differences across cohorts. Therefore, a full description of the estimation strategy in the next section will be given to identify the impact of education on childhood immunisation rates and channels affecting them.

Table 2.2 Descriptive Statistics

	TDHS 2003				TDHS 2008			
	Control aged 22-29		Treatment aged 18-21		Control aged 22-29		Treatment aged 18-21	
Description of the Variables	Obs	Mean	Obs	Mean	Obs	Mean	Obs	Mean
Dependent Variables								
Children are Immunized against DPT3	1918	0.624	316	0.520	952	0.821	194	0.810
Children are immunized against for Hepatitis3	1918	0.491	316	0.362	953	0.788	194	0.772
Age at first marriage	1918	18.956	316	16.471	954	19.680	194	16.641
Age at first birth	1918	22.968	316	18.329	954	23.960	194	18.345
Women in the workforce	1918	0.322	316	0.290	954	0.208	194	0.134
Women`s spouses in the workforce	1886	0.471	307	0.376	947	0.596	191	0.532
Owns flushing toilet	1916	0.699	316	0.650	944	0.776	192	0.727
Wealth index of the family	1918	-0.102	316	-0.270	954	-0.076	194	-0.371
Household size	1918	5.682	316	6.023	954	5.474	194	5.788
Knowledge of the ovulation cycle	1917	0.252	316	0.134	952	0.206	194	0.111
Responsible for family budget	1918	0.185	316	0.092	952	0.139	194	0.058
Responsible for bills and dealing with authorities	1918	0.120	315	0.055	954	0.134	194	0.049
Woman and her husband arranged marriage	1918	0.494	316	0.404	954	0.466	194	0.422
Woman against violence against women	1918	0.574	316	0.438	954	0.756	194	0.773
Woman against gender inequality	1918	0.448	316	0.275	954	0.477	194	0.378
Independent Variables								
Years of schooling	1918	5.831	316	4.906	954	6.146	194	6.384
Completing 8 years of schooling	1918	0.276	316	0.173	954	0.298	194	0.571
Ethnicity	1918		316		954		194	
Turkish		0.746		0.672		0.738		0.736

Kurdish		0.216		0.290		0.231		0.248
Others		0.038		0.038		0.031		0.027
Rural/urban status during childhood	1883		312		944		193	
Rural		0.510		0.528		0.451		0.400
Urban		0.490		0.472		0.549		0.600
Child-gender dummy	1918		316		954		194	
Male		0.522		0.511		0.532		0.460
Female		0.478		0.489		0.468		0.540
The birth order dummies of children	1918		316		954		194	
First child		0.435		0.781		0.424		0.776
Second child		0.342		0.188		0.332		0.237
Third child		0.133		0.028		0.140		0.089
Fourth child		0.089		0.003		0.104		0.003
Pre-determined Factors								
Mother literate	1908	0.435	314	0.381		0.469	190	0.478
Father literate	1913	0.841	316	0.859		0.869	183	0.856
Mother with 8 years of education	1886	0.035	311	0.027		0.040	194	0.060
Father with 8 years of education	1815	0.140	294	0.124		0.174	194	0.209

unobserved time- invariant effect of the childhood environment[34] on schooling outcomes, I control for the childhood region, and place of residence (rural/urban) in which women spent most of their childhood until the age of 12. Ethnicity is also included. The fixed effects for the mother`s year of birth are used to account for the impact of various government programs and policies, as well as changes in the utilisation of healthcare services and education preferences among different cohorts, which were unrelated to the CER but occurred within the same period.

A problem arises if the regional intensity of public spending on classroom construction is not arbitrary but is higher in regions with lower pre-reform enrolment rates in grades 6-8. To deal with this issue, the interaction of the year of birth fixed effect with the gross enrolment rate in 1996-1997 in the childhood region prior to education reform is used. This controls for the differentiation in the intensity of the implementation of the education reform linked with the enrolment rates before the reform at junior high schools (grades 6-8) and other unobservable factors related to these enrolment rates.[35]

Apart from the above explanatory variables, a dummy variable representing the gender of the babies is included in the regression to control for the impact of gender on the vaccination status of children. Finally, although the number of earlier births is expected to be endogenously determined,[36] I still control for dummies reflecting the baby's birth order to account for the fixed effects of the mother's previous birth experiences about vaccination.

[34] To be more specific, these time-invariant effects may be disparities in socio-economic developments among regions, inequalities in school and teacher quality and their availability in the pre-reform period.
[35] See section 2.4.3.1.
[36] The estimation was performed with and without using previous birth experience dummies. However, the results do not differ much irrespective of whether the dummies for the parity of the children is included.

2.4.3 Empirical Strategy

2.4.3.1 Difference in Difference in Differences

Turkish children used to have to attend primary school for at least 5 years. However, in August 1997, Turkey`s compulsory years of schooling increased from 5 to 8 years. Hence, children who started the fifth grade in the 1997-98 academic year were required to complete 8 years of education. It is also worth noting that, in accordance with the law on primary education, the schooling age in Turkey is calculated by calendar year, rather than by schooling year.[37] These two features of the Turkish legal framework jointly suggest that women who were born in or after 1987 (aged 10 or less) were bound by the education reform whereas the older women (aged 11 or more) were not.[38] Therefore, the identification strategy has to be based on the fact that the education reform sorts individuals into treatment and control groups according to their dates of birth.

In this chapter, I use the three-year exogenous change in educational attainment across cohorts triggered by the timing of the education reform as an instrument for education in the IV method. One of the requirements of a valid instrument is that it should not have any impact on outcome variable other than its influence through schooling. I am self-

[37] The law states that "A child who has completed 72 months by the end of the calendar year can be registered to the first degree of primary school", according to the law published in edition No. 21308 of the official newspaper of Turkish Republic on Friday, 7 August 1992. This is important information for the construction of treatment and control groups.

[38] The compulsory education law states that "A child who has completed 72 months by the end of the calendar year can be registered to the first degree of primary school". This means that those who were born after 1986 were bound by the reform, whereas older children were not. However, the implementation of the age cut off was not strict. Hence, children who were born in early 1986 might start school in September 1991 instead of September 1992, while some of those born in late 1986 might start primary school in September 1993. This means some of the pupils who were born in 1986 could have been subject to the education reform. This could contaminate the results, and therefore 1986 cohort was excluded from the estimation as a robustness check. However, excluding this cohort yielded results which were not materially different, nevertheless.

assured that the education law amendment as an instrument meets this condition. Firstly, political events at the time of the law change in 1997 induced a reform in compulsory years of schooling, so that it has no link with the dependent variables employed in this thesis.[39] Specifically, the reform implemented to prevent the spread of religious education, and schooling law was enacted by the voters of the secular government, which came to the office just before the amendment of the schooling law. Secondly, reasons causing endogeneity of the education and reverse causality issues, including ability bias and other background characteristics, are not likely to be linked to the year of birth.

On the other hand, relying solely on the variation in the birth year cohorts might lead to bias in the estimations since there might be some other unobserved events taking place at the same time as the education reform. I, therefore, utilise the fact that this reform generated a sharp increase in sixth-grade enrolment rates so that new schools and classrooms were urgently needed and had to be built. In comparison to the 1996 budget, government spending on classroom construction increased by 30 percent in 1997. Moreover, even though the government extended compulsory education (CE) from 5 to 8 years in August 1997, it can be seen from Figure 2.1 that the government started to distribute the necessary budget for classroom construction by the February 1997 national budget. This date was earlier than the date of the reform, given that new classrooms were needed from September 1997. It should be also noticed that the regional allocation of funds was unequal among the regions of Turkey (Figure 2.2). Due to these reasons, the intensity measure of education reform was defined as additional expenditure on classroom construction per 1000 children (the difference between 1997 and 1996) in the

[39] See "Education Reform" part in section 1.2.

childhood region of the mother.[40] The region of childhood thus captures the regional variation in the distribution of the additional funds from the government`s expanded education budget for classroom construction.

Earlier studies have used the actual number of additional classrooms provided for junior high school education (e.g. Güneş, 2015) and teachers hired (e.g. Dinçer et al., 2014) as measures for the intensity of Turkey`s compulsory education reform. I use monetary spending instead. In other words, the regional intensity of additional spending on new classroom construction per 1000 children is preferred as the intensity measure of the reform for this study.

The difference between the number of classrooms and the value of the same classrooms should reflect regional price differentiation. In a densely-populated region, a newly built classroom will be utilized by more students than in regions with a lower population density. For instance, this means a new classroom might be fully utilized in Istanbul, which is the most densely-populated region in my study, whereas there might be a few students in a new classroom in the least densely-populated region. Likewise, an extra teacher might teach to higher number of additional students in a region with higher density of population whereas another teacher might be in an almost empty class elsewhere.

Construction costs should be higher in densely-populated regions than regions with low population density because of higher land prices. Additional classrooms built in densely populated regions are more likely to be used fully because of the higher population there,

[40] The estimations were made according to the difference between 1998 and 1996 as a robustness check. It seems the change in the measure of intensity does not have an impact on the outcomes of interests discussed in section 2.5.

so they are more likely to make a difference. For this reason, it can be suggested that the choice of construction expenditure as a program intensity will possibly explain more than the change in an actual number of teachers employed and classroom constructed due to the education reform.[41]

Figure 2.2 shows that there is little correlation between the enrolment rates in 1996 education year and the additional expenditures on classroom constructions: the allocation of the additional funds for classroom construction appears as good as random, making it, in combination with the year of birth, a good measure of the reform impact when applying the difference in difference estimation technique to the cross section from TDHS 2008 (see Duflo, 2001). Since the identification of the instrument comes from the fact that individuals affected by education reform experienced a higher intensity of construction expenditures, the intensity is required to be conditionally random. At first glance, the condition for the identification assumption seems to be satisfied as shown in Figure 2.2, however, there may be other avenues driving regional investment differentiations. These can be local amenities, income, education, and urbanization differences across regions. Moreover, as the primary aim of the education reform was to prevent the spread of religious thinking, the differences in average religiosity across regions might be another driving factor for regional investment differentiation. A link between the allocation of government expenditures to those regions and any of the regional variables including those specified above would probably cause a correlation with education. If this happens, there would be an identification problem. It would be convenient to test the correlation or graphing the correlation between the allocation of the expenditures and those regional

[41] I will address the relevance of the instrument further below in 2.5.3.2 Discussion of the First Stage F-Statistics section.

variables. However, data on the religiosity of the regions is not available for Turkey for the period before and after the reform. Also, regional data for average level of education, income, urbanization, and local amenities have been available since 2006. This corresponds to the period after the education reform. Higher education because of education reform is likely to cause a correlation between the allocations of funds and those regional variables as a change in educational attainment might result in a change in the average of these regional variables. Given the unavailability of the data at the regional level for these variables, one should be cautious in interpreting the lack of correlation between enrolment rates and regional spending on classroom construction. A likely correlation among other regional variables and spending allocation might cause an identification problem. Having said that, to account for unobserved time-invariant impact of childhood environment on the distribution of additional spending on classroom construction across regions, I account for the childhood region and place of residence (rural/urban) in which women spent most of their childhood until the age of 12.[42] Moreover, I control for the interaction of year of birth fixed effect with the gross enrolment rate in 1996-1997 education year in the childhood region prior to the education reform. This will account for the differentiation in the intensity of the compulsory education reform correlated with the enrolment rates before the reform at junior high school (grade 6-8) and other unobservable factors related to these enrolment rates across cohorts.

Having discussed the choice of the intensity measure, this paragraph will explain how to construct the model with the combination of year of birth and the intensity measure. If

[42] See 2.4 Data and Empirical Framework and 2.4.2 Independent Variables sections for the detailed discussion.

women were born between 1987 and 1990, they were affected by the education reform, therefore they form the treatment group, and those born between 1979 and 1986 are in the control group.[43] The schooling decision of the individuals can be estimated with the following linear model.

Model 1 is as follows: [44]

$$S_{ijt} = \mu + \beta_l + \gamma_j + \theta_t(treated * intensity_j) + \theta intensity + X_{ijt}\pi + \varepsilon_{ijt} \quad (1)$$

Where S_{ijt} denotes the educational attainment of mother *i* who lived in the childhood region *j* in treatment group *t.* As indicated previously, there are two education variables, years of education and a dummy for completing 8 years of formal education. The "$treated$" variable equals one for the treatment group, and zero for the control group. "$intensity$" shows the regional variation in the intensity of education reform in the childhood region of women, which explain the effect of other determinants related to the CER. β_l indicates the year of birth fixed effect; γ_j is the region of childhood fixed effect, which is the region where women lived most of their lives until age 12; and finally the remaining control variables are represented by X_{ijt}. These are ethnicity, the interaction of year of birth with gross enrolment rate in 1996-97, and two dummies: (i) the first one shows the birth order of the baby and (ii) the second one represents the gender of the baby.

The correlation between schooling and the reform for the treatment group is estimated by $\theta_t + \theta$ whereas the same relationship for the control group is represented by θ. Therefore, θ_t captures the impact of the compulsory education reform on the formal schooling of the

[43] See Table 2.4 for empirical identification of treatment and control groups.
[44] Model 1 was similarly constructed as in Duflo (2001).

treatment group, if the control and treatment groups are equally influenced by the other determinants associated with the intensity variable. Assuming the Compulsory Education Law (CEL) was exogenous, θ_t measures the impact of the reform intensity variable on the schooling of treated mothers.

Up to now, the discussion has focused on the assumption that the exposure of women to the CEL is jointly determined by year of birth and region of childhood. This assumption implies that factors related to the intensity of public investment on classroom construction have the identical influence on mothers in the treatment and control groups. However, if mothers' outcomes such as their use of preventive health measures for their children (e.g. vaccination) vary by age, any method that does not compare women in the same age group might be biased. However, the difference in difference methodology (DD) cannot account for the impact of age on the outcome of interest. For that reason, this research prefers the Difference and Difference in Differences (DDD) strategy over DD. This methodology rests on the fact that the education choices of individuals are a function of the date of birth, additional government spending on classroom construction per 1000 children aged 6-13 in the region of childhood and age. The Difference in Difference in Differences (DDD) strategy thus can control both year of birth fixed effects and age fixed effects (e.g. Dinçer et al., 2014)[45]. In order to use the DDD, sample of young mothers between the ages of 18 and 29 is formed whereby the 2003 and 2008 TDHS cross section data are combined.[46] As a result, the DDD methodology used by Dinçer et al. (2014) could be

[45] The DD strategy only controls for the year of birth fixed effects.

[46] The inclusion of age fixed effects is also important for the outcome measures estimated at the second stage. That is because like other outcome variables, the variation in the utilisation of vaccination as a preventive health care measure by mothers for their children can mainly be explained by their age difference. However, the DDD method comes with an additional assumption. The assumption I make here is that the treatment groups (i.e. mothers between the ages of 18 and 21) in TDHS 2003 and 2008 have identical trends related to educational attainment, utilisation of immunisation services for their babies and potential mechanisms affecting vaccination usage in the absence of education reform.

applied in this setting with the combination of 2003 and 2008 TDHS so that Model 2 is structured as follows:[47]

$$S_{ijt} = \propto + \omega_l + \beta_j + \beta_a + \theta_t(treated * intensity_j * 2008) + \theta_y(treated * intensity_j) + \theta intensity_j + X_{ijt}\pi + \varepsilon_{ijt} \quad (2)$$

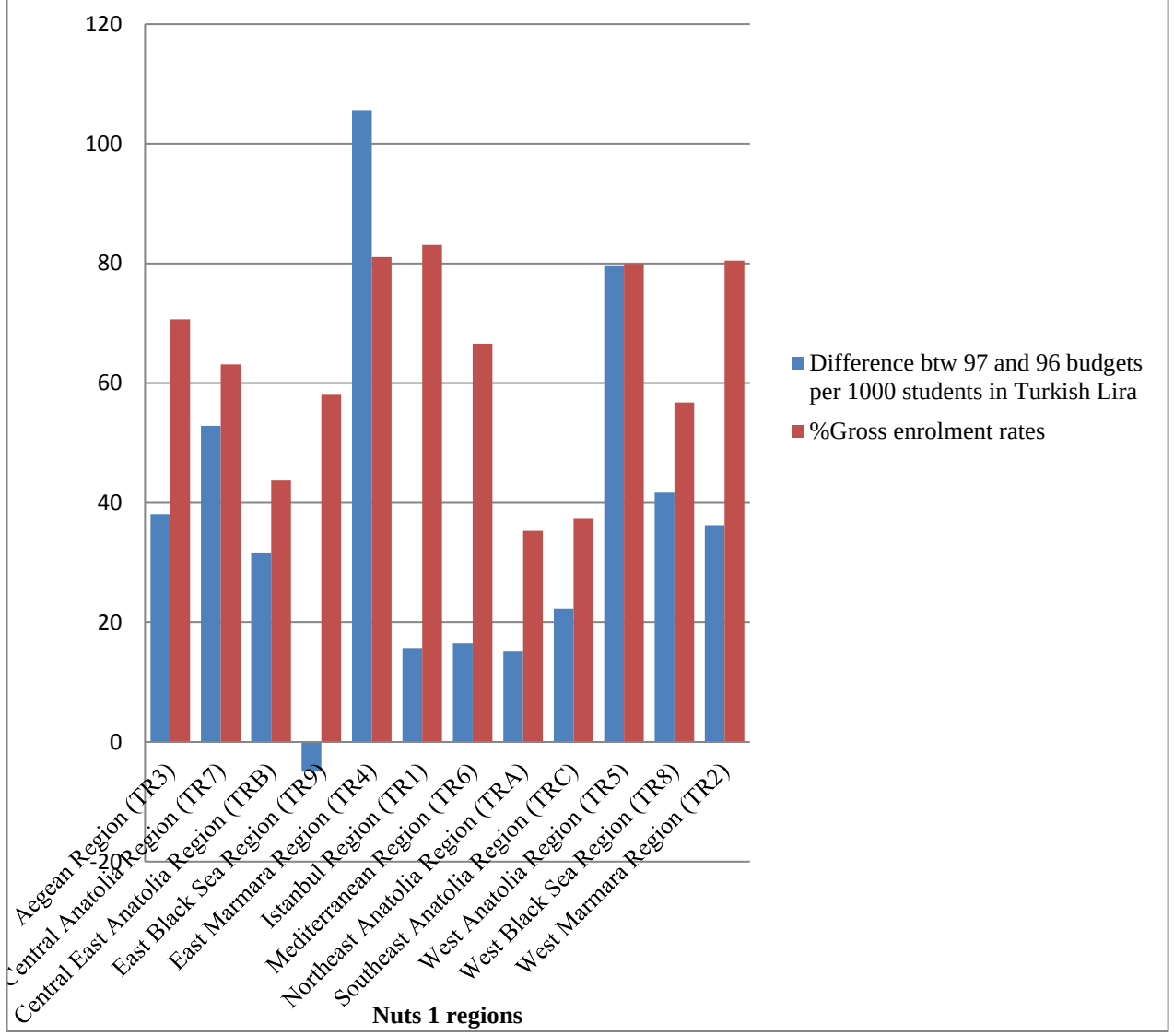
To begin with, different symbols were used to differentiate variables of Model 1 and 2. In the above regression, β_a stands for the age fixed effect; ω_l is the year of birth fixed effect; β_j is the region of childhood fixed effect and 2008 is a dummy for the TDHS 2008 cross section. The year of birth fixed effect control for general trends in the outcome of interest caused by other changes specific to age cohorts.[48] The age fixed effect, on the other hand, control for the impact of the age on the outcome of interest.

θ_y, measures how the impact of the intensity of the public spending on classroom construction for formal schooling varies between the young (i.e. aged 18-21) and old (i.e. aged 22-29) women participated in the 2003 wave of the survey. On the other hand, assuming the compulsory education law was exogenous, θ_t denotes the impact of the reform intensity on the education of young mothers aged 18 to 21 who participated in TDHS 2008.

[47] Model 2 was similarly formed as in Dinçer et al. (2014).

[48] For instance, the minimum age for marriage was raised from 15 to 17 in 2002 affecting women born after 1985. Moreover, due to a transformation in the health program passed by the government in 2003 and initiated in 2004, the amount of government funds for preventive health care measures increased substantially. As a result of this increase, public expenditure on the National Immunization Program increased from 18 million TL in 2003 to 286 million in 2008 (Ceyhan, 2010).

Figure 2.2 The variation in gross enrolment rates and investments in infrastructres



Source: Author's calculation from the Turkish Republic`s Ministry of Development`s 1996 and 1997 Statistical Yearbooks on Public Expenditure, Ministry of National Education (MONE) 1996 dated yearbook and population statistics of Turkish Statistical Institute.

In all regressions, standard errors are clustered for the 26 regions of childhood, in which individuals lived at age 12.[49] The problem with this might be that if the number of clusters is less than around 42-50, some of the researchers suggest that the null hypothesis is more likely to be rejected when it is true (Angrist & Pischke, 2009; Bertrand, Duflo, & Mullainathan, 2004). On the contrary to the above suggestion, Cameron, Gelbach, and Miller (2008) reach a more optimistic conclusion regarding the consistency of standard errors with few clusters. They argue that the null hypothesis is less likely to be rejected when it is true if the number of clusters is around 20 than when it is 50. Moreover, even with as few as six clusters, the rejection rates coming from the theory are very similar to empirical values (Cameron et al., 2008).

2.4.3.2 Ordinary Least Square and Instrumental Variable

Maternal Education and Childhood Immunization Rates

The effects of maternal education on the coverage of childhood immunisation in an Ordinary Least Square (OLS) setting could be restated by modifying the above difference in difference in differences strategy as follows (Model 3): [50]

$$Y_{ijt} = \propto + \omega_l + \beta_j + \beta_a + \delta S_{ijt} + \delta_y(treated * intensity_j * 2008) + \theta intensity_j + X_{ijt}\pi + \varepsilon_{ijt} \quad (3)$$

[49] The Turkish Statistical Institute divides Turkey into 26 sub-regions at Statistical Regional Classification Unit level (or level 2). It is constructed with respect to economic, social, cultural and geographic similarities of provinces (see Turkish Statistical Institute website: http://www.turkstat.gov.tr/Start.do)

[50] One can claim that Probit or Logit estimates are more appropriate than the OLS for the above setting, however, due to the fact that dependent and most of the independent variables are dummy variables, it is conventional to use linear probability model, i.e. OLS as the results will still be credible. Moreover, the previous literature also full of example of this usage (Breierova & Duflo, 2004; Chou et al., 2010; Dinçer et al., 2014; Güneş, 2015; Osili & Long, 2008).

Where Y_{ijt} is a dummy variable which equals 1 if children were vaccinated against DPT3 or Hepatitis B3 and 0 otherwise. On the other hand, it is apparent that OLS estimates of δ might be biased because it is possible that schooling is correlated with the error term (ε_{ijt}). For instance, a possible bias of OLS estimates occurs if unobserved characteristics of women similarly influence both their educational attainment and their behaviour related to the vaccination of their children.

However, if the reform only affects the outcome of interest through education, i.e. the reform has no direct effect on the dependent variable, then, the results of difference in difference in differences (DDD) estimates in Model 2 becomes important since it captures the effects of the CEL on maternal education. In other words, Model 2 can be used as the first stage of Instrumental Variable (IV) estimation. More specifically, the triple interaction term "$treated * intensity * 2008$" in Model 2 can be used as an instrument to estimate the schooling of mothers, i.e. $\widehat{S_{ijt}}$, the predicted value of education. By doing so, I can obtain unbiased estimates of the effect of education on the outcome considered.

Model 4 then is as follows:

$$Y_{ijt} = \propto + \omega_l + \beta_j + \beta_a + \delta\widehat{S_{ijt}} + \delta_y(treated * intensity_j * 2008) + \theta intensity_j + X_{ijt}\pi + \varepsilon_{ijt} \quad (4)$$

It is important to note that instead of IV-Probit or Logit, this chapter uses conventional 2SLS estimation technique as suggested by Angrist (1991) and Angrist (2001) since the dependent and endogenous variables, as well as the instrument, are dichotomous. Under this condition, 2SLS estimates still identify marginal treatment effect irrespective of the fact that the dependent variables are binary or continuous (Angrist & Pischke, 2009). There are plenty of examples of the usage of 2SLS estimates instead of IV-Probit or Logit

in the previous literature (e.g. Breviero & Duflo, 2004; Chou et al., 2010; Osili & Long, 2008; Mocan & Cannonier, 2012).

In this study, OLS and 2SLS strategies are used to estimate structural equations in this study. All the remaining explanatory variables, except the triple interaction term, are included in Model 4. Moreover, in the same way as with DDD estimates, in all regressions, standard errors are clustered at the level of regions of childhood for 26 regions.

Maternal Education and Channels Affecting Childhood Immunization Rates

The second objective of this chapter is to study the effect of education on the channels affecting immunisation. This subsection of the research employs a similar strategy to that mentioned for vaccination outcomes.[51] The dependent variables used are the following: (i) age at first marriage and birth, (ii) participation of women and their spouses in the labour market, (iii) measures of wealth including household`s ownership of a flush toilet, wealth index of the family and size of the households, (iv) proxies for autonomy of women, such as responsibility of women for official works; household budgets and whether marriage is jointly arranged by husband and wife, (v) the attitude of women towards gender equality including justification of violence against women and attitude of women towards gender roles.

This chapter`s empirical strategy does not allow to test whether maternal education influences childhood immunisation rates by any of these pathways. On the other hand, the effect of education on these channels could be tested, and then by doing this it might

[51] However, OLS and IV estimates do not control for gender and birth dummies of children for the outcome measures considered in this subsection.

be possible to reach some interpretations regarding the potential presence of these channels. An example of this could be if a woman`s education influences their attitudes towards gender norms, then it would be possible to draw conclusions from this about the channels through which education affects children's vaccination rates.

2.4.3.3. Reduced Form

A modification of Model 2 (the first stage regression) results in a reduced form (RF) estimates. To do this, the outcome of interest in the first stage is replaced with vaccination status and other relevant outcomes.

Model 5 is as follows:

$$Y_{ijt} = \propto + \omega_l + \beta_j + \beta_a + \theta_t(treated * intensity_j * 2008) + \theta_y(treated * intensity_j) + \theta intensity_j + X_{ijt}\pi + \varepsilon_{ijt} \quad (5)$$

The reason for employing RF estimates is that the results of the estimation may differ because of the systematic difference between young and old cohorts or because of higher education as a result of the CER. The RF model thus provides information related to the variation in the vaccination status of children and other outcomes due to the exogenous rise in public spending on classroom construction because of the CER experienced by the treatment group (young) in 2008 (i.e. $treated * intensity * 2008$).

With the exception of $\widehat{S_{ijt}}$ in Model 4, the same control variables are used for RF estimates of childhood vaccination status. However, similarly with IV and OLS estimates of channels affecting immunisation, RF of these outcomes variables does not account for the gender and birth order dummies.

2.5 Results and Discussion

2.5.1 Difference in Difference in Differences Estimation Result

The results of the Difference in Difference in Difference analysis are presented in Table 2.3.[52][53] Firstly, all DDD coefficients are positive and statistically significant as expected. More importantly, the F-statistics test of the joint significance of the triple interaction term (namely the instrument) equals more than 10 for almost all specifications (see Table 2.3).[54] This is a significant finding since it indicates that the instrument is strong (Staiger & Stock, 1997). It is worth noting that the instruments used in the previous studies on Turkey were weak for years of education for their all model specifications, and therefore the analyses were restricted to the effect of categorical education variable, i.e. completing 8 years of education, on the outcome of interest (see Dinçer et al., 2014; Güneş, 2015). Furthermore, the other studies using similar methodologies to this chapter solely examined the impact of years of education on the outcome of the interest (e.g. Breviero & Duflo, 2004; Chou et al., 2010; Osili & Long, 2008; Mocan & Cannonier, 2012).

A more detailed investigation of the findings reveals that the coefficients of estimates for completing 8 years of education in column 8 in Table 2.3 indicate that every additional 1 Turkish Lira (TL) of spending per 1000 children raised primary school completion by 0.3 percentage points. Furthermore, the average increase in public expenditure on education

[52] From now on, coefficients of the full model, namely column 4 and 8 will be analysed for childhood immunisation outcomes. However, models in column 2 and 6 will be used for the outcomes related to channels affecting immunisation rates.

[53] The robustness of the first stage estimates with additional controls brings supplementary evidence for the validity of the exclusion restriction.

[54] There are two exceptions. The value of F statistics of years of schooling for models in column 2 and 3 is slightly less than 10, however, the values of F statistics are above 10 in column 1 and 4. However, this study still reports the estimates for years of education since the final model in column 4 is used as a main model throughout the study.

was 40.36 TL.[55] In short, the combination of these two results show that each additional TL spent as part of the compulsory schooling reform led to an increase in the probability of completing at least 8 years education by 12.1 percentage points (i.e. 0.3 multiplied by 40.36).[56] Because the percentage of the treatment group with 8 or more years of education in 2003 is 17, this would represent approximately a 70 percent increase in the share of women who completed primary school and above.

Additionally, the estimates in Model 4 for completing 8years of education suggests that one additional Turkish Lira (TL) spent on classroom construction per 1000 children increases years of education by 0.011 years (4 days). As given before, the average additional public expenditure on education is 40.36. Therefore, the education reform caused an increase in years of education by about 0.44 years (162 days).

The average year of schooling for young cohorts in 2003 is 4.91. This constitutes almost 9 % increase in the years of education of the treatment group in 2003. To sum up, based on the evidence currently available, it seems fair to suggest that the education reform had a significant influence on the schooling of treated mothers in 2008.

[55] The author`s own calculation from the statistics gathered to calculate the government`s expenditure on classroom construction.

[56] Multiplication of coefficient of three-way interaction terms by the average value of additional spending on classroom construction (the intensity measure) for the treatment group in the 2008 TDHS enables me to make a prediction of the change in highest grade completed and the probability of completing having 8 years of compulsory education because of the CER.

Table 2.3 The impact of the Compulsory Education Law on Formal Schooling-DDD analysis (The first stage of IV regression)

Dependent Variable:	Years of schooling				Completing 8 years of schooling			
	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8
treatment*intensity*2008	0.014***	0.009***	0.009***	0.011***	0.003***	0.002***	0.002***	0.003***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)
Controls								
Ethnicity	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Rural/urban status during childhood	No	Yes	Yes	Yes	No	Yes	Yes	Yes
A child-gender dummy	No	No	Yes	Yes	No	No	Yes	Yes
The birth order dummies	No	No	No	Yes	No	No	No	Yes
R-squared	0.779	0.810	0.810	0.826	0.370	0.436	0.436	0.464
F-statistics	14.97	7.00	7.24	12.40	44.96	34.84	35.33	39.34
Observations	3,339	3,327	3,327	3,327	3,339	3,327	3,327	3,327

Note: Women aged 18-29 in 2003 and 2008 form the sample of analysis. Women aged 18-21 form the treatment group. The intensity variable is measured as the difference between the 1997 and 1996 government funds distributed for primary school construction at the region of childhood. Robust standard errors in parentheses cluster at the region of the childhood. F-statistics are the test of the joint significance of the triple interaction term (treatment*intensity*2008). The baseline Models 1 and 5 include no control variable. In addition to the controls given in the table, all models include ethnicity, the urban/rural status of the region of residence in childhood (except Models 1 and 5), the region of childhood, year of birth and age of respondent fixed effects, the intensity variable, the interaction of year of birth with gross enrolment rate in the region of childhood and the interaction of treatment and intensity variables. *** p<0.01, ** p<0.05, * p<0.1

2.5.2 Validation of treatment and control groups

As explained before, the treatment group is formed by young mothers between the ages of 18 and 21 in the 2003 and 2008 TDHS, whereas those in the age group of 22-29 in the same surveys constitute the control group for the sake of the analysis. Consistent with the strategy of previous studies, there will be a test of the validity of the treatment and control groups in this section (e.g. Güneş, 2015; Osili & Long, 2008). To do this, three-way interaction terms in Model 2 is replaced by 12 separate interaction terms. This means that the treatment variable is turned into 12 dummies, one for each year of age. As expected, estimates of the coefficients for mothers aged 22-29 are close to zero and statistically insignificant for both years of education and primary school completion (see Table 2.4). However, results are statistically significant and positive for women aged 18-21. Above all, these findings provide evidence supporting the construction of treatment and control groups to implement the DDD methodology.[57]

2.5.3 Discussion of DDD Estimation Results

2.5.3.1 Parallel Path Assumption

The crucial assumption in the above DDD estimation is "Parallel Paths". It states that the average differentiation in the group used as control shows the counterfactual differences in the group used as treated if the treatment group was not treated. However, the treatment group prior to treatment (i.e. young women in 2003 data) cannot be a priori assumed to be a true counterfactual. The data sets of this chapter are cross sections collected in every 5 years.

[57] The 2003 TDHS forms our base level comparisons.

Table 2.4 The impact of CER on the schooling of each age separately

	Dependent Variables	
Age in 2008	Completing 8 years of education	Years of education
18	0.004***	0.027***
	(0.001)	(0.008)
19	0.004***	0.029***
	(0.001)	(0.005)
20	0.004***	0.024***
	(0.001)	(0.006)
21	0.003***	0.009**
	(0.000)	(0.004)
22	0.000	0.004
	(0.000)	(0.004)
23	0.000	-0.003
	(0.001)	(0.004)
24	0.000	-0.002
	(0.000)	(0.004)
25	-0.000	-0.002
	(0.000)	(0.002)
26	0.000	0.001
	(0.001)	(0.004)
27	0.000	0.004
	(0.000)	(0.003)
28	0.000	0.001
	(0.000)	(0.003)
Observations	3,327	3,327

Table 2.4 shows the impact of CER on primary school completion rates and single years of education for each age. The estimation sample covers mothers aged 18-29 at the time of the surveys. The interaction term is the interaction of age*intensity*2008 for each age. Robust standard errors are in parenthesis. Moreover, standard errors cluster at the region of childhood. *** p<0.01, ** p<0.05, * p<0.1

Therefore, there is an implicit 5-year shift forward (i.e. time trend) in the whole economy and preferences that might not be captured and affect outcomes.

Comparison of pre-treatment characteristics can be used to ensure comparability. Table 2.2 reports summary statistics for the dependent variables, selected independent variables, and some family-related characteristics. Some of these variables could be used as pre-determined factors. Comparing the average change in control and treatment group related to pre-determined factors should indicate potential violation or satisfaction of the parallel path assumption. Even though there are limited number of pre-determined variables available, this chapter still discusses the parallel path assumption with these available pre-determined factors. The ethnicity of a woman, residence status during childhood, the literacy of a woman`s mother and father are classified as pre-determined factors.

I performed t-tests to examine the hypothesis that the means of treatment group in 2003 and 2008 are equal for these pre-determined factors. The result of t-tests provided evidence that there is no significant difference in the average of these two groups. I also ran t-tests to test whether the average of the control group in 2003 are different from those in 2008. The t-tests again show no significant differentiation across groups, with an exception of urban-rural status. The control group in 2008 data are more likely to live in urban areas at one percent significance level. However, I have used cross section data sets, which mean different people constitute the sample of the analysis in different years, so it is expected to have some differences. Overall, t-tests show that some characteristics are largely pre-determined and similar across cohorts.

According to Table 2.2, i.e. descriptive statistics table, the treatment group in 2003 obtained significantly less education than the treatment group in 2008. The difference for

years of education is 1.5 years and 30 percentage points for completing 8 years of education. Also, t-tests of these education variables indicate statistically significant differences at one percent level between these groups. However, the differences of control groups in 2003 and 2008 are 0.3 years for years of education and 5 percentage points for completing 8 years of education. Moreover, t-tests show that there is no statistically significant difference between these groups. Overall, it can be said that the difference in outcomes for the variables affected by the education reform is more significant than those observed in those pre-determined factors.[58]

This implies that even though there might be an implicit time trend in the economy and preferences because of 5-year shift forward, it seems that DDD results are still valid as there are small differences in the average of pre-determined factors. Also, in all models, I control for fixed effects of a woman`s year of birth to account for the impact of various government programs and policies, as well as changes in the utilization of health care services, and education and other preferences across cohorts, which were unrelated to the compulsory education reform but occurred within the same period, and, therefore, might cause a time trend. All in all, it can be concluded that comparison of pre-determined characteristics and accounting for the year of birth fixed effects indicate that the treatment group of 2003 TDHS can be used as counterfactual and, therefore, parallel path assumption is likely to hold in the construction of DDD estimation for this study.

[58] The results of t-tests are available upon request.

2.5.3.2 Discussion of the First Stage F-statistics

This chapter presents larger first stage F-statistics for the years of education and completion of 8 years of education variables than the previous studies on Turkey. This is massively different to Dinçer et al. (2014), who use a similar estimation technique and investigate the impact of the reform on education outcomes for Turkey.

There could be four possible reasons behind larger first stage F-statistics. It can be: (i) using a different measure of the regional intensity variable of the compulsory education reform to construct the instrument, (ii) the usage of different sub-samples, (iii) defining treated population differently, and (iv) using slightly different covariates in the estimated model. To begin with, as explained earlier in section 2.4.3.1, previous literature uses actual alteration in the number of classrooms constructed for junior high school education and employment of teachers as the measures of education reform. However, as discussed in the empirical strategy section of this chapter, this study uses monetary spending on classroom construction. The differentiation in actual number of classrooms constructed and monetary spending on classroom construction should reflect regional price differences. The construction costs should be higher in a region with higher population density than other regions with lower population density.

Table 2.5 Variation in the first stage F-statistics

	Intensity variables	F-statistics: Years of education	F-statistics: Completing 8 years of education	Observation
Women aged 18-21 form the treatment group as in Table 2.3	*Construction expenditure*	12.4	39.34	3327
	Teacher	9.1	31.11	3327
Women aged 18-22 form treatment group as in Dinçer et al. (2014)	*Construction expenditure*	4.37	14.1	3327
	Teacher	7.93	14.48	3327
Dinçer et al. (2014)	*Teacher*	6.51	13.42	5147

Note: "Construction expenditure" variable is measured as the difference between the 1997 and 1996 government funds distributed for primary school construction at the region of childhood because of the education reform. Similarly, teacher variable is defined as in Dinçer et al. (2014) and, therefore, measured as the additional teacher employed due to education reform. F-statistics are the test of the joint significance of the triple interaction term (treatment*intensity*2008). Models in column 4 and 8 in Table 2.3 are estimated for comparisons. When teacher variable is used as an intensity measure, the intensity of construction expenditure variable is replaced with teacher variable. Also, models have been modified accordingly. The last row of the table reports F-statistics of Dinçer et al. (2014)` original study to make a comparison of the results reported in this table with their study.

Also, additional classrooms might be fully utilized in densely populated regions, whereas it might be almost empty in other regions with the lowest population density. Therefore, the correlation between the change in educational attainment and spending in classroom construction is more likely to be higher than other intensity measures. Potentially, this results in a higher explanatory power of the monetary instrument than actual measures of other studies.

Secondly, in the Turkish Demographic and Health Survey (TDHS), the data about mothers` health care utilization during pregnancy and pro-pregnancy period is available for mothers who gave birth in the last five years before the interview date. On the other hand, in the same survey, women who gave birth in the last three years before the interview date responded to questions related to their children`s immunization status. In this chapter, I used the answers to the latter questions to construct the data set exploited in this chapter. By doing this, I obtained a different sample in terms of size and population studied than Dinçer et al. (2014) as they used the former questions as their data source in their study. For instance, the number of observation is used in Table 2.3 to regress models in column 4 and 8 is 3327 whereas Dinçer et al. (2014) used 5147 observations to their first stage analysis. However, their study uses the nearest methodology to this chapter`s estimation technique as explained earlier.

To test whether dissimilar F-statistics are because of employing a monetary measure of the regional intensity variable of the education reform, or different sub-samples for the analysis, I replaced the intensity of construction expenditures with the intensity of the number of teachers employed after the reform as in Dinçer et al. (2014) `s study to construct the instrument. Then, I modified models in column 4 and 8 in Table 2.3 accordingly for this intensity measure. Later, these models are estimated with this new

instrument. I found that the value of the F statistics are 9.10 and 31.11 for the years of education and completing 8 years of education outcomes respectively as illustrated in the first row of Table 2.5. However, when the intensity of construction expenditure is used as an intensity measure, the reported F-statistics are 12.40 and 39.40 for the years of education and completing 8 years of education respectively as reported in Table 2.3 and the second row of Table 2.5. These F-statistics are greater than the values when teacher recruitment rates are exploited as a measure of the reform intensity. However, they are still much greater than those reported in Dinçer et al. (2014), as shown in Table 2.5. It can be suggested that using a different intensity variable can partly explain the significant difference in the F-statistics. Therefore, analysing a different sub-sample with a different sample size could explain some differentiation in the F-statistics. Having said that, one should be cautious before drawing such conclusion. The instrument of this study should be tested with exactly the same data set and model used in Dinçer et al. (2014) to conclude these findings. However, because of the reasons explained earlier, it is impossible to have the same data set.

Thirdly, Dinçer et al. (2014) also differ to this study as they define the treatment group as women aged 18 to 22 whereas only women aged 18-21 are included in this study. In other words, individuals who were born in 1986 (i.e. aged 22) are placed in the treatment group in their study, but not in this study. According to the compulsory education reform, students who started fifth grade in September 1997 were subjected to the education reform whereas individuals who started sixth grade in September 1997 are born in 1986 or aged 11 and were not bound by the reform. Having said that, as explained earlier some of the individuals who were born in 1986 might be still affected by the reform as the age cut off

for registering the first grade of primary school was not restrict.[59] Table 2.4 shows that the impact of the education reform on individuals aged 22 is statistically insignificant. Therefore, it is quite likely that including this age cohort into the treatment group instead of the control group would cause an important drop in the F-statistics.

The third and fourth row of Table 2.5 illustrate the first stage F-statistics for both intensity variables with the data set of this study when individuals aged 22 are in the treatment group. The fifth row of Table 2.5 gives the F-statistics of Dinçer et al. (2014). When I define affected individuals as defined in Dinçer et al. (2014) and estimate models in column 4 and 8 in Table 2.3 with their intensity measure as done in the previous paragraph, the F-statistics for both education variable drop significantly. Moreover, they are slightly higher than those obtained in Dinçer et al. (2014). If I go back to my intensity variable and estimate models in column 4 and 8 of Table 2.3 with this modified treatment group, the results of the F-statistics are also quite similar with Dinçer et al. (2014). However, as discussed earlier, the significant drop in the F-statistics is not surprising.

Lastly, there is still slight differentiation in the F-statistics. These small differences can be attributable to using slightly different covariates and difference in clustering robust standard errors. It can be seen from Table 2.3 that adding covariates changes the magnitude of F-statistics for both education variable, which was also observed in Dinçer et al. (2014). Also, the clustering in this study is done with respect to 26 sub-regions of Turkey, but they clustered for 20 regions of Turkey which might influence the standard errors and, therefore, F-statistics. However, in light of the above discussion it is fair to argue that differentiation in the definition of the treated population and using a different

[59] This was explained in greater details in 2.4.3 Empirical Strategy Section.

measure of the treatment intensity seems to explain a large part of the differences in F-statistics between Dinçer et al. (2014) and this study.

2.5.*4 Effects of maternal education on DPT and Hepatitis B vaccination*

In the previous part, the first stage of the IV estimation was discussed, that is the correlation between the Compulsory Education Reform (CER) and maternal education. This section has two objectives. Firstly, it focuses on the effect of additional funds distributed for classroom construction per 1000 children due to the CER on the take-up of the third dose[60] of the Hepatitis B and DPT vaccines for children (i.e. RF estimates). Secondly, it examines the causal effects of maternal education on the same outcome interest (i.e. IV and OLS estimates).

Starting with the reduced form (RF) estimates, the results in Table 2.6 indicate that the exogenous rise in public spending on classroom construction because of the CER experienced by treated women in 2008 had a positive and significant impact on the vaccination status of their babies. To put it another way, based on the figures in Table 2.6, RF estimates state that as a consequence of the CER, there is 4 and 8 percentage points growth in the probability of the third (last) dose of DPT and Hepatitis B being administered respectively. These results provide confirmatory evidence that vaccination rates may differ because of the systematic difference between young and old individuals, or because of receiving a higher education due to the reform.

When it comes to explaining OLS coefficients, both years of education and primary school completion also have a positive, and statistically significant effect, but size of the

[60] Intake of the third dose of these vaccines represents a child's completion of the entire course of immunisation necessary to be protected against those specific viruses.

effect is modest. Moreover, as can be seen from Table 2.6, an additional year of maternal education is associated with 1.3 and 1.4 percentage points rise in the likelihood of complete immunisation status of infants for both DPT3 and Hepatitis B3 respectively.

In the same way, completing 8 years of formal schooling resulted in an increase in the probability of vaccination rates of around 5% for DPT3 and 7% for Hepatitis B. Despite this, the regression coefficients of primary school completion are only significant at ten and five percent levels respectively.

However, it is likely that the results of the OLS estimates may be misleading. As previously argued in 2.4.3 Empirical strategy section, educational attainment may be endogenously determined by some unobservable omitted variables affecting both the educational attainments of women and their preference for the use of vaccines for their children. If this is the case, it violates the exogeneity assumption of OLS as it implies a correlation between the education variable and the error term of the regression. I address this issue by employing the Instrumental Variable (IV) technique.

On the contrary, mothers' completion of 8 years of schooling leads to a much greater rise in the probability of receiving the third dose of these vaccines for their children: by 55% growth for DPT 3 administration and by 92 % for Hepatitis B. To sum up, considering the IV results, it can be concluded that maternal education has a positive significant effect on their children's vaccination rate.

Table 2.6 The Causal Impact of Education on the Complete Vaccination Status of children aged over 6 months

	DPT3	***Hepatitus3***
Reduced Form	0.001**	0.002***
	(0.001)	(0.001)
OLS		
Years of Education	0.013***	0.014***
	(0.004)	(0.003)
Completing 8 years of schooling	0.048*	0.070***
	(0.025)	(0.023)
IV		
Years of Education	0.127**	0.215***
	(0.054)	(0.058)
Completing 8 years of schooling	0.546**	0.920***
	(0.216)	(0.214)
Observations	3325	3326

Note: Women aged 18-29 in 2003 and 2008 form the sample of analysis. Women aged 18-21 form the treatment group. The intensity variable is measured as the difference between the 1997 and 1996 government funds distributed for primary school construction at the region of childhood. Robust standard errors in parentheses cluster at the region of childhood. F-statistics is the test of the joint significance of the triple interaction term (treatment*intensity*2008). For the analysis of all types of regressions, Model 8 is used. Therefore, all models include ethnicity, the urban/rural status of the place of childhood, region of childhood, year of birth and age of respondent fixed effects, the intensity variable, the interaction of year of birth with the gross enrolment rate in the region of childhood, the interaction of treatment and intensity variables.

*** p<0.01, ** p<0.05, * p<0.1

2.5.5 Effects of education on channels affecting the childhood vaccination rates

After having obtained evidence for the causal effects of maternal education on the immunisation rates of children aged over six months, the question of how education affects channels affecting vaccination can be addressed. This is crucial because one still needs to question how maternal education affects the intake of the third dose of Hepatitis B and DPT. For instance, education may affect immunisation through its direct impact on cognitive development. Then again, it might also affect some other potential mechanisms affecting immunisation rates. Although the research methodology of this study does not allow us to estimate the causal impacts of these channels on vaccination outcomes directly, it can shed some light on the potential role of these channels.[61]

Effects of education on age of marriage and first birth, wealth, working status, and knowledge

As mentioned above, in the present section, estimates of some of the potential mechanisms given in Table 2.7 and 2.8 will be analysed in detail. The OLS estimates show that one extra year of education for women raises the age of first marriage by 0.27 years and the age at first birth by 0.05 year as can be seen in Table 2.7. Likewise, a ten percent increase in the proportion of women with 8 years of education increases the age of first marriage and age at first birth by around 1.8 (0.15*12) and 0.4 (0.03*12) months respectively.

The IV estimates are much larger than the OLS estimates. To illustrate this point, an additional year of formal education increases the age at first marriage and birth by 0.9 and 1.3 years respectively while a ten percent increase in woman with completed primary

[61] See the last paragraph of section 2.4.3.2.

school education increases the age at first marriage 3.96 (0.33*12) and 6 (0.50*12) months respectively.

The results regarding the age of first marriage matched those observed in earlier studies by Breirova and Duflo (2004) for years of education and Güneş (2015) for categorical education respectively. However, the findings of Dinçer et al (2014) indicates no role for completing 8 years of education as a source for an increase in the age of marriage and birth and the size of impact of having 8 years of schooling is larger than previous studies.[62]

Interestingly, the OLS estimates for the other outcome variables in Table 2.7 are mostly statistically significant at the one percent level (except mother`s working status) and have expected signs for both years of education and primary school completion. 2SLS estimates of years of education and completing 8 years of education indicate that the husbands of more educated women are more likely to be in the labour force. Also, the 2SLS estimates also indicate that an increase in women completing 8 years of education has a negative impact on their labour force participation.

Lastly, the coefficients of reduced form (RF) estimation reported in Table 2.7 are also statistically significant for the age of first marriage, first birth and labour market status of women and their husbands. However, the RF results for the half of the dependent variables illustrated in Table 2.7 are statistically insignificant as seen in the IV estimates. This casts doubt on the usage of OLS estimates since this confirms that the IV results are substantially different and that endogeneity is an issue here. Results regarding 8 years of education differs for the knowledge of the ovulation cycle from the study by Dinçer et al. (2014). On the contrary to the findings of Güneş (2015), this study finds that women`s

[62] These studies can only account for the impact of either the years of or categorical education variables on these channels.

education increase their husbands` labour market participation whereas it decreases women's working status. The results might differ from the previous literature because as indicated in the previous discussion, this study exploits a different variable as a measure of treatment intensity and uses a different sub-sample of TDHS. The specification of the treatment and control groups also differ from Dinçer et al. (2014).

Effects of education on the autonomy of women and their attitude towards gender inequality and violence against women

As shown in Table 2.8, it can be seen that the OLS, RF and IV estimates reveal similar conclusions to those in the previous subsection. Specifically, the OLS coefficients for the years of education and completing 8 years of education show an important correlation with the autonomy of the woman, attitude towards gender inequality and violence against women. However, in almost half of these cases, IV estimates are statistically insignificant except women`s attitude towards violence against women and gender discrimination.[63]

The IV estimates of both the attitudes of women towards spouse violence against women and gender discrimination show that education decreases the probability of justification of domestic violence and being in favour of gender inequality. Significantly, Table 2.8 also shows that the magnitude of the effect of both estimates of education variables with the IV technique are much larger than the OLS estimates.

[63] To the best of my knowledge, in addition to being first study estimating causality between maternal education and their children's vaccination status, this study is also in the category of few studies estimating the causal effect of education on the autonomy of women (e.g. Samaracoon & Parinduri, 2015). The other distinction is that in comparison with Dinçer et al. (2014) who use variables about the attitude towards gender norms separately, as discussed in 2.4 Data and empirical framework section, this chapter builds two separate indices to measure the attitude of women towards gender norms. This is a common practice in vaccination literature and enables researchers to obtain a more reliable representation of women's attitude towards gender norms (e.g. Abuya et al., 2011; Singh et al., 2013).

Table 2.7. Effects of maternal education and intensity of the reform on age of first marriage, birth, wealth, working status and knowledge

VARIABLES	Age at first marriage	Age at first birth	Mother`s working status	Spouse`s working status	Ownership of Flush toilet	Wealth index of the family	Household size	Knowledge of the ovulation cycle
RF	0.008***	0.012***	-0.001*	0.001**	0.000	-0.000	-0.000	-0.000
	(0.002)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.004)	(0.000)
OLS								
Years of education	0.270***	0.050***	0.008*	0.034***	0.021***	0.110***	-0.184***	0.031***
	(0.027)	(0.014)	(0.004)	(0.003)	(0.004)	(0.006)	(0.025)	(0.004)
Primary school completion	1.529***	0.314***	0.009	0.204***	0.118***	0.630***	-0.982***	0.171***
	(0.195)	(0.112)	(0.023)	(0.021)	(0.024)	(0.042)	(0.145)	(0.032)
IV								
Years of education	0.879***	1.317***	-0.080	0.129**	0.046	-0.021	-0.047	-0.012
	(0.337)	(0.509)	(0.049)	(0.057)	(0.072)	(0.127)	(0.367)	(0.044)
Primary school completion	3.337***	5.001***	-0.305**	0.491***	0.173	-0.081	-0.177	-0.047
	(0.892)	(0.954)	(0.148)	(0.180)	(0.257)	(0.476)	(1.415)	(0.167)
Observations	3,327	3,327	3,327	3,257	3,313	3,327	3,327	3,324

Note: Women aged 18-29 in 2003 and 2008 form the sample of analysis. Young mothers between the age of 18 and 21 form the treatment group. The intensity variable is measured as the difference between the 1997 and 1996 government funds distributed for primary school construction at the region of childhood. Robust standard errors in parentheses cluster at the region of the childhood. F-statistics is the test of the joint significance of the triple interaction term (treated*intensity*2008). For the analysis of all types of regressions, Model 8 is used. Therefore, all models include ethnicity, the urban/rural status of the place of childhood, region of childhood, year of birth and age of respondent fixed effects, the intensity variable, the interaction of year of birth with the gross enrolment rate in the region, in which individuals lived during their childhood at age 11 in 1996 and the interaction between the treated and intensity variables. *** p<0.01, ** p<0.05, * p<0.1

The findings of the current study are consistent with those of Dinçer et al. (2014) and Mocan and Cannonier (2012) for categorical and years of education respectively who found that education improves women`s attitude towards spouse violence against women. However, the magnitude of the IV coefficients in those papers are smaller for years of education and completing at least 8 years of education. Also, the results regarding the effect of education on gender discrimination are inconsistent with Dinçer et al. (2014). They found an insignificant impact of education. Using a different measure of the intensity variable or the construction of the index for the attitude of women towards spouse violence against women might be a cause for different results. Moreover, the RF estimates are very similar to IV estimates. This result is important because it shows that the IV is indeed different from OLS estimates and endogeneity matters.

In addition, education does not have any impact on the dependent variables used to measure the autonomy of women in this study. For example, it does not affect her position as the main person responsible for organising the household budget or dealing with the authorities, and it also seems to have no influence on her ability to choose her spouse independently. This supports the findings of the previous research by Samarakoon and Parinduri (2015), who found no significant association between female education and a range of autonomy variables considered.

Table 2.8. Estimates of the impact of education on the autonomy of women and their attitude towards gender inequality and violence against women

	Responsibility for the Budget	Responsibility for official work	How marriage was arranged	Domestic violence index	Gender discrimination index
Reduced form	-0.000	0.000	-0.001	-0.001***	-0.001***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
OLS					
Years of education	0.015***	0.006**	0.011***	-0.021***	-0.031***
	(0.003)	(0.002)	(0.004)	(0.002)	(0.003)
Primary school completion	0.077***	0.021	0.070***	-0.113***	-0.174***
	(0.022)	(0.016)	(0.024)	(0.015)	(0.017)
IV					
Years of education	-0.049	0.014	-0.084	-0.118**	-0.078**
	(0.058)	(0.033)	(0.076)	(0.049)	(0.032)
Primary school completion	-0.187	0.053	-0.319	-0.448***	-0.296***
	(0.210)	(0.129)	(0.234)	(0.154)	(0.094)
Observations	3,324	3,326	3,327	3,327	3,327

Note: Women aged 18-29 in 2003 and 2008 form the sample of analysis. Young mothers between the ages of 18-21 form the treatment group. The intensity variable is measured as the difference between the 1997 and 1996 government funds distributed for primary school construction at the region of childhood. Robust standard errors in parentheses cluster at the region of the childhood. F-statistics is the test of the joint significance of the triple interaction term (treated*intensity*2008). For the analysis of all types of regressions, Model 8 is used. Therefore, all models include ethnicity, the urban/rural status of the place of childhood, region of childhood, year of birth and age of respondent fixed effects, the intensity variable, the interaction of year of birth with the gross enrolment rate in the region, in which individuals lived during their childhood at age 11 in 1996 and the interaction between the treated and intensity variables. *** p<0.01, ** p<0.05, * p<0.1

Overall, as mentioned earlier the empirical strategy of this chapter does not allow to directly measure the impact of these potential channels on vaccination rates. On the other hand, it is still possible to draw the same inference regarding the observed results. For instance, it could be said that the change in the vaccination status of infants observed in this study might not be attributable to the change in the autonomy of the women.[64]

However, women`s education seems to have a causal impact on other channels. These are the age of first marriage and first birth, employment status of women and their husbands, and women's attitude towards domestic violence against women and gender inequality that empower women. Similar to the logic stated in the previous paragraph, therefore, it could be argued that the available evidence indicates that the increase in the age of marriage and birth and as well as improvements in attitude towards domestic violence and gender discrimination, and the change in labour market status of women and their husbands might be the cause of the improvements in the rates completion of the DPT and Hepatitis B vaccination courses for the children of treated mothers in 2008.[65]

One could argue that there are some drawbacks of using a large number of outcome measures as given in Table 2.7 and 2.8. When estimating 20 regressions, and one of them shows a result that is statistically significant at 5 percent level, then it cannot be claimed that this result shows anything, because it would be expected to have one regression out of 20 to show an incorrect result at this significance level. That means that when estimating more than one regression with significant results (at 5 percent level) out of 20,

[64] However, it is difficult to make a general conclusion from our results. The results may be country specific or heavily depend on the variables used here.

[65] In an unreported regression, this study estimated several reduced form regressions explaining vaccination with age at first marriage and birth, husband`s working status and attitudes towards spousal violence as well as other covariates used in main estimates in Table 2.6. Even after controlling for these covariates jointly or separately, RF estimates reported in Table 2.6 for vaccination status are still robust and have an almost identical coefficient for the instrument for various specifications.

then this is unlikely to be by chance. Similarly, if one regression out of 20 shows a significant result at 1 percent level, then, this is also unlikely to be by chance, as it would be expected for this to happen for one out of 100 and not one out of 20.

In the case of this study, there are 8 outcome measures in Table 2.7, and 4 of them are significantly affected by education, and most of them are significant at 1 percent level. Employment status of women is only significant at 5 percent level. Also, in Table 2.8, education has a significant causal impact on the outcomes in 2 out of 5 cases at 1 percent level of significance. As explained earlier, at 5 percent level, it would be expected to have the wrong estimation as 5 percent of all estimates. However, Table 2.7 and 2.8 shows almost half of the education coefficients are significant. It is much higher than the 5 percent level. Therefore, using a large number of dependent variables should not be an issue in the estimates.

2.5.6 Discussion of the IV Results

To the best of our knowledge, there is no study exploring the causal impact of maternal schooling on immunisation status of their children. Furthermore, there are a limited number of papers examining the causal impact of education on channels affecting vaccination rates. Despite the fact that previous studies considered different measures of child health outcomes and channels affecting those outcomes than this study, the present findings seem to be consistent with other studies which found that IV coefficients are in general much larger than the OLS estimates.[66] Various reasons could be responsible for this.

[66] The IV coefficient showing the impact of maternal schooling on other preventive health care measures and child health, in general, are larger than the OLS results in other studies too (e.g. Currie & Moretti, 2003; Dinçer et al., 2014; Güneş, 2015).

Firstly, it is key to remember some of the assumptions the IV estimates require. To estimate the average treatment effect (ATE), IV makes three key assumptions, which are; (1) homogeneous treatment effect, (2) instrumental relevance expressed as a monotonicity restriction – for example, policy forces people to participate, and (3) means independence. However, a potential unrealistic assumption of IV is the homogeneity of treatment effects. To address this issue, Imbens and Angrist (1994) propose the Local Average Treatment Effect (LATE). More specifically, the different key assumptions in LATE are that it has no selection on the instrument, and instrumental relevance is expressed as a monotonicity restriction. By doing so, they suggest that LATE measures the effect for individuals forced to change their treatment status as a result of the instrument (the Compulsory Education Law (CEL) in this case).

As stated above, because of the CEL, individuals who were inclined to quit school after fifth grade had to continue their education. Therefore, the large effect observed here may stem from the impact of the reform on those individuals, which makes the OLS estimates much smaller than the IV estimates.

Secondly, the omitted variable bias and miscalculation of errors in OLS might cause the smaller OLS coefficients than IV estimates. For instance, a regressor that is negatively correlated with mother's schooling and positively associated with the outcome of the interest, may be a source of downward bias in the OLS estimation compared to the IV results. Background variables such as family environments or network impact serve as good examples of this.[67]

[67] For example, due to a network effect, women may learn of the benefits of vaccination and be more inclined to vaccinate their children. However, the same women may also choose less formal education because of the negative influence of their network on schooling. This can also work vice-versa.

So far above discussion has focused on the potential causes of having larger IV coefficients than OLS estimates. However, it can be seen that this chapter`s IV coefficients of the attitude of women towards spouse violence against women (Dinçer et al., 2014; Mocan & Cannonier, 2012), age at first birth (Güneş, 2015) and marriage (Breierova & Duflo, 2004) are also larger than the coefficients of the other studies in the literature.[68]

There might be several reasons. To begin with, even though the empirical strategy of the other studies is similar to that of this study, the intensity of the education reform that measures differs. Secondly, some potential mechanisms used in this study differ since, in contrast to above-mentioned studies, this chapter constructed indexes as a measure of the attitude of women towards spouse violence against women. As discussed in the data section, the choice of the indexes was not arbitrary. The indexes designed in a way to show the effects of education on the intensity of the acceptance of violence and gender inequality. Therefore, the findings indicate that education decreases the intensity of women`s tolerance to gender inequality and violence against women.

Thirdly, in the context of Turkey, Dinçer et al. (2014) and Güneş (2015) similarly used the Turkish Demographic and Health Survey (TDHS). However, they used a different sub-module of the TDHS data set: maternal health care utilisation which was collected for mothers who gave birth in the five years before the interview data. In contrast, the vaccination status of children is reported for mothers who gave birth in the last three years, which determines the sample used in this study. Moreover, Güneş (2015) only

[68] As mentioned before, Dinçer et al. (2014); Güneş (2015) are able to measure the impact of primary school completion on the outcome of interest whereas Mocan and Cannonier (2012); Breierova and Duflo (2004) can account for the effect of years of education. However, this chapter may account for the effect of both primary school completion and years of education on considered dependent variables.

employs the 2008 TDHS round and, therefore, performs estimations with the Difference in Difference methodology (e.g. Breviero & Duflo, 2004; Osili & Long, 2008; Mocan & Cannonier, 2012). On the other hand, like Dinçer et al. (2014), this study exploits the repeated cross section of the 2003 and 2008 TDHS to use Difference in Difference in Differences (DDD) estimation. However, as mentioned earlier, Dinçer et al. (2014) defines the control and treatment groups differently. It is possible that these factors drive the differences in findings of this study. To sum up, the above discussion gives reasons for the differences between OLS and IV coefficients of this study. It also provides an explanation for having different IV coefficients than other studies.

2.6 Conclusion

The literature exploring the effects of maternal education on the vaccination status of children and channels affecting these outcomes generally finds a positive correlation. As a response to these findings, policymakers tend to focus on increasing female education in order to improve the overall vaccination coverage of babies and children. By doing so, it is anticipated that an enhancement in the overall health of individuals will be accomplished.

However, so far, these studies have failed to address the endogeneity of education. To the best of my knowledge, this chapter is the first study providing evidence as to whether the observed correlation in the previous studies between maternal education and childhood immunisation rates implies causation. To do this, this chapter has used a natural experiment from Turkey. Specifically, the natural experiment used within this study is the Compulsory Education Law (CEL) passed in 1997 in Turkey. This legislative change generated an exogenous increase in the compulsory years of schooling from 5 to 8 years

for the individuals born after 1986. This, in turn, has led to an increase in spending on the construction of new classrooms and employment of new teachers. Importantly, the additional spending on teaching infrastructure varied substantially across the regions of Turkey.

This chapter uses the education law amendment act of 1997 and the regional differentiation in the intensity of its application as an instrument to estimate the schooling of young women aged 18-21. The estimated schooling variables (i.e. years of education and completing at least 8 years of education) are then used to find the causal relationship between maternal education and the intake of the third dose (last dose) of the Hepatitis B and DPT course of vaccination as well as potential channels affecting these outcomes. By applying the instrumental variable technique, this chapter finds that an exogenous rise in maternal education improves the coverage of the last dose of Hepatitis B and DPT immunisation, even after controlling for the gender and birth order of the child. I also found that education increases the age of first marriage and birth and alters women`s and their spouse`s labour market status. It also affects women`s attitude towards spousal violence against women and gender discrimination in a manner that empowers women.

It is worth remembering that the estimation technique of this study cannot test the impact of channels affected by education and childhood immunisation rates. However, it is still possible to draw some conclusions from above-mentioned results regarding channels. Therefore, on the basis of the evidence currently available, it seems reasonable to suggest that the improvements in the vaccination rates of children may be attributable to the changes in women`s behaviour towards violence against women, gender discrimination, marriage and fertility ages, and the change in labour market status of couples that empower women.

However, one should be cautious when interpreting the above findings as Turkish Demographic Health Survey (TDHS) are repeated cross sections and collected every 5 years. Therefore, unobserved heterogeneity or fixed effects at the individual level cannot be captured. Given the limited control, the results of this study should be interpreted with caution considering this limitation.

Chapter 3. The Effect of Education on Mental Health: Evidence from Turkey.

3.1 Introduction

Education and health are two important components of human capital. Furthermore, these two outcomes tend to be closely correlated with each other, and the positive correlation between education and health remains significant even after controlling for various socioeconomic and background characteristics (e.g. Cutler & Lleras-Muney, 2006; Grossman, 2004; Grossman, 2006). This suggests that education, while being beneficial in its own right, also enhances individual health outcomes.

However, many previous studies overlook the endogeneity of education and the estimates without addressing the endogeneity issue are expected to be biased. The instrumental variable method can be used to overcome the endogeneity of schooling when estimating the health effects of education (e.g. Arendt, 2005; Albouy & Lequien, 2009; Breakman, 2011; Mazumder, 2008; Lleras-Muney, 2005; Kemptner et al., 2011; Oreopoulos, 2006; Silles, 2009, Xie & Mo, 2014, etc.). On the other hand, a stream of literature has emerged that offers extremely contradictory findings regarding the causal impact of education on health.[69] Even though the identification strategy was similar, i.e. based on using changes in compulsory years of schooling, the findings differ across countries, periods of time and gender (Gathman et al., 2015). As a result, there is little agreement on this causal relationship.

[69] See section 3.2 for the detailed discussion.

In this chapter, I explore the causal impact of education on health, in particular mental health in the context of a large less-developed emerging economy, Turkey. The survey data exploited in this study provide women's responses to questions about their overall health status, the severity of self-reported pain and mental health problems. While there are numerous previous studies on the effect of education on overall health as discussed in the following section, this chapter is one of very few attempts to shed light on the relationship between education and mental health.[70] Exploring the causal impact of education on mental health has vital policy implications, not only in order to decrease social costs of mental disorders but also because improvements in mental health can constitute another return to schooling.

A systematic review and meta-analysis of 174 surveys from 63 countries used to obtain period (155 surveys) and lifetime prevalence (85 surveys) estimates of common mental disorders, such as anxiety, mood and depressive disorders, finds that 1 in 5 survey participants met the criteria for common mental health problems 12 months prior to the survey date, and around 1 in 4 people are identified as experiencing common mental health issues at some point during their lifetime (Steel et al., 2014). Currently, people who suffer from common mental disorders account for 13% of the worldwide disease burden including premature death and years lived with disability, and disability component of mental disorders account for around 25 to 33 percent of years lived with disability in the low and middle-income countries. As can be seen, mental health disorders are quite common and constitute a large share of the global disease burden.

[70] Chevalier and Feinstein (2006) for the UK is the only working paper on this issue, however, their estimation strategy is different from the technique used in this study.

Moreover, even though both genders suffer from mental health problems, the prevalence of depression and mood or anxiety disorders is vastly higher among women than men (Steel et al., 2014). For instance, 50% more women experience depression than men, and these figures are consistent for women irrespective whether they live in middle or higher income countries (Mathers, Fat, & Boerma, 2008). Consequences of depression among females may even go beyond the adverse impact on them. Studies in developing countries showed that one of the reasons for poor development and growth outcomes among adolescents could be maternal depression (Rahman, Patel, Maselko, & Kirkwood, 2008). Taking into consideration the above-mentioned discussion, this project provides an important opportunity to advance our understanding of the causal impact of education on women`s overall health status, the severity of self-reported pain and various mental health conditions.

Turkey is an important case study due to several reasons. Firstly, it is one of the largest upper middle-income country. Secondly, following more than a decade of sustained economic growth, the average income per person in Turkey has tripled, from $3,470 in 2002 to $10,800 in 2013 (in current dollars).[71] At the same time, according to the World Bank`s country overview, during the same period, the percentage of people living in extreme poverty in Turkey significantly dropped, from 13 to 4.5 percent, while moderate poverty has seen a similar decrease from 41 to 21 percent.[72] This suggests that important benefits accrued also to the less affluent segment of the society, in terms of access to healthcare services, education, and urban life.[73]

[71] See http://data.worldbank.org/country/turkey?display=default.
[72] See http://www.worldbank.org/en/country/turkey/overview.
[73] The World Bank has called on other developing countries to take Turkey as a role model, producing a report to explain the achievements of the country to other emerging markets (World Bank, 2014).

In addition to the improvements in economic performance, there have been radical educational policy interventions aimed to improve the quality of and access to education in Turkey since the mid-1990s. These reforms create a unique opportunity to examine the causal link between education and health. In particular, the change in the Compulsory Education Law in 1997, extending mandatory education from 5 to 8 years for individuals born after 1986, stands out among these policy interventions because of its enormous impact on access to education for both genders. The reform generated an exogenous increase in compulsory years of schooling by three years. This is greater than increases due to similar reforms in other countries: one (in the UK[74], US, Germany[75] and France) or two (Denmark from 7 to 9 years in 1975[76]). It generated a rapid increase in the gross enrolment of students in grade 1 to 8. Figure 3.1 shows that after a slow but steady decline in the enrolment rates during the six years prior to the education reform, the enrolment rates increased from 80 percent in the 1996-97 academic year to 86 percent in 1998-99. Additionally, in 1997-1998, the enrolment rates for girls in the sixth grades in provinces with the highest gender inequalities, which are generally more conservative places, was 162 percent greater than in the 1996 base year (Dulger, 2004).

This research follows the strategy of the previous literature (see 3.2 Literature section for the discussion) and exploits this exogenous variation in the compulsory schooling of women in order to address possible biases that can arise when using OLS. Since the compulsory education was raised from 5 to 8 years for those born after 1986, it had no

[74] Previously, minimum leaving the age of formal education in England was 14. However, it became 15 in 1947 and then 16 in 1972 by two subsequent changes in the mandatory education law.

[75] The main objective of the change in compulsory years of schooling in Germany was to extend the mandatory education 8 to 9 years. Hamburg was the first state to implement this change in 1949, while the last one was Bavaria in 1969.

[76] However, in the context of Denmark, most students were already inclined to stay until finishing grade 9 (Arendt, 2005).

effect on those born in or before this year. I can, therefore, use this increase in compulsory education by three years for the purpose of causal identification.

To identify health effects of education, I have used data from the 2008 and 2014 waves of the Turkey`s National Survey on Domestic Violence against Women (NSDVW). With OLS, I find that education significantly improves self-reported health, lowers the probability of reporting severe or extreme pain and reduces the incidence of some of the mental health measures. However, when compulsory education reform (CER henceforth) is used as an instrument for the schooling of women, most of these effects disappear; education increases even the likelihood of reporting some of the mental health issues in the survey. All in all, the study suggests little evidence of a causal link between women`s education and health with the exception of experiencing pain and some of the mental health measures. These findings seem quite robust to alterations in the regression definitions and to the inclusion of additional individual-level control variables such as having one`s own income, employment status, marital status, occupation, domestic abuse history in the family, and rural/urban status.

I also find a heterogeneous effect of education reform based on urban/rural status and the respondents' maternal abuse status. Moreover, heterogeneous effects tests indicate that the effect of education depends on whether the woman has her own income or not and the respondents labor market status.

One possible explanation for this lack of evidence could be the fact that the educational reform took place recently and those affected by it are still young and relatively healthy (see Xie & Mo, 2014). In contrast, the fact that educated women are more likely to report mental health issues can be attributed to the fact that their higher education helps them

better understand such issues and recognise their symptoms. This can have important benefits, as recognition of mental health problems is a precondition to their effective treatment.

Overall, there are several important areas where this study makes an original contribution to the existing literature examining causal health effects of education. The rich data sources exploited in this study provide responses of survey participants (i.e. women) to questions associated with their overall health status, the severity of self-reported pain and mental health problems. Firstly, the benefit of having general health status in the survey will enable comparison of findings with existing literature. Secondly, I focus on the effects of education on mental health status of women. Since previous studies have examined the various form of health outcomes including general health status, ignored mental health. To the best of my knowledge, there is no published study on the causal impact of schooling on mental health disorders.

Additionally, it adds to the literature investigating causality between education and health by exploiting a different institutional environment, i.e. Turkey than used in the previous studies. Most of the attention has been paid to the US, the UK or other European countries (Arendt, 2005; Albouy & Lequien, 2009; Breakman, 2011; Clark & Roayer, 2013; Mazumder, 2008; Gathmann et al., 2015; Lleras-Muney, 2005; Kemptner et al., 2011; Oreopoulos, 2006; Silles, 2009, etc.). To the best my knowledge, the sole study outside of the Europe and the US was for China (Xie & Mo, 2014). Although the topic is investigated in various institutional context and from various perspectives, the related studies in Turkey are still rare: the sole unpublished study on Turkey is Cesur, Dursun and Mocan (2014).

While Cesur et al. (2014) and the present study use the CER in Turkey as a natural experiment, owing to the usage of a unique data set from the 2008 and 2014 waves of the National Survey on Domestic Violence against Women, the empirical strategy, dependent and independent variables, the clustering of the standard errors are dissimilar. For example, in addition to the self-reported health status as an outcome measure, which was common in both studies, the current study employs 20 different outcome measures related to the mental health of women as well as a measure of the degree of severe or extreme pain in the last four weeks. Moreover, the previous study only uses completion of 8-years of education as a measure of education, however, I present the results for years of education and completing 8-years education. Lastly, different from Cesur et al. (2014), I can control for childhood region fixed effect, which is the region in which the individuals lived mostly during their childhood, whether respondents` mother experienced domestic violence, whether the respondent was abused sexually before reaching the age of 15.

The next section reviews the previous literature on the relationship between education and health. This is followed by a brief background to the 1996-1997 Education Reform. Section 3.4 and 3.5 describes the data and the empirical strategy used for this study respectively. Section 3.6 presents and discusses the findings of the research. Finally, in section 3.7, I give a short summary and assessment of the results obtained.

3.2 Review of Literature

3.2.1 How does education affect health?

The evidence presented by the previous literature suggests that the causal health effects of education are inconclusive. Moreover, the literature focuses on quantity of schooling. There has been few quantitative analysis of quality of schooling. One of the few examples

is by Ross and Mirowsky (1999). They investigate quantity, selectivity and credential aspects of individual's education. They find that there is a link between college selectivity and health outcomes, however, the correlation between quantity of education and health is stronger.

Another limitation of the empirical literature is that these studies do not give a full explanation of why education affects health. However, there are several theoretical explanations for the causal correlation from education to health. Firstly, the link between education and health might be driven by (household) income. Behrman and Rosenzweig (2002) find that a woman's formal education is positively correlated with her chances of earning higher income, more likely to be married, and to marry a more educated husband, and a husband with a higher income level. Higher income through education, therefore, increases accessibility of health inputs, such as health care services. Secondly, longer years of education might also affect the characteristics of the job. Higher education might also improve the chance of a safer work environment as well as income and health insurance (Cutler & Lleras-Muney, 2006).

Thirdly, unemployed individuals with higher education are more likely to develop the symptoms of mental health problems. It is likely that education increase their ambitions, which include higher reservation wages. For instance, in Chapter 2 of this study, it is found that women`s education decrease their participation in the labour force. Being educated and not working can make women more depressed. On the other hand, educated women, who are employed, obtain benefits of education and are more likely to fulfil their ambitions, which make them less depressed. However, theories related to income, health insurance, working status, occupation characteristics and dummies for the industry does not seem to be a possible explanation for the whole effects of education. Previous studies

check against these variables (e.g. Cutler & Lleras-Muney, 2006; Lahelma, Martikainen, Laaksonen, & Aittomäki, 2004) and find that adding these explanatory variables have a very little influence on the magnitude of the education coefficients for most of the health outcome measures they considered.[77] Also, the size of education effect even rises in some cases.

Fourthly, above-mentioned changes in income, occupation, labour market status, medical insurance, the industry they work, and other income-related factors might not affect health but it may alter the incentives for health investment (Cutler & Lleras-Muney, 2006). This theory is supported by Murphy and Topel (2006) who writes a theoretical model for the value of health and life expectation, contingent upon person`s incentives to pay. They find that individual's willingness to spend on health increases when there is an increase in income. Cutler and Lleras-Muney (2006) suggest that this theory explains why more educated individuals are less inclined to have riskier habits because they give more value to the life at later ages. However, it is difficult to test this theory empirically since data on this issue is difficult to obtain.

Fifthly, another pathway for the correlation between education and health is easier access to information and improvements in cognitive skills (i.e. critical thinking), however, the direction of the effect might be also from higher critical thinking skills to more education (Cutler & Lleras-Muney, 2006). For example, de Walque (2010) finds that the information regarding negative effects of smoking on health started to diffuse in the 1960s

[77] I also do some robustness checks and heterogeneous effect tests to see potential effects of some of these mechanisms, such as income and labour market status (see 3.6.4 Robustness Checks and 3.6.5 Heterogeneous Effects sections).

in the US and, therefore, the widespread presence of smoking decreased in the US but there was a more dramatic decline amongst the more educated.

The findings of empirical research show that the information differentiation across education groups in the explanation of the inequalities in health outcomes carries little importance (Kenkel, 1991; Meara, 2001). Meara (2001) finds that information, together with its usage can explain almost a third of the differences in smoking by educational attainments. It could be argued that education enhances health not because of the particular information, but improvements in critical thinking and decision-making abilities are the reasons behind these enhancements in health outcomes (Cutler & Lleras-Muney, 2006). Similarly, in his theoretical article, Grossman (1972) finds that improvements in cognitive skills are the main causes behind the education-health relationship. According to him, there are two main theoretical explanations for the pathways linking education to cognitive skills, and then health. To begin with, in addition to lower productivity of less educated people in the labor market, they are also inefficient users of health care services compared to the more educated people. This means that with given fixed amount of health inputs, education increases the probability of producing better health outcomes. This is often called the *productive efficiency* of education. In addition, education alters the usage of inputs in the production of health: more educated people are less inclined to espouse risky and unhealthy habits such as smoking and drinking since they are more concerned about their harmful effects than those with less education. In other words, education helps one obtain information regarding what is healthy, and/or makes the usage of medical knowledge better. This situation has been referred to as the *allocative efficiency of education*. Empirical studies show that education can indeed help one obtain information regarding what is healthy, and/or makes the

utilization of health-related information easier (e.g. Glied & Lleras-Muney, 2008; Kenkel, 1991; Nayga, 2000; De Walque, 2007; Lochner, 2011).

Patients with superior reading skills are more likely to understand instructions related to usage of the emergency room (Spandorfer, Karras, Hughes, & Caputo, 1995). Also, they are more likely to realize their asthma condition and use their inhalers appropriately (Williams, Baker, Honig, Lee, & Nowlan, 1998). Likewise, educated individuals are more aware of mental health problems, which increase their recognition. Therefore, they are more likely to report mental health issues in the survey. This indicates that discrepancies in health outcomes might partly come from effects of education on cognitive skills. However, testing how education works through this channel is empirically difficult, and, therefore, the present literature offers no causal estimates to attribute the effects of education on this mechanism.

Sixthly, the change in preference through education can be another explanation of health disparities among different education groups. Becker and Mulligan (1997) propose that the less educated have higher discount rates. Education can increase future revenue, and encourage individuals to lower their discount rates, however, data on discount rates by schooling is difficult to collect (Cutler & Lleras-Muney, 2006). Therefore, no causal evidence exists that higher schooling drops the discount rates. In addition, the educated are less likely to take a risk (Cutler & Lleras-Muney, 2006). Having said that, empirical evidence suggests that people with very high education and low education are more inclined to take a risk, but people with a modest level of educational attainment are the most reluctant to take a risk (Barsky, Kimball, Juster, & Shapiro, 1995). There is some evidence to suggest that variation in preferences and discount rates through education is

not the main cause of the education-health relationship (Fuchs, 1982; Leigh, 1990), but these measures are difficult to be quantified by education level.

Seventhly, schooling might alter social status or rank of someone in the society, and the relative position itself might affect health (Cutler & Lleras-Muney, 2006). According to Cutler and Lleras-Muney (2006), the correlation between rank and health occurs as people located at the higher rank of the society have higher control over their life, and are less likely to experience constant demands by others, which reduce stress and, therefore, stress-related illnesses. Empirical findings indicate that individuals with low education are more likely to report negative emotions, such as symptoms related to depression, anxiety, and hostility, and these are correlated with worse health outcomes at advanced ages (Adler et al., 1994; Gallo & Matthews, 2003). Also, less educated people are more emotionally responsive when experiencing adverse incidents in their life (McLeod & Kessler, 1990). They are more likely to have a lower sense of control and lower self-esteem, which are correlated with worse health outcomes (Ross and Mirowsky, 1999). However, these studies do not offer causal evidence regarding the direction of the effect. It is likely that education affects the relative position in the society, which then affects self-esteem or self-esteem affects relative position and schooling (Cutler & Lleras-Muney, 2006).

Eighthly, social network theory can be an alternative explanation for the education-health relationship (Cutler & Lleras-Muney, 2006). The educated might have more friends and are more likely to be married, which brings them emotional, physical and monetary support which in turn might improve their health outcomes (Berkman, 1995). It could be expected that these supports from family members and friends turn someone into a less depressive person, who are less likely to report symptoms related to depression and other

mental health problems. For instance, Berkman and Syme (1979) show that less educated people are less likely to have a larger social network, and lack of social contact increases mortality rates controlling self-assessed health, death year, socioeconomic status, health behaviours including smoking, alcohol, the frequency of exercise, the usage of preventive medical services.

In summary, the above discussion shows that there are several channels causing the differences between health outcomes for educated and uneducated people. However, there is limited evidence regarding the effect size of these mechanisms on health. Income, health insurance, employment status and other income related channels do not seem to account for a significant part of the differentiation in health.[78] Moreover, the change in preference and risk-taking behaviours through education does not give a full explanation to the education-health correlation. However, the change in utilization of information through the change in cognition because of higher education is more likely to explain a large share of the education effect on health.

3.2.2 Empirical Background

So far, a considerable amount of literature has been published on health effects of education. To date, significant evidence has been found associating education with health positively. A number of review studies report this positive correlation and the positive correlation from education to health remained significant even after accounting for various socioeconomic and background variables (see for instance Cutler & Lleras-Muney, 2006; Grossman, 2004; Grossman, 2006). For instance, education has a negative

[78] It is not possible to test all these mechanisms because of data limitation. However, the effect of income, labour market status, marital status, occupation and rural/urban status will be discussed in sections 3.6.4 and 3.6.5.

impact on smoking and obesity rates, which are two significant causes of premature mortality (Mokdad, Marks, Stroup, & Gerberding, 2004). Also, exercise, drinking, diet habits and the usage of preventive health care increase with more education (Cutler & LIeras-Muney, 2010). Similarly, the less educated are less likely to live longer, more likely to report functioning problems, such as poor/fair self-reported health status, depression and other functional limitation symptoms (Cutler & Lleras-Muney, 2006). Moreover, Juhakoski, Tenhonen, Anttonen, Kauppinen, and Arokoski, (2008) find that higher education drops the likelihood of reporting severe/extreme self-reported pain, which is also a measure of functioning problems.

However, the existence of the positive correlation between education and health does not have to be causal. To begin with, more schooling could directly increase earnings (e.g. Devereux & Hart, 2010; Meghir & Palme, 2005; Oreopoulos, 2006), which in turn improves access to health inputs such as medical care. Secondly, omitted variables (e.g. genes, inherited ability and individuals' time preferences) may be the reason for the observed education-health relationship (Fuchs, 1982; Grossman, 2006). Also, there might be a reverse causality problem between education and health: the direction of the effects could be from better health to education or the opposite. A recent research by Cornaglia et al., (2015) supports this hypothesis and finds that, for instance, poor mental health lowers the likelihood of attending school. Due to previously stated factors, the generalizability of much of the published research on this issue is limited. Since the Ordinary Least Square (OLS) estimation technique will result in biases, an estimation technique that corrects for the above issues is required.

For this reason, recent academic attention has focused on the provision of causal evidence on the relationship between education and health. In order to address the endogeneity of

education and other aforementioned measurement errors related to OLS estimates, the researchers have exploited educational policy interventions that exogenously altered completed schooling years of some individuals but not of others, so as to obtain causal estimates with respect to the impact of education on the outcome of the interests.

These types of studies began with Angrist and Krueger's (1991) proposition to use compulsory starting age of schooling, changing according to the quarter of birth and state of birth (in the US). Individuals born at the beginning of academic year reach the age at which they are allowed to leave education earlier than those born in subsequent quarters. Because of this, the quarter of birth can be used as an instrument for education to estimate the causal impact of education on earning. By exploiting similar strategy, Adams (2002) found evidence of health effects of education for self-reported health measures. However, the following factors emphasize the weakness of quarter of birth as an instrument: (i) there is correlation among season of births and proxies for developments in early (pre-school) childhood, and (ii) the correlation between quarter of birth and educational attainment is generally weak (Bound et al., 1995; Staiger & Stock, 1997).

The weak results with the season of birth as an instrument for schooling led some researchers to employ compulsory education reforms as an instrument, which altered compulsory years of schooling. The assumption is that the reform is a naturally occurring incident generating some sort of natural assignment of individuals into treatment and control groups by the changes in the program exposure which vary by year of birth. In particular, the reform forces some individuals, who would quit education in the absence of the reform, to complete longer years of formal education.

Because of its convenience, use of compulsory education reforms has become a popular tool amongst education and labor economists to estimate the monetary and non-monetary returns to education. One of its advantages is that it generates natural experiments which enable researchers to use post-policy evaluations methods. These include Regression Discontinuity Design (RDD), Instrumental Variable (IV) and Difference-in-Difference (DID) estimation techniques. These methods yield robust estimates of the causal effects of education on the market and non-market outcomes. To date, several studies found a positive causal correlation between education and earning (Devereux & Hart, 2010; Meghir & Palme, 2005; Oreopoulos, 2006).

However, a stream of the literature has emerged that offers extremely contradictory findings regarding the causal impact of education on health. As a result, there is little agreement on this causal relationship. For example, some studies have identified a significant causal effect of education on the certain type of health measures (Fletcher, 2015; Kemptner, Jurges, & Reinhold, 2011; Lleras-Muney, 2005; Oreopoulos, 2006; Silles, 2009). However, others have found no or negligible causality among education and various health measures they exploited (Albouy & Lequien, 2009; Breakman, 2011; Clark & Roayer, 2013; Gathmann, Jurges & Reinhold, 2015; Mazumder, 2008; Xie & Mo, 2014). Overall, this heterogeneity in the estimates indicates that there is a clear need to understand the previously noted correlation between education and health.

The first contribution in this context was Lleras-Muney (2005) who extended the usage of compulsory education reforms from labor market outcomes, such as earnings and employment status to health, to investigate the causal link between education and certain health measures (mortality rates). By employing the variation in exposure to the education reform with respect to year and states, the study found that education caused a reduction

in 10-year mortality rates in the US by around 6 percentage points. However, studies by van Kippersluis, O`Donnell, and van Doorslaer (2011) in the Netherlands and Fisher, Karlsson, and Nielsson (2013) in Sweden reached different conclusions, finding much smaller impacts. Additionally, a recent study by Gathmann et al. (2015) analyzed the data from 18 compulsory education reforms in 11 European countries and concluded that the extension in compulsory education in Europe caused a small decrease in mortality rates for males both in the short and long run while the magnitude of the effect was insignificant for females. Similarly, other studies (Albouy & Lequien, 2009; Clark & Roayer, 2013; Mazumder, 2008 for France, the United Kingdom, and the United States respectively) found no effect of education on survival rates. Hence, the findings demonstrate a high disagreement.

Furthermore, studies from a variety of different contexts produce mixed results about the association of education with various self-reported and objective health measures. Clark and Roayer (2013) use an increase in compulsory education in the UK to demonstrate that this reform has a positive effect on education and earnings. Their analysis, however, fails to identify any gains in terms of health that could be attributed to longer education: this includes an impact on long-term limiting illness, self-reported health and health-affecting behaviors such as smoking and drinking. Similarly, in the context of China, Xie and Mo (2014) finds no influence of additional years of schooling, stemming from the education reform on either subjective or objective health measures of both genders.

Mazumder's (2008) shows that education has had a significant impact on self-reported health status in the US. However, it did not have any impact on specific health measures considered, such as health problems related to hearing, speaking, vision, and back problems (with the exception of diabetes). According to Mazumder (2008), these results

cast doubt on the assertions of the previous theories regarding the impact of education on intermediary factors.[79] Conversely, Siles (2009) finds that the likelihood of reporting good physical health increases by up to 5 percentage points for each additional year of formal education induced by the extension in compulsory years of schooling in the UK. Similarly, Oreopoulos (2006), also within the UK context, concludes that education leads to an improvement in self-reported physical health. Fletcher (2015) re-examined this issue in the US context by exploiting extensive data on diet and health information of around 600 thousand participants. The research found a role of schooling in enhancements of numerous measurement of health, which include the outcomes related to weights, cardiovascular, and self-reported.

In the context of Germany, Kemptner et al. (2011) utilize the fact that the timing of the change in compulsory years of schooling reform varied across states. A strong, positive causal association was found between males` education and long-term health condition, whereas no effect has been identified for females. Additionally, in contrast to Fletcher`s research in the US context (Fletcher, 2015), the German study found much weaker support for the positive impact of education on the reduction in the probability of having a weight problem. Another evidence supporting health effects of education comes from a Danish study. It shows that not only the probability of self-reported better health increase with education, but also, excess weight decreases with education (Arendt, 2005).[80] However, Cesur et al., (2014) find an insignificant effect of education on self-

[79] See section 3.2.1 for possible intermediators affecting health through education.

[80] However, by the inclusion of the instrument, the standard errors of the estimates of self-reported health and weight problems became larger and therefore the study cannot reject exogeneity of the education and the null hypothesis stating no effect of education.

reported health status of males and females using a change in the compulsory education law in Turkey as an instrument for schooling.

It is fair to argue that if the observed correlation between education and health actually reflects causality, governments and international organizations would be well advised to develop evidence-based policies to improve education so as to ease the burden of increasing health expenditures (Xie & Mo, 2014). Considering this, further research is necessary in order to bring a credible explanation regarding the education-health gradient. This might have important policy implications and help the governments achieve the efficient distribution of limited government resources for the required investments.

Although in the aforementioned studies, even though the identification strategy was similar, i.e. based on using changes in compulsory years of schooling, the findings differ across countries, periods of time and gender (Gathman et al., 2015). In his re-examination of the effects of education on health in the US, Fletcher (2015) argues that the contradictory results might be attributable to the specific context studied. One of the relevant characteristics is the nature of its compulsory education reform. Specifically, the education reform might affect different education categories or levels in different countries; and hence the affected sub-sample from the reform would differ across countries. In other words, inconsistencies in the results of earlier studies might be due to the systematic differences in characteristics of the education reform implemented, rather than be coincidental (Gathman et al., 2015). This hypothesis was extended by Li and Powdthavee (2015). According to them, the reasons for the different results are the usage of different measures of health outcomes, data sets, estimation methods, and the difference in the nature of compulsory education reform. For example, in the context of China, Xie and Mo (2014) claimed that insignificant estimates in their study might be due

to the characteristics of the sub-sample studied: both the average educational attainment and age of their sample were below the country average, so that the impact of education on health has not been observed yet.

3.3 Institutional Background

Before August 1997, it was mandatory for Turkish pupils to attend 5 years of school. Public education has been provided free of charge in Turkey since the foundation of the republic in October 1923. The compulsory education reform (CER) increased compulsory education to 8 years. To facilitate this, the primary school (i.e. grade 1-5) and the lower secondary school (i.e. grade 6-8) were combined. However, the education reform has had almost no effect on the quality of education. In an in-depth analysis of CER by Dulger (2004) for the World Bank found that the 1968 national education curriculum has been kept with only minor alterations because of the time constraint in the implementation of the reform. Instead, the Ministry of National Education of Turkey (MONE) was mainly concerned with the issue of the capacity of the educational establishment to accommodate the additional students. In order to expand capacity, the budget of Ministry of Education of Turkey was increased by US$2 billion for the three-year period between 1997 and 2000 (Dulger, 2004). This increase was used to construct new schools, employ new teachers and renovate old schools. For instance, the government of Turkey expanded the capacity of schools by building 81,500 new classrooms for primary education from 1997 to 2002, which corresponds to around 30 percent capacity increase (World Bank, 2005).

As a result of the reform of the basic education law and following the increased investment in education, there was a dramatic expansion in access to primary education. In fact, gross enrolment rate of primary school education, i.e. grade 1-8, was decreasing

in the last six years before the amendment of the mandatory schooling law (Figure 3.1). This was followed by a sharp increase in the gross enrolment rate in the primary education after the compulsory education reform. World Bank`s (2005) report on the education sector in Turkey states that "few cases in the history of any national education system have produced such striking improvement so quickly. Turkey's leadership has earned the right to be proud of its accomplishment", (p. 6).

3.4 Data and Variables

3.4.1 Data

The data used in this chapter is collected from the National Survey on Domestic Violence against Women (NSDVW). This survey, which is nationally representative, was conducted in 2008 and 2014.[81] For the 2008 wave, a sample of 24,048 households were selected whereas 2014 survey was conducted with 15,072 households. The samples were chosen using weighted, multilevel, random clustering sampling technique from both rural and urban areas of Turkey.

Only one woman aged 15 to 59 from each household was interviewed. When there was more than one suitable woman among household members, one of them was randomly selected for the face-to-face surveys. For each individual, information on demographics, socio-economic characteristics, health status, marriage history, and parental abuse, attitude towards gender norms, domestic violence, and sexual violence during the childhood is collected. In terms of health, the NSDVW contains questions on multiple subjective general and mental health issues, such as self-reported health (SRH), the

[81] T.R. Prime Ministry Directorate General on the Status of Women. (2009). *Domestic Violence against Women in Turkey*. Ankara: T.R. Prime Ministry Directorate General on the Status of Women publications

presence of severe pain and various mental health disorder symptoms during the last month. Using both waves of the survey allows me to have a larger sample size to conduct the study and a balanced scale of control and treatment groups. To be able to concentrate on the health effects of education, I restrict the sample to those women who were born between 1982 and 1990, inclusive. This enables me to focus on young women aged from 18 to 32, and gives 3,748 observations.

3.4.2 Variables

I use three measures of educational attainment: (1) completed years of education, i.e. highest grade completed (HGC), (2) completion of junior high school (JHS), dummy equals one if a woman graduated from JHS and zero otherwise, and (3) completing senior high school (SHS), a dichotomous variable equals one if a woman finished SHS and zero otherwise.

There might be several other determinants that may influence the health of women. The NSDVW survey contains information on whether the woman`s mother was physically abused by her partner or husband, and whether the woman was abused during childhood (before the age of 15).[82] The dichotomous variables are equal to one if the incident happened, otherwise zero. These variables are important as it has been found that vulnerability of people to mental disorders increases in exposure to violence and abuse.[83]

[82] The information regarding childhood sexual abuse of women was gathered in two ways. Firstly, women were asked a direct question about sexual abuse before the age of 15. Secondly, at the end of the interview, women were asked to mark a crying or smiling face to show their sexual violence status. Women who marked the crying face were sexually abused during their childhood. All in all, women who report sexual abuse through either method were counted as sexually abused.

[83] See http://www.who.int/mental_health/WHA65.4_resolution.pdf.

Figure 3.1 Gross enrolment rate in 8-year primary school education

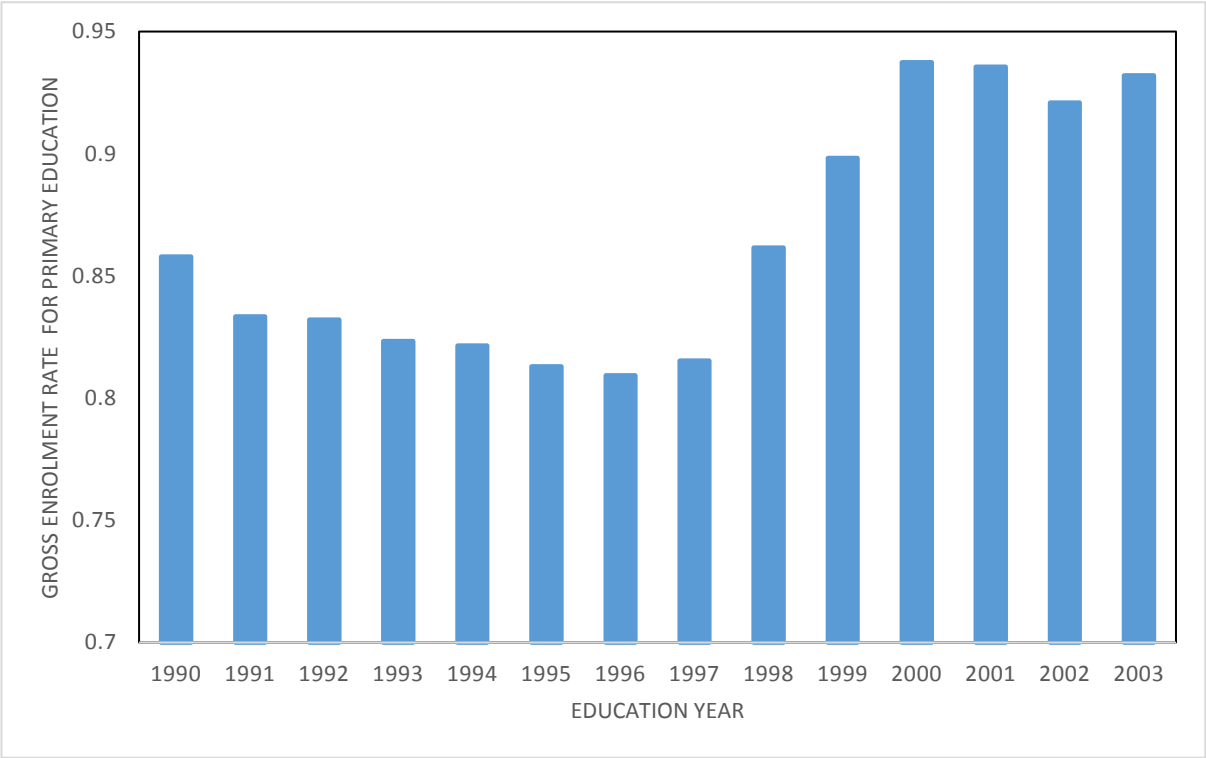


Figure 3.1 Gross enrolment rate in 8-year primary school education. Notes: Gross enrolment rate in 8-year primary school education by Academic Year calculated as the number of students in grade 1 to 8 is divided by the relevant population in that age group (i.e. aged 6-13); enrolment rates in the 1990/1991-1996/1997 education years are prior to the changes in the CER. For those years, the number of students is calculated as the sum of the students in the 5-year compulsory school and 3 years junior high school. Based on MONE statistical data, from 1990/91 to 2003/04. Each bar corresponds to the gross enrolment rate calculated for that education year.

Furthermore, I also account for community level dynamics, the region of residence and rural residence, in order to control for variation in the provision and quality of medical care services, as well as unobserved cultural and social features of the regions. The living standards in both urban and rural areas of Turkey have improved significantly during the 2000s and thereafter. Therefore, in order to account for the progress over time, the model also includes dummies for survey waves. I also control for the interaction of year of birth with region of residence so as to control for the time variant factors in the provision of medical service, health care investments, culture, and social structure of the region over time, as well as other time-variant factors of the region of residence across cohorts (e.g. Cesur et al., 2014). By doing so, the changes in individual`s subjective and objective health will be controlled for across regions and cohorts alike.

In addition, all models control for centralized age, year of birth, their squares, survey dummies and fixed effect for 26 regions in which the woman spent her childhood until the age of 12. Accounting for childhood region allows me to control for time-invariant factors related to schooling and distribution of schooling inputs across those regions when the women started the 6^{th} grade.

To construct the dependent variables, I use three groups of indicators: (1) self-assessed health status of women (SRH), (2) experience of severe or extreme pain (or discomfort) in the last four weeks, (3) a group of various dummy variables related to the mental health status of women. These variables take the value of 1 if the problem exists and zero otherwise.[84]

[84] See Appendix A for the definition of dependent variables and selected covariates.

Starting with SRH, this is the most frequently used measure of health in the previous literature. In the NSDVW, the respondents were asked: "How would you describe your health, in general?" The respondents select an answer from a 1-5 scale, where 1 equals to "excellent", 2 equals "good", 3 equals "fair", 4 equals "poor", and 5 equals "very poor". I converted this into a dummy variable so that 1 corresponds to "poor" or "very poor" SRH and zero otherwise.[85] Previous research has found that a poor self-rated health is a vital predictor of mortality, morbidity and functioning disabilities (Appels, Bosma, Grabauskas, Gostautas, & Sturmans, 1996; Case, Lubotsky, & Paxson, 2002; Idler & Kasl, 1995; McCallum, Shadbolt, & Wang, 1994). In addition, the World Health Organization (WHO) describes health as the state of well-being, rather than the nonappearance of any illnesses, therefore, considers SRH as a measures of good health (Ross & Mirowsky, 1999).

The survey also asks individuals about the pain they experienced in the last four weeks.[86] The degree of the pain is indicated on a 1-5 scale, where 1 is "no pain or discomfort", 2 is "slight pain or discomfort", 3 is "moderate pain or discomfort", 4 is "severe pain or discomfort" and 5 is "extreme pain or discomfort". This is again converted to a dummy variable with 1 corresponding to reporting "severe or extreme pain or discomfort" and zero otherwise.

Survey participants have also answered questions related to their mental health in the past 4 weeks before the interview as well as whether they have had suicidal thoughts at any point in their life. This allows us to examine the effects of education also on mental health.

[85] Transforming the 1-5 scales to a binary variable is a common practice in the previous literature (e.g. Arendt, 2005; Fletcher, 2015; Siles, 2009; Xie & Mo, 2014).

[86] Juhakoski et al., (2008) use self-reported pain as a measure of health problem related to functioning disorders. Likewise, they transform "reported pain" variable into a dummy variable as converted in this study.

The nature of the survey questions is such that they address known symptoms of depression.[87]

The outcomes are coded as one if the respondent had experienced that mental health problem in the last four weeks, otherwise zero. For example, the indicator variables, such as "frequent headache", "poor appetite", "sleeping", "being easily frightened by many things", "shaky hands", "poor digestion", "incapable of thinking clearly", "crying more frequently than usual", "difficulty in decision making", "loss of interest", "feeling useless", "feeling worthless", "stomach (abdomen) ache", "unhappiness", "nervousness", "reluctance in performing daily life", delaying daily activities", "feeling tired all the time" and "getting easily tired", equal to 1 if the woman reports experiencing that particular mental health problem in the past four weeks and zero otherwise. Finally, I also generated a dichotomous dependent to record whether the woman ever had a suicidal thought throughout their life, which equals one if she had it, otherwise zero.

3.4.3 Descriptive statistics

Table 3.1 presents summary statistics. The averages of independent variables show that the older cohort is less educated, though this difference is not necessarily due to the compulsory education reform (CER). Compared to those born in 1985 or older, individuals born in 1987 or later (those who were exposed to the CER) have on average around 1.15 more years of schooling. The likelihood of younger women completing junior or senior high school is also higher than for the older cohort.

The averages do not show strong evidence of the impact of CER on self-assessed health and having experienced severe pain in the last four weeks. Having said that, women in

[87] See http://www.who.int/mediacentre/factsheets/fs369/en/.

the younger cohort are less likely to report poor health, and fewer suffers from severe pain. Symptoms of mental health disorders of the younger and older women show a mixed pattern.[88] For most of the symptoms, the older and younger women differ little. The maximum difference between the cohorts is 6% points (for nervousness) whereas the minimum is 0 percent (for feeling useless).

Table 3.1 also reports summary statistics for selected independent variables. The averages of some of the pre-determined characteristics, such as the existence of sexual violence towards women during their childhood before the age of 15 and intimate partner violence to their mothers indicate no significant differentiation between young and old cohorts. Similarly, the proportions of people living in the rural area are the same for both cohorts. This shows that the independent variables that are largely pre-determined are similar between the two cohorts.

[88] For example, the older cohorts are more likely have the problems caused by mental illness, such as a headache, shaking hands, anxiety, digestion, clear-thinking, unhappiness, crying more than usual, not-enjoying-daily-activities, difficulty-in-daily-activities, difficulty-in-decision-making, losing-interest, feeling-of-continuous-tiredness, stomach problems and tired easily. However, they are less likely to experience disorders, including appetite, sleeping, frightening, feeling-of-worthless, and the-thoughts-of-ending-life. Lastly, the average of feeling-of-useless is equal for both cohorts.

Table 3.1 Descriptive Statistics

	1982-1990 cohort		1982-1985 cohort		1987-1990 cohort	
Description of the Variables	**Obs**	**Mean**	**Obs**	**Mean**	**Obs**	**Mean**
Dependent Variables						
SRH	3747	0.39	2152	0.43	1595	0.35
Severe/extreme pain	3745	0.21	2153	0.24	1592	0.17
Frequent headache	3745	0.51	2151	0.51	1594	0.50
Poor appetite	3746	0.33	2151	0.32	1595	0.35
Poor sleep	3746	0.45	2151	0.45	1595	0.46
Easily frightened	3743	0.30	2150	0.29	1593	0.31
Shaky hands	3746	0.25	2151	0.26	1595	0.23
Anxiety	3745	0.69	2150	0.71	1595	0.65
Poor digestion	3746	0.27	2151	0.28	1595	0.26
Incapable of thinking clearly	3742	0.46	2148	0.46	1594	0.45
Unhappy	3747	0.52	2152	0.54	1595	0.50
Crying more than usual	3746	0.27	2152	0.28	1594	0.27
Reluctance in performing daily life	3745	0.55	2151	0.57	1594	0.52
Difficulty in decision making	3744	0.41	2151	0.42	1593	0.41
Delaying daily activities	3746	0.54	2152	0.56	1594	0.52
Feeling useless	3743	0.26	2151	0.26	1592	0.26
Loss of interest	3744	0.36	2152	0.37	1592	0.36

Feeling worthless	3742	0.30	2149	0.29	1593	0.31
Feeling tired all the time	3742	0.63	2147	0.65	1595	0.60
Stomach (abdomen) ache	3743	0.38	2148	0.38	1595	0.37
Getting tired easily	3741	0.58	2148	0.60	1593	0.56
Ever thinking ending life	3744	0.19	2150	0.18	1594	0.21
Independent Variables						
Highest Grade Completed (HGC)	3748	7.99	2153	7.49	1595	8.64
Completing 8 years of schooling (JHS)	3748	0.56	2153	0.44	1595	0.72
Completing Senior High School (SHS)	3748	0.38	2153	0.32	1595	0.44
Mother experienced violence	3540	0.30	2056	0.30	1484	0.29
Abuse during the childhood	3607	0.12	2061	0.11	1546	0.13
Rural	3748	0.19	2153	0.19	1595	0.19

3.5 Empirical Strategy

The basic model for identifying health effects of education is given by Equation 1 below.

$$(1) \qquad H_i = \vartheta + \theta X_i + \beta S_i + \varepsilon_i$$

where H_i is the health outcome variable (i.e. poor SRH, severe or extreme pain or experiencing mental health disorders); S_i is the schooling of individual i measured by three different education variables as indicated earlier (i.e. highest grade completed, or completing JHS or SHS); X_i is a vector of covariates (k x 1) that might have an impact on the outcome of interest; and ε_i is a random error term, which contains unobserved factors not captured in either S_i or X_i that might affect the outcome. The primary interest of this study is the parameter β, the impact of education on health measures.

X_i includes linear and quadratic terms of centralised age and year of birth variables, the region of childhood fixed effect for the 26 regions, and fixed effect for 12 regions of current residence. Following the idea in Stephens and Yang (2014), I also include the interaction of linear term of the centralised year of birth and region of residence fixed effects. This is to control for the variation in the trends in health by regions across cohorts (e.g. Cesur et al., 2014). In addition to other controls, X_i contains dummies for survey wave, physical abuse of respondents` mothers by their intimate partners as well as the respondents` experience of sexual violence prior to the age of 15.

Robust standard errors are clustered at the region of residence-by-survey wave level (i.e. 24 clusters). The problem with this might be that if the number of clusters is less than around 42-50, some of the researchers suggest that the null hypothesis is more likely to be rejected when it is true (Angrist & Pischke, 2009; Bertrand, Duflo, & Mullainathan, 2004). On the contrary, Cameron et al., (2008) find that the null hypothesis is less likely

to be rejected with 20 clusters than 50 when it is true. Furthermore, they argue that even with as few as six clusters, the frequency of rejection based on the theory is in line with empirical findings. Hence, it can be said that the number of clusters in this study is sufficient to obtain reliable clustered robust standard errors.

It is worth remembering that every health outcome considered in this study is measured by means of a dichotomous variable. At a first glance, the usage of the Probit or Logit models instead of linear probability model would seem appropriate. However, due to the fact that almost all covariates are dichotomous variables, it is prevalent in the literature to use a linear probability model as it will cause any bias in the reliability of the estimates. Nevertheless, estimating Equation (1) with OLS can produce biased results. One reason is the possibility of reverse causality, whereby health status might also affect education. Alternatively, it is possible that omitted variables such as time preference, genetic inheritance and family background might have an influence on both educational attainment and health (Groot & van den Brink, 2004; Grossman, 1999).

I exploit the three-year exogenous increase in the schooling of women induced by the compulsory education reform (CER) in Turkey in 1997 as an instrument to address the problems that affect OLS. The identification assumption relies on the fact that the education reform is a naturally occurring event assigning individuals into treatment and control groups according to their dates of birth. Importantly, it has no relationship with the outcomes other than via its impact on schooling.

I am confident that CER satisfy these conditions. The amendment in the education law went into effect in September 1997, which was immediately after the approval of the law. The students enrolled to fifth grade in September 1997 were forced to stay in school until

completing 8 grade whereas students who completed fifth grade before September 1997 were not subject to the reform. The law was implemented rapidly due to the political reasons. Firstly, it has been seen that an increase in the level of education might speed up the process of being a full member of European Union by shortening the negotiations between Turkey and Europe. Secondly, another aim of the law was to prevent individuals from having religious education in junior high school. After the meeting of the National Security Council on 28 February 1997, the military forced the incumbent Turkish government to resign because of its religious inclinations, which the military saw as a threat to the secular character of modern Turkey.

At the same time, the National Security Council recommended an increase in compulsory education from 5 to 8 years. This change facilitated restricting religious education in Turkey: religious lower secondary schools (grades 6-8) were closed as this level became part of the compulsory education covered by the national curriculum. Additionally, the reform restricted university choice: students who graduated from religious schools could only go to university departments related to religion.

However, at a macro level, the exogeneity of the instrument requires that the education reform has no effect on health through government health expenditure or other government programs. In other words, if the government decides to cut health investments or funding for other government programs that could affect health, then the exogeneity assumption is problematic. Figure 3.2 indicates that compared to 1996 budget for education investments, there has been a marked increase in the government investment in education in 1997.[89] However, the graph also shows that the budget allocated to

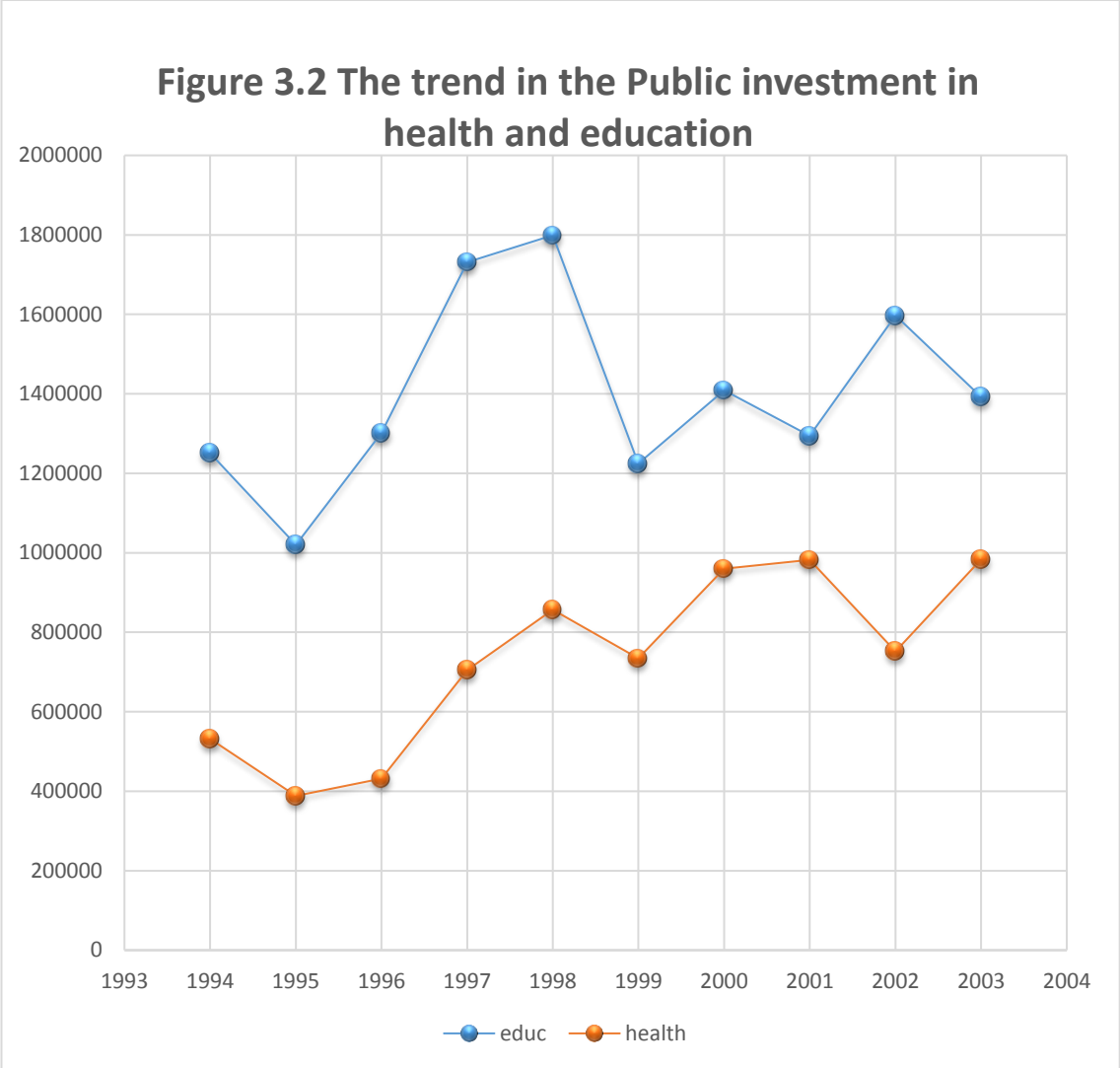
[89] Inflation adjustment has been done according to 1998 prices.

compulsory education reform was not taken from public health expenditures. This indicates that the financial requirements for the implementation of the education reform were financed by other sources. Detailed examination of compulsory education reform by Dulger (2004) shows that the government used 3 ways to fund necessary investment for the implementation of the reform. These are earmarked taxes, the loan from World Bank and contribution of the private sector to the implementation of the education reform by building free public schools. Thus, it can be claimed that the exogeneity assumption is likely to be satisfied and government did not cut its budget for health to finance educational investments.

At this point, it is necessary to define the instrument. The compulsory education law states that "A child who has completed 72 months by the end of the calendar year can be registered to the first degree of primary school".[90] This means that those who were born after 1986 were bound by the reform, whereas older children were not. However, the implementation of the age cut off was not strict.[91] Hence, children who were born in early 1986 might start school in September 1991 instead of September 1992, while some of those born in late 1986 might start primary school in September 1993. This means some of the pupils who were born in 1986 could have been subject to the education reform. This could contaminate the results, and therefore 1986 cohort was excluded from the estimation (including this cohort yielded results which were not materially different, nevertheless).

[90] Issue No. 21308, Official Newspaper of Turkish Republic, 7 August 1992.

[91] For instance, previous studies also found median age to start schooling in Turkey as 7 and considered cohorts who were born in 1986 as affected by the education reform (Kırdar, Dayıoğlu and Koç, 2009, 2011).



Source: Author's calculation from the Turkish Republic`s Ministry of Development`s Statistical Yearbook on Public Expenditure from 1994 to 2002.

Instead of IV-Probit or Logit, this chapter uses a conventional 2SLS estimation technique, as suggested by Angrist (1991, 2001) since the dependent variables, endogenous variables and the instrument are all discrete. 2SLS estimates identify local average treatment effect irrespective of the fact that the dependent variables are binary or continuous (Angrist, 2009). Previous literature is replete with examples of using 2SLS rather than IV-Probit/Logit and Probit/Logit (e.g. Cesur et al., 2014; Clark & Royer, 2013; Jürges, Reinhold, & Salm, 2011; Siles, 2009; Xie & Mo, 2014).

As a result, I exploit the exposure to the reform as an instrument for schooling, as given below by Equation 2.

$$(2) \quad S_i = \gamma + \rho X_i + \sigma T_i + \mu_i$$

where T_i is a dichotomous indicator variable, (i.e. the instrument) which equals one if the individuals were born in and after 1987, and zero for those were born before 1986. However, if age is an important driving factor of health outcomes employed in this chapter, any method that does not capture the effect of age on the outcome of the interest is subject to some degree of bias. Owing to the utilization of two cross-section surveys that cover a time period of 7 years (2008-2014), I can account for the impact of age on the health.

If the reform only affects the outcome of interest through education, i.e. there is no direct effect of the reform on health, then the results of equation two become important since it gives the effects of CER on maternal education. In other words, it can be used as the first stage of Instrumental Variable (IV) estimation. More specifically, T_i in Equation 2 can be used as an instrument to estimate the predicted schooling of women, $\widehat{S_i}$.

Then, in the second stage, the unbiased causal estimate of the impact of education on the dependent variables considered is obtained in Equation 3:

$$(3) \qquad H_i = \delta + \pi X_i + \beta \widehat{S_i} + \varepsilon_i$$

where $\widehat{S_i}$ is the estimated value of education by Equation 2. All the remaining explanatory variables are the same as in Equation 2, except the instrumental variable. Again, standard errors are clustered at the region of the residence-by-survey year.

Furthermore, I can alter Equation 2 (i.e. the first stage regression) to obtain the reduced form (RF) estimates of the effect of the CER on health. To do this, the dependent variable of the first stage (i.e. S_i) is replaced with the health outcomes considered, as indicated by Equation 4:

$$(4) \qquad H_i = \omega + \alpha X_i + \varphi T_i + e_i$$

where φ shows reduced form impact of the CER. The reason for employing RF estimates is that the results of the estimation may differ because of the systematic differences between young and old cohorts or because of higher education as a consequence of the CER. The estimation of the RF model measures the variation in the health outcomes caused by the exposure to the CER. It is worth remembering that with the exception of S_i in equation 2, the same control variables are used for RF estimates of health outcomes. Having discussed how to construct the OLS, IV and RF strategies, the next section of this chapter will report and discuss the findings of these estimates.

3.6 Results and Discussion

3.6.1 Construction of Treatment and Control groups

Figure 3.3 shows the effect of year of birth on the highest grade completed (HGC), junior high school (JHS), senior high school (SHS) and university education (UCR) from a linear probability model of equation 2 without any other controls. To do this, "T_i" in equation 2 is replaced by the year of birth dummies. The effects of year birth dummies on education for individuals born between 1982 and 1985 are close to zero and statistically insignificant (See Figure 3.3). However, it is greater than zero and statistically significant for all year of birth dummies for individuals born between 1987 and 1990. Moreover, the jump in the educational attainment between the 1985 and 1987 cohorts is substantial for each way of measuring education apart from the university education. Therefore, women born between 1982 and 1985 are clearly not affected by the reform and constitute a suitable control group whereas the younger cohorts belong to the treatment group. Above all, these findings provide evidence supporting the construction of treatment and control groups to implement the 2SLS methodology.

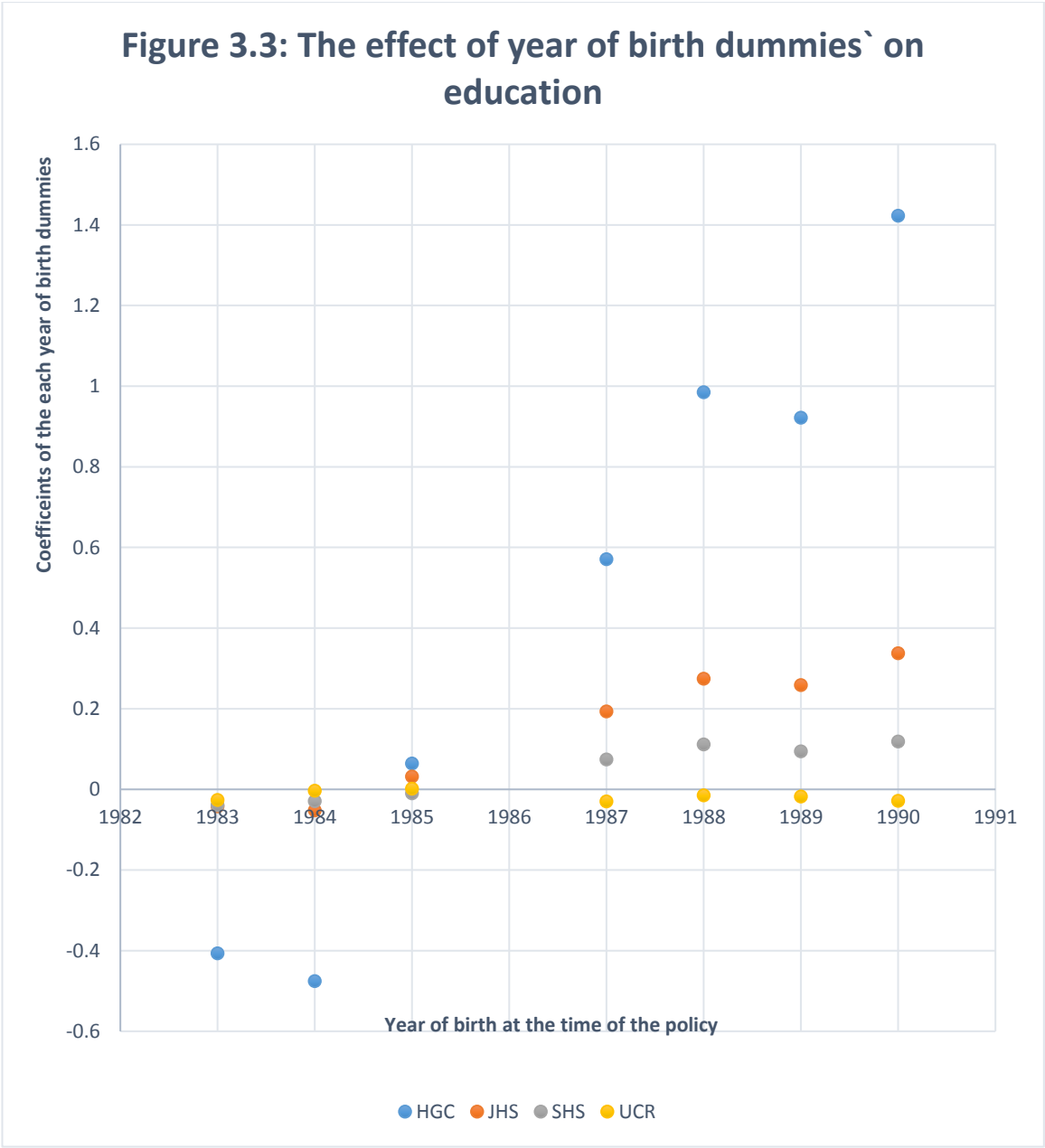


Figure 3.3: **Effects of CER on years of education, completion of JHS, SHS and UCR. Notes**: the sample includes all women born between 1982 and 1990 at the time of the surveys. It is author`s calculation from the NSDVW 2008 and 2014 surveys. Women born in 1987 are the first cohort affected by CER. Each point corresponds to the coefficient estimated for that year of the birth dummy. Those born in 1986 are excluded from the sample.

3.6.2 First Stage Results

Table 3.2 illustrates the impact of Compulsory Education Reform (CER) on various educational attainment variables. It is also the first stage estimates of the two-stage least squares (2SLS) estimation of the health-related dependent variables considered in this study.

As seen, the effect of CER on highest grade completed (HGC) and completion of junior high school (JHS) are statistically significant at the p=0.01 level and positive as expected. Furthermore, the F statistics testing the validity of instrument in the first stage, i.e. T_i are above 10 for HGC and JHS. However, it is less than 10, i.e. 7.05, and education coefficient is statistically less significant for completing senior high school (SHS).[92] Staiger and Stock (1997) suggest that if the value of F-statistic on the excluded instrument is less than 10, one should worry about weak instrument issue, i.e. the weak correlation between the instrument and endogenous variable. This suggests that the instrument is weakly correlated with completing SHS. As compulsory education reform is a valid instrument for HGC and JHS, these variables will be used as a measure of education in the remaining part of this study.

Turning now to the explanation of the first stage results, the introduction of the CER raises the HGC by around 2.1 years. This represents a clear increase given that the average woman completed 7.5 years of schooling before the reform. Moreover, the CER increased the probability of completing JHS by around 25 percentage points, a 57.5 % increase

[92] When the above-mentioned controls are added one by one or jointly to the models in Table 3.2, the significance and the coefficient of the instrument does not change significantly. This indicates that the instrument employed in this study was robust to adding additional controls.

Table 3.2 First Stage Results of 2SLS Estimates

VARIABLES	HGC	JHS	SHS
T_i	2.097***	0.253***	0.164**
	(0.579)	(0.056)	(0.062)
F statistics	13.09	20.4	7.05
Observations	3,414	3,414	3,414

Robust standard errors clustered at the region of residence by-survey wave are reported in parenthesis. Besides, I report the F-statistics on the excluded instrument. *** p<0.01, ** p<0.05, * p<0.1 shows the significance of the coefficients at 1, 5 and 10 percent level respectively. All regressions control for centralized year of birth, age and their square terms, and rural residence, maternal physical abuse status, childhood sexual abuse status, and childhood region, the region of residence and survey wave fixed effects. In addition, the interaction of the region of residence fixed effect and centralized year of the birth variable is controlled for.

given that around 44 percent of women completed junior high school before the introduction of the reform. First stage results also show that the reform increases the likelihood of graduating from SHS by about 16 percentage points, representing a 51% rise in the completion rate of that level of education given that the completion rate of senior high school was 32% before the reform. Taken together, these results suggest that there is a significant association between the CER and the schooling of treated women.

3.6.3 The effect of education on various health measures

Table 3.3 reports reduced form (RF), ordinary least square (OLS) and instrumental variables (IV) estimates, obtained with the pooled sample. Consider first the OLS estimates. OLS assumes that the schooling variable is exogenous and ignores the possible endogeneity of schooling. Due to this reason, they are likely to be biased and, therefore, not credible. However, the OLS estimates are still provided to make a comparison with the IV results.

3.6.3.1 Reduced Form (RF)

RF regressions estimates are reported in column 1 in Table 3.3 They show whether the exposure to the reform has caused a significant change in the health-related outcomes for the exposed cohorts of the respondents. To begin with, the sign and significance of RF coefficients are in the same direction as with the IV estimates, as expected. Around a third of RF estimates are statistically significant (i.e. 8 out of 23 cases were significant). They are exactly the same coefficients that are also significant for IV. This is not surprising as the IV estimates could also be obtained by dividing the reduced form estimates by the relevant first stage estimates. RF estimates suggest that exposure to the education reform had a significant positive impact on lowering the risk of experiencing severe pain

Table 3.3 RF, OLS and IV estimates of the impact of schooling on SRH, severe or extreme pain and mental health measures.

	RF	OLSHGC	OLSJHS	IVHGC	IVJHS
SRH	0.078	-0.019***	-0.154***	0.037	0.308
	(0.068)	(0.003)	(0.019)	(0.039)	(0.306)
pain4weeks	-0.107**	-0.010***	-0.094***	-0.051***	-0.425***
	(0.045)	(0.003)	(0.024)	(0.019)	(0.152)
headache	0.024	-0.015***	-0.131***	0.012	0.096
	(0.061)	(0.002)	(0.029)	(0.028)	(0.240)
appetite	0.101*	-0.006***	-0.052**	0.048	0.399
	(0.051)	(0.002)	(0.025)	(0.033)	(0.246)
sleeping	0.062	0.007**	0.073***	0.030	0.247
	(0.058)	(0.003)	(0.020)	(0.030)	(0.236)
frightened	-0.001	-0.010***	-0.079***	-0.000	-0.004
	(0.067)	(0.002)	(0.023)	(0.031)	(0.256)
shaking hands	0.020	-0.011***	-0.087***	0.009	0.078
	(0.059)	(0.003)	(0.021)	(0.028)	(0.224)
nervous	0.111	0.001	0.002	0.053	0.440
	(0.067)	(0.003)	(0.028)	(0.040)	(0.304)
digestion	0.067	0.003	-0.003	0.032	0.265
	(0.050)	(0.005)	(0.027)	(0.025)	(0.208)
clear thinking	0.085	0.003	0.012	0.040	0.334
	(0.062)	(0.005)	(0.033)	(0.033)	(0.253)
unhappy	0.017	0.004	0.006	0.008	0.067
	(0.062)	(0.003)	(0.029)	(0.028)	(0.234)
crying	0.034	-0.008***	-0.055	0.016	0.136
	(0.053)	(0.003)	(0.039)	(0.025)	(0.198)
not enjoying daily activities	-0.007	0.010***	0.070***	-0.003	-0.027
	(0.037)	(0.003)	(0.019)	(0.017)	(0.140)
difficulty in making decision	0.108**	0.003	-0.001	0.051*	0.425*
	(0.052)	(0.003)	(0.034)	(0.029)	(0.233)
difficulty in daily activities	0.121**	0.002	0.028	0.058**	0.480*
	(0.053)	(0.003)	(0.019)	(0.028)	(0.249)
feeling useless	0.019	-0.008***	-0.075***	0.009	0.077
	(0.066)	(0.001)	(0.013)	(0.032)	(0.257)
losing interest	0.108**	-0.002	-0.005	0.052**	0.426***

	(0.039)	(0.003)	(0.022)	(0.023)	(0.158)
feeling worthless	0.028	-0.008***	-0.056*	0.013	0.110
	(0.054)	(0.003)	(0.029)	(0.026)	(0.216)
feeling always tired	0.134*	-0.005	-0.036	0.064	0.529*
	(0.073)	(0.004)	(0.029)	(0.042)	(0.317)
stomach problems	0.059	-0.002	-0.019	0.028	0.232
	(0.067)	(0.002)	(0.026)	(0.034)	(0.276)
tired easily	0.191**	-0.007	-0.059*	0.090*	0.754*
	(0.087)	(0.005)	(0.029)	(0.048)	(0.404)
Ever thinking ending life	0.128**	-0.003	-0.004	0.061*	0.503**
	(0.052)	(0.002)	(0.024)	(0.036)	(0.256)

Notes: The coefficients of the effect of education (as indicated in the column heading) on health outcomes. Robust standard errors clustered at the region of residence by-survey wave are reported in parenthesis. *** p<0.01, ** p<0.05, * p<0.1 shows the significance of the coefficients at 1, 5 and 10 percent levels respectively. All regressions control for centralized year of birth, age and their square terms, and rural residence, maternal physical abuse status, childhood sexual abuse status, and childhood region, the region of residence and survey wave fixed effects. In addition, the interaction of the region of residence fixed effect and centralized year of the birth variable is controlled for.

whereas it has no effect on the possibility of reporting self-reported poor health.

3.6.3.2 Ordinary Least Square (OLS)

Inasmuch as more educated individuals take better care of their health and have healthier lifestyles, one would expect education to decrease the probability of reporting poor health, experiencing severe pain and having various mental problems. However, the estimates obtained with OLS are not significant for many outcome variables (Table 3.3 columns 2-3). Nevertheless, the significant OLS estimates for the highest grade completed (HGC) and completion of junior high school (JHS) suggest that education is positively correlated with a lower risk of developing poor mental health symptoms and experiencing severe pain in the last four weeks.[93] Also, higher education attainment is associated with a reduction in the likelihood of reporting poor self-rated health. On the other hand, the magnitude of the correlation between education and health differs with respect to the usage of different education variable as a measure of education. To be more specific, in the OLS estimates, the size of the coefficients of completing JHS is larger than the HGC for all specifications illustrated in Table 3.3.

3.6.3.3 Instrumental Variable (IV)

As with the OLS, the IV estimates suggest that both education variables reduce the probability of experiencing severe pain in the last four weeks (Table 3.3 columns 4-5). However, the picture changes when looking at the IV estimates for the remaining measures of health. The significant estimates of OLS lose significance with the IV, and in some cases, the insignificant impact of education found by OLS turns into a statistically

[93] However, education increases the probability of having sleeping disorders and reluctance in daily activities.

significant negative effect by IV. This means overall good health effects of education observed by the OLS estimates turn into either "no" or "worse health" effects. It is also important to notice that IV estimates for all dependent variables are also several times larger than OLS estimates independent of the sign and significance of the estimates.

To begin with, there is no causal association between self-reported poor health and education, whereas negative regression coefficient in the OLS estimate indicates that education decreases the propensity to report poor health.[94] The differences between the IV and OLS estimates also appear with respect to mental health problems. To begin with, most of the IV estimates are insignificant, unlike those obtained with OLS. The IV results suggest that education increases the propensity to report a number of mental health issues: education increases the probability of having thoughts about ending their lives, delaying daily activities, losing interest and being tired easily, and having difficulties in decision making. However, insignificant education coefficients in the remaining IV estimates suggests no role of education in reducing the specific mental health problems considered in this study.[95]

3.6.3.4 Discussion of IV estimates

Even though I employed many different measures of health compared to the previous literature, the main findings of the present study are quite consistent with the existing literature (e.g. Braakmann, 2011; Cesur et al., 2014; Fletcher, 2015; Johnston, Lordan, Shields, & Suziedelyte, 2015; Li & Powdthavee, 2015; Xie & Mo, 2014).

[94] Even though the IV coefficients for self-reported poor health are not statistically significant, the signs of the coefficients are positive suggesting that education increases the probability of reporting poor health.

[95] Having said that, it is important to note that almost all insignificant estimates have a positive sign which may indicate that education worsens self-reported mental health with the exception of reluctance in daily activities and being easily frightened by many things.

On the other hand, there might be several reasons behind the differentiation between OLS and IV results.[96] Firstly, the bias in the measurement of years of education completed in the survey might cause a downward bias in the OLS results. However, previous literature has found that self-reported educational attainment has 90 percent reliability, indicating that only 10 percent difference between OLS and 2SLS can be explained by measurement error (Card, 1999). It is important to note that even though most of the 2SLS estimates given by Table 3.3 are insignificant, the magnitude of the effect is several times larger than OLS estimates, suggesting that the measurement error can only account for a tiny amount of difference between the estimates (Siles, 2009).

Secondly, the differences could stem from the endogeneity bias of the schooling variables in OLS regressions. By contrast, the IV estimates accounts for the endogeneity of schooling. Thirdly, the OLS and IV estimates measure different effects. Particularly, as the estimates of the IV's are LATE as proposed by Imbens and Angrist (1994), and therefore, 2SLS methodology captures the marginal impact of education on health outcomes for only those individuals who altered their educational status as a result of the education reform.

The plausible assumption is that in the absence of the reform, due to the higher marginal cost of schooling, those individuals would have chosen a lower level of schooling attainment. Moreover, if the marginal return to schooling is also greater for those individuals, the conventional 2SLS estimates will over-state the average return of education for the whole population. Nevertheless, it still provides reliable evidence about the causal link between schooling and health for that sub-population. It is apparent that

[96] 3.2 Literature section gives a detailed discussion on the findings of previous studies.

this offers a reasonable explanation for the magnitude of the gap between OLS and 2SLS estimates as well as other inconsistencies mentioned above. To test this hypothesis, similar to Silles (2009), I re-estimated the models by including the square term of years of education variable, i.e. HGC square. The estimates show a negative sign on the squared term of HGC, proposing that the link between education and health is greater at lower levels of the schooling distribution.[97] Overall, this provides confirmatory evidence regarding the difference in size between IV and OLS regression coefficients.

However, it is important to note that the analysis of health effects of education is problematic. Similar to this study`s data sets, several studies use self-reported health measures because of data limitation. Along with real differentiation in health outcomes through education, because of the nature of the data sets, the effects of education on any type of self-reported health measures including self-reported pain, health status and mental health disorders symptoms, can be easily explained by the fact that the knowledge of existing health disorder can be also correlated with education itself (Cutler and Lleras-Muney, 2006). For instance, individuals with longer years of education can be more aware of their mental health disorders symptoms, which results in increasing notice of mental health problems. Therefore, they would report their mental health problems with a higher likelihood in the survey. However, testing how education works through this intermediator is empirically impossible with the available data set, and, therefore, this chapter does no causal analysis to attribute the influence of education on this channel.

In summary, the results displayed in the fourth and fifth column of Table 3.3 shows that schooling has no effect on self-assessed health, whereas it reduces the propensity to

[97] The results are available upon request.

having severe pain. On the other hand, education tends to be associated with a greater probability of reporting some mental health problems. Lastly, the 2SLS estimates are several times larger than the OLS ones. The following section subjects these results to several robustness tests to assess their sensitivity with respect to sample specification and other changes.

3.6.4 Robustness Checks

To test the validity of the findings for different specifications, I run a number of robustness checks: (i) selecting an alternative year of birth window; (ii) restricting the sample to the people with different levels of education; (iii) running two falsification tests to see whether there are other jumps in education caused by events other than the educational reform (i.e. time trend in education) and to check whether there is a time trend in health other than the effects of the change in educational attainment due to compulsory education reform, and (iv) adding some controls to test some potential mechanisms behind the education and health relations.

3.6.4.1 Alternative year of birth windows

The baseline specification of the model in Table 3.3 was estimated for a sample of women born between 1982 and 1990, with women born from 1982 to 1985 being the unexposed cohort (control group). As a robustness check, an alternative narrower year of the birth window was selected (see Table 3.4), containing women born between 1983 and 1989, with the women born between 1983 and 1985 serving as the control group. The advantage of using the narrower sample is to have a more homogenous sample in terms of age. The downside is that it reduces the sample size significantly.

Table 3.4 presents the impact of education on the selected outcome measures using the new year of the birth window. Columns 1 and 2 reports the IV estimates for the 1983-1989 sample. Overall, the estimates are very similar to those with the full sample. However, the magnitude of the education effect in most cases is larger. Additionally, in some cases, the effect of education becomes also more significant. For example, the previously insignificant estimates of education effect on some mental health disorders, such as anxiety, digestion and clear thinking problems, turn into statistically significant.

3.6.4.2 Alternative education levels

The complete sample consists of individuals with any education levels. The sensitivity of the main findings were tested while using two alternative specifications. Firstly, I restricted the sample to only individuals with at most a junior high school (JHS) degree, i.e. the post-reform compulsory schooling degree or below. Secondly, I considered those who held at most a senior high school degree, i.e. not including women who hold a university degree.

Restricting the sample in this manner is important as another related explanation of the insignificant results obtained with the full sample could be that that the causal link between schooling and health might exist but it does not appear on the low schooling margin (Braakmann, 2011). In fact, Cutler and Lleras-Muney (2010) find a stronger causal relationship between schooling and health when somebody moves up the distribution of the schooling. Considering the fact that the instrument only explains the differentiation in educational attainments of people at the lower end of the schooling distribution, this idea appears to be a plausible explanation.

Table 3.4 also presents the results for these alternative samples. Column 3 and 4 are for women whose highest degree is at most the SHS; while column 5 and 6 report the results for those whose highest degree is JHS.[98] It shows that the sign, magnitude and significance of the findings in the baseline estimation are almost identical in the restricted sample and the baseline sample when I consider those whose highest degree is at most the SHS.[99] The reason for this similarity between the complete and restricted sample, presumably, lies in the fact that relatively few Turkish women attain a university degree.[100]

The picture changes little when the highest degree is at most JHS. Compared to the full sample, the sign and significance of most coefficients are almost identical to the full sample estimates.[101] However, the magnitudes of the significant coefficients in the restricted sample are much larger than in the full sample for both education variables. Also, due to the smaller sample size, the restricted sample always has larger standard errors.

[98] The F-statistics testing the validity of the instrument was over 10 in all estimates reported in Table 3.4 with an exception of years of education variable for the sample consists of people who completed at most junior high school. Nevertheless, the direction in the sign and significance of the education coefficients of completing JHS and years of education in the sample covering individuals with at most JHS degree are quite similar to each other, which was seen in other restricted samples as well. Moreover, the endogeneity and over-identification test results are also consistent with the one reported in the baseline model.

[99] However, the insignificant impact of education in the full sample becomes significant for anxiety and appetite disorders.

[100] 242 women out of 3748 have at least university education, which equals 7 percent of the whole sample.

[101] However, two out of six significant education coefficients, "difficulty in decision making" and "difficulty in daily activities", changed into insignificant in the restricted sample.

Table 3.4 Robustness checks of IV estimations by restricting complete sample with different specifications

	Restricted birth window		At most SHS education		At most JHS education	
	HGC	JHS	HGC	JHS	HGC	JHS
SRH	0.037	0.365	0.045	0.358	0.134	0.68
	(0.035)	-0.34	(0.038)	(0.275)	(0.116)	(0.42)
Pain in 4 weeks	-0.045**	-0.449**	-0.040*	-0.318*	-0.138**	-0.698**
	(0.019)	(0.186)	(0.021)	(0.164)	(0.054)	(0.315)
Headache	0.014	0.139	0.014	0.108	0.007	0.034
	(0.018)	(0.184)	(0.034)	(0.279)	(0.061)	(0.313)
Appetite	0.022	0.218	0.053*	0.417**	0.09	0.454
	(0.019)	(0.186)	(0.03)	(0.205)	(0.092)	(0.371)
Sleeping	0.02	0.201	0.051	0.404	0.152*	0.768*
	(0.02)	(0.195)	(0.035)	(0.265)	(0.083)	(0.413)
Frightened	0.002	0.019	0.008	0.064	0.039	0.197
	(0.029)	(0.289)	(0.035)	(0.281)	(0.093)	(0.46)
Shaking hands	0.015	0.153	0.016	0.129	0.09	0.456
	(0.021)	(0.202)	(0.025)	(0.19)	(0.084)	(0.339)
Nervous	0.046	0.452*	0.055	0.433*	0.115	0.58
	(0.028)	(0.266)	(0.034)	(0.252)	(0.109)	(0.477)
Digestion	0.043*	0.424*	0.04	0.319	0.095*	0.482
	(0.024)	(0.24)	(0.025)	(0.209)	(0.056)	(0.338)
Clear thinking	0.061**	0.608**	0.034	0.27	0.087	0.438
	(0.03)	(0.272)	(0.034)	(0.257)	(0.089)	(0.392)
Unhappy	0.02	0.194	0.014	0.107	-0.024	-0.122
	(0.024)	(0.231)	(0.026)	(0.208)	(0.069)	(0.331)
Crying	0.01	0.097	0.021	0.166	-0.002	-0.009
	(0.018)	(0.179)	(0.022)	(0.174)	(0.048)	(0.244)
Not enjoying daily activities	0.004	0.042	0.004	0.031	-0.043	-0.218
	(0.022)	(0.218)	(0.02)	(0.154)	(0.069)	(0.34)
Difficulty in making decision	0.062*	0.609*	0.060*	0.474*	0.12	0.606
	(0.035)	(0.333)	(0.031)	(0.246)	(0.082)	(0.42)

Difficulty in daily activities	0.040**	0.393*	0.063**	0.499**	0.134	0.676
	(0.019)	(0.202)	(0.029)	(0.24)	(0.111)	(0.564)
Feeling useless	0.03	0.299	0.017	0.138	0.074	0.375
	(0.035)	(0.329)	(0.03)	(0.228)	(0.076)	(0.335)
Losing interest	0.03	0.3	0.062***	0.490***	0.135**	0.683**
	(0.023)	(0.219)	(0.023)	(0.161)	(0.066)	(0.293)
Feeling worthless	0.009	0.093	0.015	0.118	0.037	0.19
	(0.026)	(0.264)	(0.026)	(0.201)	(0.075)	(0.364)
Feeling always tired	0.067**	0.664**	0.071*	0.561**	0.166**	0.836**
	(0.031)	(0.286)	(0.038)	(0.278)	(0.074)	(0.399)
Stomach problems	0.045	0.443	0.032	0.252	0.017	0.085
	(0.031)	(0.297)	(0.034)	(0.263)	(0.061)	(0.3)
Tired easily	0.075***	0.741**	0.091**	0.726**	0.181*	0.931**
	(0.027)	(0.288)	(0.04)	(0.324)	(0.103)	(0.44)
Ever thinking ending life	0.054**	0.535**	0.068**	0.534**	0.149	0.758*
	(0.027)	(0.253)	(0.03)	(0.217)	(0.092)	(0.404)

Notes: Robust standard errors clustered at the region of residence by-survey wave are reported in parenthesis. *** p<0.01, ** p<0.05, * p<0.1 shows the significance of the coefficients at 1, 5 and 10 percent level respectively. All regressions control for centralized year of birth, age and their square terms, and rural residence, maternal physical abuse status, childhood sexual abuse status, and childhood region, the region of residence and survey wave fixed effects. In addition, the interaction of the region of residence fixed effect and centralized year of birth variable is controlled for.

To sum up, on the contrary to the finding of Cutler and Lleras-Muney (2010), this chapter finds that the restricted education samples yield estimates that are very similar to the baseline results with only a few differences. Where there are differences, they suggest that the effects for low-educated women are larger. This suggests that contrary to the aforementioned previous findings, the effect of education is stronger on the lower margin on education.

3.6.4.3 Falsification tests

The schooling of the treated women might be higher due to reasons other than the CER. For example, the difference it might be because of pre-existing time trends in schooling attainment. To deal with this concern, I compare the 1982-1985 cohort to the 1978-1981 one as a falsification test. It is important to remember that neither of these groups are exposed to the reforms.

If the educational attainments of the younger cohorts are significantly different from those of the older women, it could be argued that the time trends might have a role in explaining the significant education differences in the first stage estimates of the baseline sample given in Table 3.2. However, as shown in Table 3.5, comparing successive cohorts indicates no evidence in favour of time trends in schooling attainment before the introduction of the reform. Overall, this finding provides additional evidence for the identification assumption.[102]

Moreover, in unreported estimates, I ran a falsification test in health for using the date sets of the estimates illustrated in Table 3.5. To do this, I used the baseline IV models

[102] The F statistics, testing the validity of the instrument, is close to zero, which provides confirmatory evidence about the invalidity of the instrument for those cohorts unaffected by the reform.

reported in Table 3.3. But all results were statistically insignificant and the standard errors of the estimates blew up.[103] This was not surprising as the value of F-statistics for the instrument was close to zero, which reduces reliability of the results (See Table 3.5). In this study, all regressions account for the centralized year of birth and its square, survey waves fixed effects. In addition, the interaction of the region of residence fixed effect and centralized year of the birth variable is controlled for. Accounting for these variables is likely to capture time trend in health.

3.6.4.4 Potential Mechanisms

The benchmark models reported in Table 3.3 include the region of residences and rural-urban status. It is possible that individuals migrate from less urbanized regions to urbanized regions or from rural to urban areas because of longer years of education to look for a better job and life opportunities. It is conceivable that this results in a change in their health outcomes. In unreported regressions, I estimated models by excluding the region of residences, their interactions, and rural-urban status. However, excluding these variables jointly or separately did not change the results. On the other hand, the baseline estimates do not include other variables that might have been affected by education, and are likely to cause health differences across different education groups. In the literature review of this chapter, there was an extensive discussion of these channels affecting health through education, therefore, it will not be discussed in detail here. In addition, because of data limitation, it is impossible to control for all these channels.

[103] The results are available upon request.

Table 3.5 Falsification test

VARIABLES	HGC	JHS	SHS
T_i	0.416	0.003	0.012
	(0.304)	(0.029)	(0.026)
F statistics	1.86	0.01	0.22
Observations	4,248	4,248	4,248

Notes: Robust standard errors clustered at the region of residence by-survey wave are reported in parenthesis. Besides, I report the F statistics on the excluded instrument. *** p<0.01, ** p<0.05, * p<0.1 shows the significance of the coefficients at 1, 5 and 10 percent level respectively. All regressions control for centralized year of birth, age and their square terms, and rural residence, maternal physical abuse status, childhood sexual abuse status, and childhood region, the region of residence and survey wave fixed effects. In addition, the interaction of the region of residence fixed effect and centralized year of the birth variable is controlled for.

Covariates of income, working status, occupation and marital status are likely to be correlated with individual`s education and affecting health outcomes as discussed in the literature.[104] However, for the majority of health outcomes reported in Table 3.3, adding these controls jointly or separately has a very little effect on the education coefficients, and in all cases, the magnitude of education coefficient becomes a little larger.[105] Also, the significance of education coefficients remains the same for all cases reported in Table 3.3. Therefore, it can be said that even though education is likely to alter someone`s experience in the labor market or marital status, this does not seem to be the main channel by which education produces health differentiation between educated and uneducated individuals.[106]

3.6.5 Heterogeneous Effects

3.6.5.1 Own income

Next, I considered whether the findings differ by sub-group of the population. Firstly, I divided the full sample into two groups: women with or without their own personal income. The first stage results are presented in Table 3.6 and the second stage results are in Table 3.7. The results of the first stage and second stage of 2SLS estimation are similar to those obtained with the full sample. However, when considering women without their own income, the size of the negative effects of education increases for almost all the mental health outcomes, and therefore some of the variables becomes more significant

[104]Regressing labour market status, income, occupation, marital status and residence status on education suggests no causal relationship with education with the exception of residence status and marital status (education decreases the likelihood of living in rural areas and of being married). These results are available upon request.

[105] The results are available upon request.

[106] There will be a further examination of some of these covariates by means of heterogeneous effect tests.

Table 3.6 First stage estimates, women having/not having their own personal income

	With personal income		Without personal income	
VARIABLES	HGC	JHS	HGC	JHS
T_i	3.257**	0.315***	2.084***	0.258***
	(1.203)	(0.095)	(0.596)	(0.068)
F statistics	7.33	10.88	12.22	14.57
Observations	637	637	2,779	2,779

Notes: Robust standard errors clustered at the region of residence by-survey wave are reported in parenthesis. Besides, I report the F-statistics on the excluded instrument. *** p<0.01, ** p<0.05, * p<0.1 shows the significance of the coefficients at 1, 5 and 10 percent level respectively. All regressions control for centralised year of birth, age and their square terms, and rural residence, maternal physical abuse status, childhood sexual abuse status, and childhood region, the region of residence and survey wave fixed effects. In addition, the interaction of the region of residence fixed effect and centralised year of birth variable is controlled for.

and in some cases variables that were insignificant in the main results reported in Table 3.3 turn into significant; the latter is the case with problems regarding appetite, sleeping, anxiety, digestion, clear thinking problems, unhappiness.

In contrast, in the analysis for women who have their own income, a significant association between education and health was detected for only a few outcomes. Interestingly, the previously found negative impact of education on some mental health problems turned positive in this sub-sample for most of the variables. For example, education enhances mental health problems significantly for "sleeping disorders", "unhappiness" and "feeling useless". However," feeling always tired" and "stomach problems" variables turned significant with a less precise estimation and are negatively influenced by education.

One of the possible explanations could be the direct effect of the change in the labor market status through education. This change would result in an alteration in income status, which is likely to alter health status. Also, unemployed educated women without any income are more likely to develop more mental health problems. It is possible that the higher level of schooling increases their ambitions. The educated but unemployed women can, therefore, be more depressed because of unfulfilled desires. However, educated women, who are employed and have an income can obtain advantages of schooling and are more likely to feel accomplishment regarding their ambitions, which makes them less depressed.[107] These results can also be described by the social rank theory. It states that schooling might alter rank of an individual in the society, and this might have a direct effect on health outcomes (Cutler and Lleras-Muney, 2006). This is

[107] See the discussion in section "3.2.1 How education affects health?" for the channels affecting health through education.

Table 3.7 Heterogeneous effects by personal income status

	Full sample HGC	Full sample JHS	No income HGC	No income JHS	With income HGC	With income JHS
SRH	0.037	0.308	0.026	0.207	0.032	0.336
	(0.039)	(0.306)	(0.036)	(0.271)	(0.027)	(0.262)
Pain in 4 weeks	0.051***	0.425***	-0.047*	-0.382*	-0.039**	-0.401**
	(0.019)	(0.152)	(0.027)	(0.210)	(0.019)	(0.179)
Headache	0.012	0.096	0.020	0.161	-0.016	-0.163
	(0.028)	(0.240)	(0.035)	(0.298)	(0.031)	(0.302)
Appetite	0.048	0.399	0.067**	0.541**	-0.011	-0.110
	(0.033)	(0.246)	(0.031)	(0.220)	(0.030)	(0.312)
Sleeping	0.030	0.247	0.090*	0.728**	-0.072***	-0.741**
	(0.030)	(0.236)	(0.047)	(0.307)	(0.021)	(0.290)
Frightened	-0.000	-0.004	0.008	0.067	-0.012	-0.128
	(0.031)	(0.256)	(0.037)	(0.300)	(0.028)	(0.288)
Shaking hands	0.009	0.078	0.013	0.105	0.009	0.092
	(0.028)	(0.224)	(0.030)	(0.225)	(0.035)	(0.353)
Nervous	0.053	0.440	0.091**	0.738**	-0.053	-0.548
	(0.040)	(0.304)	(0.046)	(0.326)	(0.040)	(0.351)
Digestion	0.032	0.265	0.053**	0.429**	-0.021	-0.221
	(0.025)	(0.208)	(0.024)	(0.191)	(0.025)	(0.235)
Clear thinking	0.040	0.334	0.048	0.386*	0.001	0.008
	(0.033)	(0.253)	(0.034)	(0.232)	(0.032)	(0.333)
Unhappy	0.008	0.067	0.045**	0.365**	-0.076**	-0.786***
	(0.028)	(0.234)	(0.022)	(0.172)	(0.033)	(0.289)
Crying	0.016	0.136	0.025	0.204	-0.011	-0.118
	(0.025)	(0.198)	(0.021)	(0.152)	(0.030)	(0.314)
Not enjoying daily activities	-0.003	-0.027	-0.005	-0.039	-0.001	-0.007
	(0.017)	(0.140)	(0.020)	(0.160)	(0.029)	(0.303)
Difficulty in making decision	0.051*	0.425*	0.067*	0.542**	0.024	0.246
	(0.029)	(0.233)	(0.036)	(0.259)	(0.025)	(0.245)
Difficulty in daily activities	0.058**	0.480*	0.088**	0.712*	-0.043	-0.447
	(0.028)	(0.249)	(0.044)	(0.380)	(0.042)	(0.437)
Feeling useless	0.009	0.077	0.026	0.213	-0.051**	-0.534**
	(0.032)	(0.257)	(0.030)	(0.212)	(0.025)	(0.215)
Losing interest	0.052**	0.426***	0.070***	0.566***	-0.026	-0.270
	(0.023)	(0.158)	(0.027)	(0.168)	(0.036)	(0.403)
Feeling worthless	0.013	0.110	0.029	0.238	-0.022	-0.228
	(0.026)	(0.216)	(0.027)	(0.219)	(0.029)	(0.309)
Feeling always tired	0.064	0.529*	0.084*	0.677**	0.034*	0.341*
	(0.042)	(0.317)	(0.049)	(0.340)	(0.020)	(0.181)
Stomach problems	0.028	0.232	0.031	0.250	0.027*	0.271
	(0.034)	(0.276)	(0.036)	(0.286)	(0.014)	(0.179)
Tired easily	0.090*	0.754*	0.096**	0.782**	0.050	0.503
	(0.048)	(0.404)	(0.043)	(0.351)	(0.042)	(0.440)

Ever thinking ending life	0.061*	0.503**	0.062**	0.501**	0.020	0.209
	(0.036)	(0.256)	(0.030)	(0.203)	(0.027)	(0.287)

Notes: Robust standard errors clustered at the region of residence by-survey wave are reported in parenthesis. *** p<0.01, ** p<0.05, * p<0.1 shows the significance of the coefficients at 1, 5 and 10 percent level respectively. All regressions control for centralised year of birth, age and their square terms, and rural residence, maternal physical abuse status, childhood sexual abuse status, and childhood region, the region of residence and survey wave fixed effects. In addition, the interaction of the region of residence fixed effect and centralised year of the birth variable is controlled for.

also related to unfulfilled ambitions explained before. Unemployed woman with more education is likely to feel that she has not reached the rank or social status she deserved in the society (i.e. being employed and having a personal income), which makes her more depressed. Overall, it can be concluded that the effect I observed in the baseline estimates reported in Table 3.3 largely come from its effects on the unemployed women with no income.

It is important to note, however, that the weak instrument problem arises for the years of education variable for the sample of woman who have income so that the results obtained with that variable should not receive too much weight. To conclude, the findings indicate that the effect of education depends on whether the woman has her own income or not.[108]

3.6.5.2 Rural vs urban

Another potential important characteristic is the residence status (rural or urban). In these models, the F-statistics of the instrument testing the strength of the instrument for the sub-sample of the rural population is much less than 10 for all education variables (see Table 3.8). The effect of the instrument on education, furthermore, turns out insignificant. This might imply heterogeneous effect of education reform based on urban/rural status. Therefore, compulsory education reform (CER) is not a valid instrument of education for the rural population, which undermines the credibility of the second stage estimates for this subsample.[109] In contrast, as seen in Table 3.9, the estimates for the urban population show almost no variation from the baseline findings in Table 3.3.

[108] In unreported estimates, I also considered employment status (women in labour force vs not working women). The results are quite analogous to the one obtained by personal income status given in Table 3.7. These findings are not surprising as around 90 percent of women with income are working in the labour market and, therefore likely to have an income.

[109] Hence, the findings of second stage estimates for rural population are not reported here but are available upon request.

Table 3.8 First stage of estimates by residence status

	Rural population		Urban population	
VARIABLES	HGC	JHS	HGC	JHS
T_i	-0.323	0.149	2.233***	0.247***
	(0.904)	(0.095)	(0.695)	(0.063)
F statistics	0.13	2.48	10.33	15.12
Observations	821	821	2,593	2,593

Notes: Robust standard errors clustered at the region of residence by-survey wave are reported in parenthesis. Besides, I report the F-statistics on the excluded instrument. *** p<0.01, ** p<0.05, * p<0.1 shows the significance of the coefficients at 1, 5 and 10 percent level respectively. All regressions control for centralised year of birth, age and their square terms, and maternal physical abuse status, childhood sexual abuse status, and childhood region, the region of residence and survey wave fixed effects. In addition, the interaction of the region of residence fixed effect and centralized year of the birth variable is controlled for.

Table 3.9 Heterogeneous Effects by rural/urban and maternal abuse status

	Full sample HGC	Full sample JHS	Urban HGC	Urban JHS	No maternal violence HGC	No maternal Violence JHS
SRH	0.037	0.308	0.035	0.320	0.041	0.273
	(0.039)	(0.306)	(0.044)	(0.383)	(0.043)	(0.254)
Pain in 4 weeks	-0.051***	-0.425***	-0.058**	-0.521***	-0.066**	-0.442**
	(0.019)	(0.152)	(0.023)	(0.163)	(0.032)	(0.184)
Headache	0.012	0.096	0.013	0.121	0.019	0.124
	(0.028)	(0.240)	(0.032)	(0.297)	(0.024)	(0.170)
Appetite	0.048	0.399	0.033	0.295	0.037	0.245
	(0.033)	(0.246)	(0.032)	(0.267)	(0.038)	(0.229)
Sleeping	0.030	0.247	0.030	0.267	0.045	0.303
	(0.030)	(0.236)	(0.029)	(0.247)	(0.049)	(0.295)
Frightened	-0.000	-0.004	0.002	0.018	-0.027	-0.179
	(0.031)	(0.256)	(0.029)	(0.264)	(0.022)	(0.155)
Shaking hands	0.009	0.078	-0.007	-0.062	0.001	0.007
	(0.028)	(0.224)	(0.030)	(0.275)	(0.023)	(0.151)
Nervous	0.053	0.440	0.048	0.437	0.013	0.084
	(0.040)	(0.304)	(0.043)	(0.360)	(0.044)	(0.288)
Digestion	0.032	0.265	0.026	0.231	0.036	0.243
	(0.025)	(0.208)	(0.030)	(0.267)	(0.034)	(0.211)
Clear thinking	0.040	0.334	0.033	0.297	0.022	0.149
	(0.033)	(0.253)	(0.032)	(0.275)	(0.028)	(0.180)
Unhappy	0.008	0.067	0.009	0.080	0.015	0.098
	(0.028)	(0.234)	(0.030)	(0.265)	(0.034)	(0.231)
Crying	0.016	0.136	0.006	0.057	0.004	0.024
	(0.025)	(0.198)	(0.029)	(0.262)	(0.039)	(0.260)
Not enjoying daily activities	-0.003	-0.027	0.001	0.012	-0.014	-0.097
	(0.017)	(0.140)	(0.018)	(0.165)	(0.022)	(0.150)
Difficulty in making decision	0.051*	0.425*	0.051	0.458	0.069	0.459
	(0.029)	(0.233)	(0.035)	(0.293)	(0.051)	(0.296)
Difficulty in daily activities	0.058**	0.480*	0.050**	0.452*	0.088*	0.586*
	(0.028)	(0.249)	(0.025)	(0.267)	(0.049)	(0.315)
Feeling useless	0.009	0.077	0.006	0.055	0.017	0.116
	(0.032)	(0.257)	(0.031)	(0.280)	(0.030)	(0.190)
Losing interest	0.052**	0.426***	0.046*	0.419**	0.040	0.263
	(0.023)	(0.158)	(0.025)	(0.192)	(0.029)	(0.164)
Feeling worthless	0.013	0.110	0.001	0.010	0.015	0.104
	(0.026)	(0.216)	(0.021)	(0.192)	(0.035)	(0.230)
Feeling always tired	0.064	0.529*	0.066	0.597*	0.082	0.541*
	(0.042)	(0.317)	(0.043)	(0.361)	(0.057)	(0.328)

Stomach problems	0.028	0.232	0.037	0.330	0.012	0.082
	(0.034)	(0.276)	(0.040)	(0.356)	(0.018)	(0.123)
Tired easily	0.090*	0.754*	0.078*	0.708	0.078*	0.526**
	(0.048)	(0.404)	(0.047)	(0.460)	(0.043)	(0.252)
Ever thinking ending life	0.061*	0.503**	0.069*	0.625**	0.061*	0.409**
	(0.036)	(0.256)	(0.040)	(0.310)	(0.037)	(0.189)

Notes: Robust standard errors clustered at the region of residence by-survey wave are reported in parenthesis. *** p<0.01, ** p<0.05, * p<0.1 shows the significance of the coefficients at 1, 5 and 10 percent level respectively. All regressions control for centralised year of birth, age and their square terms, and rural residence, maternal physical abuse status, childhood sexual abuse status, and childhood region, the region of residence and survey wave fixed effects. In addition, the interaction of the region of residence fixed effect and centralised year of birth variable is controlled for.

3.6.5.3 Maternal domestic violence

As a final step, I divided the sample into two groups depending on whether the respondent's mothers experienced domestic violence or not. Table 3.10 presents the first stage estimates obtained with these two sub-samples. As it can be seen, the reform does not have a significant effect on women whose mothers experienced violence whereas it has a significant effect on those whose mothers did not experience domestic abuse. Again, the reform does not appear to be a good instrument for the education of those women whose mothers had been abused by their partners, which drops credibility of the second stage results.[110] Column 5-6 of Table 3.9 shows the 2SLS estimates for the sub-sample of women whose mothers do not have a history of abuse. The main findings again hold in this sub-sample. Overall, it can be argued that there is heterogeneity in the effect of CER on education, however, it is difficult to claim the effects of education on health vary according to the respondents' maternal abuse status.

3.7 Conclusion

We explore the relationship between education and health, using a natural experiment resulting from the compulsory education reform in Turkey which increased mandatory education for children born after 1986 from 5 to 8 years. This policy change had dramatic impacts on educational attainment of the affected cohort, allowing me to use it as an instrument for education, so as to avoid the likely endogeneity issues. We explore this issue by using two large nationally representative surveys of Turkish women, carried out in 2008 and 2014.

[110] Hence, the findings of second stage estimates for women whose mother had been abused by their partner are not reported here but are available upon request.

Table 3.10 First stage of estimates by maternal abuse status

	Mother faced domestic violence			
	Yes		No	
VARIABLES	HGC	JHS	HGC	JHS
T_i	1.784*	0.109	1.960***	0.293***
	(0.915)	(0.113)	(0.684)	(0.055)
F statistics	3.8	0.93	8.21	27.97
Observations	965	965	2,449	2,449

Notes: Robust standard errors clustered at the region of residence by-survey wave are reported in parenthesis. Besides, I report the F-statistics on the excluded instrument. *** p<0.01, ** p<0.05, * p<0.1 shows the significance of the coefficients at 1, 5 and 10 percent level respectively. All regressions control for centralised year of birth, age and their square terms, and maternal physical abuse status, childhood sexual abuse status, and childhood region, the region of residence and survey wave fixed effects. In addition, the interaction of the region of residence fixed effect and centralised year of birth variable is controlled for.

The results suggest some but limited positive effects of education: most notably, education lowers the probability of reporting severe pain in the last four weeks (but is not correlated with self-reported overall health). On the other hand, education is also correlated with greater incidence of some mental health issues. These results appear very robust to changes in the regression specification and to controlling for individual characteristics such as having one's own income, labor-market status, marital status, occupation, history of domestic abuse in the family, or residence status.

I also find the heterogeneous effect of education reform based on urban/rural status, the respondents' maternal abuse status. Moreover, heterogeneous effects tests indicate that the effect of education depends on whether the woman has her own income or not and the respondents labor market status.

A plausible explanation for the lack of effect of education on self-reported health is that respondents affected by the reform are still generally young and therefore unlikely to experience ill health. In contrast, the fact that educated women are more likely to report mental health issues can be attributed to the fact that their higher education helps them better understand such issues and recognize their symptoms. This can have important benefits, as recognition of mental health problems is a precondition to their effective treatment.

Overall, the results of the study suggest that there are some suggestive health benefits of education. As the respondents affected by the educational reform have aged, these benefits are likely to become stronger and more pronounced.

Chapter 4. The Impacts of Husband`s Education on Violence against Women: Evidence from Turkey

4.1 Introduction

Violence against women is a serious social issue that has the potential to threaten the lives of women and undermine their participation in the labour market and the society in general. Even though most countries have adopted formal rules in recent years to criminalise violence against women, enforcement of such rules are often lacking and women remain on the receiving end of abuse all around the world. A recent report by the World Health Organization (WHO, 2013) for instance shows that 35 percent of women around the world have been abused physically and/or sexually.[111] Moreover, the most common form of violence against women is abuse inflicted by their own spouse (Garcia-Moreno, Jansen, Ellsberg, Heise, & Watts, 2006; Heise, Ellsberg and Gottemoeller, 1999). A review of around fifty population-based surveys from around the world shows that between 10 and 60 percent of women were beaten by their spouses (Heise et al., 1999). Similarly, a study conducted in 15 areas of 10 different countries by the World Health Organisation (WHO) finds that 15-71 percent of women have experienced physical and/or sexual violence from their intimate partner or husband during their lifetime (Garcia-Moreno et al., 2006).[112]

Moreover, the likelihood that a woman will experience spousal violence is closely related to the spouse's level of education in Turkey. The results of the 2014 National Research

[111] World Health Organization (2013). Global and Regional Estimates of Violence against Women: Prevalence and Health Effects of Intimate Partner Violence and Non-partner Sexual Violence. Geneva. Switzerland.

[112] See also Violence against women, http://www.who.int/mediacentre/factsheets/fs239/en/.

on Domestic Violence against Women (NRDVW) in Turkey indicate that the percentage of spousal violence, including economic, emotional, physical and sexual varies from 59.5 percent among women whose husband have no or incomplete primary education to 47.1 percent of women whose husband have completed the secondary school or have attained higher education (Table 4.1). The pattern for each violence category separately is similar. The role of husband`s education is an important determinant of reducing violence against women, as has been highlighted in the literature.[113] However, these studies ignore the endogeneity of education and any estimation not correcting for it is likely to be biased.

Table 4.1 Violence against Woman by Spouses Educational Attainment

Spouse`s Education	Violence	Economic	Emotional	Physical	Sexual
No education/Primary incomplete	0.595	0.317	0.405	0.366	0.121
8 Years Primary School complete	0.500	0.248	0.357	0.205	0.062
Secondary and higher school	0.471	0.218	0.349	0.175	0.055

Source: The Author`s own calculation using data from NRDVW 2014

In this chapter, I study the determinants of spousal violence against women in the context of a developing country, Turkey. I am particularly interested in the role of male education. However, as it was previously mentioned, the inference in this context is hampered by the fact that both education and propensity to engage in domestic violence can be driven by the omitted variable bias, such as upbringing or cultural and social norms. These results are in a bias akin to that caused by endogeneity. To get around this problem, I exploit a specific natural experiment: a three-year exogenous variation in schooling induced by the Compulsory Education Reform (CER) implemented in Turkey in 1997. The reform increased the obligatory schooling from 5 to 8 years and generally improved

[113] See the 4.2 Literature Review for the discussion.

access to education for the affected cohort. In particular, individuals who were born in or after 1987 received three more years of education than those born earlier. I can, therefore, use the variation in the exposure to the CER by birth year as an instrumental variable (IV). I use cross section data collected as part of the 2014 National Research on Domestic Violence against Women in Turkey to estimate the effect of husbands` schooling on domestic violence against women and controlling and socially unaccepted behaviour of husbands.

This study contributes the literature in several respects. First, no previous study has investigated the causal effects of spousal education on exposure of women to domestic violence. It is also the first study to investigate the causal effect of the husband's educational attainment on marriage characteristics, and on controlling and socially inacceptable behaviour of husbands against their wives. Finally, I contribute to the literature on using natural experiments to examine the causal link between education and nonmarket outcomes.

Besides education, I consider also a broad range of other determinants of spouse-inflicted violence against women: employment status of women, unemployment status of husband, differences in age, education and ethnicity between the two spouses, husband's ethnicity, asset ownership of the woman, wealth index of the family, rural residence, husband's and wife's history of maternal physical abuse, husband's history of physical abuse during childhood, and others.

I find that the husband's education reduces the incidence of most sorts of spousal violence, including economic, emotional and physical violence but not of sexual violence. The 2SLS estimates confirm this. Considering some of the other outcomes of interest,

education has no significant association with the incidence of paying bride money to the wife`s family, having a blood relationship with the husband or on controlling behaviour of men. It thus appears that increasing compulsory years of schooling has lowered the incidence of domestic violence but has had little impact on other marriage characteristics.

The study proceeds as follows. Section 4.2 contains the literature review. Section 4.3 describes the Turkish context while Section 4.4 describes the compulsory education reform. Section 4.5 and 4.6 describes the data and empirical strategy. Section 4.7 gives the results and discusses the findings. Lastly, Section 4.8 concludes.

4.2 Literature review

4.2.1 Education Effect

There is already an extensive literature on the causal effect of female education of a broad variety of outcomes. The literature often relies on natural experiments to identify the education effect. Osili and Long (2008) for Nigeria and Breierova and Duflo (2004) for Indonesia suggest that educated women have lower fertility rates. Mocan and Connanier (2012 exploit the variation in program intensity across regions and variation in exposure to the education program generated by date of birth in Sierra Leone. They find that the exogenous increase in educational attainment of women alters the attitudes that empower women. Moreover, their findings indicate that more schooling improves women`s attitudes towards risky health behaviours and reduces their tolerance of violence that threatens a woman`s wellbeing. Women`s education also decreases the desired number of children and raises the usage of modern contraception methods (Mocan & Connanier, 2012).

In contrast, McCrary and Royer (2011) exploit regression discontinuity design and argue that schooling does not drop fertility of women in the United States. Nevertheless, Samarakoon and Pariduri (2015) use exogenous variation in education because of a longer education year in Indonesia in 1978 to deal with the endogeneity of schooling and estimate the effects of women`s education on the empowerment of women with a fuzzy regression discontinuity design. They find that more education reduces the number of live births, increases the usage of contraception and reproductive health practices including breastfeeding, and increases the take-up of tetanus injections. On the other hand, their findings have shown no relationship between women`s education and their authority in decision-making (except savings), ownership of the assets (with the exception of owning jewellery and household appliances) and participation in the community (except visiting community-weighing post).

Several papers investigate the correlation between male`s education and violence against women. Lawako (2008) finds a negative correlation between male education and his justification of intimate partner violence in Kenya, whereas no such association was found for Zambian men. A systematic review of the previous studies in middle and low-income countries reveals that if the partner has at least secondary education, the risk of physical and sexual violence against women from their partners drops significantly (Vyas & Watts, 2009). In the context of China, the extensive review of the literature by Tang and Lai (2008) indicates that lower level education of male or female is correlated with higher prevalence of intimate partner violence against woman.

Studies investigating the effect of female education on spousal violence using credible instruments are rare. There is only one unpublished paper by Erten and Keskin (2016) dealing with the endogeneity of schooling for females. They use the same education

reform in Turkey with an older version of the same survey employed in the present chapter and a Regression Discontinuity (RD) Design. They find that female education has no impact on marriage decision and payment of bride money. Another unpublished paper by Gulesci and Mayersson (2015) also exploited the same education reform by means of RD design but used a different dataset, 2008 Turkish Demographic and Health Survey (TDHS). They find that female education increases the probability of having a say in marriage decision, and decreases the incidence of paying bride money. The closest paper to this one could be Mocan and Connaier (2012), who find that even though female education changes her attitude towards her wellbeing, the education of men does not affect their attitude towards women`s wellbeing.

The previous literature investigating this issue without addressing endogeneity finds that women with higher education who live in more conservative societies may face a higher domestic violence compared to similar women living in less conservative environments (Abuya, Onsomu, Moore, & Piper, 2012; Karamagi, Tumwine, Tylleskar, & Heggenhougen, 2006). If the majority of women in the society come from the higher end of the education spectrum, education plays a protective role against violence, specifically against abuse (Karamagi et al., 2006). It seems that female education is not correlated with spousal violence, rather, the role of the environment is crucial.

There is also no previous literature on husband's education and controlling behaviour against his spouse or other socially unacceptable behaviour of men. These types of behaviours can strengthen the risk of violence against women (Flake, 2005; Jewkes, Levin, & Penn-Kekana, 2002; Koenig et al., 2003; Rao, 1997). The effects of drinking alcohol on increasing marital conflicts, and thus violence, are widely accepted. Nevertheless, there is an ongoing debate about how much alcohol affects violence (Gil-

Gonzalez, Vives-Cases, Alvarez-Dardet, & Latour-Pérez, 2006). The aforementioned unpublished study by Erten & Keskin (2016) find no causal association between the woman's schooling and controlling behaviour of her partner.

Finally, a number of previously unpublished studies use the same education reform in Turkey as an instrument for the schooling of men to investigate education effect on the wage (Aydemir & Kirdar, 2015) and on the health of men (Cesur et al., 2014). They find none or negligible effects of male education on these outcomes.

4.2.2 Effects of Other Determinants

4.2.2.1 Personal history of childhood abuse

According to the "cycle of violence" hypothesis, personal history of childhood abuse increases the likelihood of experiencing or engaging in violence in later years. Previous studies have also shown that experience of violence during childhood is an important determinant of spousal abuse later in life (Ellsberg, Pena, Herrera, Liljestrand, & Winkvist, 1999; Flake, 2005; Gelles, 1980; Jewkes et al., 2002; Kalmuss & Straus, 1982; Martin et al., 2002; Rivera-Rivera et al., 2003; Straus & Gelles, 1986).

Those who witness violence at home during their childhood are more likely to accept violence as normal behaviour (Romito, Saurel-Cubizolles, & Crisma, 2001) even though the behavioural response of children differs according to the severity and frequency of violent behaviours that are experienced (Little & Kantor, 2002). Also, if a husband had experienced violence during childhood, or witnessed violence against his mother, the probability of using violence against his wife is higher (Abrahams & Jewkes, 2005; Naved & Persson, 2005). In the context of Turkey, a recent study has found that if a man or woman has experienced abuse from their parents in childhood, this increases the

likelihood of the woman being a victim of violence at the hands of her husband (Yüksel-Kaptanoğlu, Türkyılmaz, & Heise, 2012).

4.2.2.2 Marriage Formation

There is a correlation between power dynamics among couples and the difference in educational attainment and ages of married couples. If the man is older than the woman, the authority of the husband may increase and this may result in more violence against the woman. In the context of Nepal, Adhikari and Tamang (2010) find age difference between husband and wife to be a significant factor of violence against the wife. However, other studies found a weak correlation with the age difference for Bangladesh (Hindin, Kishor, & Ansara, 2008; Abramsky et al., 2011). On the other hand, the findings are inconclusive about the effect of education gap between couples on violence against women. For example, when women have more education than their partner, they are more likely to experience spousal violence in India (Ap, Kawachi, Barbeau, & Subramanian, 2008), whereas Hindin et al. (2008) report no significant association for Bangladesh.

4.2.2.3 Determinants linked to family

It is important to mention that family-related factors, particularly the dynamics inside the family, has also been proposed as determinants of violence against a woman by her partner. It has been found that violence rises when women are isolated from their biological family and close friends (Ellsberg et al., 1999; Heise, 1998). Additionally, if women are able to obtain more support from their family members, they are less likely to face spousal violence (Clark, Silverman, Shahrouri, Everson-Rose, & Groce, 2010; Naved & Persson, 2005).

4.2.2.4 Characteristics of the Households

Family wealth is generally seen as diminishing the incidence of violence against women (Hoffman, Demo, & Edwards, 1994). For instance, financial difficulties (Jewkes et al., 2002), having a lack of household goods (Carlson, 1984, cited in Flake, 2005) and poverty (Ellsberg, Pena, Herrera, Liljestrand, & Winkvist, 1999) have been noted to raise the risk of violence against women in South Africa, the USA and Nicaragua. In India, Egypt and Peru, women who come from the higher end of the wealth spectrum are protected more compared to women living in lower economic conditions (Kishor and Johnson, 2004). However, other studies have demonstrated a more complicated relationship, which results are dependent on the country studied (Vyas & Watts, 2009).

4.2.2.5 Present circumstances of partners

There is an ambiguous relationship between violence and the employment status of women. Some researchers, for example, find a negative association between violence and women`s employment status. Other researchers, however, have found a positive correlation (Flake, 2005; Kalmuss & Straus, 1982; Vyas & Watts, 2009). More specifically, Rao`s (1997) findings for women in rural South India suggest that the personal income of a woman has a pronounced negative influence on physical violence from her partner. Nevertheless, a recent study by Krishnan et al. (2010) find that low-income women in Bangalore who were employed are more likely to experience domestic violence than women who were unemployed. Furthermore, a change in the employment status of men may also have an effect on violence against women, according to a longitudinal study from Bangalore in India. For instance, men who were employed on the first visit and unemployed on the second visit of the study are around 70% more likely to

inflict violence against her partner than those who were employed in both interviews (Krishnan et al., 2010).

Another study also found that women`s ownership of property such as land lowers the risk of marital violence in Kerala, India (Panda & Agarwal, 2005). Being an owner of a property may offer women a choice outside of marriage as well as a security against labour market shocks. Therefore, it was recommended by Panda and Agarwal (2005) that public policies aiming to reduce violence against women should focus on increasing women`s property rights. Preservation of male dominance due to the existence of patriarchal family structures and female attitudes towards the authority of men inside the family have an effect on violence against women (Heise, 1998; Dibble & Straus, 1980). Several studies confirm the hypothesis that if women accept men's dominance and violence against women in general, they are more likely to experience violence than women who do not accept male dominance and violence against women. Previous studies on the Middle East and North Africa cited in Boy and Kulczycki (2008) underline the importance of men`s and women`s attitudes.

Theoretical literature on empowerment of women has suggested that if women possess a larger proportion of resources at home and take advantage of the opportunities presented to them outside of the home then there would be an enhancement of their empowerment (Lundberg, & Pollak, 1993; Manser & Brown, 1980; McElroy & Horney, 1981). Pitt, Khandker and Cartwright (2006), exploiting instrumental variables, demonstrated that when women have access to microfinance in Bangladesh, they become more confident in making important decisions, their mobility increases, and their participation in social life also improves. Another study by Panda and Agarwal (2005) for India have used regression control strategies and found that if a womans' ownership of land increases, the

authority of women to make important decisions rises, and violence against women decreases.

4.2.2.6 Community-level determinants

One might argue that the behaviours of men might be different towards their spouse as a result of differences in cultural values between urban and rural areas. So far, few studies have investigated community level determinants. In the Middle East, women who live in rural areas are at higher risk of violence than those in urban places (Boy, & Kulczycki, 2008). However, in Peru, living in urban place raises the probability of abuse (Flake, 2005).

4.3 Violence against women in Turkey

In Turkey, domestic abuse of women was put on the public agenda for the first time in the 1980s with the "stop violence" march, organised by the feminist movement in 1987. Since then, the government and feminist organisations have opened safe houses for victims of domestic violence. The Law No. 4320 on the "Protection of the Family" aiming to combat domestic abuse against women, was enacted in 1998. However, women in Turkey still continue to suffer from violence by their intimate partners or family members.

In order to foster the adoption of evidence-based public policies, the first nationally representative survey on domestic abuse against women in Turkey was carried in 2008. It was a cross-sectional, comprehensive and nationally representative survey and the first of its kind in Turkey. The purpose of the study was to determine the prevalence and causes of violence as well as to provide data for further research on this topic. In light of the findings of this research, there has been a substantial enhancement in the legal system to address violence against women in Turkey. For example, Turkey was one of the first

countries signing European Council`s Convention on Prevention and Fighting Violence against Women". To put this convention into action in Turkey, in 2012, Law No. 6284, which brings new legislation on family`s protection and prohibition of domestic abuse against women was put into practice. This new law has opened up new opportunities in the fight against the abuse of women by bringing the legal structure up to international standards with its comprehensive regulations.

Following the legal and institutional changes, the second version of the national survey on domestic violence against women was conducted in 2014 in order to ascertain whether there have been improvements since 2008. This survey was intended to show the consequences of the implementation of no tolerance policies against women abuse, and of other measures taken by the government for the protection, rehabilitation and guidance of affected women to reduce violence against women at every level of society.

The results of the 2014 waves of the National Research on Domestic Violence against Women (NRDVW) show that women in Turkey continue to experience physical, sexual, economic and emotional violence from their intimate partners and husbands. More than a third of ever-married women (36%) reported that they had experienced physical violence at husbands' or intimate partners' hands. Moreover, more than one in ten of ever-married women (12%) were sexually abused at some point in their life. It is worth noting that these two forms of abuse are likely to be experienced together. Approximately 38% of ever-married women were subject to physical and/or sexual violence by their intimate partners or husbands. Furthermore, 30 percent of women have experienced economic violence at some point in their life. Finally, married women in Turkey are more likely to suffer from emotional violence than any other form of abuse: 44% of ever-married women were exposed to emotional violence during their lifetime.

Turkey is a country with a population of more than 80 million and with significant variation in socio-economic development across regions in demographic and socio-economic characteristics. For instance, the Eastern part of Turkey is less industrialised and has seen less socio-economic development than Western Turkey. Moreover, the daily life of many women are still shaped by traditional values, religion and conservative expectations within society.

Women in Turkey are also subject to gender-based discrimination. According to the results of World Economic Forum`s Global Gender Gap index 2014, Turkey is also one of the lowest in the ranking, placed in 125th position out of 142 countries (although there has been a steady improvement with 5.7 % percentage change relative to the 2006 score) and worst performing member of the OECD on the overall index. It is the worst country according to Economic Participation and Opportunity sub index, ranking 132nd. 92 % of women are literate whereas 98% of men are, 75% of males enrol into education, while only 64 % of women do, 32 % of women participate in the labour market whereas 76 % of men do, earnings of females equals 40 percent of male earnings, merely 12 out of 100 legislators, senior officers and managers are women, 14 out of 100 parliament members are women, only 4 percent of ministers are women, and 30.9 % of adolescent girls aged 15-19 already have children of their own (World Economic Forum, 2014).

The above statistics are important evidence of the persistence of male dominance in Turkey, due to the existence of patriarchal family structures and women's attitude towards the authority of men within the family. This, in turn, undermines the empowerment of women. Samarakoon and Parinduri (2015) argue that conservative cultural values and patriarchal families in Asia undermine women`s status, access to education and healthcare services, and participation in the labour market by giving more power and resources to

men. The “missing women” phenomenon reflects a shortfall of women who could have lived if they had similarly benefited from nutrition, general health care as well as medical attention as men (Sen, 1990). According to a recent report by the World Bank, 6 million women are missing every year (World Bank, 2011)

4.4 Institutional Background

Until the approval of the compulsory education law in August 1997, compulsory education was 5 years in Turkey. Public education has been provided free of charge in Turkey since the foundation of the republic in October 1923. The education law change increased the compulsory education to 8 years. By doing so, primary school (grade 1-5) and lower secondary school (grade 6-8) were combined. However, the education reform has had little effect on the quality of education. An in-depth analysis of CER by Dulger (2004) for the World Bank concludes that the 1968 national education curriculum has been kept with minor alteration because of the time constraint during the implementation of the reform. Instead, the Ministry of National Education of Turkey (MONE) was mainly concerned with the capacity of educational institutions. In order to accommodate the new students, the MONE budget was increased by US$2 billion for the period between 1997 and 2000 (Dulger, 2004). With these additional resources, the government constructed new schools, employed new teachers and renovated old schools. For instance, the government of Turkey expanded the capacity of schools by building 81,500 new classrooms for primary education during 1997-2002, which amounts to around 30% capacity increase (World Bank, 2005).

As a result of the enactment of the basic education law and the increased investment in education, there has been a dramatic increase in the gross enrolment rates to primary

education. As can be seen in Figure 4.1, the gross primary school enrolment rate (grade 1-8) decreased somewhat in the period before the compulsory education reform (1990-97). In contrast, there was a sharp increase in the gross enrolment rate in the primary education after the reform's implementation.

The amendment in the education law went into effect in September 1997, immediately after the approval of the law. The cohorts enrolled to 5th grade in September 1997 were required to stay in school until completing 8th grade whereas students who completed fifth grade before September 1997 were not subject to the reform. According to Turkey`s primary education law, the schooling age is calculated by calendar years.[114] Therefore, boys born in 1987, who started the 4th grade in September 1997 or later were exposed to the schooling reform and had to complete 8 years of compulsory education, whereas older individuals were not bound by the reform. However, those who were born in the last quarter of 1986 might be still affected by the reform as the implementation of age threshold was not strict. Because of this reason, I checked the sensitivity of the results by dropping the 1986 birth cohort. In the next section, I discuss the data in detail.

[114] The law published in 21308 edition of the official newspaper of the Turkish Republic states that "A child who completed 72 months by the end of the calendar year can be registered to the first degree of the primary school".

Figure 4.1 Gross enrolment rate in 8-year primary school education by Academic Year

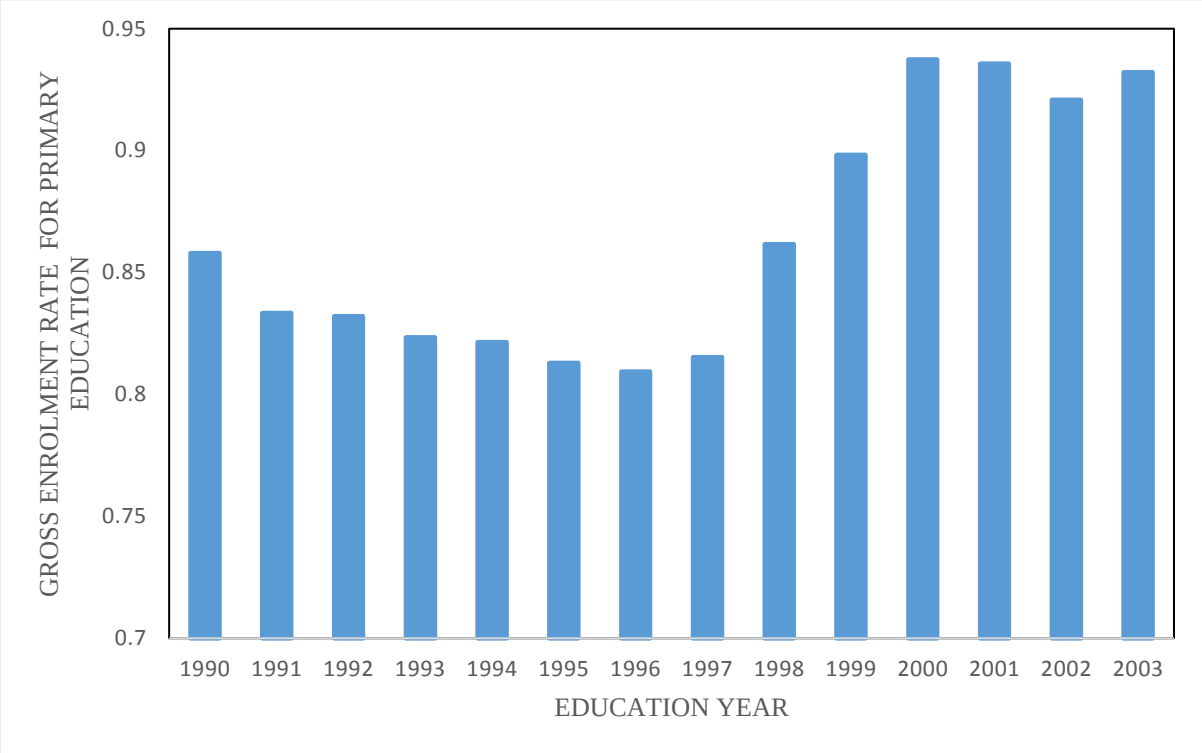


Figure 4.1: Gross enrolment rate in 8-year primary school education by academic year calculated as the number of students in grade 1 to 8 divided by the relevant population at that age group (i.e. aged 6-13). Enrolment rates during the 1990-97 period (prior to the CER) are calculated by adding the sum of the students in the primary school and junior high school. Own calculation based on MONE statistical data for 1990/91 to 2003/04 school years.

4.5 Data and Descriptive Statistics

With the aim of providing nationwide reliable data, so as to combat violence against women effectively, the first wave of the cross section data on domestic violence against women was performed in Turkey in 2008.[115] One of the recommendations from the first survey was to conduct follow-up studies to measure the trends in the prevalence of violence against women. Therefore, in line with the recommendations, the second wave of the study was conducted in 2014. Main research data in this chapter is drawn from this survey, which is the 2014 wave of the National Survey on Domestic Violence against Women (NSDVW).

Considering the sensitivity of the research, the safety of the interviewers and interviewed women carried great importance. To ensure this, within the data collection period, the relevant World Health Organization's ethical and safety guidelines were used in every phase of the research to ensure the safety of the interviewers and the interviewed women.[116] One of the recommendations was using an inoffensive title for the research. For example, instead of the word violence in the title of the survey, "Turkey Women and Family Survey" was used during the fieldwork.

15,084 houses constituted the initial sample size of the study. Out of those, 13,403 were suitable for the interviews. However, the interviews were performed with only 11,247 houses. This means the response rate of the households was 83.9 percent. The absence of households at home, the address being empty at the time of the interview, and rejecting

[115] T.R. Prime Ministry Directorate General on the Status of Women. (2009). *Domestic Violence against Women in Turkey*. Ankara: T.R. Prime Ministry Directorate General on the Status of Women publications

[116] World Health Organization Department of Gender and Women's Health. (2001). *Putting Women First: Ethical and Safety Recommendations for Research on Domestic Violence against Women*. WHO/FCH/GWH/01.1. Geneva: WHO publications.

the interview were the main reasons for not completing the survey in these houses. Next, 13,310 women aged 15-59 were identified for the face to face interview in the households. Of these, 8,960 women were chosen for the interview by means of the Kish method.[117] It is important to remember that by using Kish method the interview was conducted with only one randomly selected woman within the households even if there were more than one woman available in the households. All the interviews started after taking the consent of the respondents. Finally, the survey was conducted with 7,642 suitable women by face to face interviews. Moreover, weighted, stratified, multilevel clustering sampling technique used to obtain data at the national level as well as at urban/rural residence and 26 regions of residence of Turkey.

4.5.1 Questionnaires

Several survey questions identify acts of physical, sexual, emotional and economic violence women experienced from their spouses. These are the same questions used by WHO (see Garcia-Moreno et al., 2005). As stated above, women aged 15-59 constitute the target population of the study. There were two questionnaires employed in the study, household and women questionnaires. In the women questionnaire, women answered questions such as their educational and family related background characteristics, marriages and how their marriages were formed. Another section of the survey features a set of questions regarding background characteristics as well as various questions regarding the behaviour of their spouses towards them.

[117] If there are more than one eligible women in the households for the interview, the Kish method enables an unbiased random selection of one woman (Kish, 1949).

4.5.2 Dependent Variables

Violence indexes[118]

The respondent was asked about her experience of physical, sexual, emotional and economic violence from their current spouse as well as over her lifetime. First, women who have ever had at least one partner answered the first question related to whether a specific type of violence has ever been inflicted on them by their partners. The next questions were asked to women who were victims of spousal violence to identify the frequency of the abuse by their intimate partner. For the sake of the analysis, I combined these two questions to calculate the frequency of the violence. For each violence type, the frequency of the violence ranges from 0 to 8. The value of 0 corresponds to no experience of that particular violence type whereas 8 means that her partner has abused her numerous times during their relationship or marriage.

a) Physical Violence index: Six different variables related to physical violence were used to construct this index. As stated above, the frequency of each variable ranges from 0 to 8, with higher values reflecting a higher frequency of a particular physical abuse by her husband. The variables used to construct the physical violence index are: husband or intimate partner (i) slapped/thrown something that could cause injury at wife, (ii) pulled her hair, (iii) punched or hit her with things that could hurt her, (iv) kicked, dragged or beat her up, (v) burned or choked her, and (vi) threaten her with a gun, knife or any other weapons or actually used it. To form the index, the six variables are added up so that the aggregate index ranges between 0 and 48 as each variable is related to the physical abuse of a woman by her partner. To make the interpretation easier, each index is normalized

[118] As a robustness check, I used PCA, principal component analysis, for the creation of the indices, and I got results that were not different from those presented in the chapter.

by dividing by the maximum possible value. In this example, the maximum value is 48. The normalised index then always ranges between 0 (no experience of violence) to 1 (the highest frequent experience of aggregated physical violence). The same procedure is used to construct the other indexes of violence.

b) Sexual Violence index: 3 variables were used, reflecting whether the woman: (i) was ever forced to have sexual intercourse; (ii) had sexual intercourse because of the fear of her husband; (iii) was forced to participate involuntarily in a sexual act with her husband/intimate partner that she finds humiliating and degrading. Again, to make the interpretation easier, the aggregate index is normalised so that it ranges between 0 (no experience of violence) and 1 (the highest frequent experience of sexual abuse).

c) Economic Violence index: A set of 3 variables were used capturing whether the husband: (i) prevented the woman from working or made her quit her job, (i) refused to give her money for household expenditures even though he had money, and (iii) took her income without her permission. The index again ranges from zero to one.

d) Emotional violence index: The emotional-violence-related variables measure whether the husband: (i) insulted, (ii) humiliated, (iii) scared, or (iv) threatened to hurt the woman. The index again ranges from zero to one.

f) Lifetime violence index: This index collects all 16 variables into a single overall index showing the frequency of all types of violence experienced by the woman from her spouse during her lifetime.[119] Again, the index ranges from zero to one.

[119] These are the aforementioned 6 physical violence variables, 3 on sexual violence, 3 on economic violence and 4 emotional violence variables.

Controlling behaviour index: A set of 9 binary variables, which take the value of one if the woman reports she experienced a particular controlling behaviour from her husband and zero otherwise, are used to construct the index. These are: her husband (i) is trying to keep her away from her friends, (ii) is trying to restrict her contact with her birth family or close relatives, (iii) always insist on knowing where the respondent is, (iv) overlooks and shows little interest in her, (v) gets annoyed when she speaks with other men, (vi) is frequently suspicious that she is unfaithful, (vii) expects her to seek his permission to go to health care service providers, (viii) requires her to dress as he asks, and (ix) interferes with her use of social media, such as Twitter or Facebook. To build the index, variables are added up. The resulting value is divided by the maximum frequency, 9. Hence, the index ranges from zero to one.

Socially unacceptable behaviour index: A set of 5 binary variables, which take the value of one if the woman reports a particular type of behaviour by her husband, is used to build the socially unacceptable behaviour index. These variables are whether her husband: (i) often drinks alcohol, (ii) frequently gambles, (iii) uses drugs, (iv) argues with other men including engaging in physical violence, (v) cheats on her. Again, these are added up and normalised so that the index ranges from 0 to 1.

Unwanted marriage: A dummy variable which equals to one if the woman did not want the marriage and zero otherwise.

Blood relationship with husband: A dummy variable which equals to one if the woman has a blood relationship with the husband and zero otherwise.

Bride money paid: A dummy variable which equals to one if the husband`s family paid bride money to her family and zero otherwise.

4.5.3 Independent Variables:

Asset ownership index of woman: A set of five dummy variables are used to construct the index. Every variable equals one if the woman owns the assets either by herself or jointly with someone else, and zero otherwise. Ownership of land, house, company, vehicle and savings in a bank are included as assets. These are added up and normalise so that the index ranges from zero to one.

Wealth index: This index was calculated by considering the ownership of various assets by the households and specific features of the house to obtain a measurement of the socio-economic status of the households. The method has been previously applied by Filmer and Pritchett (2001). The wealth index ranges from 1 (poorest) to 5 (richest), or from 0.2 to 1 after normalisation, with the richest households taking the value of one.

HGC: Years of formal schooling completed by respondent`s husband

JHS: A dummy variable equals to one if the respondent`s husband completed 8 years or more formal education (junior high school), and zero otherwise.

HSE: A dummy variable equals to one if the respondent`s husband completed 11 years or more formal education, and zero otherwise.

UEDC: A dummy variable equals to one if the respondent`s husband completed 15 years or more formal education, and zero otherwise.

*Husband`s mother experience of domestic violence: Three* dummy variables were generated: (1) the husband`s mother was not abused by her partner, (2) she was abused, (3) the respondent does not know whether her mother in law has experienced violence or not.

*The respondent`s mother experience of domestic violence:* Three dummy variables were generated: (1) the respondent`s mother was not abused by her partner, (2) she was abused, (3) the respondent does not know whether her mother has experienced violence or not.

Husband`s experience of violence: Three dummy variables were generated: (1) her husband was not abused by family members, (2) he was abused, (3) the respondent does not know whether he has experienced violence or not.

Regional dummies: Dichotomous variables for each of the 26 regions where the respondent and her husband live.

Rural: A dichotomous variable was defined as one if the respondent lives in the rural location.

The ethnicity of husband: Three dummy variables were generated, one for each of the following ethnicity types. Turkish, Kurdish, and others.

The difference in ethnicity: A dummy variable equals to one if the husband and respondent have a different ethnicity, and zero otherwise.

The difference in education: Three dummy variables were generated for each of the following categories: (1) husband has more education than his wife, (2) no difference in education, and (3) woman has more education than her husband

The difference in age: Four dummy variables generated for each of the categories: (1) approximately the same age, i.e. maximum one-year age difference. (2) woman is older than her husband. (3) the man is older than his wife by 2 to 4 years. (4) husband is older than his wife by more than 5 years.

Employed woman: A dummy variable was coded as one if a woman works, zero otherwise.

Unemployed husband: A dummy variable coded as one if the husband is unemployed.

Family members of the respondent live far from her: A dichotomous variable which equals one if the respondent lives far from her family, and zero otherwise.

Woman can count on family members for support: Three dummy variables are generated for each category of the family support variable: (1) yes, (2) no, and (3) does not know.

Table 4.2 presents the summary statistics for the outcome and selected explanatory variables. Approximately 25% of the sample were exposed to the Compulsory Education Reform (CER), and approximately 67 % of them finished 8 years of schooling. Additionally, the average number of years schooling completed is around 9. Around 37 % of women did not want to marry their husbands, 23% have a blood relationship with their spouse, and 12% of men paid bride money. Moreover, 84% of women experienced controlling behaviour from their husbands, 21% incurred socially unacceptable behaviour. 27% experienced economic abuse, 37% emotional violence, 26% physical violence, and 8% of women experienced sexual violence. Overall, 54% of women experienced at least one type of violence.

Table 4.2 also presents descriptive statistics for selected independent variables. 25% of husbands' mothers and 29% of the women's mothers experienced spousal violence, and 21% of husbands experienced violence during childhood. 5% of the spouses have a different ethnicity, 44.5% of the men have more education than their wife, and 35% of men are around the same age with their wife.

Table 4.2 Descriptive Statistics for Dependent and Selected Independent Variables

Variables	Obs.	Mean	Std. Dev.	Min	Max
Dependent Variables					
Life time violence	1270	0.531	0.499	0	1
Life time economic violence	1291	0.270	0.444	0	1
Life time emotional violence	1294	0.373	0.484	0	1
Life time physical violence	1286	0.257	0.437	0	1
Life time sexual violence	1302	0.081	0.273	0	1
Unwanted marriage	1303	0.371	0.483	0	1
Blood relation with wife	1300	0.234	0.424	0	1
Husband paid bride money	1301	0.123	0.328	0	1
Man controlling behaviour	1292	0.835	0.371	0	1
Socially unacceptable behaviour	1299	0.208	0.406	0	1
Explanatory variables					
Completing Junior high school	1292	0.671	0.470	0	1
Years of education completed	1292	8.949	3.672	0	19
Man aged 23/27	1303	0.252	0.435	0	1
Husband`s mother experienced spouse violence	1302				
No[r]		0.520	0.500	0	1
Yes		0.252	0.434	0	1
Does not know		0.228	0.420	0	1
Husband experienced physical violence from his family during his childhood	1300				
No[r]		0.612	0.487	0	1
Yes		0.212	0.409	0	1
Does not know		0.175	0.380	0	1
Woman`s mother experienced violence from her spouse	1303				
No[r]		0.665	0.472	0	1
Yes		0.294	0.456	0	1
Does not know		0.041	0.198	0	1
Wealth index of the family	1303	0.588	0.268	0.2	1
Difference in ethnicity	1298	0.052	0.221	0	1
Educational difference	1292				
No difference in education [r]		0.318	0.466	0	1
Woman has more education		0.236	0.425	0	1
Husband has more education		0.445	0.497	0	1
Age difference	1303				
Almost the same age[r]		0.352	0.478	0	1
Women is older than man		0.088	0.284	0	1
Man is older than woman 2/4 years		0.290	0.454	0	1

Man is older than woman more than 5 years		0.270	0.444	0	1
Husband`s ethnicity	1299				
Turkish[r]		0.777	0.416	0	1
Kurdish		0.172	0.378	0	1
Other		0.051	0.219	0	1
Employed woman	1303	0.255	0.436	0	1
Unemployed husband	1303	0.061	0.240	0	1
Asset ownership of woman	1302	0.233	0.423	0	1
Woman family members live far away from her	1303	0.325	0.469	0	1
Woman counts on family support in case of a need	1301				
Yes[r]		0.814	0.389	0	1
No		0.160	0.367	0	1
Does not know		0.025	0.157	0	1
Lives in rural residence	1303	0.202	0.401	0	1

r used as a reference category

Moreover, the vast majority (78%) of the men are Turkish, most women do not work (26% are employed) whereas only 6% of the men are unemployed, 23% of the women own of at least one type of asset, 32% of the women live far from their birth family, 81% of the women report that they can count on their families for support, and 20% of the respondents live in rural area.

4.6 Empirical Framework

The link between education and its non-market returns is captured by Equation (1) below, where Y stands for the non-market outcome of interest. This can be domestic violence and abuse, or marriage characteristics, such as whether the spouses have a blood relationship; the husband paid bride money; or the wife was forced into the marriage.

$$Y_i^{OLS} = \sigma + \theta X_i + \beta S_i + \varepsilon_i \qquad (1)$$

S_i represents the schooling of husband *i* measured by completing junior high school (i.e. completing 8 years of education). X_i consists of a vector of independent variables, which include: (i) personal abuse history of the husband, his mother`s and wife's mother, (ii) characteristics of the couple, such as dummies for age, education and ethnicity differences, and employment status of both husband and wife, (iii) ethnicity of the husband, (iv) wealth index of the family, (v) asset ownership index of the woman, (vi) dummies for whether woman lives close to her birth family; and can count on family support in an emergency. Equation (1) also controls for dummies for the region of residence for 26 regions of Turkey and for living in a rural neighbourhood.[120]

[120] Although control variables are likely to be endogenously determined, I still control for these variables in order to account for the fixed effects of these determinants on violence against women. Importantly, this issue applies to control variables which are interesting but not crucial. Even if those coefficients are biased, it should not affect the estimated effect of education, which is the main point of the chapter.

Robust standard errors are clustered at the 26 regions of residence of the country in all regressions. At a first glance, it seems the number of clusters is relatively small. According to Bertrand, Duflo, & Mullainathan, (2004), if the number of clusters is less than 42-50, the null hypothesis is more likely to be rejected even if it is true. However, a more recent study by Cameron et al., (2008) reaches a more optimistic conclusion about drawing inferences with few clusters and finds that the likelihood of the rejection of the null hypothesis, when it is true, is lower when there are less than 20 clusters. Hence, it can be said that the number of clusters in this study is sufficient to obtain reliable clustered robust standard errors.

Some of the outcomes considered are dichotomous such as the various marriage characteristics. One could argue that it is appropriate to use the Probit or Logit estimation technique for those dichotomous dependent variables in such circumstances. However, if most of the control variables and the instruments are dummies as in the case of this study, it is common practice to use the Ordinary Least Square (OLS) as it will not bias the estimates.

However, the results can be biased by the endogeneity of schooling, reverse causality between education and outcome variables or measurement error, yielding biased coefficients. To deal with this, I exploit the three-year exogenous variation in schooling attainment across cohorts induced by the timing of the Compulsory Education Reform as an instrument for education. A valid instrument should have no direct effects on the outcome of the interest other than its impact through education. My instrument satisfies this condition. First, the compulsory education reform (CER) was implemented due to political events in 1997, so that it has no connection with the outcomes considered in this study. Specifically, the main purpose of the reform was to prevent the spread of religious

education, and the law related the reform was enacted by the voters of the secular government, which came to the office just before the introduction of the education reform. Second, factors causing endogeneity of the schooling and reverse causality problems, such as ability bias and other background characteristics, are unlikely to be related to the birth year. For all these reasons, I am confident that the reform satisfies above-mentioned validity condition.

The men who were born in 1987 and who started the fourth grade in September 1997 or in subsequent years were exposed to the schooling reform and therefore completed 8 years of compulsory education. Older individuals were not bound by the reform. However, individuals who were born in the last quarter of 1986 might be still affected by the reform as the implementation of schooling starting age law was not strict. Because of this, I checked the sensitivity of the results by dropping the 1986 birth cohort.

Angrist (1991) and Angrist (2001) recommend using the Two Stage Least Square (2SLS) rather than IV-Probit or Logit as the instrument and dependent variables are dummies. Imbens and Angrist (1994) demonstrate that the conventional 2SLS estimates identify the Local Average Treatment Effect (LATE). It is the effect of the treatment on those who changed their behaviour due to the instrument (i.e. compliers). Moreover, in such a case, the 2SLS technique estimates LATE without any bias (Angrist, 2009). There are numerous examples of using the 2SLS and Linear Probability Models instead of IV Probit/Logit and Probit/Logit in the economics of education literature (e.g. Cesur et al., 2014; Clark & Royer, 2013; Jürges, Reinhold, & Salm, 2011; Siles, 2009; Xie & Mo, 2014).

The first stage of the 2SLS estimation is given by equation 2:

$$\widehat{S_i} = \gamma + \rho X_i + \sigma treated_i + \mu_i \quad (2)$$

where $\widehat{S_i}$ is the predicted value of schooling of men measured, alternatively, by the number of years of education and by completing junior high school (i.e. completing 8 years of education); X_i is the set of control variables defined above; *treated* is a dummy variables equal to one for men born in or after 1987, and zero for those who were born before 1986. Hence, men aged 23-27 in 2014 constitute the treated group, and older men aged 28-33 form the control group.

It is conventional in the literature to estimate the Linear Probability Model of Equation (1) without controls to test the validity of the treatment and control groups. To do this, the $treated$ dummy is replaced by dummies representing each age of the respondents (in years) at the time of the survey. Figure 4.2 plots the coefficients of these age dummies.[121] These are jointly significant for ages 23-27, and insignificant for men aged 28 to 32 (the p-values are 0.018 and 0.996, respectively).[122]

If the education reform has no direct impact on the outcomes other than its effect on schooling, the results of Equation (2) can be used as the first stage of the 2SLS estimation. More specifically, $treated$ serves as an instrument for schooling.

Therefore, unbiased effect of education can be obtained by estimating Equation 3:

$$Y_i^{2SLS} = \varphi + \delta X_i + \gamma \widehat{S_i} + \varepsilon_i \quad (3)$$

[121] Unreported results of this unrestricted model are available upon request.
[122] Men aged 33 years is the omitted age dummy.

where $\widehat{S_i}$ indicates the predicted value of schooling, as given by Equation (2), and Y_i^{2SLS} shows the outcome of interest. The remaining explanatory variables and clustering of robust standard errors are the same as in Equation (2).

Finally, both the OLS and 2SLS methodologies give structural estimates. By replacing $\widehat{S_i}$ in Equation (2) with the outcome of interests, I can obtain the reduced form (RF) estimates:

$$Y_i^{rf} = \beta + \mu X_i + \varphi treated_i + e_i \quad (4)$$

where φ indicates the RF effect of the compulsory education reform. The RF estimates measure the change in the outcome of interest induced by the exposure to the CER.

4.7 Regression Results and Discussion

4.7.1 First Stage Results of the 2SLS Estimation

Table 4.3 shows the effect of CER on various measures of educational attainment, which serve as the first stage of the 2SLS estimates. Robust standard errors clustered at the 26 regions of residence are reported in parenthesis. All regressions control for a broad range of individual and couple-specific characteristics and fixed effects for 26 regions of residence.

Figure 4.2 Coefficients of age dummies

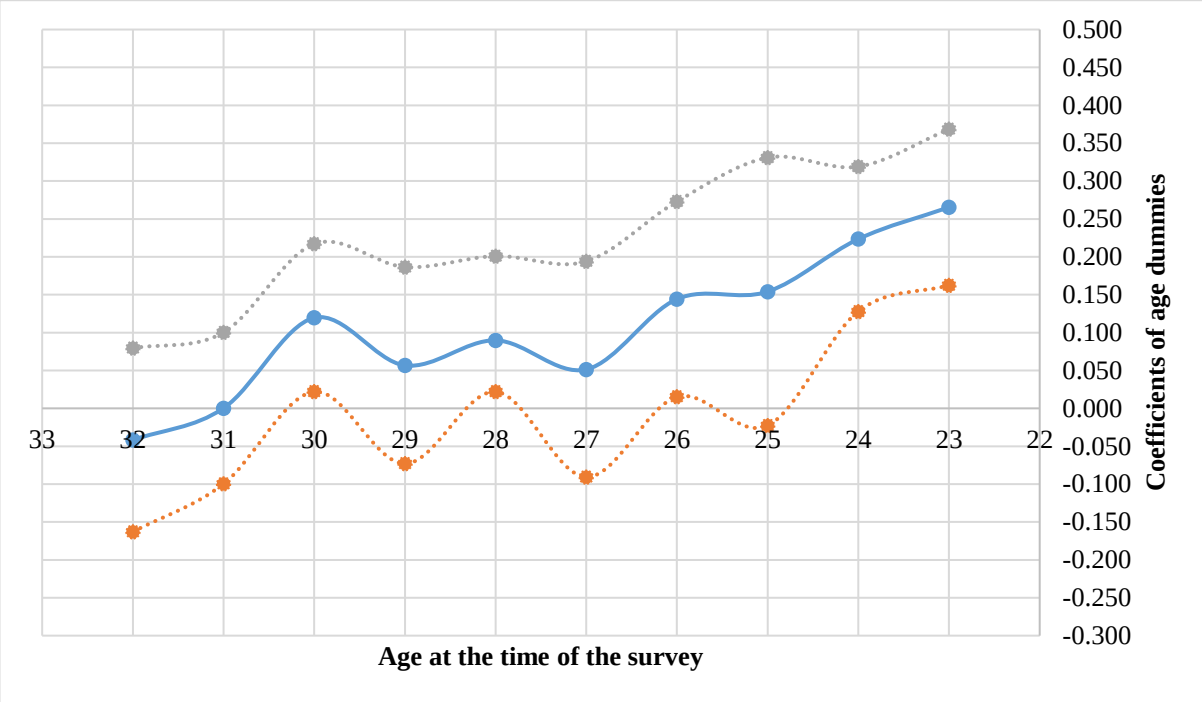


Figure 4.2 Coefficients of age dummies. *Notes: The sample covers all men aged of 23-33 at the time of the survey. Men aged 28 are the youngest unaffected birth cohort. Each point on the solid line shows the coefficients of each age dummies. Dashed lines show 95% confidence interval.*

It is clear from Table 4.3 that the CER has a significant effect on educational attainment of the treated cohort. The F statistics, testing the validity of the excluded instrument, is very high for completing 8 years of education (JHS). However, it is relatively low for the years of education, and insignificant for completing senior high school (SHS) and obtaining a university degree (UEDC). This is not surprising, as the CER had no direct effect on the higher stages of education. These results are important since if the value of F statistics is less than 10, the weak instrument problem arises (Staiger & Stock, 1997). For this reason, completing 8 years of education variable will be considered as the sole measure of schooling in this chapter.

The reform has had a considerable effect on the probability of completing 8 years of schooling for individuals aged 23 to 27. More specifically, the results of column 2 in Table 4.3 suggest that the probability of completing at least 8 years of compulsory education increases by 18 percentage points, which corresponds to a 28.5 percent jump in the share of those completing 8 years of education, which was 63 percent before the reform. Thus, it can be said that compulsory education reform is a highly relevant instrument and had a substantial positive effect on the educational attainment. Moreover, these results do not change significantly when I exclude the individuals born in 1986 (these results are available upon request).

Table 4.3 The Effect of CER on School Completion (First Stage Results)

VARIABLES	HGC	JHS	SHS	UEDC
Instrument	0.522**	0.176***	-0.000	-0.012
	(0.226)	(0.019)	(0.035)	(0.029)
F statistics	5.350	85.680	0.000	0.180
Observations	1,281	1,281	1,281	1,281

Notes: Robust standard errors clustered at the 26 regions of residence are reported in parenthesis. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. All regressions control for employment status of man and woman, difference in ethnicity between husband and wife, ethnicity of husband, asset ownership index, wealth index, rural residence, husband`s and wife`s maternal physical abuse history, differences in education and age, and fixed effects of 26 regions of residence.

4.7.2 Second Stage Results

4.7.2.1 Effect of Education on Violence

Before presenting the OLS and 2SLS estimates on the effects of spouse`s schooling on spousal violence against women, I explored the effect of the CER on engaging in violent behaviour against one`s spouse, that is, the RF estimates. The second row of Table 4.4 shows the RF estimates. The coefficients of the instrument in RF regressions are significant for general, economic, emotional and physical violence but not for sexual violence. However, the magnitudes of the coefficients are quite small. Overall, considering the sizeable impact of the reform on the schooling of husbands given by Table 4.3, the RF estimates suggest that the effect of education on domestic violence is significant but small.

First and third rows of Table 4.4 display the OLS and 2SLS of returns to schooling, respectively. The OLS estimates of the return to completing 8 years of education are not statistically significant and the coefficients are close to zero for all measures of violence considered. However, the significance and magnitude of the 2SLS coefficients of return to an exogenous increase in schooling vary by the type of violence categories considered. The first column shows that schooling lowers the incidence of overall spousal violence against women by 12.4 percentage points. Considering the sub-components, the negative effect is driven by economic, emotional and physical violence. In particular, husband`s education reduces the frequency of economic violence by 9.3, emotional violence by 19.1

Table 4.4 The Effect of Husband`s Education on Husband's Violent Behaviour against Wife

	General	Economic	Emotional	Physical	Sexual
OLS	-0.013	-0.019	-0.004	-0.014	-0.016
	(0.013)	(0.013)	(0.016)	(0.010)	(0.010)
RF	-0.022***	-0.017***	-0.034***	-0.018***	0.001
	(0.007)	(0.006)	(0.011)	(0.005)	(0.011)
IV	-0.124***	-0.093***	-0.191***	-0.103***	0.197
	(0.034)	(0.035)	(0.055)	(0.026)	(1.465)
Observations	1,250	1,271	1,272	1,264	1,280

Notes: Robust standard errors clustered at the 26 regions of residence are reported in parenthesis. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. All regressions control for employment status of man and woman, difference in ethnicity between husband and wife, ethnicity of husband, asset ownership index, wealth index, rural residence, husband`s and wife`s maternal physical abuse history, differences in education and age, and fixed effects of 26 regions of residence.

and physical violence by 10.3 percentage points. In contrast, the impact of education on sexual violence is not significant.[123]

So far, there is no previous work examining the causal link between the husband`s education and his engagement in violent behaviour against his spouse which addresses the endogeneity of schooling, which makes it difficult to compare my results with those obtained elsewhere. However, there are previous unpublished studies which used the same education reform in Turkey as an instrument for the schooling of men to investigate wage (e.g. Aydemir & Kirdar, 2015) and health effects (e.g. Cesur et al., 2014). They find no or negligible effects of the education of men on these outcomes. Another unpublished study by Erten and Keskin (2016) uses the same education reform with an old version of the same survey employed in the present chapter to address the endogeneity of female`s schooling with a Regression Discontinuity (RD) Design. They find that there is no causal link between female education and spousal violence against women. In contrast, the evidence presented in this section suggests that education has an important impact on reducing spousal violence against women.

In addition, it is clear from Table 4.4 that even though the signs obtained with both estimation methods are similar, the size of the 2SLS coefficients is much larger than with the OLS. However, comparing the OLS and 2SLS coefficients might be misleading as the 2SLS estimate shows only the Local Average Treatment Effect (LATE) for the complier with the education reform. In particular, the weights of each level of schooling distribution in the estimation of average return to schooling on the outcome considered differ between the OLS and 2SLS methodologies. For example, the OLS gives larger

[123] I also used PCA, principal component analysis, to generate violence indexes, as a robustness check and the findings were not different from those presented in Table 4.4.

weights to university graduates to calculate the average treatment effect, and the number of these individuals are low among the compliers. Also, dropping the 1986 birth year yields results that are almost identical. The significance and magnitude of the coefficients are quite analogous to full sample estimates (results are available upon request).

In addition, it is beyond the scope of this study to examine the effects of education reform (through an increase in women`s education) on women`s perception, attitude, tolerating, or reporting violence against women. Having said that, if there is a reform effect through a change in women`s education on these behaviours (all of which seems possible), then the analysis of domestic violence effects of male education can be problematic.

There are various marriage possibilities. Treated or untreated husbands are likely to marry treated wives since husbands are usually older than wives.[124] However, some women in the sample are older than their husbands. This means that treated and untreated men can have untreated wives. Therefore, the treatment status of women is not clear. This may cause a systematic bias in the estimates. Moreover, more educated women due to education reform may be less inclined to marry somebody who they anticipate to be violent. Untreated males after the reform receive less resistance to their violent behaviour than treated males because they are, on average, married to less educated women than the treated males. On the other hand, Erten and Keskin (2016) find a statistically insignificant causal effect of women`s education on spouse violence against them, women`s attitude towards domestic violence against women and features of their husbands. They suggest that higher level of women's education through education reform did not cause an

[124] Treated means individuals who were forced to change their educational attainment due to the education reform, whereas untreated means individuals who were not exposed to the education reform.

empowerment in the households. All in all, even though it is not possible to investigate behavioural changes of women through education because of unclear treatment status of women, available evidence suggests that there might be some shortcomings of this study but they are less likely to be significant.

Lastly, there may be other changes in state polices and perceptions or social norms of the community post compulsory education reform, which are closely linked to the incidence of domestic violence against women. However, the data used in this chapter is a cross section and this would not allow separating out the impacts of these changes from the effects of the education reform through its effect on male`s education. For example, earlier discussion in section "4.3 Violence against women in Turkey" gives information about the legal amendments, institutional changes and zero violence policy of Turkish government that may reduce the incidence of domestic violence against women.

The estimates of this chapter imply that males born post 1987 are less likely to be violent than those born prior to 1987 but this can partially be attributed to these changes happened post compulsory education reform. To deal with this problem, three falsification tests are run. The expectation would be that the falsification tests would produce insignificant link between education and the incidence of domestic violence. If it is not, the drops in the incidence of violence may be attributable to alternative factors, i.e. social trend.

In each test, individuals are selected from participants who are one year older than the previous group. Specifically, three falsification tests are done for individuals aged 30-37 (people aged from 30 to 33 belong to the treatment group), 31-38 (people aged between 31 and 34 are in the treatment group), and 32-39 (people aged 32-35 are in the treatment group) separately. It is important to note that people in these particular samples are not

exposed to the education reform and older individuals in each sample constitute control groups. To get the estimates, this study uses the IV models reported in the third row of Table 4.4. However, the findings of all falsification tests show an insignificant link between husbands` education and the incidence of spousal violence against women.[125] This suggests that presence of government policies aiming to combat violence against woman and other changes in social norms can influence estimates, but falsification tests indicate that their effects on estimates are not significant.

4.7.2.2 Effect on marriage characteristics, controlling behaviour and socially unacceptable behaviour

Next, I turn to the question whether schooling of men has an effect on marriage characteristics, controlling behaviour of men against their spouses and socially unacceptable behaviour of men. These variables constitute channels through which higher male education can alter the incidence of violence against women.

4.7.2.2.1 Marriage Characteristics

Columns 1 to 3 of Table 4.5 present the effects of husbands' education on marriage characteristics. The RF estimates are reported in the second row of Table 4.5. The estimates indicate that the reform caused a statistically significant drop in the share of women who had an unwanted marriage. However, the instrument has had no significant impact on the incidence of paying bride money to the wife`s family and having a blood

[125]Also, the first stage F-statistics are between 6 and 8 for falsification tests. Results are available upon request.

Table 4.5 The Effects of Husband`s Education on Potential Mechanisms

	Unwanted marriage	Relationship with husband	Partner paid a bride price	Controlling behaviour	Socially unacceptable behaviour
OLS	-0.178***	-0.094**	-0.058*	-0.022	-0.000
	(0.031)	(0.036)	(0.030)	(0.014)	(0.010)
RF	-0.107***	0.049	0.004	0.001	-0.014*
	(0.024)	(0.036)	(0.020)	(0.014)	(0.007)
IV	-0.607***	0.279	0.024	0.007	-0.078*
	(0.140)	(0.213)	(0.108)	(0.078)	(0.041)
Observations	1,281	1,279	1,279	1,270	1,278

Notes: Robust standard errors clustered at the 26 regions of residence are reported in parenthesis. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. All regressions control for employment status of man and woman, difference in ethnicity between husband and wife, ethnicity of husband, asset ownership index, wealth index, rural residence, husband`s and wife`s maternal physical abuse history, differences in education and age, and fixed effects of 26 regions of residence.

relationship with the husband. Therefore, I can conclude that the schooling reform has had little impact on marriage characteristics.

The OLS estimates of marriage formation characteristics indicate that husband education led to a decline in the prevalence of having an unwanted husband by 17.8, having blood relationship with wife by 9.4, and paying bride money by 5.8 percentage points. However, the 2SLS estimates suggest that completing 8 years of formal schooling by the husband leads to a 60.7% point reduction in the prevalence of having an unwanted marriage, whereas the effect on the other characteristics is insignificant.

Once again, to the best of my knowledge, this is the first study assessing the impact of male education on these marriage characteristics while dealing with the endogeneity of education. However, there are plenty of studies exploring the effects of female education on marriage outcomes, which address the endogeneity of the education in a similar fashion. For instance, in the context of Turkey, a recent unpublished study used an old version of the same data set with a regression discontinuity design (RD) (Erten & Keskin, 2016). They find that female education has no impact on marriage decision and payment of bride money. Another unpublished study by Gulesci and Mayersson (2015) also exploited the same education reform by RD design but used a different data set, 2008 Turkish Demographic and Health Survey (TDHS). They find that female education increases the probability of having a say in marriage decision, and decreases the incidence of paying bride money. Moreover, in the context of Indonesia, Breierova and Duflo (2004) exploited a massive school construction program as an instrument for schooling and find that wife`s education is strongly associated with marriage age and early fertility choice, however, spouses` education is an equally important determinant of child mortality.

4.7.2.2.2 Controlling and Socially Unacceptable Behaviours

Columns 4 and 5 of Table 4.5 present the effects of education on the frequency of engaging in controlling behaviour against the wife and socially unacceptable behaviour of men. The OLS estimates in row 1 shows no statistically significant correlation between the husband`s education and these outcomes. However, the 2SLS estimates in row 3 indicate that education is negatively associated with the intensity of socially unacceptable behaviour. The 2SLS results indicate that completing 8 years of schooling does not improve the incidence of controlling behaviour, whereas it decreases the intensity of socially unacceptable behaviour by 7.8 percentage points. The RF estimates for male controlling behaviour also suggest that the reform has had no impact on its frequency. On the other hand, it has generated a reduction by 1.4 percentage points in the frequency of the socially unacceptable behaviour. However, the 2SLS and RF coefficients of this index are only statistically significant at the 10-percent level. Hence, it appears that the reform has had a negligible impact on controlling behaviour and socially unacceptable behaviour.

The magnitude of the 2SLS estimates is again much higher than the OLS ones, and the significance levels are also often different. However, as discussed earlier, comparing the OLS and 2SLS coefficients might be wrong as the 2SLS estimates show the impact of education on compliers with the education reform (LATE) only. Also, different weights are associated with every level of education in the OLS and 2SLS. To investigate this issue in detail, in the next section, I impose different restrictions to the highest educational attainment in the sample. Lastly, exploring the sensitivity of the results reported in Table

4.5 by dropping 1986 birth year does not alter the findings: the significance and magnitude of the coefficients are similar to those with the full sample.[126]

4.7.3 Effects of Other Explanatory Variables

Next, I examine the other determinants that affect spousal violence against women, marriage characteristics or controlling and socially unacceptable behaviour of men. Table 4.6 shows the impacts of the other factors. These correspond to the 2SLS regressions reported as the third row of Tables 4.4 and 4.5.

The effects of the ethnicity of husband, a proxy for his cultural environment, indicates that Kurdish men are more likely to pay bride money for their wife than Turkish men. However, the incidences of socially unacceptable behaviours, emotional and physical violence are all lower for Kurdish compared to Turkish husbands.

Personal abuse history of both spouses seems to be an important determinant of the outcomes examined. Compared to a husband without a mother who experienced physical violence from their partner, the intensity of all violence measures and the frequency of controlling behaviour increase when the husband`s mother was abused by her husband. Similar increases in domestic violence (with the exception of economic violence) and controlling behaviour are also associated with the husband's history of physical abuse during childhood. History of physical abuse on the woman's mother`s side is associated with similar increases in domestic violence with respect to general, economic, emotional and physical violence as well as in the frequency of controlling and socially unacceptable

[126] The results are available upon request.

behaviour. Hence, domestic violence, on either the husband's or wife's side, can have significant repercussions also in future generations.

If a woman has more education than her husband, the probability of unwanted marriage increases compared to couples with no education difference. When the education difference is in favour of men, the intensity of general, economic, emotional and physical violence and the probability of having unwanted marriage increases.

Women who are older than their husband are significantly more likely to have an unwanted marriage, while the likelihood of paying bride money to marry falls. Furthermore, general, economic and sexual violence and controlling behaviour become less likely. If the man is older than his wife by 2-4 years, women are more likely to experience general and physical violence, while the incidence of paying bride money again falls. If the husband is older than his wife by more than 4 years, the probability of having an unwanted husband increases. In all cases, the reference category is couples with an age difference up to 1 year.

A crucial determinant of the dependent variables explored in this study is "counting on family members for support". A woman who does not think her birth family would support her in an emergency experiences more physical violence. The husband of such a woman is also more likely to pay a bride price, but she is less likely to have an unwanted marriage. If the woman`s birth family lives far from her, there is a higher likelihood of having a blood relationship with the husband. Moreover, if the woman lives in rural area, she is more likely to have an unwanted marriage, but the incidences of economic violence and socially unacceptable behaviours of men both fall.

Table 4.6 Effects of Other Control Variables

VARIABLES	General	Economic	Emotional	Physical	Sexual	Unwanted marriage	Relationship with husband	Husband paid a bride price	Controlling behaviour	Socially unacceptable behaviour
Husband`s mother abused	0.044***	0.048***	0.066***	0.020**	0.537**	0.044	0.097	0.011	0.047**	0.010
	(0.012)	(0.016)	(0.016)	(0.009)	(0.270)	(0.033)	(0.063)	(0.019)	(0.019)	(0.014)
Husband does not know	-0.016	-0.005	-0.019	0.020***	-0.158	-0.054	-0.053*	0.054**	0.005	-0.006
	(0.010)	(0.011)	(0.015)	(0.007)	(0.168)	(0.043)	(0.031)	(0.021)	(0.019)	(0.012)
Abused husband	0.037***	0.001	0.063***	0.034***	0.645**	-0.048*	-0.008	-0.019	0.044**	0.025
	(0.012)	(0.010)	(0.016)	(0.012)	(0.306)	(0.028)	(0.026)	(0.021)	(0.018)	(0.017)
Does not husband abused	0.019	0.003	0.039	0.016	0.014	0.010	0.003	0.023	0.033*	-0.014
	(0.014)	(0.011)	(0.024)	(0.010)	(0.181)	(0.066)	(0.044)	(0.028)	(0.018)	(0.013)
Abused mother	0.039***	0.021**	0.046***	0.036***	0.346	0.043	0.008	0.003	0.048***	0.016*
	(0.009)	(0.009)	(0.015)	(0.007)	(0.234)	(0.040)	(0.035)	(0.017)	(0.015)	(0.008)
Does not know mother abused	0.012	0.028	-0.000	0.018	-0.306	-0.133	-0.079	-0.045	0.037	0.055***
	(0.016)	(0.019)	(0.028)	(0.013)	(0.311)	(0.095)	(0.055)	(0.038)	(0.027)	(0.021)
Woman has more education	0.006	-0.002	0.007	0.001	0.086	0.120***	-0.057	0.008	0.015	0.007
	(0.012)	(0.011)	(0.020)	(0.011)	(0.239)	(0.034)	(0.041)	(0.022)	(0.023)	(0.015)
Man has more education	0.029**	0.029**	0.047**	0.018*	-0.097	0.205***	-0.066	0.004	0.017	0.004
	(0.013)	(0.012)	(0.022)	(0.010)	(0.370)	(0.056)	(0.061)	(0.035)	(0.027)	(0.014)
Woman is older than man	-0.019*	-0.025**	-0.022	-0.008	-0.289*	0.144**	0.055	-0.054**	0.057***	-0.023
	(0.011)	(0.012)	(0.019)	(0.011)	(0.173)	(0.070)	(0.043)	(0.024)	(0.018)	(0.014)
Man is older than woman 2/4 years	0.026***	0.012	0.052***	0.012	0.153	0.018	-0.011	-0.049**	0.001	0.005
	(0.009)	(0.013)	(0.011)	(0.008)	(0.360)	(0.036)	(0.038)	(0.021)	(0.016)	(0.012)
Man is older than woman more than 5 years	-0.006	-0.013	0.002	-0.006	-0.111	0.060*	-0.072	0.008	0.009	-0.006

	(0.007)	(0.008)	(0.012)	(0.005)	(0.186)	(0.035)	(0.047)	(0.018)	(0.019)	(0.013)
Husband`s ethnicity Kurdish	-0.033	-0.025	-0.053**	-0.035**	0.319	-0.072	0.183	0.220***	0.001	-0.025*
	(0.020)	(0.017)	(0.024)	(0.017)	(0.530)	(0.051)	(0.112)	(0.033)	(0.025)	(0.014)
Husband`s ethnicity others	0.066***	-0.038**	0.104***	0.043***	1.086***	0.023	0.153	0.413***	-0.058**	0.049***
	(0.016)	(0.018)	(0.027)	(0.016)	(0.384)	(0.076)	(0.122)	(0.070)	(0.024)	(0.011)
Woman`s birth family supports woman in case of a need	0.015	0.008	0.002	0.018*	0.418	-0.061*	0.014	0.118***	0.026	0.005
	(0.012)	(0.015)	(0.020)	(0.010)	(0.340)	(0.037)	(0.054)	(0.033)	(0.021)	(0.015)
Woman is not sure about her birth family`s supports in case of a need	-0.001	-0.013	-0.014	0.019	1.110	0.076	-0.028	0.079	0.068	0.031
	(0.024)	(0.019)	(0.033)	(0.024)	(0.912)	(0.106)	(0.062)	(0.054)	(0.046)	(0.027)
Wealth index	0.008	0.001	0.028	0.013	-0.775	0.087	0.444***	-0.049	-0.076	0.035
	(0.028)	(0.027)	(0.046)	(0.023)	(0.742)	(0.098)	(0.116)	(0.107)	(0.057)	(0.029)
Difference in ethnicity	0.015	0.017	0.020	0.005	0.417	-0.104*	-0.078	0.122***	0.028	0.033
	(0.023)	(0.022)	(0.032)	(0.017)	(0.432)	(0.060)	(0.079)	(0.039)	(0.035)	(0.022)
Employed women	0.006	-0.002	0.013	0.005	-0.119	-0.009	-0.023	-0.014	-0.003	0.041***
	(0.008)	(0.008)	(0.012)	(0.008)	(0.242)	(0.023)	(0.046)	(0.026)	(0.014)	(0.012)
Unemployed husband	0.001	0.019	-0.007	-0.001	-0.224	-0.020	-0.011	-0.018	0.005	0.071***
	(0.013)	(0.021)	(0.020)	(0.011)	(0.241)	(0.084)	(0.061)	(0.049)	(0.024)	(0.026)
Asset ownership index	-0.028	-0.003	-0.043	-0.031**	-0.404	-0.095	-0.099	-0.054	-0.062	0.047
	(0.018)	(0.018)	(0.028)	(0.013)	(0.407)	(0.085)	(0.081)	(0.040)	(0.040)	(0.029)
Family lives far	0.002	-0.003	0.018	0.001	0.101	0.043	0.027	0.035**	-0.008	0.005
	(0.007)	(0.005)	(0.012)	(0.007)	(0.193)	(0.070)	(0.019)	(0.016)	(0.017)	(0.008)
Rural	-0.007	-0.014*	-0.014	-0.002	0.174	0.082**	0.005	0.082	0.018	-0.024**
	(0.008)	(0.008)	(0.009)	(0.009)	(0.216)	(0.034)	(0.051)	(0.056)	(0.013)	(0.010)
Observations	1,250	1,271	1,272	1,264	1,280	1,281	1,279	1,279	1,270	1,278

Notes: This table reports the coefficients explanatory variables of the 2SLS model specifications reported in the third row of Tables 4.4 and 4.5. Significance: *** p<0.01, ** p<0.05, * p<0.1 . Robust standard errors adjusted for clustering at the 26 regions of residence are reported in parenthesis. All models control for fixed effects of 26 regions of residence and include the instrumented schooling variable.

One percentage point increase in the family wealth index increases the probability of blood relationship with husband by 44.4 percentage points. Moreover, ethnicity difference of couples decreases the likelihood of unwanted marriage and of paying bride money. The intensity of socially unacceptable behaviour of men increases when the wife works and also when the husband is unemployed. Having her own assets is also important: one percentage point increase in the asset ownership index of a woman decreases the intensity of physical violence by 3.1 percentage points.

4.7.4 Sensitivity Tests: Restricted Schooling Attainment Outcomes

The 2SLS estimate shows the impact of education on compliers (LATE) only. As shown before, the education reform has no impact on obtaining senior high school (SHS) or university degree. If the reform does not have any spillover effects on completion of university and senior high school degrees, removing SHS and university graduates from the sample does not alter the composition of compliers. However, some members of the control group hold SHS and university degrees, and to some extent, their observed control variables should be dissimilar from others in the sample. Because of these, excluding them from the sample might have a significant impact on the estimated coefficients (Aydemir & Kirdar, 2015). To explore this in detail, in this section, I impose different restrictions on the highest educational attainment in the sample.

Firstly, I remove the university graduates. Row B of Table 4.7 shows the results of the 2SLS estimates for people who hold at most a SHS degree.[127] It is apparent from the table that the results are robust to this.[128] Next, I exclude also SHS graduates. Now, the sub-

[127] Model specifications of the third row of Tables 4.4 and 4.5 are used to the estimates reported in Table 4.7.

[128] In this restricted sample, the effects of the reform on completing 8 years of education, JHS, was also quite similar to the baseline estimates.

sample includes only compliers, many of whom would complete only 5 years of schooling in the absence of the reform but were required to complete 8 years of compulsory schooling after the CER was implemented. As shown by Row C of Table 4.7, the education effect falls but remains significant after excluding senior high school graduates across the board: for general, economic, emotional, and physical violence, for unwanted marriage, and for socially unaccepted behaviour. Moreover, the OLS coefficients are still much lower than the 2SLS estimates, and including or excluding birth cohort of 1986 does not change the estimates significantly.[129]

The results with restricted education attainment are not surprising. One of the explanations for the drops in magnitude of the education coefficient could be that the causal link between education and its non-market returns exists but it does not appear on the low schooling margin. For instance, Cutler and Lleras-Muney (2010) find a more pronounced relationship between education and health when individuals are on the high schooling margin. Moreover, Aydemir and Kirdar (2015) also use the same schooling reform with a different data set to estimate wage effects of schooling and finds similar estimates with narrowed composition of education distribution.

4.7.5 Sensitivity Tests: Narrower Birth Year Window

I further tested the sensitivity of the baseline results by employing a narrower window of birth years around the treatment year: individuals aged 24 to 31. The individuals aged 24 to 27 form the treatment group, whereas older individuals belong to the control group. By doing this, the two groups became more similar in terms of age; the downside is a much smaller sample size. As shown by Row D of Table 4.7, after narrowing the window

[129] The OLS results are available upon request.

around the treatment, the 2SLS estimates and their standard errors get larger for all outcome measures as expected so that the estimates become statistically insignificant for economic violence and socially unacceptable behaviour of men. Cesur et al. (2014) exploited the same education reform with a different data set to estimate health effects of education and reaches a similar conclusion with narrower age sample.

4.8 Conclusion

This chapter constitutes, to the best of our knowledge, the first empirical investigation of the relationship between the husbands' education and violent and abusive behaviour against women, estimated in a way that is robust to endogeneity of education. Specifically, I take advantage of a natural experiment, a compulsory education reform in Turkey, which increased legally mandated schooling from five to eight years. The results of our analysis suggest that increasing male education reduces the incidence of domestic violence in general, and for most types of violent behaviour: physical, emotional, and economic, the only exception is sexual violence, which is not affected by an increase in education. Higher education also reduced the frequency of marriages that were concluded against the woman's wishes and makes men less prone to engage in socially unacceptable behaviour (drinking, gambling, drug abuse and the like), albeit this effect is somewhat less precisely estimated.

Education has important private and social returns, which are well documented in previous literature. Our analysis suggests a range of additional benefits. Given the widespread incidence of domestic abuse against women, in developed and developing countries alike, and the adverse effects that it has on women, the effects identified by our analysis can lead to substantial improvements in women's wellbeing.

Furthermore, our results show support for the cycle of violence hypothesis: the history of maternal domestic abuse, either on husband's or wife's side, increases the incidence of domestic violence at present. Therefore, reducing violence against women today can lead to improvements both contemporaneously and in the future

Table 4.7 Effects of the 2SLS Estimates by Imposing Various Restrictions

	General	Economic	Emotional	Physical	Sexual	Unwanted marriage	Relationship with husband	Husband paid a bride price	Controlling behaviour	Socially unacceptable behaviour
A. 2SLS full sample	-0.121***	-0.093***	-0.191***	-0.103***	0.197	-0.607***	0.279	0.024	0.007	-0.078*
	(0.034)	(0.035)	(0.055)	(0.026)	(1.465)	(0.140)	(0.213)	(0.108)	(0.078)	(0.041)
Observations	1,250	1,271	1,272	1,264	1,280	1,281	1,279	1,279	1,270	1,278
B. Less than University Education	-0.121***	-0.091***	-0.175***	-0.102***	0.076	-0.615***	0.250	0.058	0.035	-0.078**
	(0.034)	(0.033)	(0.054)	(0.025)	(1.468)	(0.138)	(0.165)	(0.106)	(0.074)	(0.038)
Observations	1,128	1,148	1,147	1,140	1,155	1,156	1,154	1,154	1,145	1,153
C. Less than SHS education	-0.094***	-0.071**	-0.161***	-0.074***	0.653	-0.465***	0.166	0.037	0.004	-0.05
	(0.034)	(0.031)	(0.047)	(0.024)	(1.535)	(0.157)	(0.132)	(0.087)	(0.062)	(0.037)
Observations	703	716	718	713	721	722	720	720	713	720
D. 4 years Date of Birth Window	-0.164***	-0.106	-0.252***	-0.139***	-0.420	-0.753***	0.530	0.100	-0.015	-0.094
	(0.059)	(0.068)	(0.094)	(0.046)	(2.413)	(0.264)	(0.373)	(0.157)	(0.096)	(0.074)
Observations	834	848	850	847	856	857	856	855	848	856

Notes: Robust standard errors clustered at the 26 region of residence are reported in parenthesis. Besides, I report the F statistics on the excluded instrument. *** p<0.01, ** p<0.05, * p<0.1 shows the significance of the coefficients at 1, 5 and 10 percent level respectively. All regressions control for working status of man and woman, difference in ethnicity husband and wife, ethnicity of husband, asset ownership index, wealth index, rural residence, husband`s and wife`s maternal physical abuse status, husband`s physical abuse status from their family, fixed effects of 26 regions of residence. In addition, the fixed effects of difference in education and age variables as well as whether woman has support from her family in case of emergency are controlled for.

Chapter 5. Conclusion

5.1 Concluding comments and policy implications

On February 1997, the secular military enforced the elected Turkish government to leave the office as it was seen as spreading the religious thoughts and ideas and, therefore, as a threat to the Turkish Republic and democracy in Turkey. After the resignation of the government, a new secular government came to the office, and immediately amended compulsory education law as a first job in August 1997. As a result of this intervention into education, compulsory years of schooling was extended to 8 from 5 years. It was thought that increasing the mandatory years of schooling could prevent the spread of religious thoughts and education. The reform has generated an enormous impact on the gross enrolment rates to grade six for males and females. Therefore, it created an opportunity for researchers to use econometric evaluation techniques to assess the impact of this reform on certain outcome measures.

In this thesis, I exploit this three-year exogenous increase in schooling attainment of affected cohorts, who were born after 1986 as a result of Turkey`s compulsory education reform as an instrument in order to investigate the causal relationship between education and its non-market outcomes with an instrumental variable (IV) method. There are two motives to consider the education reform as a valid instrument. First, the education reform was a result of the policy events and it has no connection with the outcome considered in this thesis. Second, aforementioned reasons inducing the endogeneity problem of education, such as omitted variable bias and reverse causality issues are unlikely to be correlated with the birth year.

The reform is also a strong instrument due to following reasons. In Chapter 2 and 3, the thesis established a causal relationship between the amendment of the 1997 Compulsory Schooling Law and educational attainment of women. The findings show that the law change had an enormous impact on completion of 8 years of schooling and highest grade completed at school. It has no effect on high school completion rates. The results are robust to adding additional explanatory variables and the instrument passes the weak identification tests for completing 8 years of schooling and highest grade completed. Then, in Chapter 4, I investigated effects of the reform on schooling of males. The results indicate that there is a quite strong association between the education reform and completing 8 years of compulsory schooling for affected male cohorts but it has an insignificant influence on the other measures of the educational attainment including the highest grade completed, completing the senior high school and university degree. The findings of Chapter 4 also are robust to the inclusion of additional control variables and the instrument passed the weak identification test for completing 8 years of schooling but not for others.

The findings presented in Chapter 2, 3 and 4 regarding the effects of the mandatory schooling reform on educational attainment of both genders also have direct policy implications. Firstly, the case of Turkey clearly shows that an extension in the mandatory years of schooling and provision of necessary public resources to support the healthy implementation of the legal amendment can have an important effect on schooling attainment. In the context of Turkey, it can be argued that the application of and compliance with the mandatory schooling reform might be thought as an effective educational policy intervention. Gross enrolment rates into 8-year primary education prior to the education reform in 1996/1997 education year was 81 percent and jumped to

90 percent for the third cohort, subjected to the schooling reform in 1999/2000. It should be noted that the enrolment rates reached almost 94 percent for the fourth cohort in mid-2000s. The education sector report by World Bank also provide evidence clearly showing the accomplishment of the compulsory education reform of Turkey. It is stated that "rare cases in the past of any nationwide schooling system have produced such outstanding development so rapidly. Turkey's management has gained the right to be proud of its achievement.", (p. 6) (World Bank, 2005). Therefore, the case of Turkey gives an important policy lesson for policy makers due to its substantial influence on schooling attainment of both genders. This is also important as one of the primary aims of United Nations Millennium Development Goals is to ensure that boys and girls living all around the world should be able to complete compulsory primary education. Therefore, by increasing mandatory years of schooling and providing its healthy implementation of and compliance with the educational policy intervention, local and international policy makers might accomplish desired policy outcomes in terms of schooling.

Effects of maternal education on childhood immunization rates

In Chapter 2, the analysis provides the first causal evidence on the effects of maternal education on completion of the third (full) dose of Hepatitis B and DPT for their children. In this chapter, I also suggested a new intensity measure calculated as the additional regional government expenditures on classroom constructions per 1000 children, which is the difference between 1997 and 1996 government funds for regional education spending. With the help of this new intensity measure, the instrument for schooling of young mothers in 2008 was defined as the combination of both the year of birth and differentiation in the intensity of its implementation.

2SLS estimates suggest that schooling of mothers significantly improve the coverage of these vaccinations. Also, the investigation of channels affecting vaccination coverage through maternal education indicates that schooling of woman increases the age at first marriage and birth, alters employment status of both husband and wife, improves the attitude of women towards partner violence against women and gender discrimination in a way that empower women.

Chapter 2 also has direct policy implications as the life of millions of children could have been saved by full vaccination. For example, a report prepared by the partnership of the World Health Organization and the United Nations Children`s Funds (UNICEF)[130], states that 1.4 million children aged under 5 would have been alive if they were fully vaccinated. As given above and earlier in Chapter 2, causal evidence suggests that education significantly increases coverage of full vaccination for certain vaccination measures considered in this study. On the basis of this evidence, the public authorities might use educational policy interventions in order to enhance coverage of childhood immunization rates to prevent the death of those children who could have been saved by being fully vaccinated.

Effects of women`s education on mental health of women

Chapter 3 investigates the causal link between education and health-related measures, in particular, mental health. It is the first study analysing causal mental health with return of education. To do this, I used 2008 and 2014 waves of the Turkey`s National Survey on Domestic Violence against Women (NSDVW). Also, to be able to identify this causal

[130] World Health Organization and UNICEF: Global Immunization Data; July 2014. Accessible at http://www.who.int/immunization/monitoring_surveillance/global_immunization_data.pdf [cited on 24/07/2015].

relationship, in this chapter, the exposure to the education reform varied by the birth year used as an instrument to address the endogeneity of the education of women.

The finding indicates some but limited positive impacts of schooling: in particular, schooling drops the likelihood of reporting severe pain in the last four weeks (but it is not causally related to self-reported general health status). In the context of Turkey, Cesur et al. (2014) also investigated the causal return of education on general health status of both genders. This study uses the same education reform as an instrument for the schooling of males and females with a different dataset but reached a similar conclusion with the findings of Chapter 3.

However, there is a causal correlation between schooling and the greater occurrence of some mental health disorders. These findings seem quite robust to alterations in the regression definitions and to the inclusion of additional individual-level control variables such as having one`s own income, employment status, marital status, occupation, domestic abuse history in the family, and rural/urban status. The findings of Chapter 3 also show that the heterogeneous effects of the schooling reform depend on the residence status and maternal abuse history of a woman's birth mother. Additionally, heterogeneous effect tests find that schooling effects vary based on personal income and labour market status of women.

A plausible explanation for the insignificant impact of schooling on self-reported overall health status could be that cohorts affected by the education reform are still young and, therefore, not likely to experience sicknesses. On the contrary, longer years of schooling might help women recognize symptoms of mental health disorders easier than less educated women. Overall, the findings of Chapter 3 propose that education has some

possible significant health advantages. As the respondents exposed the schooling reform have aged, there is a high likelihood that benefits of education might appear better and easily noticeable in the future.

Chapter three has also direct policy implications. Nowadays, 13% of the world population has developed some form of prevalent mental health problems such as depression, mood, and anxiety disorders, and women are more likely to suffer from these problems than men (Steel et al., 2014). Therefore, it can be said that mental health issues constitute a large share of the worldwide disease burden, and the figures are even worse for women than men. Moreover, adverse effects of mental disorders on women might go far beyond than the effect on women. The findings of studies from developing countries show that children of women experiencing maternal depression are highly likely to suffer from poor development and growth outcomes (Rahman et al., 2008). The fact that women with higher education easily recognize mental health problems can have a key policy implication as the realization of these disorders is a precondition to recover effectively.

Effects of male education on violence against his spouse

Chapter 4 provides the first empirical evidence regarding causality between husband`s education and violent and abusive behaviour against his wife. To address the endogeneity of schooling, I exploit the birth date variation in the exposure to the mandatory education reform, which extended mandatory years of schooling from 5 to 8, as an instrument for the schooling of males in Turkey in 1997.

The findings presented in Chapter 4 shows that higher education of males decreases the occurrence of domestic abuse in general and for most sorts of abusive behaviours including physical, emotional and economic abuse. The mere exception is sexual abuse,

which is not affected by schooling. Additionally, increasing male education also drops the incidence of involuntary marriage. It also makes men less likely to participate in socially disapproved manners, such as drinking, gambling, drug abuse and the like, however, these effects are, to some extent, less precisely identified. Lastly, these findings are also robust to changes in sample specifications, such as narrowing the birth year window and restricting educational attainment.

Chapter 4 also indicates significant policy implications. First, there is a well-documented previous literature showing crucial private and social returns to schooling. The analysis of this chapter proposes several other benefits. As discussed in the beginning of Chapter 4, domestic abuse against women is a global issue and the large share of those women experienced violence are abused by either their partners or husbands. Additionally, given the negative effects that it has on a woman and the fact that male education reduces the incidence of violence against a woman can lead to considerable enhancements in women`s wellbeing.

Moreover, the findings back the cycle of violence hypothesis: a personal history of domestic violence, either on husband`s or wife`s side, increases the occurrence of domestic abuse at present. Hence, decreasing domestic violence against women at present can lead to enhancements in women`s wellbeing both today and in the future.

5.2 Shortcomings and future research

While the exogenous variation in educational attainment due to the schooling reform helped identify several non-market returns to education, some aspects of these findings need to be interpreted cautiously.

Firstly, the 2SLS estimates only capture local average treatment effects (LATE), i.e. the effects of the reform on compliers, who were forced to change their schooling decisions. Those individuals are likely to come from the lower segment of the schooling distribution. Therefore, the findings cannot give any insights into the impacts of higher levels of schooling. For example, it is possible that the effect of completing a university degree on the outcomes considered in this study might be different. Therefore, this can be extended by using education policy interventions at the higher stage of education distribution in the future in order to improve our understanding regarding the non-market returns of education at this level of educational attainment.

Secondly, in this thesis, I identified several additional non-market returns of education. Also, in the second chapter, the findings indicate many channels affecting immunization rates. As discussed earlier in the introduction of the thesis, education is seen not only a sustainable development goal until 2030 by the United Nations but also as a tool to accomplish almost all other development goals including growth, health, employment, production and so on. Therefore, future studies should focus on the channels in non-market returns of education. It would be also interesting to see the direct effects of these channels on outcomes considered in this study.

Thirdly, even though the datasets exploited in this study provide information regarding the region in which individuals started the sixth grade, it is impossible to identify whether the individuals in the surveys are in the fourth grade in the 1996-1997 schooling year. The education reform should only affect those who were born after 1986, completed fourth grade in the 1996-1997 education year. However, as explained before, the implementation of the schooling starting age policy is not strict in Turkey. Therefore, information regarding in which grade survey participants are in 1996-1997 education year

might help avoid misclassification of affected and unaffected cohorts in the treatment and control groups. However, it can be argued that the misclassification issue does not seem to be powerful as the classification in this thesis relies on administrative and survey data. Also, in all empirical chapters of the thesis, I addressed this issue by running some robustness checks, which also supported the hypothesis that the misclassification is not detrimental.

Fourthly, Chapter 3 suggests an insignificant effect of education on the overall health status of females. As the respondents experienced the schooling reform in the datasets are young and, therefore, are less likely to experience any health problems. In the future, the analysis in Chapter 3 might be worth revisiting when those exposed to the reform have aged. By doing so, the health and other benefits of education might be more visible.

Fifthly, Chapter 3 utilizes responses to survey questions in order to measure the mental health status. Another way of doing so is by means of observed symptoms. For instance, one might use the suicide rate in order to measure the prevalence of those mental health disorders associated with this. In such an estimation, the unit of observation would be a cohort in a specific region. However, this would require suicide data on such a disaggregated level, which is not available in the case of Turkey. To conclude, there are some shortcomings of this thesis and they cannot be solved in the absence of the supplementary administrative, survey or experimental data.

Appendix A List of Model Variables and Their Definition Used in Chapter 3

- HGC: Highest grade of schooling that the respondent completed
- Completion of JHS: A dichotomous variable equals one if the respondent graduated from junior high school, i.e. completed minimum 8 years of schooling.
- Completion of SHS: A dichotomous variable equals one if the respondent completed senior high school or above, i.e. completed minimum 11 years of schooling.
- SRH: A dichotomous variable equals one if the respondent assessed her health status as fair or poor, or very poor and zero otherwise.
- Severe/extreme pain or discomfort: A dichotomous variable equals one if the respondent has experienced severe or extreme pain in the past 4 weeks.
- Headache: A dichotomous variable equals one if the respondent has had the frequent headaches problems in the past 4 weeks.
- Poor appetite: A dichotomous variable equals one if the respondent has had a poor appetite problem in the past 4 weeks.
- Problems in sleeping: A dichotomous variable equals one if the respondent have had problems in sleeping in the past 4 weeks.
- Easily frightened: A dichotomous variable equals one if the respondent has been easily frightened by many things in the past 4 weeks.
- Shaky hands: A dichotomous variable equals one if the respondent have experienced a shaky hands problem in the last four weeks.

- Anxiety: A dichotomous variable equals one if the respondent has not felt nervous, uneasy, tense or worried in the past 4 weeks.
- Poor digestion: A dichotomous variable equals one if the respondent has experienced poor digestion problem.
- Difficulty in thinking clearly: A dichotomous variable equals one if the respondent has experienced any problems with collecting her thoughts and reduction in their ability to think clearly in the past 4 weeks.
- Unhappy: A dichotomous variable equals one if the respondent has not felt unhappy in the past four weeks.
- Crying: A dichotomous variable equals one if the respondent has cried much more often than usual in the past four weeks.
- Unwillingness in daily activities: A dichotomous variable equals one if the respondent has not been unenthusiastic to carry out her daily activities in the past four weeks.
- Difficulty in decision making: A dichotomous variable equals one if the respondent has experienced trouble making decisions in the past four weeks.
- Non-delayed daily activities: A dichotomous variable equals one if the respondent has not delayed the activities of daily life in past four weeks.
- Feeling useless: A dichotomous variable equals one if the respondent has thought that she was useless in the past four weeks.

- Loss of interest: A dichotomous variable equals one if the respondent has lost her interest in the things that she usually enjoyed in the past 4 weeks.
- Feeling worthless: A dichotomous variable equals one if the respondent has felt worthless in the past 4 weeks.
- Ending life: A dichotomous variable equals one if the thoughts about ending her life ever crossed the respondent`s mind in the past 4 weeks.
- Feeling tired: A dichotomous variable equals one if the respondent has not had constant tiredness problem in the past 4 weeks.
- Stomach (abdomen) ache: A dichotomous variable equals one if the respondent has had uncomfortable stomach-ache problems in the past four weeks.
- Getting tired easily: A dichotomous variable equals one if the respondent has been easily tired in the past 4 weeks.
- Feeling suicidal: A dichotomous variable equals one if the respondent has ever had the thoughts about ending her life during her life.

Covariates:

- Rural: A dichotomous variable equals one if the respondent lives in a rural area.
- Region of childhood dummies: Dichotomous variables for each of the 26 regions where the respondent was mostly lived during their childhood until 12 years old.
- Region of residence dummies: Dichotomous variables for each of twelve regions where the respondents currently live in.

- Mother experienced partner violence: A dichotomous variable equals one if the respondent`s mother experienced physical abuse from her intimate partner.
- Sexual violence: A dichotomous variable equals one if the respondent has been abused sexually before the age of 15 by anyone in her family or her relatives.
- Survey dummy: A dichotomous variable equals one if the respondent comes from the 2014 wave of NSDVW.

Appendix B Ethical Approval Form and Form UPR16 Research Ethics Review Checklist

University of Portsmouth

Certificate of Ethics Review

Project Title:	Essays on Non-market Returns of Education. Evidence from a Natural Experiment in Turkey
User ID:	711782
Name:	Mustafa Ozer
Application Date:	15/08/2016 13:21:18

You must download your certificate, print a copy and keep it as a record of this review.

It is your responsibility to adhere to the University Ethics Policy and any Department/School or professional guidelines in the conduct of your study including relevant guidelines regarding health and safety of researchers and University Health and Safety Policy.

It is also your responsibility to follow University guidance on Data Protection Policy:

- General guidance for all data protection issues
- University Data Protection Policy

You are reminded that as a University of Portsmouth Researcher you are bound by the UKRIO Code of Practice for Research; any breach of this code could lead to action being taken following the University's Procedure for the Investigation of Allegations of Misconduct in Research.

Any changes in the answers to the questions reflecting the design, management or conduct of the research over the course of the project must be notified to the Faculty Ethics Committee. **Any changes that affect the answers given in the questionnaire, not reported to the Faculty Ethics Committee, will invalidate this certificate.**

This ethical review should not be used to infer any comment on the academic merits or methodology of the project. If you have not already done so, you are advised to develop a clear protocol/proposal and ensure that it is independently reviewed by peers or others of appropriate standing. A favourable ethical opinion should not be perceived as permission to proceed with the research; there might be other matters of governance which require further consideration including the agreement of any organisation hosting the research.

GovernanceChecklist
A1-BriefDescriptionOfProject: My research examines the causal impact of education on non-market outcomes such as mental health, childhood vaccination rates and domestic violence against women. My main contribution is in dealing with the issue of endogeneity of education, which has not been addressed by the economics of education literature before. In particular, I use the compulsory-education reform from Turkey. This was an exogenous public policy intervention into education, extending compulsory years of schooling from 5 to 8 years. Specifically, the identification strategy employed in this research comes from the fact that cohorts who were born in or before 1986 were not

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FORM UPR16

Research Ethics Review Checklist

University of Portsmouth

Please include this completed form as an appendix to your thesis (see the Postgraduate Research Student Handbook for more information)

Postgraduate Research Student (PGRS) Information			Student ID:	UP711782
PGRS Name:	MUSTAFA OZER			
Department:	ECONOMICS AND FINANCE	First Supervisor:	Dr Ansgar Wohlschlegel	
Start Date: (or progression date for Prof Doc students)	3SEPTEMBER 2013			
Study Mode and Route:	Part-time ☐ Full-time ☒	MPhil ☐ PhD ☐	MD ☐ Professional Doctorate ☐	

Title of Thesis:	ESSAYS ON NON-MARKET RETURNS OF EDUCATION: EVIDENCE FROM A NATURAL EXPERIMENT IN TURKEY
Thesis Word Count: (excluding ancillary data)	54806

If you are unsure about any of the following, please contact the local representative on your Faculty Ethics Committee for advice. Please note that it is your responsibility to follow the University's Ethics Policy and any relevant University, academic or professional guidelines in the conduct of your study

Although the Ethics Committee may have given your study a favourable opinion, the final responsibility for the ethical conduct of this work lies with the researcher(s).

UKRIO Finished Research Checklist:
(If you would like to know more about the checklist, please see your Faculty or Departmental Ethics Committee rep or see the online version of the full checklist at: http://www.ukrio.org/what-we-do/code-of-practice-for-research/)

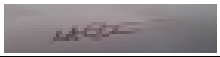
a)	Have all of your research and findings been reported accurately, honestly and within a reasonable time frame?	YES ☒ NO ☐
b)	Have all contributions to knowledge been acknowledged?	YES ☒ NO ☐
c)	Have you complied with all agreements relating to intellectual property, publication and authorship?	YES ☒ NO ☐
d)	Has your research data been retained in a secure and accessible form and will it remain so for the required duration?	YES ☒ NO ☐
e)	Does your research comply with all legal, ethical, and contractual requirements?	YES ☒ NO ☐

Candidate Statement:

I have considered the ethical dimensions of the above named research project, and have successfully obtained the necessary ethical approval(s)

Ethical review number(s) from Faculty Ethics Committee (or from NRES/SCREC):	CERTIFICATE CODE: 7B7F-9EDA-F583-93D4-E908-5587-B1A8-0E96

If you have not submitted your work for ethical review, and/or you have answered 'No' to one or more of questions a) to e), please explain below why this is so:

Signed (PGRS):		Date: 08/10/2016

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