The Impact of Female Education on Fertility: Evidence from Turkey*

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Abstract

This paper explores the causal relationship between female education and fertility by exploiting a change in the compulsory schooling law (CSL) in Turkey. Using exposure to the CSL across cohorts as an instrumental variable, the results indicate that an extra year of female schooling reduces teenage fertility by 0.03 births, which is a reduction of 33%. Exploring heterogeneous effects indicates that female education reduces teenage fertility more in provinces with higher initial fertility and lower population density. Finally, the CSL postpones childbearing by delaying marriage thereby reducing fertility.

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1 Introduction

Fertility and education are key factors in advancing development and reducing poverty. The reduced fertility typical of demographic transitions has been shown to confer a number of benefits (Schultz, 2008). Examples include benefits to the mother, such as improved health, greater investment in human capital, and greater labor supply; as well as benefits to the child, such as improved nutrition, greater investment in schooling, and various improved health outcomes. As a consequence, an array of policy interventions has been adopted with the aim of accelerating the demographic transition and, thus, bringing these benefits earlier than they would otherwise occur. More generally, development economists have emphasized the role of female education in fertility, health, and human capital formation, and investment in female education has been adopted as a development tool in many developing countries (Schultz, 1993). However, a thorough understanding of the causal relationship between fertility and female education has lagged behind the enthusiasm for educational interventions as a tool to reduce fertility.

This paper uses exposure to a nationwide reform of compulsory education system in 1997 in Turkey, which extended the basic educational requirement from five to eight years (free of charge in public schools) as an instrumental variable. The main objectives of the compulsory schooling law (CSL) were to increase the education level to universal standards and to provide assistance to ensure that all children can comply. In order to accommodate the increased number of primary school students, additional classes and schools were constructed, new teachers were recruited, and transportation was arranged for children living in rural areas, who are often far away from existing schools. The CSL led to a significant increase in the number of students in primary school between the 1996/97 and the 2000/01 Academic Years, by around 21% from 8.65 million to 10.48 million.[1] The CSL provides

[1] For educational statistics, see http://sgb.meb.gov.tr.

an ideal natural experiment, providing an instrument that varied the number of years of schooling, without significant curriculum changes, to identify the impact of schooling on fertility.[2]

This paper demonstrates that the CSL had a significant immediate effect on female education, thereby, providing a useful instrument for evaluating the impact of schooling on fertility. Using exposure to the CSL by year of birth as an instrumental variable, I show that an extra year of female schooling reduces teenage fertility by around 0.03 births, which is a reduction of 33%. Further, the results are robust with respect to a rich set of controls. The effect is higher than the corresponding effect estimated by ordinary least squares (OLS), which suggests about a 17% reduction in teenage births. This difference may be a consequence of education impacting fertility greater for a subsample of women whose educational attainment has been affected by the CSL. Exploring heterogeneous effects indicates that female education reduces teenage fertility more in provinces with higher initial fertility and lower population density. Moreover, the effect of the CSL on education depends on several characteristics of birth-province: initial levels of education, income, urbanization, and population density. I also find that the effect of the educational policy operates through a delay in marriage, which in turn postpones childbearing.

The existing literature documents strong associations between education and child health and fertility, even after controlling for family and community background variables. (For a survey of the literature, see Strauss and Thomas, 1995.) However, the observed associations do not imply causality. Omitted variables (Berger and Leigh, 1989)–in particular ability (Griliches, 1977) and discount rates (Fuchs, 1982), which are highly correlated with both education and fertility decisions–may bias the relationship between education and fertility. Thus, studies treating education levels as exogenous fall short of answering the question of whether there is a causal relationship between education and fertility.

[2] I discuss the features of the CSL in Section 2.

While there is a growing literature examining the causal effect of education on non-market outcomes, there are surprisingly few studies examining the effect of education on fertility in developing countries. Part of the reason for this is difficulty in identifying natural experiments. Breierova and Duflo (2004) examine the effect of a primary school construction program in Indonesia (INPRES) on child mortality and fertility, using the number of schools constructed in the region of birth and exposure across age cohorts induced by the timing of the program as instrumental variables. Their results suggest that the average parental education is an important determinant of very early fertility (before the age of 15), whereas it is unimportant for early fertility (before the age of 25). Similarly, Osili and Long (2008) estimate the effect of female schooling on early fertility (before the age of 25) by exploiting regional and age differences in the exposure to an Universal Primary Education (UPE) program implemented for the non-Western regions of Nigeria. Using the state classroom construction funds per capita as a measure of program intensity, their results suggest that female education reduces the number of early births.

This paper follows recent studies using instrumental variables (IV) and adds to the existing literature in several respects.[3] First, previous studies have investigated the impact of female education on fertility at markedly different points in the demographic transition; however, the role of policies is highly dependent on the stage of demographic transition. The case of Turkey provides an interesting case study because the policy intervention occurred at a later transition stage when the pace of fertility decline had slowed (starting from the early 1990s), which makes further reductions in fertility more difficult to achieve. Second, previous studies use variation in only the supply of education (school and classroom construction and free public provision), whereas the CSL entailed variation in both the sup-

[3] Recent studies have used similar strategies to uncover the causal effect of schooling on different outcomes of nonmarket returns: for adult health, see van Kippersluis, 2011; Kenkel et al., 2006; de Walque, 2007; Webbink et al., 2010; Grimard and Parent, 2007; Lleras-Muney, 2005; Silles, 2009; Clark and Royer, 2010; Kemptner et al., 2011; Albouy and Lequien, 2009; for child health, see Currie and Moretti, 2003; Lindeboom et al., 2009; McCrary and Royer, 2011.

ply of and demand for education. Third, this study explores heterogeneous effects across various dimensions, including pre-change levels of initial fertility and education, population density, urbanization, agricultural activity, and income in the province of birth as well as parental education and ethnicity. This understanding is crucial for understanding the effect of educational reforms on fertility as these dimensions vary significantly within developing countries. Finally, this study discusses several channels through which education affects fertility.

This paper focuses on early fertility for a number of reasons. First, early fertility is an important precursor in total fertility. For instance, Osili and Long (2008) show that variation in fertility before age 25 explains 58 percent of the variation in completed fertility in Nigeria. Similarly, in Turkey, I find that births before age 18 and completed fertility are highly correlated (0.62) and, importantly, 20% of first births occurred before age 18 for women who completed their fertility.[4] Thus, the impact of female education, which has been the emphasis of several recent educational reforms in developing countries, can be accessed without waiting for several decades of time to lapse. Second, education is a key determinant of early childbearing, thus exploring the impact of education on early fertility is of particular interest. Finally, teenage childbearing, in particular, adversely affects social and economic well-being for both the mother and her children. Therefore, uncovering the effects of early fertility uncovers the effects of fertility in general, and the particular effects associated with early childbearing in particular.

This paper has several important implications for development policy, especially for countries experiencing slowed pace of fertility declines. While Turkey roughly followed a similar demographic transitional history as other developing countries over the second half of the 20th century, Turkey has recently exhibited a marked divergence in two particular areas. Firstly, Turkey recently exhibits the low-fertility patterns (postponed marriage and first

[4]Author's calculation, using the 2008 Turkish Demographic Health Survey.

births and lower fertility rates) of a developed country. Second, the gap in female education levels between urban and rural areas has narrowed dramatically.[5] The CSL was successful at increasing female enrollment rates in both rural and urban areas (rural enrollment in grade six increased significantly in the first year of the change in the law, roughly 162%[6]) and, partially as a consequence, the tempo effects (postponed marriage and delayed motherhood) accelerated the fertility transition. Thus, this paper contributes to the literature by providing causal evidence that educational interventions can accelerate the demographic transitions at later stages.

The remainder of this paper is organized as follows: Section 2 provides background on fertility, development, and the educational policy in Turkey; Section 3 describes the data and the identification strategy; Section 4 presents the empirical strategy and the results; and Section 5 concludes.

2 Background

In this section, I discuss the conceptual framework, present the trends in fertility prior to the change in the CSL, discuss the background on education system in Turkey, and describe the CSL and the trends in education. The CSL increased compulsory schooling from five to eight years (free of charge in public schools) in 1997, with the objective of increasing education level to universal standards. However, it also had an effect on early fertility.

2.1 Conceptual Framework

Economic theory provides several mechanisms through which education may influence fertility choices. One explanation is that education increases the returns to labor market

[5]The difference in the median number of years of education is 0.3 for ever-married women ages 15-49 in 2008: http://www.hips.hacettepe.edu.tr.

[6]http://www.unicef.org/turkey/gr/ge21ja.html.

participation, thereby, increasing the opportunity cost of time-intensive activities (Becker, 1981; Schultz, 1981). As a result, women might substitute time-intensive activities, such as childbearing and child rearing, in order to devote more time to the labor market participation. Therefore, education might result in fewer children for women. Also, education may affect fertility preferences–for instance, more educated women may prefer fewer but healthier (higher quality) children (Becker and Lewis, 1973). Improvements in child health resulting from female education may also reduce child mortality, thereby, lowering fertility since fewer births are required to achieve the same family size (Lam and Duryea, 1999; Schultz, 1993). Education may reduce fertility through increased knowledge about contraceptives and the effective use of contraceptive methods (Rosenzweig and Schultz, 1985, 1989). Lastly, education may increase women's autonomy and bargaining power in the household, thereby, increasing women's participation in fertility decision-making (Mason, 1986). In addition, staying in school longer might postpone childbearing if having children impedes upon attending school.

Economic theory points to a number of mechanisms in which education influences fertility; however, according to the demography literature, the relevance of these mechanisms is highly dependent on a country's stage of demographic transition. Changes in fertility behavior, including the adoption of birth control methods and preferences for smaller family size, caused by the spread of new ideas and information through mass media, family planning programs, etc., account for changes in the decline of the fertility rate in the early phase of the transition. However, as a country approaches the later stages of the transition, fertility becomes more closely tied to the level of socioeconomic development (Bongaarts, 2002). Further fertility declines, therefore, depend on improvements in socioeconomic conditions, particularly female education and child survival (Caldwell, 1980; Sen, 1999; Bongaarts, 2001). Therefore, increases in female education in demographic transitions may be linked to fertility declines at later stages. Many developing countries have experienced rapid fertility declines since the 1960s; however, the pace of decline slowed in a number of countries, including Turkey in the 1990s (Bongaarts, 2006). Causal evidence that policies can influence fertility at later stages, however, is absent. This paper therefore contributes to the literature by exploring the role of education in fertility declines at later stages of the transition.

2.2 Trends in fertility and development in Turkey before the CSL

Similar to many developing countries, Turkey has experienced a rapid fertility decline since the early 1960s. In 1980, Turkey implemented export-oriented policies, which increased the demand for labor in the service and industrial sectors. As a result, migration from villages to cities increased, leading to rapid urbanization and industrialization, which had a profound effect on fertility. The total fertility rate (TFR) exceeded 6 children per woman in the early-1960s, dropped to 5 in the late-1970s, and dropped further to around 3 in the late-1980s.[7] In the 1990s, however, fertility remained at around 2.6 births per woman (Figure 1).

Proximate determinants of fertility, particularly contraceptive use and marriage, are possible factors explaining the trend in fertility. Turkey's fertility decline started with a family planning program introduced in 1965, which legalized the sale and use of contraceptives. Moreover, a new Population Planning Law in 1983 legalized induced abortions upon request for up to ten weeks gestation and allowed trained nurses and midwives to administer IUDs, which increased the prevalence of modern contraceptives and as a result subsequently decreased induced abortions. During the 1990s, Turkey experienced a leveling off in contraceptive prevalence around 60%, which coincided with a period of slowed

[7] TFR is defined as the average number of children that would be born to a woman by the end of her childbearing period if she were to experience the exact current age-specific fertility rates.

fertility decline.[8] The traditional marriage pattern of Turkey is characterized by the universality of marriage: almost all women engage in either civil or religious marriages by the end of their reproductive ages and childbearing out of wedlock is uncommon in Turkey.[9] Hence, age at first birth depends on marriage age, which in turn affects the overall fertility. Since the time interval between marriage and first birth has been stable with an average around 1.6 years in Turkey, a delay in age at first marriage may result in an overall fertility decline by postponing first births. The singulate mean age at marriage[10] for both sexes did not change (22 for females and 25 for males) over a period of 13 years from 1985 to 1998 (Figure 1). Thus, a delay in age at first marriage can play a crucial role in reducing fertility.

Even though there is not a consensus on the effects of socioeconomic factors on fertility, it is useful to look at changes in socioeconomic indicators in order to understand fertility trends, especially in the later stages of the transition.[11] The Gross Domestic Product (GDP) per capita almost doubled from 1980 to 1990; however, economic recessions were frequent during the 1990s (4 major crises took place in 1991, 1994, 1999, and 2001). Following the export-oriented reforms in the 1980s, the share of the population in urban areas rose from 44% in 1980 to 59% in 1990, but did not significantly increase during the 1990s (reaching 65% in early 2000). The labor force in the agricultural sector decreased from 60% in the 1980s to 47% in 1990 and to 45% in 1995. From 1990 to 1995, life expectancy at birth increased from 65 to 68 and from 61 to 64 years for females and males, respectively. Despite improvements in infant and children under five mortality rates in the 1980s, both exceeded 55 per thousand live births during the first half of the 1990s, which is very high compared to developed countries. Adult literacy rates (the proportion of the adult population aged 15+ which is literate) leveled off around 70 for females and 90 for males during the 1990s

[8] 2008 Turkey Demographic and Health Survey: http://www.hips.hacettepe.edu.tr.

[9] Ibid.

[10] It is defined as the average number of years lived as single (never-married) for females or males before they get married for the first time among those who marry before age 50.

[11] For statistics related to socioeconomic indicators, http://www.turkstat.gov.tr.

prior to the CSL. Hence, the CSL took place when many development indicators either leveled off or showed very little progress.

2.3 Education and Compulsory Schooling Law in Turkey

2.3.1 Turkey's Education System

After the establishment of the Republic of Turkey in 1923, radical curricular and structural educational reforms were carried out. One major reform was the Unification of Education Law, which unified schools under a common curriculum.[12] Further reforms were the centralization of the system and organization of the decision-making authority, the Ministry of National Education (MONE). MONE directs all educational related policy decisions, prepares the curriculum of educational institutions, and monitors implementation in cooperation with provincial offices.

Formal education in Turkey consists of pre-school, primary, secondary and higher education. Pre-primary education is offered to children up to age 6 on a voluntary basis before compulsory primary education. Prior to the law change in 1997, five years of primary education was compulsory for all citizens. In 1997, compulsory primary education was increased from five to eight years. Following primary school, students may choose to attend one of the following secondary educational programs: general, vocational or technical high schools. The basic 8-year primary education level (public and private) gross enrollment rate is 107.58% in 32,797 schools with 503,328 teachers (Ministry of National Education, 2011).[13] As of 2010, there are more than 4.5 million students in secondary schools with a 93.34% gross enrollment rate.

[12] the Unification of Education Law no 430 issued on 03.03.1924.

[13] MONE calculates the gross enrollment rate by dividing the total number of students in a specific level of education by the population in the theoretical age group.

2.3.2 Compulsory Schooling Law and Trends in Education

In 1997, the Turkish government took a "big bang" approach to education reform, increasing compulsory schooling from five to eight years.[14] The main objective of the 8-Year Basic Education Program was to increase the education level to universal standards. In order to encourage compliance with the law, a new Primary School Diploma is awarded for only those completing the 8th grade.

Education is provided free of charge in public schools. The 8-Year Basic Education Program included construction of schools and classes and recruiting new primary school teachers in order to accommodate a greater number of students. The Program aimed at providing opportunities for all children to stay in school at least to the eighth grade. Thus, low-income students were provided free textbooks, school meals, and student uniforms. Moreover, transportation expenses to children living at least 2.5 km away from nearby village schools were covered under the Bussed Primary Education Scheme launched in the 1989/1990 Academic Year in order to improve access for children in rural areas, especially for those in poor families. In addition, regional boarding primary schools (YIBO) were established to provide primary education services to settlements having no schools.[15]

While the Program aimed to extend educational opportunities to a greater share of the population, the qualitative components of the education system in general and the design of the curriculum in particular stayed the same. In an in-depth case study prepared for the World Bank on the implementation of the 1997 Basic Education Law, Dulger (2004) attests that the Primary Education Program maintained the 1968 national curriculum with minor changes and that, due to time constraints in implementation, the MONE primarily focused on capacity issues to accommodate new students. Moreover, a 2007 OECD educational

[14] Compulsory education was extended to 8 years with the Basic Education Law No 4306 dated 18.08.1997 as of the 1997/1998 Academic Year.

[15] According to MONE, there were 687,056 children bussed to the primary schools, and 539 YIBO with 247,563 students in the 2010/2011 Academic Year.

report emphasizes that the 1997 educational program in Turkey lacked implementation of a new curricula in order to improve the quality of the education system.[16]

The CSL had an impressive effect on enrollment rates of both sexes, especially on female enrollments in rural areas. The net primary enrollment rate increased from 84.74 in the 1997/1998 Academic Year to 93.54 in the 1999/2000 Academic Year (Ministry of National Education, 2011).[17] The increase in the net primary enrollment rate was greater for females than for males: 90.25 to 98.41 for males and 78.97 to 88.45 for females. The sex ratio in primary education rose from 85.63 to 88.54.[18] Presently, the net primary enrollment rate is 98.41 for both sexes, 98.59 for boys and 98.22 for girls, and the sex ratio is 100.42. Over ten million children in all types of education institutions, including YIBOs receive 8 years of basic education in about 33,000 schools with approximately 503,000 teachers.

Figure 2 shows the trend in the number of students in basic education by academic year. The figure demonstrates that the CSL in 1997 had a significant effect on student primary school participation. Enrollments increased by around 15% from 9.08 million in the 1997/98 Academic Year to 10.48 million in the 2000/01 Academic Year.

3 Data and Identification Strategy

3.1 Data

The analyses are based on the 2008 Turkish Demographic and Health Survey (TDHS-2008). The TDHS survey is a demographic health survey conducted every five years by Hacettepe University Institute of Population Studies (HUIPS) since 1993. Of the 11,911

[16] Reviews of National Policies for Education: Basic Education in Turkey: http://www.oecd.org.

[17] The net primary enrollment rate is calculated by dividing the number of students of a theoretical age group enrolled in a specific level of education by the population in that age group.

[18] Sex Ratio indicates the relative greatness of female gross enrollment ratio as compared to male gross enrollment ratio in a specific educational year and level of education. It is calculated by dividing the female gross enrollment ratio by the male gross enrollment ratio multiplied 100.

households surveyed in 2008, 10,525 were successfully interviewed, which yields an approximate response rate of 88%. Among 10,525 interviewed households, 8,003 women were ever-married of reproductive ages at 15-49. The response rate for the ever-married sample is approximately 92%.

The TDHS-2008 uses two types of questionnaires, the Household Questionnaire and the Individual Questionnaire. The latter targets ever-married women of reproductive ages (15-49), whereas the former targets all usual members of and visitors to the household. The nationally representative survey provides information on socioeconomic and demographic characteristics of a large number of women and contains a detailed fertility history of women surveyed with the Individual Questionnaire. The TDHS-2008 data is appropriate for the purpose of this paper since it contains data on the education, year and province of birth, fertility and marriage history of women. Table 1 presents summary statistics for women in the sample of analysis, which are between the ages of 18 and 30.[19] The data include 4,684 women, of which 2,185 have children.[20] The average level of completed schooling is 6.84. The average fertility (the number of ever-born children) is 0.94 for the entire sample, 0.09 for fertility before the age of 18, 0.04 for fertility before the age of 17, and 0.02 for fertility before the age of 16.

Other data sources are the National Education Statistics books by MONE, Turkey's Statistical Year Books and detailed education data by Turkish Statistics Institute (TurkStat). The sources contain detailed information on enrollment rates in formal and non-formal education for both sexes, number of teachers, number of schools and classes for different age groups in all provinces and for all academic years. I use mid-year population projections

[19]The basis of sample selection is discussed under the identification section.

[20]The TDHS-2008 contains information on whether a pregnancy has ever ended in a miscarriage, induced abortion, or a still birth; however, it does not provide the year of pregnancy termination, except for the latest pregnancy. Thus, I cannot determine whether or not the pregnancy was ended as a teenager. However, the results remain robust to the exclusion of such cases (653 women out of 4,684 for the sample of women ages 18-30, and 157 women out of 2,993 for the sample of women ages 18-25).

provided by TurkStat for the number of primary school age children in the province of birth in 1995 (80 provinces).[21]

3.2 Identification Strategy: Effect of the Compulsory Schooling Law on Education and Fertility

Exposure to the CSL is determined by year of birth. Children aged 12 or older in 1997, when the CSL took place, had already graduated from primary school in 1997 since most Turkish children attend primary school between the ages of 7 and 11, and therefore are "unexposed" to the policy.[22] On the other hand, children aged 11 or younger in 1997 would be affected by the CSL and therefore are "exposed" to the policy. Because I use the 2008 TDHS data set, the children exposed to the education policy were between the ages of 18 and 22 at the time of the survey, while the unexposed were aged 23 and over. The exposed cohort is a young group at the time of the 2008 TDHS survey, thereby, limiting the analysis to teenage fertility indicators rather than completed fertility. I use the number of children born before age 18 as a key dependent variable due to the fact that the fertility history of the exposed cohort is censored.

Figure 4 illustrates the effect of the CSL on female schooling for each cohort. The vertical solid line indicates the timing of the education policy, where cohorts to the right of the vertical line (females aged 12 in 1997) are exposed to the law. Each point on the solid line represents the average education for each cohort. The pattern is consistent with the hypothesis that the change in compulsory schooling had no impact on the education of unexposed cohorts and had a positive effect on the education of the cohorts 11 and

[21] Turkey is divided into 5 main regions: West, South, Central, North, and East. However, a new regional breakdown has been adopted from the European Union for statistical purposes as of 2002. Accordingly, there are 12 regions (NUTS I) with 81 provinces (Figure 3).

[22] It is possible that some of these females might have been exposed to the policy because of grade repetition. However, there was not a high prevalence of them, and, moreover, results are robust to excluding these females.

younger. Thus, the figure shows that the 1997 law appears to have a substantial effect on female schooling. Moreover, there is no clear trend in female schooling prior to the CSL (left side of the vertical line).

Figure 4 also shows the percentage of mothers for each cohort, where the percentage of mothers is the percentage of women with at least 1 ever-born child before age 18 and 17 ("Before 18" and "Before 17"). The figure shows that there are no particular pre-existing trends in the percentage of teenage mothers prior to the education policy (left side of the vertical line) and that the percentage of teenage mothers declined following the CSL (right side of the vertical line).

Formal analysis of the effects of the CSL on female education and teenage fertility are presented in the following section.

4 Empirical Methodology and Results

In this section, I first explore the reduced form effect of the CSL on female education using a number of different specifications and provide evidence for the identification strategy. Second, I estimate the effect of female education on teenage fertility using both OLS and IV, as well as an alternative approach (difference-in-difference with the CSL as a treatment variable). Third, I explore whether there are heterogeneous effects, for both the effect of the CSL on female education and fertility and the impact of female education on fertility. Further, I employ robustness checks using various intensity indicators. Lastly, I discuss several channels through which education influences fertility.

4.1 Effect of the CSL on Education

4.1.1 Reduced form

Identification follows from the generalized regression framework:

$$E_{ijk} = a + \alpha_{1j} + \sum_{l=7}^{18}(d_{il})\gamma_{1l} + \sum_{l=7}^{18}(C_j \times d_{il})\delta_{1l} + \varepsilon_{ijk} \tag{1}$$

where E_{ijk} is the education of an individual i, born in province j, in year k. As in Duflo (2001), d_{il} is a dummy that indicates whether individual i is age l in 1997 (a year-of-birth dummy), a is a constant, α_{1j} is a province-of-birth fixed effect, and C_j is a vector of province-specific variables–the number of primary school aged children and the enrollment rate in the province of birth (in 1995). Females aged 19 in 1997 is the control group and hence this dummy is omitted from the regression. In all specifications, including the above, I correct the standard errors for clustering at the province level.

In these unrestricted estimates, each parameter of interest, γ_{1l}, estimates the impact of the CSL on a given cohort. Children aged 12 and older in 1997 were unlikely to have been affected by the change in compulsory schooling. Thus, I expect the coefficients of interest would be zero for females aged greater than 11 in 1997. Specifically, I can test this restriction by $\gamma_{1l} = 0$ for $l > 11$. Exposure to the CSL implies the coefficients γ_{1l} should be increasing from l=11 to 7 and be significantly positive. The year of birth coefficients (γ_{1l} for each l) from the regression results of equation (1) with no controls are jointly significant for l=7 to 11, and insignificant for l=12 to 18 (The F-statistics are 34.97 (p=0.000) and 1.01 (p=0.419) respectively).[23] These results validate the identification strategy and indicate that the CSL had an effect on female education.

Furthermore, the following equation is estimated to test whether there are pre-existing trends in education:

[23] See the results for this unrestricted specification in Appendix B.

$$E_i = a_1 + T_i\delta_1 + (UT_i \times YOB_i)\beta + X_i\theta + \varepsilon_i \tag{2}$$

where E_i is the education of an individual i, a_1 is a constant, T_i is a dummy indicating whether individual i belongs to the "treated" age group (exposed), UT_i is a dummy indicating whether individual i belongs to the "untreated" age group (unexposed), and YOB_i is the year of birth of an individual i. X_i is a vector of province-specific control variables, including province of birth fixed effects, interactions between the number of primary school aged children in the province of birth (in 1995) and year of birth dummies, and interactions between the enrollment rate in the province of birth (in 1995) and year of birth dummies. If there are pre-existing trends in education, β would be significantly different than zero. The regression results of equation (2) for a sample of women ages 18-30 suggest that the CSL increased female education by 2.01 years and rejects that pre-existing trends are present (β is estimated to be very small (0.066) and statistically indistinguishable from zero).[24] Thus, the results provide further evidence that the differences in education are not driven by pre-existing time trends.

4.1.2 First-Stage Estimation

To gain precision, I follow Duflo, 2001 and impose the restriction that coefficients are zero for the unexposed (age greater than 11 ($\gamma_{1l} = 0$ for $l > 11$)). This is justified because, as demonstrated in the previous section, the CSL did not affect the cohorts unexposed to it. The following estimates the impact of the law as follows:

$$E_{ijk} = a + \alpha_{1j} + \sum_{l=7}^{11}(d_{il})\gamma_{1l} + \sum_{l=7}^{11}(C_j \times d_{il})\delta_{1l} + \varepsilon_{ijk} \tag{3}$$

[24]Estimation of equation (2) for a sample of women ages 18-25 also yields similar results: β is 0.005 and statistically insignificant at any conventional significance level.

The reference group is now the women aged 12 to 19 in 1997.

The results for different specifications starting with the baseline model of no controls (column (1)) are presented in Table 2. Column (2) controls for only the province of birth to account for time-invariant, unobserved differences across provinces.[25] Column (3) adds controls for the interaction of a year of birth dummy and the primary school aged population in the province of birth in 1995. It is possible that the effect of the CSL on education is larger in areas where the initial enrollment rates were lower. Thus, in order to capture any time-varying factors correlated with pre-program enrollment rates, column (4) adds enrollment rates in the province of birth in 1995 interacted with year of birth dummies as controls as well as the other controls in column (3).

As expected, the CSL had larger effects on younger cohorts in all specifications. The estimated coefficients are all positive and statistically significant (except the estimate of age 11 in 1997 in column (4)). The F-statistics for testing the joint significance of the five age cohorts are reported in Table 2. The set of year of birth estimates are jointly significant at all conventional significance levels. The F-ratios reported in Table 2 are much larger than the rule of thumb that the instruments are weak if the first stage F-ratio is less than 10.[26] The estimates of the increase in female schooling due to the CSL range from 0.44 to 2.69 in the specification with no controls (column (1) of Table 2). The results suggest that the education of the youngest cohort increased by 2.5 years due to the CSL. The estimates increase as more controls are added to the baseline.

[25] There are 80 provinces included in the estimations based on the 1995 boundaries of Turkey. In all the estimations throughout the study, women born in Düzce are assumed to be born in Bolu since Düzce broke off Bolu and became a province in November 1999.

[26] Critical F-ratio of 10 is suggested by Staiger and Stock (1997). Cameron and Trivedi (2005) use this rule of thumb, but they also propose a less strict rule of thumb of critical F-ratio of 5.

4.1.3 Alternative Approach: Difference-in-difference (DID)

To estimate the impact of the CSL on education, we can also simply compare the average education of women exposed and unexposed to the law based on year of birth in a regression framework as follows:

$$E_i = a_1 + T_i\delta_1 + X_i\theta + \varepsilon_i \tag{4}$$

where the parameters are defined similar to equation (2).

Equation 4 is used to estimate the effect of the law on education for two samples. Table 3 (columns (1)-(4)) reports the effect of the CSL on the number of years of schooling completed. Panel A compares the education levels of women aged 7 to 11 in 1997 (exposed) with the education levels of women aged 12 to 15 in 1997 (unexposed). The results for several specifications are presented. The estimates indicate that the CSL increased the education levels of exposed females by 1.75 to 1.98 years in columns (1)-(3), while it increased female schooling by 2.23 years in column (4). The estimated coefficient in column (4) is slightly larger, indicating that it does not confound the effect of the CSL. In sum, the estimates suggest that there is a significant and positive effect of the CSL on the number of years of schooling completed for females.

As further verification that there are no pre-existing trends in educational attainment across cohorts, Panel B of Table 3 compares the education levels of the cohort aged 12 to 15 in 1997 to the cohort aged 16 to 19 in 1997 (neither cohort should have been affected by the CSL). If education levels were already increasing prior to the change in compulsory schooling then there should be a positive and significant coefficient for the cohort of aged 12 to 15 in 1997 in Panel B. However, I find no evidence of pre-existing trends in schooling– the coefficients are typically small and insignificant, thereby, providing some evidence that the identification assumption is satisfied.[27] Thus, this control experiment demonstrates that the results in Panel A are reliable.[28]

4.2 Effects of Female Schooling on Fertility: IV and OLS Estimates

The following equation estimates the impact of female education on fertility

$$Y_{ijk} = a_2 + \alpha_{2j} + \pi E_{ijk} + \sum_{l=7}^{18} (C_j \times d_{il})\delta_{2l} + \nu_{ijk} \tag{5}$$

where Y_{ijk} is the fertility of a woman i, born in province j, in year k. The other parameters are defined similar to equation (1). In order to account for the fact that the fertility history of younger women is censored, I use the number of children born before age 18 as the main dependent variable.[29]

OLS estimates may be biased if schooling (E_{ijk}) is correlated with unobserved factors (ν_{ijk}), such as family background and personal traits. For instance, women with high discount rates of time or low ability levels are less likely to have higher education levels and more likely to become teenage parents. As a result of omitted individual characteristics, OLS estimates could overstate the effect of schooling. In order to identify the causal effect

[27] I also compare the outcomes of females aged 7-11 to females aged 15-18 in 1997 in Panel A, and of females aged 15-18 to females aged 19-22 in 1997 in Panel B in order to account for cases where the CSL might have affected females aged 12-14 due to grade repetition and/or enrollments at different ages. The effects were higher for this different age cohort comparison, therefore, I decided to be more conservative and use the age cohorts in Table 3.

[28] The DID estimate can be simply determined by subtracting the estimate in Panel B from the estimate in Panel A in Table 3.

[29] The youngest women in the sample are 18. The effect of female education on teenage fertility before the ages of 17 and 16 are also explored. As a robustness check, I compare the number of children born before age 20 of females that were aged 9-11 in 1997 to females aged 12-14 in 1997, as well as the number of children born before age 19 of females that were aged 8-11 in 1997 to females aged 12-15 in 1997. The OLS estimates suggest about a 15% and a 16% reduction in the number of children born before age 20 and age 19 starting at the mean (0.25 and 0.14 for the associated samples), while the IV estimates correspond to a 32% and a 22% reduction, respectively–estimations include all controls and observation numbers are 2,132 and 2,862. These tighter age window comparison results are consistent with the findings of the effect of female education on teenage fertility before the age of 18.

of female education on fertility, a two-stage least squares (2SLS) methodology is implemented. The set of year of birth dummies are valid instruments in the above equation if exposure to the CSL had no direct effect on fertility other than via changing educational attainment of women (Breierova and Duflo, 2004). I also use a single instrument–the treatment dummy for women aged 7-11 in 1997–to determine the impact of female education on fertility.

Table 4 presents both OLS and IV estimates of the effect of female schooling on teenage fertility–both with and without controls. Panels A, B, and C of Table 4 report estimates for fertility outcomes, as measured by fertility before age 18, age 17, and age 16, respectively for the sample of 18-30 year old women in columns (1)-(4) and 18-25 year old women in column (5).

The first line of Panel A displays the OLS estimates: a one-year increase in female education reduced the number of births before age 18 by 0.015 (significant at the 1% level). This result corresponds to about a 17% reduction in teenage births starting at the mean (0.09 for women ages 18-30). The second and third lines of Panel A present the 2SLS results with different instruments, which are quite similar, but slightly higher for the IV estimates using year of birth dummies ("YOB dummies").[30] The estimates are around 0.03 across different specifications; hence, a one-year increase in female education reduces teenage fertility by 0.03 births, which is a reduction of 33%. Column (5) presents the results for a tighter window, and the results remain robust for all specifications.[31] The 2SLS estimates are significantly different from the OLS estimates, suggesting that the standard OLS estimates may underestimate the effect of female education on fertility.

[30] p-values of the overidentification test are in square brackets.

[31] As a robustness check, the estimations are repeated for a sample of 20-25 year old women for all teenage fertility outcomes (2,132 observations). The estimates confirm the results reported in Table 4. For this sample, I also explore the effect of female education on fertility before age 20. As mentioned in footnote 29, OLS estimate suggests that a one-year increase in female education reduced fertility before age 20 by 0.04 births, which is a 16% reduction starting at the mean (0.25 for women ages 20-25), while 2SLS estimate suggests that it reduces fertility before age 20 by 0.08 births, which is about a 32% reduction.

Similarly, the IV estimates of the effect of female schooling on fertility before age 17 and 16 (Panels B and C) are significantly different from the OLS estimates, consistent with the view that the OLS estimates can be biased. OLS estimates suggest that a one-year increase in female education reduces fertility before age 17 and 16 by around 0.008 and 0.003 births, which is close to a 20% and 15% reduction starting at the mean (0.04 and 0.02 for women ages 18-30, respectively). The 2SLS estimates indicate that the reduction in fertility before age 17 and 16 is around 0.02 and 0.01 births, which is about a 50% reduction in teenage births. The estimates again remain robust for the subsample of 18-25 year old women.

The IV estimates exceed the OLS estimates for all teenage fertility outcomes. The OLS estimates may be biased downwards due to omitted variables that correlate with both higher levels of schooling and early child rearing, such as access to economic opportunities. Another possible explanation is that the IV estimates pertain to only a subsample of women whose educational attainment has been affected by the change in the compulsory schooling law. The effect of education on fertility may be higher for this subsample, thereby, leading to larger IV estimates compared to OLS estimates. The possibility of heterogeneous effects of education on teenage fertility is explored in Section 4.3.

4.2.1 Alternative Approach: Difference-in-Difference (DID)

Analogous to equation (4), the following specification estimates the impact of the CSL on fertility:

$$Y_i = a_2 + T_i\delta_2 + X_i\theta + \varepsilon_i \tag{6}$$

where Y_i is the fertility of a woman i, and the other parameters are defined similar to equation (4). The outcome of interest is the teenage fertility, as measured by the number of children before age 18.

Table 3 (columns (5)-(8)) reports the results for estimating equation 6 using two sub-samples based on the year of birth. The results suggest that the CSL decreased teenage fertility by 0.04 births. As in the education case, I report the control experiment in Panel B of Table 3 to verify whether the results are driven by differential time trends across cohorts. It appears that time trends do not confound the impact of the CSL on teenage fertility. The coefficients of the control experiment are small and insignificant. In both comparisons of Panel A and Panel B, the coefficients are increasing as additional controls are added to the baseline specification of no control. The same exercise for fertility before age 17 and 16 suggests that the CSL decreased fertility before age 17 and 16 by 0.04 and 0.02 births, respectively, and, moreover, the results are not driven by time trends (the coefficients of control experiment of Panel B are small and insignificant).[32]

Furthermore, Table 5 demonstrates that the effect of the CSL on fertility persists for fertility before the ages of 19, 20, 21, and 22 (much beyond the ages above which the CSL binds). For instance, the CSL decreased early fertility before age 20 of females aged 9-11 in 1997 and before age 21 of females aged 10-11 in 1997 by around 0.07 births, compared to females aged 12-15 in 1997, which is a reduction of 27% and 18% starting at the mean (0.26 and 0.40 for the associated samples), respectively.

4.3 Are there heterogeneous effects?

The effect of education on fertility is likely to depend on certain characteristics. That is, there are heterogeneous effects–possibly for both the effect of the CSL on education and fertility and the effect of education on fertility.[33] Uncovering heterogeneous effects has

[32]Results are available upon request.

[33]I also test whether the effect of the CSL on education differs by parental education and ethnicity (Appendix C). The results provide evidence that the CSL was more successful at increasing education of women with lower levels of parental education; however, most of the estimates are not significant enough to be

important policy implications both in understanding the expected outcomes and for designing optimal policy interventions. To examine whether there are heterogeneous effects, I split the sample into various subsamples of birth-province and used the specifications that include all controls in Table 3 (columns (4) and (8)), and Table 4 (column (4) and 2SLS with "YOB dummies" instrument).

A. Pre-change levels of education and fertility in the province of birth

One hypothesis is that it is easier to increase education when the baseline level is lower and, similarly, to reduce fertility when the baseline level is higher (Barham, 2011). I explore heterogeneity of both the effect of female education on fertility and the effect of the CSL on education and fertility according to the baseline (pre-change) levels of fertility and education by dividing the sample into provinces (by birth) with average fertility or education of the unexposed cohort above (or below) the sample median.

Table 6A (first row) suggests that the CSL increased education levels more in provinces where the initial levels were lower than the sample median. In provinces with levels of initial education below the median, the CSL increased female education by 3.05 years, compared to 1.87 years in provinces with initial fertility above the median (the difference is significant at the 5% level). Second, in provinces with levels of initial fertility above the median, the CSL decreased teenage fertility by 0.102 births, compared to an insignificant effect in provinces with initial fertility below the median (the difference is significant at the 1% level). Third, the impact of female education on teenage fertility (third row) is higher (lower) in provinces with initial fertility above (below) the median. Specifically, one more year of female education reduces teenage fertility by 0.04 births in provinces with initial fertility above the median, whereas it reduces teenage fertility by 0.01 births in provinces with initial fertility below the median (the difference is significant at the 1%

conclusive. Moreover, the effect does not seem to differ by parental ethnicity.

level). The results, therefore, indicate that there are heterogeneous effects by pre-fertility and pre-education levels in birth-provinces.

B. Pre-change characteristics of the province of birth

Another possible source of heterogeneity is population density because females in sparsely populated provinces are more likely to be affected by the CSL, either as a consequence of new school constructions or more transportation services. Other possible sources of heterogeneity are income (GDP per capita), urbanization rates (the percentage of population in cities), and agricultural activity (percentage of households engaged in agricultural production).[34]

The results are reported in Table 6B. As expected, the effect of the CSL on education (first row) is higher in provinces with population densities, urbanization rates, and income levels, below the median. In provinces with population densities, incomes, and urbanization rates below the median, the CSL increased female education by around 2.70 years, compared to 1.76, 1.90, and 1.86 years in provinces above the median, respectively (the differences are significant at the 5%, 10%, and 1% levels, respectively). However, the effect of the CSL on education does not appear to depend on agricultural activity. The second row of Table 6B presents the results of the effect of the CSL on teenage fertility. The results suggest that the CSL decreased teenage fertility by 0.10 births in provinces with population density below the median, compared to 0.03 births in provinces above the median (the difference is significant at the 10% level). However, the effect does not depend on income, urbanization, and agricultural activity. The impact of female education on teenage fertility (row 3) is slightly higher in provinces with lower incomes, urbanization rates, and

[34]I use GDP per capita, population densities, and urbanization rates in 1990 (prior to CSL). However, I use agricultural activity in 2001 (the earliest data I could get by province level is 2001) and assume that the percentage of households engaged in agricultural activity has not changed significantly over the four years since the change of the CSL in 1997.

percentages of HH's engaged in agricultural production; however, the differences are not statistically significant. The results suggest that female education reduced teenage fertility by 0.04 births in provinces with population density below the median, compared to 0.03 births in provinces above the median (the difference is significant at the 1% level).

4.4 Robustness checks by intensity measures

Following Breierova and Duflo, 2004 and Osili and Long, 2008, I use the number of children bussed in the 2000/2001 Academic Year per 1,000 primary school aged children (in 1995) in each province of birth to examine whether the effect of the CSL depends on some measure of intensity.[35] This is preferable to an intensity measure calculated by the planned numbers because it provides more information on the allocation of schooling inputs to the provinces.[36] The following examines if the effect of the CSL was higher for females born in higher intensity provinces:

$$E_{ijk}(or Y_{ijk}) = a + \alpha_j + \sum_{l=7}^{11}(Intensity_j \times d_{il})\gamma_l + \sum_{l=7}^{11}(C_j \times d_{il})\delta_l + \varepsilon_{ijk} \quad (7)$$

where $Intensity_j$ is the intensity measure in the province of birth. γ_l gives the reduced form estimate of the effect of the CSL on either education or fertility of each cohort in the treated group. Y_{ijk} is the teenage fertility of a female i, born in province j, in year k. Other

[35] I do not have data for the number of children bussed to primary schools at the province level for the 1997/1998 Academic Year when the CSL became effective–the earliest data by province level is for the 2000/2001 Academic Year; however, I have data from the 2000/2001 Academic Year on. I look at the changes in the number of children bussed between the 2000/01 and the 2001/02 Academic Year to corroborate the assumption that it has not changed much between the 1997/98 and the 2000/01 Academic Year. I also compared the results of the effects of the CSL to the ones in which I exclude the provinces where the change was greater than 25% (in absolute value) and got similar results. Thus, it is plausible to use the data for the 2000/01 Academic Year to measure the intensity of the CSL. I also use the 1990 Population Census of Turkey rather than the 1995 population projections for the intensity measure–obtained similar results.

[36] The intensity measure is also calculated in a different way to capture the variation by province for only females. That is, the number of female children bussed per 1,000 primary school aged female children in each province of birth is the intensity measure in the analysis. The findings follow the same pattern, therefore, I do not report the results.

variables are defined as before. In equation 7, the omitted group is the females aged 12 to 19 in 1997.

The results for different specifications are presented in Table 7A. Columns (1)-(4) show the estimated effects of the CSL on years of education. The coefficients are all positive and mostly statistically significant (except the estimates of the interaction between the dummy for age 11 in 1997 and intensity measure in columns (3) & (4)). The F-statistics (reported in the table) show that the interaction terms are jointly significant. Column (4), which includes all controls, suggests that the CSL increased the education of females aged 8 in 1997 by 1.3 years given that 92.56 children were bussed per 1,000 children on average. I also find that a 100 increase in the number of students bussed increases the years of education of this cohort by 1.4, which corresponds to a 0.36 standard deviation gain in years of education (the standard deviation of the mean is 3.9).

Columns (5)-(8) present the results for the effect of the CSL on teenage fertility. The estimates shown in column (5) are all negative and significant (except the estimates for females age 11 in 1997). The effects are same for females aged 7-10 in 1997 (columns (7) & (8)). In column (8), a 100 increase in the number of students bussed per 1,000 decreases the number of teenage births by 0.03 for females aged 7-10 in 1997, which corresponds to a reduction of about 33% in teenage births (the average number of children born before age 18 in the sample is 0.09).

An alternative measure of the intensity of the CSL is the additional number of classrooms (between the 1997/98 and the 1996/97 Academic Year) per 1,000 children (in 1995) in each province of birth.[37] Table 7B presents the results of the effects of the CSL on both

[37] There are 5 provinces–Ağrı, Çanakkale, Giresun, Kilis, and Bartın–that actually decreased the number of classrooms in between these periods. This stems from closing down some village schools in these provinces due to the unification purposes. Rather, the students from the closed schools were transferred to the schools in the cities and some of the classrooms were united instead of adding classrooms to accommodate more students. As a consequence, the intensity measure is negative in these provinces. However, the results are robust to the exclusion of these provinces (214 observations in these 5 provinces) or to adding a constant to the intensity measure of all provinces in order to avoid negative measures. In any case, the estimated

education and teenage fertility. The coefficients of the interactions, as shown in columns (1)-(4), are all positive and mostly significant and jointly significant for all specifications (F-statistics are given in the table). As expected, the effect is larger for younger cohorts– with the greatest effect on the education levels of the females aged 8 in 1997. As shown in column (4), one additional classroom per 1,000 children increases the years of schooling of this cohort by 0.195. The average number of additional classrooms per 1,000 children is 9.42, thus, the CSL is estimated to increase the education of females aged 8 in 1997 by 1.84 years (the average years of schooling is 6.8 years).

Similarly, the effects of the CSL on teenage fertility for different cohorts are presented in columns (5)-(8). The coefficients of the interactions are all negative and jointly significant for all specifications. The estimates of the effect of the CSL on teenage fertility are higher for younger cohorts with the greatest effect on females aged 8 in 1997. The estimate in column (8) for the youngest cohort suggests that an increase of 10 classrooms per 1,000 children decreases teenage fertility by 0.06 births, which corresponds to a 66% reduction in teenage births at its mean value of 0.09.

4.5 Channels through which education affects fertility

In this section I discuss possible channels through which education affects fertility. As mentioned, schooling may reduce fertility by delaying marriage, especially since child-bearing out of wedlock is uncommon in Turkey. I estimate the effect of the CSL on the probability of being married and the probability of having no children before age 18.

Table 8 displays the results of whether the CSL had an effect on the probability that a woman remains single and does not have kids before age 18. Estimations of different specifications for both outcomes produce statistically significant coefficients with expected

coefficients are a little higher in these robustness checks and do not statistically differ from the ones found in the analysis with negative intensity measures. Results are available upon request.

signs. The estimates from a linear probability model (LPM) suggest that the CSL decreased the probability of getting married before age 18 by 5 percentage points, while it raises the probability of having no kids by 3 percentage points. Thus, the fall in fertility before age 18 may be partly explained by postponed childbearing due to delayed marriage.

Furthermore, education may influence contraceptive knowledge and use. Family planning programs, starting in 1965, increased the prevalence of contraception; however, the trend stalled at around 60% during the 1990s. In the 2000s, the trend resumed, increasing to 70%, and in particular modern contraceptive use increased by 10%.[38] While we cannot precisely account for the effect of education on contraceptive knowledge and use, it is plausible that greater education had an important role on the increased prevalence. This represents another channel through which education may reduce fertility.

Another possible mechanism is via the effect of schooling on labor market participation. Female labor force participation for women aged 15+ in Turkey declined from around 30% in the 1990s to around 25% in the 2000s.[39] In both decades, women with greater education (high school or more) had higher participation rates than women with less education. Because there are many confounding factors affecting the labor market from one year to another, it is difficult to draw conclusions on the effect of female education on labor force participation. This might be explored in future research as more years of data become available.

The tradeoff between "quality" and "quantity" of children may be another possible channel. Given that infant and children under five mortality stalled at very high rates in the 1990s (both rates exceeded 55 per thousand live births), increased female education may affect child health, thereby, reducing the number of children.[40] Parents with more education may also invest more in their children's schooling, which increases both the quality and the

[38] See footnote 8.
[39] Ibid.
[40] http://data.un.org.

cost of children, thereby reducing the number of children desired. Future research might also explore this tradeoff as more data becomes available.

Finally, men's education might also influence fertility. Appendix D presents the effect of the CSL on men's education, number of children, and marriage. Because men received over 8 years of education on average prior to the CSL, I do not expect that the CSL would change education attainment for most men. The results suggest that the CSL had a very small effect (0.3 years) on men's education, compared to the increase in women's education (around 2 years). Furthermore, the CSL had no effect on men's marriage and number of children before 18. Moreover, Güneş (2013) shows that maternal education does not affect assortative matching in terms of husband's education and type of occupation.

5 Conclusion

In this paper, I explore the causal relationship between female education and fertility using a change in the compulsory schooling law in Turkey. The results suggest that the CSL increased female schooling by approximately 2 years for primary school age females (aged 7-11 in 1997) and reduced teenage fertility, as measured by the number of births before age 18, by 0.04 births on average, and the effects remain robust with different specification tests. Moreover, robustness checks employing various intensity measures confirm the effect of the CSL on education and teenage fertility.

Variation in female schooling generated by the CSL identifies the causal effect of female education on fertility. The reported IV estimates from a number of different specifications suggest that an extra year of female schooling reduces teenage fertility by around 0.03 births, which is a reduction of 33%. The findings also suggest that there are heterogeneous effects. First, there is a larger decline in teenage fertility in provinces with higher initial fertility and lower population density. Second, the effect of the CSL on female education and teenage fertility depends on several characteristics of birth-province: initial levels of fertility and education, income, urbanization, population density, and agricultural activity. Finally, I provide evidence that the effect of the educational policy can be partly explained by postponed childbearing due to delayed marriage. Exploring alternative channels, such as labor market participation and increased investment in children, represents an interesting area for future research.

These findings are of interest to policy makers since it has been widely pointed out that early childbearing adversely affects mother and child morbidity and mortality, labor market participation, and educational opportunities. The presence of heterogeneous effects, as demonstrated in this paper, has important policy implications for designing optimal policy interventions, especially for developing countries that share similar features with rural areas in Turkey, such as high fertility and/or low population density. The results therefore demonstrate that educational interventions in developing countries–especially ones with high teenage fertility rates–might be an effective policy tool for addressing fertility-related concerns and can accelerate the demographic transitions at later stages.

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Figure 1: Total Fertility Rate (TFR) and Mean Age at First Marriage and Birth (MAFM and MAFB); Sources: TurkStat, Hacettepe University Institute of Population Studies (HUIPS)

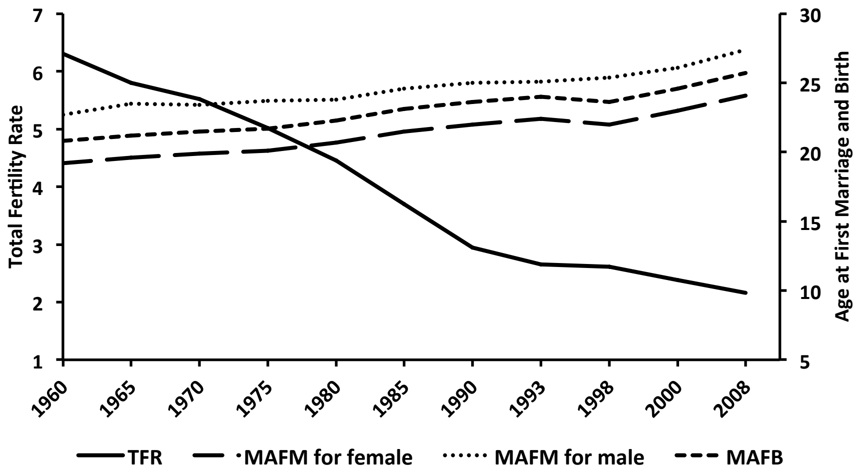


Figure 2: Number of Students in 8-year Primary Education by Academic Year; Enrollments in the 1992/93-1996/97 Academic Years prior to the change in the CSL are the sum of the number of students in the 5-year compulsory primary education and 3-year junior high school

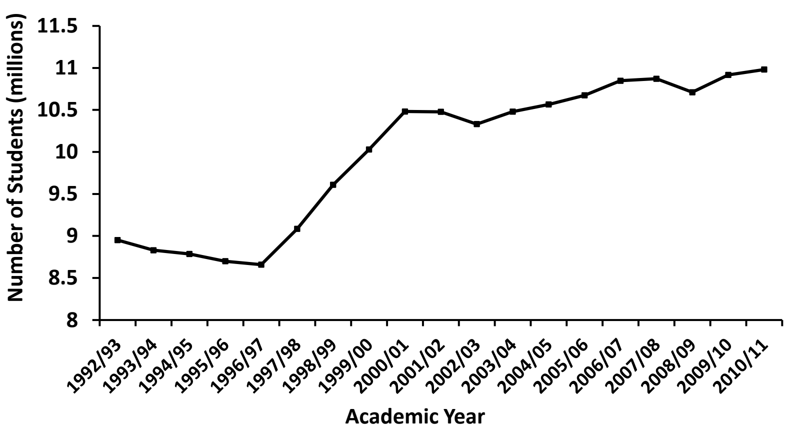
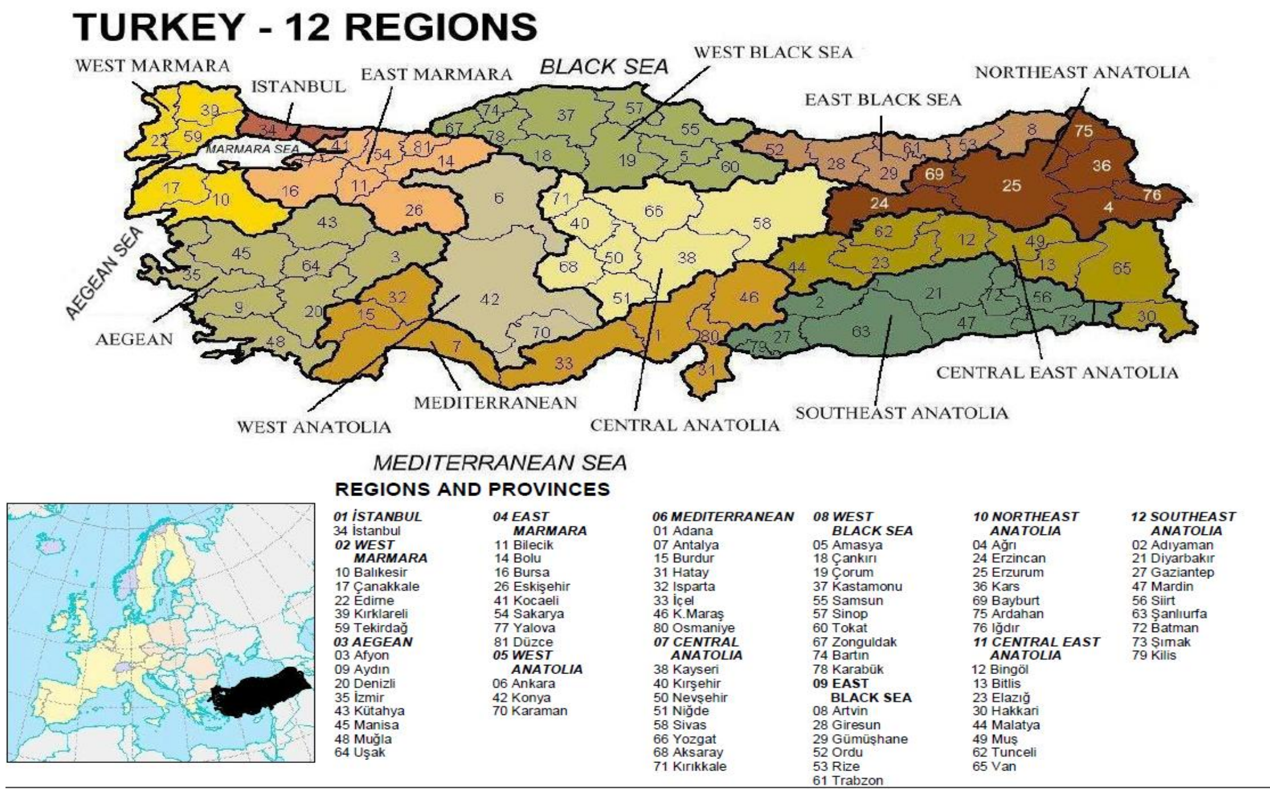
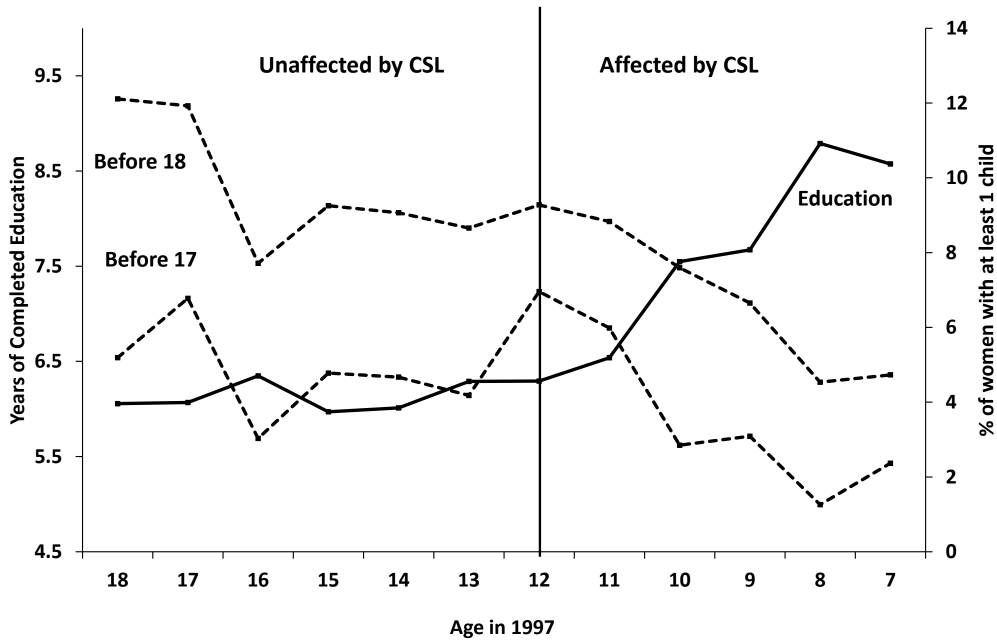


Figure 3: Administrative Regions and Provinces of Turkey



Source: Turkey Demographic and Health Survey 2008 Main Report, Hacettepe University Institute of Population Studies, http://www.hips.hacettepe.edu.tr/eng/index.html

Figure 4: Percentage of Mothers Before Age 18 and 17, and Female Education



Notes: The sample includes all females between the ages of 18 and 29 at the time of the survey. Females aged 12 in 1997 is the youngest unaffected cohort (solid vertical line). Each point on the solid line represents the average education for each cohort. Percentage of mothers for each cohort is the percentage of women with at least 1 ever-born child before age 18 and 17.

Table 1: Descriptive Statistics

	Mean
Female Age	23.76
Female Age in 1997 Year-of-Birth Dummy Fractions	
Age 7 in 1997	0.09
Age 8 in 1997	0.08
Age 9 in 1997	0.09
Age 10 in 1997	0.07
Age 11 in 1997	0.08
Female Years of Completed Education	6.84
Completed five or more years of education	0.82
Completed eight or more years of education	0.46
Fraction of married women	0.56
Fraction of married women before age 18	0.17
Fraction of women having no kids at the time of the survey	0.53
Fraction of women having no kids before age 18	0.93
Number of children ever born	0.94
Number of children before age 18	0.09
Number of children before age 17	0.04
Number of children before age 16	0.02
Number of Observations	4684
Number of Female With Children	2185

Notes: The sample includes all females between the ages of 18 and 30 at the time of the survey.

Table 2: First Stage Coefficients: Effects of the CSL on Completed Years of Schooling

	Dependent Variable: Years of Education			
Age in 1997 Dummies	(1)	(2)	(3)	(4)
Cohort 7 (age = 7 in 1997)	2.475***	2.602***	2.898***	3.449***
	(0.249)	(0.230)	(0.268)	(0.370)
Cohort 8 (age = 8 in 1997)	2.691***	2.669***	2.963***	3.522***
	(0.263)	(0.207)	(0.230)	(0.328)
Cohort 9 (age = 9 in 1997)	1.573***	1.860***	2.047***	2.307***
	(0.280)	(0.217)	(0.265)	(0.407)
Cohort 10 (age = 10 in 1997)	1.448***	1.451***	1.542***	0.883**
	(0.248)	(0.223)	(0.248)	(0.379)
Cohort 11 (age = 11 in 1997)	0.439**	0.805***	0.752***	0.439
	(0.215)	(0.214)	(0.262)	(0.386)
Control Variables:				
Province of birth dummies	No	Yes	Yes	Yes
Year of birth*Number of children in 1995	No	No	Yes	Yes
Year of birth*Enrollment rate in 1995	No	No	No	Yes
F-statistics	28.22	43.10	42.00	30.07
Adjusted R-square	0.065	0.310	0.312	0.316
Observations	4,684	4,684	4,684	4,684

*Significant at 0.1 level. ** Significant at 0.05 level. ***Significant at 0.01 level.

The F-statistics test the hypothesis that the coefficients of the cohort dummies are jointly zero.

Notes: Standard errors are in parentheses. Standard errors are adjusted for clustering on the province of birth. The number of children in 1995 is the number of primary school age children in the province of birth in 1995 (80 provinces). Enrollment rate in 1995 is the number of children enrolled in primary school in 1995 (obtained from TurkStat) divided by the number of primary school age children in the province of birth in 1995.

Table 3: Effect of the CSL on Education and Fertility Before Age 18

		Dependent Variable							
		Years of Education				Fertility Before Age 18			
	Obs	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Women Aged 7-11 to 12-15 in 1997									
Women ages 7 to 11 in 1997 dummy	3,327	1.747***	1.839***	1.976***	2.231***	-0.039***	-0.043***	-0.051***	-0.039*
		(0.174)	(0.155)	(0.183)	(0.283)	(0.011)	(0.012)	(0.015)	(0.023)
Panel B: Women Aged 12-15 to 16-19 in 1997									
Women ages 12 to 15 in 1997 dummy	2,735	0.090	0.205	0.349**	0.267	-0.024	-0.030	-0.033	-0.051
		(0.153)	(0.125)	(0.148)	(0.287)	(0.016)	(0.017)	(0.022)	(0.034)
Control Variables:									
Province of birth dummies		No	Yes	Yes	Yes	No	Yes	Yes	Yes
Year of birth*Number of children in 1995		No	No	Yes	Yes	No	No	Yes	Yes
Year of birth*Enrollment rate in 1995		No	No	No	Yes	No	No	No	Yes

*Significant at 0.1 level. ** Significant at 0.05 level. ***Significant at 0.01 level.

Notes: Standard errors are in parentheses. Standard errors are adjusted for clustering on the province of birth. The number of children in 1995 is the number of primary school age children in the province of birth in 1995 (80 provinces). Enrollment rate in 1995 is the number of children enrolled in primary school in 1995 (obtained from TurkStat) divided by the number of primary school age children in the province of birth in 1995.

Table 4: Effects of Female Schooling on Fertility Outcomes: OLS and 2SLS Estimates

Method (Instrument)	(1) 18-30	(2) 18-30	(3) 18-30	(4) 18-30	(5) 18-25
Panel A: Dependent Variable:					
Fertility Before Age 18					
OLS	-0.018***	-0.016***	-0.016***	-0.015***	-0.013***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
2SLS (Treatment Dummy)	-0.028***	-0.029***	-0.031***	-0.027**	-0.023*
	(0.007)	(0.007)	(0.008)	(0.011)	(0.013)
2SLS (YOB Dummies)	-0.029***	-0.029***	-0.032***	-0.029***	-0.028***
	(0.006)	(0.006)	(0.007)	(0.008)	(0.009)
	[0.424]	[0.468]	[0.372]	[0.334]	[0.121]
Panel B: Dependent Variable:					
Fertility Before Age 17					
OLS	-0.010***	-0.009***	-0.008***	-0.008***	-0.007***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
2SLS (Treatment Dummy)	-0.016***	-0.016***	-0.018***	-0.018**	-0.018**
	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)
2SLS (YOB Dummies)	-0.018***	-0.018***	-0.020***	-0.020***	-0.021***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)
	[0.526]	[0.549]	[0.571]	[0.428]	[0.303]
Panel C: Dependent Variable:					
Fertility Before Age 16					
OLS	-0.005***	-0.004***	-0.004***	-0.003***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
2SLS (Treatment Dummy)	-0.009***	-0.009***	-0.010***	-0.010***	-0.010*
	(0.003)	(0.002)	(0.003)	(0.004)	(0.006)
2SLS (YOB Dummies)	-0.009***	-0.009***	-0.010***	-0.010***	-0.009***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
	[0.216]	[0.285]	[0.320]	[0.141]	[0.101]
Control Variables:					
Province of birth dummies	No	Yes	Yes	Yes	Yes
YOB*Number of children in 1995	No	No	Yes	Yes	Yes
YOB*Enrollment rate in 1995	No	No	No	Yes	Yes
Observations	4,684	4,684	4,684	4,684	2,993

*Significant at 0.1 level. ** Significant at 0.05 level. ***Significant at 0.01 level.

Treatment: Age 7-11 in 1997; Control: Age 12-19 in 1997 in columns (1)-(4). Treatment: Age 7-11 in 1997; Control: Age 12-14 in 1997 in column (5). *Notes:* Standard errors are in parentheses. Standard errors are adjusted for clustering on the province of birth. P-values of the overidentification test are in square brackets. "YOB" refers to year of birth. The number of children in 1995 is the number of primary school age children in the province of birth in 1995 (80 provinces). Enrollment rate in 1995 is the number of children enrolled in primary school in 1995 (obtained from TurkStat) divided by the number of primary school age children in the province of birth in 1995.

Table 5: Effect of the CSL on Fertility

	Dependent Variable			
	Before 19	Before 20	Before 21	Before 22
	(1)	(2)	(3)	(4)
Comparison Group	8-11 vs 12-15	9-11 vs 12-15	10-11 vs 12-15	11 vs 12-15
Treatment	-0.054***	-0.068***	-0.074**	-0.095**
	(0.017)	(0.024)	(0.028)	(0.042)
Observations	2,862	2,466	2,045	1,729

Notes: All comparison groups are defined by age in 1997. For instance, 8-11 vs 12-15 is comparing teenage fertility for females aged 8-11 in 1997 to 12-15 in 1997. Standard errors (reported in parantheses) are adjusted for clustering at the province level. Regressions do not have controls.

Table 6A: Heterogeneity of the impact and the CSL effect by pre-change levels of fertility and education

		Pre-Change Province of Birth Characteristics			
	Whole	Pre-change education		Pre-change fertility	
	Sample	<Median	>=Median	<Median	>=Median
	(1)	(2)	(3)	(4)	(5)
1) Effect of the CSL on Education					
Treatment	2.231***	3.047***	1.870***	1.837***	2.788***
(7-11 vs 12-15)	(0.283)	(0.482)	(0.274)	(0.394)	(0.369)
2) Effect of the CSL on Fertility					
Treatment	-0.039*	-0.107*	0.002	0.007	-0.102**
(7-11 vs 12-15)	(0.023)	(0.054)	(0.020)	(0.017)	(0.043)
3) Impact of Female Education on Fertility					
Years of Education	-0.025***	-0.034***	-0.017*	-0.012	-0.038***
(Treatment: 7-11 vs 12-15)	(0.008)	(0.011)	(0.009)	(0.008)	(0.010)

*Significant at 0.1 level. ** Significant at 0.05 level. ***Significant at 0.01 level.

Notes: Median pre-program education is 6.428; median pre-program fertility is 0.091.

Standard errors are in parentheses. Standard errors are adjusted for clustering on the province of birth.

Table 6B: Heterogeneity of the impact and the CSL effect by pre-change province characteristics

		Pre-Change Province of Birth Characteristics							
	Whole	Density		GDP		Urbanization		%HH in Agriculture	
	Sample	<Median	>=Median	<Median	>=Median	<Median	>=Median	<Median	>=Median
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1) Effect of the CSL on Education									
Treatment	2.304***	2.607***	1.762***	2.693***	1.900***	2.724***	1.858***	2.290***	2.212***
7-11 vs 12-19	(0.236)	(0.267)	(0.318)	(0.301)	(0.334)	(0.375)	(0.331)	(0.307)	(0.379)
2) Effect of the CSL on Fertility									
Treatment	-0.061*	-0.100***	-0.028	-0.102**	-0.033	-0.074*	-0.052	-0.068*	-0.063*
7-11 vs 12-19	(0.026)	(0.035)	(0.040)	(0.047)	(0.025)	(0.043)	(0.036)	(0.039)	(0.035)
3) Impact of Female Education on Fertility									
Years of Education	-0.029***	-0.040***	-0.025**	-0.039***	-0.024***	-0.034***	-0.027**	-0.033***	-0.025**
(Treatment: 7-11 vs 12-19)	(0.008)	(0.010)	(0.012)	(0.010)	(0.009)	(0.010)	(0.012)	(0.010)	(0.011)

*Significant at 0.1 level. ** Significant at 0.05 level. ***Significant at 0.01 level.

Notes: Median population density is 63.14 (per square kilometers); median GDP is $1908; median urbanization rate is 48.168%; median % HH engaged in agricultural activity is 73.744 %. Standard errors are in parentheses. Standard errors are adjusted for clustering on the province of birth.

Table 7A: Effects of the CSL by Year of Birth and Intensity Measure (Number of Students Bussed)

	Dependent Variable: Years of Education				Dependent Variable: Number of kids before age 18			
Coefficients of the interactions	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Age 7 in 1997 * Students bussed per	0.020***	0.018***	0.016***	0.012***	-0.0004***	-0.0003***	-0.0003***	-0.0003***
1000 children in province of birth	(0.003)	(0.002)	(0.002)	(0.002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Age 8 in 1997 * Students bussed per	0.020***	0.018***	0.016***	0.014***	-0.0005***	-0.0004***	-0.0003***	-0.0003***
1000 children in province of birth	(0.002)	(0.002)	(0.002)	(0.002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Age 9 in 1997 * Students bussed per	0.017***	0.015***	0.014***	0.012***	-0.0004***	-0.0003***	-0.0003***	-0.0003***
1000 children in province of birth	(0.002)	(0.002)	(0.002)	(0.002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Age 10 in 1997 * Students bussed per	0.012***	0.010***	0.009***	0.004**	-0.0004***	-0.0003***	-0.0003***	-0.0003***
1000 children in province of birth	(0.002)	(0.002)	(0.002)	(0.002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Age 11 in 1997 * Students bussed per	0.005*	0.004**	0.003	0.001	-0.0001	0.0000	0.0001	0.0001
1000 children in province of birth	(0.003)	(0.002)	(0.002)	(0.002)	(0.0002)	(0.0001)	(0.0002)	(0.0002)
Control Variables:								
Province of birth dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
YOB*Number of children in 1995	No	No	Yes	Yes	No	No	Yes	Yes
YOB*Enrollment rate in 1995	No	No	No	Yes	No	No	No	Yes
F-statistics	20.87	25.42	21.60	16.12	7.61	6.46	5.07	2.43
R-square	0.074	0.303	0.310	0.319	0.006	0.051	0.053	0.057
Observations	4,684	4,684	4,684	4,684	4,684	4,684	4,684	4,684

*Significant at 0.1 level. ** Significant at 0.05 level. ***Significant at 0.01 level.

The F-statistics test the hypothesis that the coefficients of interactions are jointly zero.

Notes: Standard errors are in parentheses. Standard errors are adjusted for clustering on the province of birth. "YOB" refers to year of birth. The number of children in 1995 is the number of primary school age children in the province of birth in 1995 (80 provinces). Enrollment rate in 1995 is the number of children enrolled in primary school in 1995 (obtained from TurkStat) divided by the number of primary school age children in the province of birth in 1995.

Table 7B: Effects of the CSL by Year of Birth and Intensity Measure (Number of Additional Classrooms)

	Dependent Variable: Years of Education				Dependent Variable: Number of kids before age 18			
Coefficients of the interactions	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Age 7 in 1997 * Additional Classrooms	0.153***	0.194***	0.187***	0.134***	-0.004***	-0.005***	-0.005***	-0.006***
per 1000 children in province of birth	(0.047)	(0.031)	(0.040)	(0.041)	(0.001)	(0.001)	(0.002)	(0.002)
Age 8 in 1997 * Additional Classrooms	0.181***	0.220***	0.222***	0.195***	-0.005***	-0.006***	-0.006***	-0.007***
per 1000 children in province of birth	(0.043)	(0.024)	(0.029)	(0.029)	(0.001)	(0.001)	(0.002)	(0.002)
Age 9 in 1997 * Additional Classrooms	0.089**	0.146***	0.141***	0.103***	-0.003*	-0.004***	-0.005***	-0.005***
per 1000 children in province of birth	(0.039)	(0.022)	(0.028)	(0.029)	(0.001)	(0.001)	(0.002)	(0.002)
Age 10 in 1997 * Additional Classrooms	0.069**	0.106***	0.093***	0.010	-0.002	-0.003*	-0.003	-0.003
per 1000 children in province of birth	(0.028)	(0.017)	(0.023)	(0.030)	(0.002)	(0.002)	(0.002)	(0.002)
Age 11 in 1997 * Additional Classrooms	0.008	0.081***	0.078***	0.060**	-0.000	-0.001	-0.001	-0.001
per 1000 children in province of birth	(0.027)	(0.016)	(0.019)	(0.025)	(0.002)	(0.002)	(0.002)	(0.002)
Control Variables:								
Province of birth dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Year of birth*Number of children in 1995	No	No	Yes	Yes	No	No	Yes	Yes
Year of birth*Enrollment rate in 1995	No	No	No	Yes	No	No	No	Yes
F-statistics	6.44	26.33	16.44	10.52	6.43	6.07	4.28	2.70
R-square	0.035	0.304	0.306	0.313	0.004	0.053	0.054	0.057
Observations	4,684	4,684	4,684	4,684	4,684	4,684	4,684	4,684

*Significant at 0.1 level. ** Significant at 0.05 level. ***Significant at 0.01 level.

The F-statistics test the hypothesis that the coefficients of interactions are jointly zero.

Notes: Standard errors are in parentheses. Standard errors are adjusted for clustering on the province of birth. The number of children in 1995 is the number of primary school age children in the province of birth in 1995 (80 provinces). Enrollment rate in 1995 is the number of children enrolled in primary school in 1995 (obtained from TurkStat) divided by the number of primary school age children in the province of birth in 1995.

Table 8: Effect of the CSL on Fertility Before Age 18, Marital Status, and No kids

Dependent Variable	(1)	(2)	(3)	(4)
Fertility Before Age 18	-0.039***	-0.043***	-0.051***	-0.039*
	(0.011)	(0.012)	(0.015)	(0.023)
(R-squared)	0.004	0.047	0.049	0.050
Probability of Having No kids				
Before Age 18	0.026***	0.030***	0.034***	0.027*
	(0.009)	(0.009)	(0.011)	(0.016)
(R-squared)	0.003	0.043	0.044	0.046
Probability of Being Married				
Before Age 18	-0.043***	-0.047***	-0.046***	-0.045*
	(0.012)	(0.012)	(0.015)	(0.023)
(R-squared)	0.003	0.047	0.050	0.052
Control Variables:				
Province of birth dummies	No	Yes	Yes	Yes
Year of birth*Number of children in 1995	No	No	Yes	Yes
Year of birth*Enrollment rate in 1995	No	No	No	Yes

*Significant at 0.1 level. ** Significant at 0.05 level. ***Significant at 0.01 level.
All specifications have 3,327 observations. Treatment: Age 7-11 in 1997; Control: Age 12-15 in 1997.
Notes: Standard errors are in parentheses. Standard errors are adjusted for clustering on the province of birth. The number of children in 1995 is the number of primary school age children in the province of birth in 1995 (80 provinces). Enrollment rate in 1995 is the number of children enrolled in primary school in 1995 (obtained from TurkStat) divided by the number of primary school age children in the province of birth in 1995.

Appendix A. The CSL on different levels of education

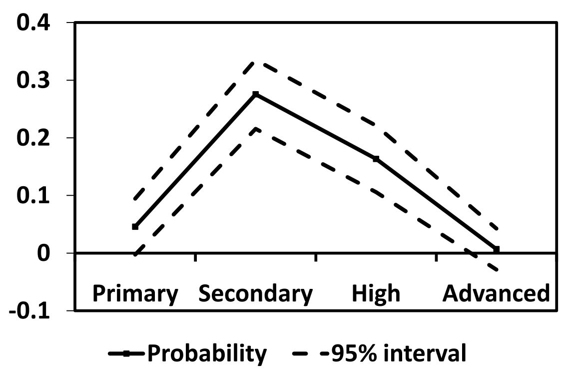
Following Duflo (2001), I estimate the equation below to check if the CSL succeeded in affecting mainly the targeted groups since the impact of the CSL on fertility depends on it.

$$E_{im} = d + G_i\beta_t + T_i\hbar_m + \varepsilon_i \quad (8)$$

where E_{im} is a schooling variable which takes value 1 if individual i completed m level of education, 0 otherwise. d is a constant, β_t accounts for group time fixed effects (7-11; 12-15; 16-19 in 1997), and T_i is the treatment dummy. $\hbar_m$ is the estimated impact of the CSL for 4 different levels of education (m): primary (5 years of education), secondary (8 years of education), high (11 years of education), and advanced (11+ years of education). Figure A.1 presents the estimated probabilities from LPM with corresponding 95% confidence intervals.

The effect of the CSL is the highest for the probability of completing 8 years of education, at the level of the goal of the education policy. There is evidence that the CSL increased the likelihood of completing high school, and a negligible effect on the probability of completing advanced education. Despite the small spillovers, the program substantially increased schooling through the level of education associated with the CSL.

Figure A.1: Probability of Completing at Least "M" Level of Education



Appendix B. First Stage Coefficients: Effects of the CSL on Completed Years of Schooling (Unrestricted Specification)

Age in 1997 Dummies	Dependent Variable: Years of Education
Cohort 7 (age = 7 in 1997)	2.854***
	(0.322)
Cohort 8 (age = 8 in 1997)	3.070***
	(0.311)
Cohort 9 (age = 9 in 1997)	1.952***
	(0.368)
Cohort 10 (age = 10 in 1997)	1.827***
	(0.329)
Cohort 11 (age = 11 in 1997)	0.818***
	(0.249)
Cohort 12 (age = 12 in 1997)	0.573
	(0.349)
Cohort 13 (age = 13 in 1997)	0.569
	(0.346)
Cohort 14 (age = 14 in 1997)	0.291
	(0.269)
Cohort 15 (age = 15 in 1997)	0.268
	(0.305)
Cohort 16 (age = 16 in 1997)	0.627*
	(0.342)
Cohort 17 (age = 17 in 1997)	0.348
	(0.266)
Cohort 18 (age = 18 in 1997)	0.335
	(0.251)
F-statistics for age 7-11 in 1997	34.97
	(p=0.000)
F-statistics for age 12-18 in 1997	1.01
	(p=0.419)
Adjusted R-square	0.316
Observations	4,684

*Significant at 0.1 level. ** Significant at 0.05 level. ***Significant at 0.01 level.

Notes: The F-statistics test the hypothesis that the coefficients are jointly zero. Standard errors (reported in parentheses) are adjusted for clustering on the province of birth.

Appendix C. Heterogeneity of the CSL effect on education by mother's education and ethnicity

	Part A: Mother's Education		Part B: Mother's Ethnicity	
	Dependent Variable: Years of Education		Dependent Variable: Years of Education	
Variables	(1)	(2)	Variables	(3)
T	1.599***	1.591***	T	2.456***
	(0.293)	(0.292)		(0.226)
ME (primary)	1.664***	1.664***	Mother's ethnicity (Kurdish)	-3.057***
	(0.163)	(0.162)		(0.263)
ME (secondary)	3.198***	3.199***	Mother's ethnicity (Other)	-2.293***
	(0.398)	(0.396)		(0.676)
ME (higher)	5.023***	5.010***		
	(0.627)	(0.625)		
T*ME (primary)	0.559**			
	(0.267)			
T*ME (secondary)	0.002			
	(0.548)			
T*ME (higher)	-0.825			
	(0.669)			
T*ME (primary)*Cohort 7		1.153***	T*Other*Cohort 7	-1.053
		(0.331)		(1.657)
T*ME (secondary)*Cohort 7		0.229	T*Kurdish*Cohort 7	-0.388
		(0.727)		(0.450)
T*ME (higher)*Cohort 7		-1.061		
		(0.646)		
T*ME (primary)*Cohort 8		0.970***	T*Other*Cohort 8	0.820
		(0.342)		(1.302)
T*ME (secondary)*Cohort 8		-0.428	T*Kurdish*Cohort 8	-0.016
		(0.768)		(0.445)
T*ME (higher)*Cohort 8		-0.876		
		(0.687)		
T*ME (primary)*Cohort 9		1.038***	T*Other*Cohort 9	-0.388
		(0.364)		(0.928)
T*ME (secondary)*Cohort 9		0.490	T*Kurdish*Cohort 9	-1.123**
		(0.641)		(0.429)
T*ME (higher)*Cohort 9		-0.325		
		(0.881)		
T*ME (primary)*Cohort 10		0.070	T*Other*Cohort 10	-0.703
		(0.403)		(0.523)
T*ME (secondary)*Cohort 10		-0.070	T*Kurdish*Cohort 10	-1.154**
		(0.860)		(0.571)
T*ME (higher)*Cohort 10		-0.905		
		(0.963)		
T*ME (primary)*Cohort 11		-0.667	T*Other*Cohort 11	0.173
		(0.500)		(1.531)
T*ME (secondary)*Cohort 11		-0.122	T*Kurdish*Cohort 11	-0.747
		(1.828)		(0.477)
T*ME (higher)*Cohort 11		-0.046		
		(0.748)		
Adj. R-squared	0.356	0.358	*Adj. R-squared*	0.364
Observations	4,186	4,186	*Observations*	4,537

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All controls are included. Standard errors are in parentheses. Standard errors are adjusted for clustering on the province of birth. T is the treatment dummy and ME is mother's education categories. Omitted groups are mothers with no education and Turkish mothers.

Appendix D. The Effect of the CSL on Men's Education, Number of Kids, and Marriage

	Dependent Variable			
	(1)	(2)	(3)	(4)
	18-25	18-25	18-25	18-25
Panel A: Reduced Form Estimation				
	Years of Education			
Men ages 7 to 11 in 1997 dummy	0.286**	0.360**	0.495***	0.418*
	(0.138)	(0.139)	(0.170)	(0.235)
Women ages 7 to 11 in 1997 dummy	1.697***	1.745***	1.966***	2.162***
	(0.176)	(0.167)	(0.188)	(0.297)
	Number of Kids Before 18			
Men ages 7 to 11 in 1997 dummy	-0.002	-0.002	-0.003	-0.003
	(0.003)	(0.002)	(0.003)	(0.003)
	Probability of Being Married Before 18			
Men ages 7 to 11 in 1997 dummy	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.003)	(0.004)	(0.004)
Panel B: 2SLS Estimation				
(Instrument: Treatment Dummy)				
	Number of Kids Before 18			
Years of Education	-0.003	-0.003	-0.004	-0.004
	(0.006)	(0.005)	(0.005)	(0.005)
	Probability of Being Married Before 18			
Years of Education	-0.000	-0.003	-0.001	-0.001
	(0.015)	(0.013)	(0.010)	(0.010)
Control Variables:				
Province of birth dummies	No	Yes	Yes	Yes
Year of birth*Number of children in 1995	No	No	Yes	Yes
Year of birth*Enrollment rate in 1995	No	No	No	Yes

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Treatment: Age 7-11 in 1997 (65%); Control: Age 12-14 in 1997 (35%).

Notes: Standard errors (reported in parentheses) are adjusted for clustering on the province of birth. Regressions include 3,262 observations. Mean education, number of kids before 18, and probability of being married before 18 are 9.601 (9.330 for unexposed cohorts), 0.006 (0.006 for unexposed cohorts), and 0.005 (0.005 for unexposed cohorts), respectively.