The Role of Maternal Education in Infant Health: Evidence from a Compulsory Schooling Law*

Pınar Mine Güneş†

PRELIMINARY, PLEASE DO NOT CITE

Abstract

This paper explores the effect of maternal education on infant health and the channels via which education operates by exploiting a change in the compulsory schooling law (CSL) in Turkey. In order to account for the endogeneity of education, variation in the exposure to the CSL across cohorts induced by the timing of the policy is used as an instrumental variable. The results indicate that mother's primary school completion improves infant health, as measured by very low birth weight, even after controlling for many potential confounding factors. This paper also demonstrates that mother's primary school completion leads to earlier preventive care initiation and reduces smoking.

*Special thanks to Anna Alberini. I am also greatful to Kenneth L. Leonard and Dana C. Andersen for many valuable comments.

†Department of Agricultural and Resource Economics (AREC), University of Maryland, Symons Hall, Rm. 2200 College Park, MD 20742. e-mail: pgunes@arec.umd.edu

1 Introduction

The significant relationship between parental education, especially maternal education, and child health has been well-documented. (For a survey of the literature, see Strauss and Thomas, 1995.) One explanation emphasized in the literature is that greater maternal education translates into greater health care utilization, including formal prenatal visits. Thus, because female education increases health care utilization, development economists have promoted female education as a means to improve infant health and child survival.

Besides health care utilization, maternal education can affect infant health through several other mechanisms. For example, better educated women have higher income and may "match" (Behrman and Rosenzweig, 2002) with better educated, and higher income, husbands. Educated women also have greater knowledge of modern health care services and ability to communicate with health-care providers (Caldwell, 1979; Barrera, 1990). Moreover, education may affect smoking and other health behaviors during pregnancy (Currie and Moretti, 2003). Another channel is through greater female autonomy, which in turn influences health-related decisions and the allocation of resources within the household (Caldwell, 1979; Caldwell et al., 1983). Other possible explanations include beliefs about the causes of diseases and increased adoption of modern medical practices (Caldwell, 1979; Caldwell, 1990; Barrera, 1990).

Barrera (1990) and Caldwell (1979) show that educated mothers benefited more from health care services, regardless of access to health services, due to greater knowledge of diseases and their treatments. Rosenzweig and Schultz (1982) argue that readily accessible health care facilities can substitute for knowledge of diseases and modern treatment acquired from female schooling. Hence, differentials in the use of health care services by maternal education should be less pronounced in areas with greater access to health care services. They find support for their substitution hypothesis in urban areas in Colombia, but not in rural areas. Behrman and Wolfe (1987) argue that the effect of female education on health outcomes may be overstated in studies that do not control for women's childhood environment during which health related skills and habits are acquired.

Previous research demonstrates that maternal education is a major factor in determining child health as well as health care services utilization in developing countries. Moreover, the result holds even after controlling for factors that affect both maternal schooling and health care utilization (and infant health), such as childhood place of residence and ethnicity, as well as socioeconomic variables, such as current residence and husband's education.[1] However, the correlations may still be biased due to unobservable omitted factors, including personal traits, such as ability (Griliches, 1977) and discount rates (Fuchs, 1982). In order to identify the causal effect of maternal education, this paper employs an instrumental variables estimation (IV) using variation in the exposure to the compulsory schooling law (CSL) in Turkey in 1997, which extended compulsory schooling from five to eight years (free of charge in public schools) across cohorts as an instrument. More specifically, this paper explores the causal relationship between mother's primary school completion (8+ years) and infant health at birth, as measured by very low birth weight, and maternal health, as measured by the length of health facility stay after delivery, which indicates delivery complications. Furthermore, I examine various channels through which maternal education may affect infant health: health care utilization, smoking behavior, type of occupation, and spouse's education and occupation. I also control for many observed and unobserved confounding factors by including individual- and community-level characteristics, and mother's province of birth fixed effects.

Currie and Moretti (2003) use availability of colleges by county when the mother is aged seventeen as an instrument for her education.[2] They find that higher maternal education improves infant health, and assess the importance of various channels through which education may improve birth outcomes in the United States. The literature exploring the effect of maternal education on infant health in developing countries is limited: Breierova and Duflo (2004) use a primary school construction program in Indonesia, while Chou et al. (2010) use a middle school expansion in Taiwan,

[1] In India Navaneetham and Dharmalingam (2002); Pallikadavath et al. (2004); Sunil et al., 2006; in Bangladesh Paul and Rumsey (2002); in Ethiopia Mekonnen and Mekonnen (2003); in Peru Elo (1992); in Turkey Celik and Hotchkiss (2000); in Thailand Raghupathy (1996); in Uganda Tann et al., 2007; in rural Guetemala Glei et al. (2003); in Indonesia Titaley et al. (2011); in South America Jewell (2009).

[2] The CSL provides a more ideal and valid instrument compared to college openings as a source of identification. Currie and Moretti (2003) addressed concerns regarding the validity of their instrumental variables: (1) the location of college openings may not be random and (2) the endogeneous mobility of women who move to attend college.

as sources of exogenous variation in schooling.[3] However, neither paper explores the channels through which education operates. This paper therefore contributes to the literature by examining the causal relationship between maternal education and infant health in a developing country and investigating potential mechanisms.

I find that primary school completion improves infant and maternal health, even after controlling for many potential confounding factors. The results also provide evidence of the causal effect of mother's education on maternal health behaviors: primary school completion leads to earlier preventive care initiation and reduces smoking. However, maternal education does not significantly affect formal prenatal care and delivery, mother's type of occupation, and husband's education and occupation. Hence, the results suggest that maternal education affects infant health in part through changing maternal health behavior.

The policy implications of this paper are straightforward. The benefits of maternal primary school completion are greater than typically recognized as completion improves not only market outcomes as often emphasized but also infant health. Thus, policies that increase primary school completion affect both mothers and children. This result highlights the importance of raising educational completion rates for populations lagging behind. The results also suggest that, even after controlling for education, region and urban/rural residence are important factors of infant health and health care utilization, and, additionally, pregnancy experience and ethnicity are important factors of health care utilization. Therefore interventions aimed at these subpopulations are important for reducing infant health and health care utilization disparities.

The remainder of this paper is organized as follows: Section 2 provides background on infant health, health care services, and the educational policy in Turkey; Section 3 describes the data; Section 4 presents the empirical strategy; Section 5 presents results and robustness checks; and Section 6 concludes.

[3]Breierova and Duflo (2004) find that parental education reduces child mortality, as measured by the total number of children who died under various ages. Chou et al. (2010) show that parents' schooling improves infant health, as measured by the probabilities of a low-weight (less than 2,500 grams) birth, a neonatal death, a postneonatal death, and an infant death.

2 Background

2.1 Infant Health and Maternal Health Care in Turkey before the CSL

Women can access preventive health care in various health facilities provided by the Ministry of Health (MOH) in Turkey. Health houses and centers are the primary public maternal health care service providers in the villages, which are staffed with at least one midwife or a nurse, whereas other health care facilities such as hospitals are mostly in urban areas. Mother and Child Health and Family Planning Centers also provide health services for pregnant women throughout the country. Overall, public services are widely used sources for preventive care compared to private sector, which provides services mostly in large urban areas.[4]

According to the demographic health surveys in 1993 and 1998, 38% and 33% of births were to mothers who did not use formal prenatal care; 25% and 27% of births were not assisted by medical professionals; and about 40% and 30% of births were not delivered at a health facility, respectively.[5] In both years, assistance of traditional birth attendants and/or relatives at the delivery are higher in rural areas, compared to urban areas. Moreover, there has been a marked difference in health care utilization by educational levels within the country in both years.[6]

Infant and children under five mortality rates were extremely high in the early 1960s (over 200 per thousand live births); however, both decreased to approximately 130 in early 1980s. Despite improvements in infant and children under five mortality rates in the 1980s, both rates exceeded 55 per thousand live births during the 1990s prior to the CSL, which is very high compared to developed countries.[7] There were large regional and residential differentials in infant and children under five mortality, despite governmental efforts to provide access to preventive health care services. In addition, there were sharp differentials by mother's educational levels. In 1993 (1998), the infant and under-five mortality rates of children of mothers with fewer than five years of edu-

[4]Turkish Demographic Health Surveys in collaboration with MOH: http://www.hips.hacettepe.edu.tr/eng/surveys.shtml

[5]http://www.hips.hacettepe.edu.tr/eng/tdhs08/TDHS-2008_Preliminary_Report.pdf

[6]For instance, only 40% of the mothers who did not complete 5 years of education used preventive care services, whereas almost 75% of the mothers with 5 to 8 years of education and almost 93% of the mothers with more than 8 years of schooling used prenatal care services in 1993.

[7]http://data.un.org/

cation were 1.6 (1.7) times higher than the rates of mothers with at least five years of education.[8] 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 prior to the CSL. Hence, the CSL took place when infant and under-five mortality rates were high, literacy rates leveled off, and the use of public preventive health care services were at suboptimal levels, even though public preventive health care services were available throughout the country.

2.2 The 1997 Educational Reform

Prior to the 1997 educational reform in Turkey, all citizens were required to receive five years of compulsory education, which is provided free of charge in public schools. In order to increase the education level to universal standards, in 1997 the Turkish government extended compulsory schooling from five to eight years as of the 1997/1998 Academic Year.[9] The government created new schools, added new classes to the existing schools, recruited new primary school teachers, provided transportation to children who live far from main primary schools, and provided free textbooks and uniforms to low-income students.

The CSL led to a significant increase in the enrollment rates between the 1997/98 and the 2000/01 Academic Years, by around 15%.[10] Rural enrollment in grade six for females increased substantially between the 1997/98 and 1999/00 Academic Years, roughly 162%.[11] In the first year of the change in the law, the net primary enrollment rate and the sex ratio increased by 10.4% and 3.4%, respectively.[12] The net primary enrollment rate for boys and girls has converged over time, reaching to 98.77 for males and 98.56 for females (98.67 for both sexes) in the 2011/12 Academic Year.

[8]For rates in 1993 and 1998, see footnote 4 and http://www.measuredhs.com/pubs/pdf/FR108/FR108.pdf

[9]The Basic Education Law No 4306.

[10]For educational statistics, see http://sgb.meb.gov.tr/istatistik/meb_istatistikleri_orgun_egitim_2011_2012.pdf

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

[12]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. Sex Ratio is calculated by dividing the female gross enrollment ratio by the male gross enrollment ratio multiplied 100.

3 Data and measurement of variables

The data used in this paper come from the most recent Turkish Demographic and Health Survey (TDHS-2008), a nationally representative household survey carried out in Turkey in 2008. The TDHS covers a representative sample of 7,405 ever-married women of reproductive ages 15-49. The survey has information on socioeconomic and demographic characteristics, fertility, and family planning, as well as maternal and child health. In addition, the survey contains information on maternal health care utilization of women who had given birth during the five years preceding the survey.

The analysis is based on the latest birth of ever-married women at the ages of 18-29 during the five years prior to the interview.[13] Restricting analysis to ever-married women is justified since childbearing out of wedlock is uncommon in Turkey.[14] Since women provide more accurate information on their most recent births, the analysis considers utilization behavior associated with only one birth (latest) per woman. Thus, the final data set is restricted to 1,677 mothers.

Measurement of Infant and Maternal Health, and Maternal Health Care Services

Birth weight and delivery complications are used as measures of infant and maternal health. This paper focuses on the "very low birth weight" (VLBW) (infants weighing less than 1500 grams), which is linked to higher risk of death within the first year of life and many adverse adulthood outcomes.[15] In order to examine the effect of mother's education on maternal health, the length of health facility stay after delivery for the mother is used as an indicator of delivery complications (the unit is "days").[16]

Four dichotomous outcomes of use of maternal health care services are analyzed: use of prenatal services from formal sources, receipt of four or more prenatal visits, delivery in a medical

[13] The reason to restrict the sample to women at the ages of 18-29 is specified under the identification section.

[14] Hacettepe University Institute of Population Studies, TDHS-2008: http://www.hips.hacettepe.edu.tr/eng/index.html

[15] Definition of VLBW is listed in the International Statistical Classification of Diseases and Related Health Problems (ICD-10) codes (World Health Organization). For adverse outcomes, see Hack et al. (1994); Hack et al. (2002); Behrman and Rosenzweig (2004); Black et al. (2007).

[16] Although a noisy measure, the length of health facility stay after delivery is the best available proxy for maternal health in the TDHS data.

institution, and delivery assistance by trained medical personnel. Following World Health Organization (WHO) definitions of appropriate maternal care, both prenatal care and assistance at delivery are coded 1 if the woman obtained services from doctors, trained nurses, or trained midwives, and 0 otherwise. I also use month of prenatal care initiation as a measure of preventive care, which takes values from 1 (preventive care is initiated in the first month of pregnancy) to 10 (mother has not initiated any prenatal care).

Independent Variables

The primary variable of interest–primary schooling completion (defined as "primary")–is an indicator variable equal to one if the mother has completed at least 8 years of schooling. Because women in the sample of analysis had completed their education prior to childbearing, the educational attainment observed in the sample represents final completed education.

There are several other factors that may affect infant health as well as health utilization behavior. Province of birth dummies and ethnicity are included to control for childhood environment.[17] As an indicator of ethnicity, father's mother tongue categories are used: Turkish (reference category), Kurdish, and others.[18] I also control for mother's prior pregnancy experience, which is measured as the number of previous ever-born births.[19] I exclude father's education from all specifications since mother's and father's educations are highly correlated (Chou et al. (2010)). Also, husband's education may be a channel through which mother's education affects outcomes if there is assortative mating, which in turn, may bias the relationship. I explore the possibility of assortative mating in the following sections.

I control for community-level factors, region and urban/rural residence at the time of the survey, in order to account for differential availability and quality of health care services, unobservable

[17] 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.

[18] Specifications are robust to using mother's mother tongue categories.

[19] There are 42 mothers who have experienced at least one stillbirth (5 of them were exposed to the CSL). The results are robust to excluding them.

social and cultural factors as well as geographic characteristics.[20]

All specifications control for the primary school aged population and enrollment rates in the province of mother's birth in 1995 (prior to the CSL) provided by the Turkish Statistics Institute (TurkStat), each interacted with mother's years of birth dummies, in order to control for any time-varying factors that may be correlated with schooling and the allocation of schooling inputs to each province (Breierova and Duflo (2004); Chou et al. (2010)).

Table 1 presents descriptive statistics for the dependent and selected independent variables. Around 16% of the sample used in the analysis were exposed to the CSL, and around 30% completed 8 years of schooling. 7% of the women had given VLBW births, and the average length of hospital stay after delivery was around 1.7 days. 89% of the women had used formal prenatal care, 67% had receipt at least 4 prenatal visits, and around 90% had used formal delivery assistance and gave birth in a health facility.

Table 1: Summary Statistics For Outcomes and Selected Explanatory Variables[a]

Variables	Mean	Std.Err.	Variables	Mean	Std.Err.
Health Outcomes			**Community-level Variables**		
VLBW (birth weight<1500 grams)	0.069	0.253	*Type of residence*		
Length of health facility stay (in days)	1.658	2.457	Rural	0.301	0.459
Health Utilization Behavior of Mothers			Urban[b]	0.699	0.459
Prenatal care from formal sources	0.894	0.308	*Region*		
Receipt of 4+ prenatal visits	0.673	0.469	Istanbul[b]	0.052	0.222
Prenatal care initiation (in months)	3.198	2.889	West Marmara	0.042	0.200
Delivery in a health facility	0.897	0.303	Aegean	0.061	0.239
Delivery assistance by health professionals	0.919	0.272	East Marmara	0.064	0.246
Individual-level Variables			West Anatolia	0.077	0.267
Compulsory Primary School Completion (8+)	0.299	0.458	Mediterranean	0.132	0.339
Age at the time of the policy			Central Anatolia	0.080	0.271
Cohort 7&8 (Age 7&8 in 1997)	0.044	0.204	West Black Sea	0.069	0.254
Cohort 9 (Age 9 in 1997)	0.048	0.214	East Black Sea	0.041	0.199
Cohort 10 (Age 10 in 1997)	0.064	0.244	Northeast Anatolia	0.095	0.294
Pregnancy Experience			Central East Anatolia	0.114	0.319
Previous Births	0.902	1.100	Southeast Anatolia	0.172	0.377
Ethnicity					
Turkish[b]	0.642	0.479			
Kurdish	0.313	0.464			
Other	0.045	0.207			

[a] N=1,677 for all; except for VLBW (N=1,616) and length of health facility stay (N=1,519).
[b] used as a reference category.

[20]Geographic location at the time of the survey is most likely the place of the latest birth as well.

4 Identification Strategy

In order to account for the potential endogeneity of maternal education, this paper employs variation in the exposure to the CSL across cohorts induced by the timing of the policy as an instrumental variable. The identifying assumption is that exposure to the CSL had no direct effect on outcomes of interest other than via changing education levels. The first-stage model is:

$$S_i = \alpha_0 + \sum_{k=7}^{17}(YOB_{ik})\alpha_{1k} + \mathbf{P_i}\alpha_2 + \mathbf{K_i}\alpha_3 + \mathbf{X_i}\alpha_4 + \mathbf{C_i}\alpha_5 + u_i \tag{1}$$

where S_i indicates whether a mother i completed 8 years of compulsory primary schooling; $\mathbf{P_i}$ is a vector of mother's birth-province fixed effects; $\mathbf{K_i}$ is a vector of mother's birth-province-specific variables (interactions between the number of primary school aged children in the province of mother's birth (in 1995) and mother's year of birth dummies, and interactions between the enrollment rate in the province of mother's birth (in 1995) and mother's year of birth dummies); $\mathbf{X_i}$ is a vector of mother's background characteristics; and $\mathbf{C_i}$ is a vector of community-level factors. YOB_{ik} is an indicator variable denoting whether mother i is age k in 1997 (a year-of-birth dummy). Mothers aged 18 in 1997 is the omitted control dummy.

In equation 1, the year of birth dummies are used to capture exposure to the CSL in a flexible fashion. The CSL affected children who did not complete 5 years of education in the beginning of the 1997/98 Academic Year. Children aged 7-10 in 1997 (born in or after 1987) comprise the post-reform cohort that were exposed to the CSL, while children aged 11 or older in 1997 (born before 1987) comprise the pre-reform cohort that were unlikely to have been affected by the CSL.[21] Estimates of the equation 1 with/without controls suggest that the change in compulsory schooling had a positive effect on the education of the cohorts 10 and younger, while it did not have any effect on the education of the cohorts 11 and older.[22] Hereafter, one year-of-birth dummy (k=7&8)

[21]The DHS provides exact date of birth for ever-married sample, and a mother's exposure to the CSL is also defined by her year and quarter of birth. Mothers born in the last quarter of 1986 (after September) may be affected by the CSL. The results, however, did not change with the definition of exposure to the CSL by year and quarter of birth, and thus the variation in the exposure to the CSL across birth-cohorts (by age) is used.

[22]Results for this unrestricted first-stage estimation are available upon request.

is used for mothers aged 7 and 8 in 1997 since the effect of the CSL was almost the same for these cohorts and statistically not different from each other.

Figure 1 plots the effect of the CSL on primary school completion for each cohort from a linear probability model (LPM) of equation 1 without controls.[23] The year of birth dummies (α_{1k} for each k) from the LPM are jointly significant for k=7 to 10 and insignificant for k=11 to 17 (p-values are 0.000 and 0.266 respectively). Imposing the restriction that mothers aged 11 to 17 in 1997 were not affected by the CSL in order to gain precision, the first-stage takes the form:

$$S_i = \alpha_0 + \sum_{k=7}^{10} (YOB_{ik})\alpha_{1k} + \mathbf{P_i}\alpha_2 + \mathbf{K_i}\alpha_3 + \mathbf{X_i}\alpha_4 + \mathbf{C_i}\alpha_5 + u_i \tag{2}$$

where the omitted control group is now mothers aged 11 to 18 in 1997. A discrete treatment dummy indicating whether mothers aged 7-10 in 1997 (post-reform cohort) is also used as an instrumental variable (in the above equation rather than year of birth dummies).

The second stage uses the predicted primary school completion from equation 2 as follows:

$$O_i = \gamma_0 + \hat{S}_i\gamma_1 + \mathbf{P_i}\gamma_2 + \mathbf{K_i}\gamma_3 + \mathbf{X_i}\gamma_4 + \mathbf{C_i}\gamma_5 + v_i \tag{3}$$

where $\hat{S}_i$ is the predicted primary school completion.[24] In all specifications, the standard errors are adjusted for clustering at the province of mother's birth. Specifications are estimated for a sample of mothers ages 18-29, where mothers ages 22-29 are the unexposed cohorts. Furthermore, I use a tighter age window as a robustness check (mothers ages 18-25, where mothers ages 22-25 are the unexposed cohorts). It should be noted that a few husbands (1.4% of the sample of analysis; 24 observations) were exposed to the policy; however, the results are robust to excluding these observations.

To test whether the results are driven by time trends, reduced-form estimates of a mother's exposure to the CSL on outcome variables are also performed:

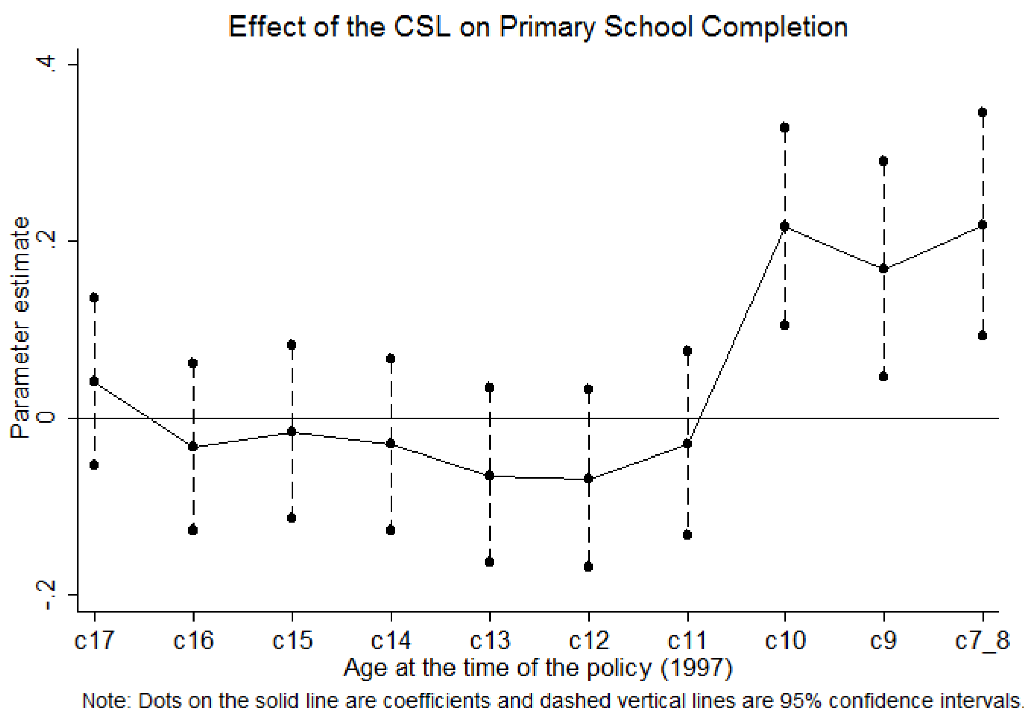
[23] A probit model is also used to estimate equation 1, and the marginal effects from the probit model suggests the same effect of the CSL for each cohort (they are also not statistically different from the LPM estimates).

[24] Angrist (1991) and Angrist (2001) discuss that conventional two-stage least squares (2SLS) models are appropriate when both the outcome and endogenous variable are discrete once valid instruments are found.

$$O_i = \alpha_0 + \sum_{k=7}^{17}(YOB_{ik})\alpha_{1k} + \mathbf{P_i}\alpha_2 + \mathbf{K_i}\alpha_3 + \mathbf{X_i}\alpha_4 + \mathbf{C_i}\alpha_5 + u_i \tag{4}$$

The set of year of birth dummies, α_1, are jointly insignificant for all unexposed cohorts ($k \geq 11$) for all outcomes at all conventional significance levels. This suggests that the effects are not due to pre-existing time trends.[25]

Figure 1: Primary School Completion of Mothers



[25] A discrete dummy is also used in equation 4 to compare the outcomes of mothers exposed and unexposed to the CSL (replace $\sum_{k=7}^{17}(YOB_{ik})\alpha_{1k}$ with $\sum_{k=7}^{14}(Treatment_{ik})\alpha_1$, thus compare the outcomes of mothers aged 7-10 to 11-14 in 1997). Furthermore, I compare the outcomes of mothers aged 11-14 to 15-18 in 1997 (both unexposed) in order to address the possibility of pre-existing trends. The reduced-form results using discrete treatment dummy suggest that the outcomes are significantly different for exposed and unexposed mothers, and moreover they are not driven by time-trends, which is checked by comparing the outcomes of two unexposed groups (aged 11-14 versus 15-18 in 1997) that should not have been affected by the CSL. For instance, mothers aged 7-10 in 1997 were 10 percentage points more likely to have formal prenatal care, compared to mothers aged 11-14 in 1997. The estimate from a comparison of formal prenatal care between mothers aged 11-14 and 15-18 in 1997, however, was small and statistically insignificant (0.025), implying that the difference between exposed and unexposed mothers is not driven by pre-existing time trends (the differences-in-differences (DID) estimate is 0.075). Results are available upon request.

5 Results

Primary School Completion (First-Stage Results)

The first stage results (equation 2) using a discrete treatment dummy and mother's year of birth dummies are shown in Table 2. The estimate in column (1) suggests that mothers exposed to the CSL have a substantially higher probability of completing primary school than unexposed mothers (around 32 percentage points higher). Column (2) presents the effect for each exposed cohort: mothers aged 7&8 at the time of the policy have the highest probability of completing primary school, and the effect decreases by age.

The first-stage results indicate that the CSL led to a substantial increase in the probability of completing primary school. F-statistic provided in columns (2) of the Table 2 (12.62) demonstrates that the set of year of birth dummies are jointly significant at all conventional significance levels.[26]

Effects of Maternal Education on Infant Health, and Health Care Utilization

Table 3 presents the effects of primary school completion on infant health and health care utilization in Panel A and Panel B, respectively. OLS estimates for the sample of mothers ages 18-29 in column (1) suggest that mothers who completed primary school (8+ years of schooling) are around 4 percentage points less likely to give VLBW births, 3 percentage points more likely to have formal prenatal care, 10 percentage points more likely to receive 4 or more prenatal visits, and have 0.7 months earlier prenatal care initiation. The estimated effects on length of health facility stay and delivery outcomes are not statistically significant at any conventional levels of significance.

Instrumental variables estimates, using either a discrete treatment dummy or mother's year of birth dummies as instruments, for the sample of mothers ages 18-29 are shown in columns (2) and (3) of Table 3, respectively. All IV estimates have the expected signs, and are statistically significant for health outcomes. IV estimates in Panel A suggest that completing primary school yields large infant health returns in terms of VLBW, and maternal health returns in terms of length

[26]The F-statistic is greater than 10, which suggests that the instruments are not weak (Staiger and Stock, 2007).

of health facility stay after delivery: primary school completion decreases the likelihood of giving VLBW births by around 17 percentage points and decreases the stay at the health facility after delivery for mothers by around 1.1 days (column (3)). Table 3 also suggests that the effect of maternal education on health outcomes may operate through earlier prenatal care initiation: mothers completed primary schooling initiate preventive care around 1.6 months earlier than the ones with less than 8 years of schooling (50 percent change relative to the mean–3.2 months). Estimates on the use of formal prenatal care, receipt of 4+ visits, delivery in a health facility, and delivery by health professionals are all positive, but not statistically significant. Formal preventive care and delivery rates are high for both mothers with and without primary schooling in the sample and, therefore, it is more likely that maternal education affects infant health via other mechanisms.

The IV estimates exceed OLS estimates for all outcomes, which may be partly due to the fact that the IV estimates present the effects of maternal education for mothers whose educational attainment has been affected by the change in the compulsory schooling law (in other words, for mothers who would not have completed 8 years of schooling if there was not a change in the CSL). The effect may be much higher for those mothers than for the population, thereby, leading to larger estimates of IV than the OLS estimates.[27]

Effects of Other Variables

I explore the others factors that determine infant health and health care utilization behavior of mothers. Table 4 presents the effects of other determinants, using the specification in column (3) of Table 3 (mother's year of birth dummies as instrumental variables).

The effects of ethnicity, one proxy for the childhood environment, suggest that Kurdish mothers are 13 percentage points less likely to receive 4+ prenatal visits, 6 percentage points less likely to deliver at a health facility, and postpone prenatal visits by around 0.7 months, compared to Turkish mothers. Mothers with other ethnicities are 22 percentage points less likely to receive 4+ prenatal visits and postpone prenatal visits by around 1 month compared to Turkish mothers.

[27]For larger IV returns to education in terms of infant health and prenatal care, see Currie and Moretti (2003); for a review of recent studies in terms of earnings, see Card (2001).

Pregnancy experience, as measured by previous births, seems to play an important role in health care utilization outcomes explored in the paper: mothers with less previous births are more likely to seek health care services. Individual-level factors, however, excluding maternal education, do not seem to explain infant health at birth.

The effect of place of residence shows that mothers in rural areas are more likely to give VLBW births (around 5 percentage points). Mothers in rural areas are also less likely to use health care services compared to mothers in urban areas. The results suggest that maternal education and place of residence have significant effects on infant health and health care utilization. There are also substantial differences in infant health and health care utilization between mothers living in Istanbul and East Anatolia, especially Southeast Anatolia in infant health and Northeast Anatolia in health care utilization. For instance, mothers living in Southeast Anatolia are 12 percentage points more likely to give VLBW births, and 15 percentage points less likely to receive more than 4 visits, compared to mothers living in Istanbul. Mothers in Central Anatolia are also 11 percentage points more likely to give VLBW birth compared to mothers in Istanbul, which again highlights the importance of regional residence.

5.1 Robustness Checks

The last three columns of Table 3 present the effects of maternal education for the sample of mothers ages 18-25, where unexposed mothers are now ages 22-25. These results provide a further robustness check for ruling out that the results are driven by time-trends. The IV estimates in columns (5) and (6) are very similar to the ones in columns (2) and (3), and, additionally, the differences are not statistically significant for all outcomes, respectively. The tighter age window estimates provide further evidence that there are significant effects of maternal education of mothers who changed their educational attainment due to the change in the CSL on infant health and prenatal care initiation.

Following Currie and Moretti (2003), the effect of maternal education is reestimated for a sample of first-time mothers.[28] Columns (1) and (2) of Table 5 present the results for a sample of mothers of any parity (as in Table 3, columns (1) and (2)); while columns (3) and (4) present the results for a sample of first-time mothers. The significant effect of maternal education on infant health, length of health facility stay after delivery, and prenatal care initiation persists for the sample of first-time mothers after controlling for the endogeneity of maternal education (column (4)). Thus, Table 5 presents evidence that the results are robust to the exclusion of higher parity mothers.

Sample selection is a problem if education affects the probability of being a mother.[29] I follow the two-step procedure developed by Heckman (Heckman, 1976; Heckman, 1979) in order to account for possible sample selection bias. Towards this end, I estimate the probit function determining whether or not a woman becomes a mother by age 18 using the instruments (year-of-birth dummies) as control variables, and the propensity scores calculated from these estimates are included as controls in the estimations of health and health utilization for first-time mothers. Column (5) of Table 5 presents the results after correcting for sample selection, indicating the results are robust to introducing correction for sample selection.

Additional robustness checks are provided in Table 6. Column (1) repeats the estimates in column (3) of Table 3, where mother's year of birth dummies are used as instruments. Column (2) adds a control variable indicating whether mothers exercise regularly (13% of the sample exercises regularly), which may affect both her and her infant's health.[30] The results show no significant effect of sports on any outcome, except for receipt of 4+ visits–mothers who exercise regularly are about 8 percentage more likely to receive 4+ visits. Column (3) of Table 6 accounts for the fact that exposure to internet may be associated with the outcomes; however, there was not any evidence of such associations (around 7% of the sample uses internet regularly). Column (4) controls for the type of sanitation facility of the household (30% did not have a flush toilet) as an indicator

[28] The treatment dummy, rather than mother's year of birth dummies, is used as the instrument for maternal education for the sample of mothers ages 18-29 due to small sample size. Of course, number of previous births is not used as a control in these specifications.

[29] Güneş (2011) shows that female education reduces teenage fertility and the probability of being a teenage mother.

[30] I find no evidence that educated mothers exercise more. Results of the effect of maternal education on exercise were insignificant (available upon request).

of household wealth. Type of sanitation facility is found to be correlated with the receipt of 4+ visits–mothers living in a house with a flush toilet are 18 percentage points more likely to receive 4+ visits. The effect of maternal education is robust to the inclusion of each additional variable in columns (1)-(4). Finally, column (5) includes all additional control variables, and the IV estimates of the effect of maternal education remain robust for health outcomes and preventive care initiation.

5.2 Other Potential Mechanisms

In this section, other potential mechanisms through which maternal education may affect infant health are explored. Table 7 presents the results from instrumental variables estimation using either a discrete treatment dummy (columns (1) and (3)) or mother's year of birth dummies (columns (2) and (4)) as instruments for the samples of mothers ages 18-29 and ages 18-25 for various potential mechanisms.

Panel A of Table 7 explores the effect of primary school completion on husband's education and occupation. Assuming that mother's exposure to the CSL affects husband's education only through assortative mating, the first two rows of Panel A report the effect of wife's primary school completion on husband's years of education as a continuous variable and husband's primary school completion (8+ years of education).[31] The results suggest that assortative matching does not play an important role. The third row of Panel A presents the effect of maternal education on husband's occupation. Results suggest that mothers who completed primary school are more likely to marry men who work in either service or industry sectors; however, none of the results are statistically significant at all conventional significance levels.

Panel B of Table 7 presents the effects of maternal education on various outcomes. One potential mechanism through which maternal education may affect infant health is smoking behavior of mothers during pregnancy; however, data is available only for ever or current smoking behavior. Arguably, current smoking is a less noisy proxy for smoking during pregnancy. The results suggest that mothers with 8+ years of education are around 30 percentage points less likely to be current

[31] Few husbands were exposed to the CSL as mentioned earlier; however, results are robust to excluding them.

smokers; however, the effect on ever smoking is insignificant. The effect of maternal education on smoking behavior is consistent with the findings of Currie and Moretti (2003), which find that an additional year of schooling reduces the probability of smoking by over 30 percent in the United States. The last potential mechanism explored is mother's occupation. There is a large effect of maternal education on the probability of mother's not working or working in the agricultural sector, but the effect is only significant at the 10% significance level in columns (1) and (3).

In sum, mother's primary school completion affects infant health through smoking behavior and prenatal care initiation.

6 Discussion and Conclusion

This paper provides evidence of the effect of maternal education on infant health and explores potential mechanisms through which maternal education may affect infant health. I use a change in the compulsory schooling law in Turkey as a natural experiment, which extended compulsory primary schooling from five to eight years (free of charge in public schools). I find that the law increased the likelihood of mothers' completing 8+ years of schooling by around 32 percentage points on average.

Variation in the probability of completing primary school across cohorts induced by the change in the CSL is used as an instrumental variable in order to explore the causal effect of maternal education on infant health and potential channels through which schooling operates. The IV estimates suggest that mother's primary school completion improves infant health, as measured by very low birth weight (reducation of approximately 17 percentage points), and, moreover, the results are robust to various specifications. The IV estimates also provide evidence that improvements in birth outcomes are partly due to the effects of maternal education on maternal health behaviors: mother's primary school completion leads to earlier preventive care initiation and reduces smoking. Exploring other factors that are likely to influence infant health does not suggest significant effects of maternal education on formal prenatal care and delivery, occupation, and assortative matching.

The results also suggest that, even after controlling for education, region and urban/rural residence are important factors of infant health and health care utilization, and, additionally, pregnancy experience and ethnicity are important factors of health care utilization. Therefore interventions aimed at these subpopulations are important for reducing infant health and health care utilization disparities.

Future research may explore the causal effect of education along different maternal schooling margins in developing countries, which may improve infant health to a greater extent. While the results are consistent with the findings of a related study for a developed country as explored by Currie and Moretti (2003), more research is needed for various settings, especially developing countries, to understand the extent that the results can be generalized.

References

Angrist, J. (2001). Estimation of limited dependent variable models with dummy endogenous regressors. *Journal of Business and economic Statistics*, 19(1):2–16.

Angrist, J. D. (1991). Instrumental variables estimation of average treatment effects in econometrics and epidemiology. Working Paper 115, National Bureau of Economic Research.

Barrera, A. (1990). The role of maternal schooling and its interaction with public health programs in child health production. *Journal of Development Economics*, (32):69–91.

Behrman, J. R. and Rosenzweig, M. R. (2002). Does increasing women's schooling raise the schooling of the next generation? *American Economic Review*, 92(1):323–334.

Behrman, J. R. and Rosenzweig, M. R. (2004). Returns to birthweight. *The Review of Economics and Statistics*, 86(2):586–601.

Behrman, J. R. and Wolfe, B. L. (1987). Women's schooling and children's health: Are the effects robust with adult sibling control for the women's childhood background? *Journal of Health Economics*, 6(3):239–254.

Black, S. E., Devereux, P. J., and Salvanes, K. G. (2007). From the cradle to the labor market? the effect of birth weight on adult outcomes. *The Quarterly Journal of Economics*, 122(1):409–439.

Breierova, L. and Duflo, E. (2004). The impact of education on fertility and child mortality: Do fathers really matter less than mothers?, NBER Working Papers 10513, National Bureau of Economic Research, Inc.

Caldwell, J. C. (1979). Education as a Factor in Mortality Decline: An Examination of Nigerian Data. *Population Studies*, 33:395–413.

Caldwell, J. C. (1990). Cultural and social factors influencing mortality in developing countries. *The Annals of the American Academy of Political and Social Science*, 510:44–59.

Caldwell, J. C., Reddy, P., and Caldwell, P. (1983). The social component of mortality decline: An investigation in South India employing alternative methodologies. *Population Studies*, 37(2):185–205.

Card, D. (2001). Estimating the return to schooling: Progress on some persistent econometric problems. *Econometrica*, 69(5):1127–1160.

Celik, Y. and Hotchkiss, D. R. (2000). The socio-economic determinants of maternal health care utilization in Turkey. *Social science & medicine (1982)*, 50(12):1797–806.

Chou, S.-Y., Liu, J.-T., Grossman, M., and Joyce, T. (2010). Parental education and child health: Evidence from a natural experiment in Taiwan. *American Economic Journal: Applied Economics*, 2(1):33–61.

Currie, J. and Moretti, E. (2003). Mother's education and the intergenerational transmission of human capital: Evidence from college openings. *The Quarterly Journal of Economics*, 118(4):1495–1532.

Elo, I. T. (1992). Utilization of maternal health-care services in Peru: the role of women's education. *Health Transition Review*, 2(1):49–69.

Fuchs, V. R. (1982). Time preference and health: An exploratory study. NBER Chapters, pages 93–120. National Bureau of Economic Research, Inc.

Glei, D. A., Goldman, N., and Rodríguez, G. (2003). Utilization of care during pregnancy in rural guatemala: does obstetrical need matter? *Social Science & Medicine*, 57(12):2447–2463.

Güneş, P. M. (2011). The impact of female education on fertility: Evidence from Turkey. Working Paper, University of Maryland, College Park.

Griliches, Z. (1977). Estimating the returns to schooling: Some econometric problems. *Econometrica*, 45(1):1–22.

Hack, M., Flannery, D. J., Schluchter, M., Cartar, L., Borawski, E., and Klein, N. (2002). Outcomes in young adulthood for very-low-birth-weight infants. *New England Journal of Medicine*, 346(3):149–157.

Hack, M., Taylor, H. G., Klein, N., Eiben, R., Schatschneider, C., and Mercuri-Minich, N. (1994). School-age outcomes in children with birth weights under 750 g. *New England Journal of Medicine*, 331(12):753–759.

Heckman, J. J. (1976). The common structure of statistical models of truncation, sample selection and limited dependent variables, and a simple estimation for such models. *Annals of Economic and Social Measurement*, 5(4):475–492.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica*, 47(1):153–161.

Jewell, R. T. (2009). Demand for prenatal health care in South America. *Applied Economics*, 41(4):469–479.

Mekonnen, Y. and Mekonnen, A. (2003). Factors influencing the use of maternal healthcare services in Ethiopia. *Journal of Health, Population & Nutrition*, 21(4):374–382.

Navaneetham, K. and Dharmalingam, A. (2002). Utilization of maternal health care services in Southern India. *Social science & medicine*, 55(10):1849–69.

Pallikadavath, S., Foss, M., and Stones, R. W. (2004). Antenatal care: provision and inequality in rural north India. *Social Science & Medicine*, 59(6):1147–1158.

Paul, B. K. and Rumsey, D. J. (2002). Utilization of health facilities and trained birth attendants for childbirth in rural Bangladesh: an empirical study. *Social science & medicine (1982)*, 54(12):1755–65.

Raghupathy, S. (1996). Education and the use of maternal health care in Thailand. *Social Science & Medicine*, 43(4):459–471.

Rosenzweig, M. R. and Schultz, T. P. (1982). Child mortality and fertility in Colombia: Individual and community effects. *Health Policy and Education*, 2(3-4):305–348.

Staiger, D. and Stock, J. H. (1997). Instrumental variables regression with weak instruments. *Econometrica*, 65(3):557–586.

Strauss, J. and Thomas, D. (1995). Human resources: Empirical modeling of household and family decisions. volume 3 of *Handbook of Development Economics*, pages 1883–2023. Elsevier.

Sunil, T., Rajaram, S., and Zottarelli, L. K. (2006). Do individual and program factors matter in the utilization of maternal care services in rural india? a theoretical approach. *Social Science & Medicine*, 62(8):1943–1957.

Tann, C. J., Kizza, M., Morison, L., Mabey, D., Muwanga, M., Grosskurth, H., and Elliott, A. M. (1979). Use of antenatal services and delivery care in Entebbe, Uganda: a community survey. BMC. *BMC Pregnancy and Childbirth*, 33(7).

Titaley, C. R., Dibley, M. J., and Roberts, C. L. (2011). Utilization of village midwives and other trained delivery attendants for home deliveries in Indonesia: results of Indonesia Demographic and Health Survey 2002/2003 and 2007. *Maternal and child health journal*, 15(8):1400–15.

Table 2: Effect of the CSL on Primary School Completion (First Stage)

	(1)	(2)
Age 7-10 in 1997	0.315***	
	(0.070)	
Age 7&8 in 1997		0.520***
		(0.099)
Age 9 in 1997		0.234***
		(0.098)
Age 10 in 1997		0.235**
		(0.111)
N	1677	1677
R^2	0.286	0.289
F-statistic		12.62

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The F-statistic test the hypothesis that the coefficients of the mother's year of birth dummies are jointly zero. *Notes:* Standard errors are in parentheses. Standard errors are adjusted for clustering on the province of mother's birth. All models include individual- and community-level variables, and interactions between the mother's year of birth dummies and the number of primary school aged children in the province of mother's birth (in 1995) as well as interactions between the mother's year of birth dummies and enrollment rates in the province of mother's birth (in 1995). Model (1) uses discrete treatment dummy, and model (2) uses mother's year of birth dummies.

Table 3: Effects of Maternal Education on Infant Health, and Health Care Utilization

	OLS 18-29 (1)	IV (T) 18-29 (2)	IV (YOB) 18-29 (3)	OLS 18-25 (4)	IV (T) 18-25 (5)	IV (YOB) 18-25 (6)
Panel A: Health Outcomes						
Very low birth weight	-0.039***	-0.166*	-0.167*	-0.038**	-0.174*	-0.184*
	(0.009)	(0.097)	(0.098)	(0.016)	(0.107)	(0.110)
Length of health facility stay	0.011	-1.788**	-1.114*	-0.153	-2.244**	-1.454**
	(0.155)	(0.844)	(0.617)	(0.240)	(0.919)	(0.648)
Panel B: Health Utilization Outcomes						
Formal prenatal care	0.032**	0.090	0.065	0.033*	0.043	0.035
	(0.014)	(0.105)	(0.086)	(0.019)	(0.110)	(0.087)
Receipt of 4+ prenatal visits	0.096***	0.092	0.061	0.073*	0.111	0.137
	(0.023)	(0.159)	(0.141)	(0.037)	(0.179)	(0.144)
Prenatal care initiation	-0.746***	-1.603*	-1.635**	-0.787***	-1.821*	-1.560*
	(0.151)	(0.850)	(0.737)	(0.191)	(0.935)	(0.802)
Delivery in a health facility	0.002	0.015	0.079	-0.008	0.033	0.085
	(0.017)	(0.091)	(0.084)	(0.025)	(0.109)	(0.092)
Delivery by health professionals	0.002	0.030	0.075	-0.006	0.037	0.076
	(0.015)	(0.082)	(0.079)	(0.022)	(0.098)	(0.090)
Observations	1,677	1,677	1,677	927	927	927

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

Notes: Standard errors (reported in parentheses) are adjusted for clustering on the province of mother's birth. All models include individual- and community-level variables, and interactions between the mother's year of birth dummies and the number of primary school aged children in the province of mother's birth (in 1995) as well as interactions between the mother's year of birth dummies and enrollment rates in the province of mother's birth (in 1995). Instrumental variables are discrete treatment dummy in models (2) and (5), and mother's year of birth dummies for those exposed to the CSL in models (3) and (6). Models (1)-(3) contain 1,616 and 1,519 observations, and models (4)-(6) contain 891 and 836 observations for VLBW and length of stay outcomes, respectively. Health utilization models (1)-(3) contain 1,677, and (4)-(6) contain 927 observations.

Table 4: Effects of Other Explanatory Variables

	(1) VLBW	(2) Time	(3) Prenatal Formal	(4) 4+ Visits	(5) Initiation	(6) Delivery Hospital	(7) Delivery Formal
Individual-level variables							
Previous Births	0.018	-0.178*	-0.062***	-0.094***	0.505***	-0.051***	-0.044***
	(0.012)	(0.093)	(0.015)	(0.017)	(0.107)	(0.011)	(0.012)
Kurdish	0.009	-0.627***	-0.029	-0.130***	0.669**	-0.055*	-0.033
	(0.023)	(0.232)	(0.030)	(0.041)	(0.267)	(0.030)	(0.027)
Others	0.018	0.204	-0.038	-0.220***	0.994***	-0.013	-0.050
	(0.031)	(0.365)	(0.032)	(0.041)	(0.359)	(0.055)	(0.043)
Community-level variables							
Rural	0.051**	-0.339**	-0.054**	-0.146***	0.764***	-0.071**	-0.080**
	(0.020)	(0.154)	(0.023)	(0.030)	(0.191)	(0.033)	(0.033)
West Marmara	-0.014	1.098*	-0.012	-0.014	0.096	0.027	0.049
	(0.025)	(0.608)	(0.050)	(0.086)	(0.467)	(0.052)	(0.030)
Aegean	-0.028	0.390	0.072**	0.136**	-1.120***	0.039	0.068**
	(0.029)	(0.329)	(0.034)	(0.064)	(0.360)	(0.048)	(0.032)
East Marmara	0.027	-0.105	0.023	-0.005	-0.175	0.057	0.014
	(0.029)	(0.289)	(0.043)	(0.058)	(0.323)	(0.041)	(0.032)
West Anatolia	0.050	0.283	-0.063	-0.094	0.992**	0.018	-0.015
	(0.031)	(0.375)	(0.054)	(0.075)	(0.456)	(0.041)	(0.033)
Mediterranean	0.077**	-0.045	0.054	-0.008	-0.537	-0.006	-0.019
	(0.034)	(0.370)	(0.045)	(0.061)	(0.411)	(0.068)	(0.051)
Central Anatolia	0.106*	0.206	0.052	-0.032	-0.588	0.034	0.011
	(0.054)	(0.423)	(0.044)	(0.073)	(0.433)	(0.037)	(0.027)
West Black Sea	0.031	1.526**	0.048	0.009	-0.399	0.037	0.003
	(0.028)	(0.723)	(0.049)	(0.066)	(0.429)	(0.035)	(0.029)
East Black Sea	0.025	0.742	-0.012	0.095	-0.035	0.085*	0.058
	(0.030)	(0.543)	(0.049)	(0.086)	(0.484)	(0.044)	(0.037)
Northeast Anatolia	0.046*	0.184	-0.107**	-0.108*	0.977**	-0.069	-0.020
	(0.026)	(0.431)	(0.051)	(0.060)	(0.420)	(0.060)	(0.034)
Central East Anatolia	0.093*	-0.257	-0.048	-0.139**	0.280	-0.060	-0.105**
	(0.053)	(0.528)	(0.052)	(0.071)	(0.419)	(0.054)	(0.042)
Southeast Anatolia	0.123***	-0.041	-0.038	-0.149***	0.095	-0.008	-0.023
	(0.036)	(0.314)	(0.056)	(0.056)	(0.459)	(0.071)	(0.051)
N	1616	1519	1677	1677	1677	1677	1677

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

Notes: Standard errors (reported in parentheses) are adjusted for clustering on the province of mother's birth. Specification in column (3) of Table 3 is used.

Table 5: Robustness Checks: First births

	Any parity		First births		
	OLS	IV (T)	OLS	IV (T)	IV (YOB)
	18-29	18-29	18-29	18-29	18-29
	(1)	(2)	(3)	(4)	(5)
Panel A: Health Outcomes					
Very low birth weight	-0.039***	-0.166*	-0.017*	-0.068*	-0.095*
	(0.009)	(0.097)	(0.010)	(0.041)	(0.055)
Length of health facility stay	0.011	-1.788**	0.083	-1.505**	-1.667**
	(0.155)	(0.844)	(0.196)	(0.585)	(0.825)
Panel B: Health Utilization Outcomes					
Formal prenatal care	0.032**	0.090	0.036***	0.035	0.019
	(0.014)	(0.105)	(0.011)	(0.054)	(0.046)
Receipt of 4+ prenatal visits	0.096***	0.092	0.089***	0.050	0.100
	(0.023)	(0.159)	(0.028)	(0.134)	(0.202)
Prenatal care initiation	-0.746***	-1.603*	-0.697***	-1.044*	-1.436*
	(0.151)	(0.850)	(0.156)	(0.608)	(0.860)
Delivery in a health facility	0.002	0.015	0.016	0.032	0.046
	(0.017)	(0.091)	(0.010)	(0.065)	(0.053)
Delivery by health professionals	0.002	0.030	0.011	0.049	0.017
	(0.015)	(0.082)	(0.009)	(0.032)	(0.051)
Correction for Sample Selection	No	No	No	No	Yes
Observations	1,677	1,677	733	733	733

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

Notes: Standard errors (reported in parentheses) are adjusted for clustering on the province of mother's birth. The coefficients in columns (1) and (2) are same with the ones in Table 3, and the same specifications (excluding the number of previous births as a control) are used for the sample of first-time mothers in columns (3) and (4). Model (5) accounts for sample selection. Models (1) and (2) contain 1,616 and 1,519 observations, and models (3), (4), and (5) contain 711 and 714 observations for VLBW and length of stay outcomes, respectively.

Table 6: Additional Robustness Checks

	IV 18-29 (1)	IV 18-29 (2)	IV 18-29 (3)	IV 18-29 (4)	IV 18-29 (5)
Panel A: Health Outcomes					
Very low birth weight	-0.167*	-0.169*	-0.168*	-0.169*	-0.171*
	(0.098)	(0.099)	(0.098)	(0.098)	(0.098)
Length of health facility stay	-1.114*	-1.211*	-1.116*	-1.071*	-1.158*
	(0.617)	(0.638)	(0.615)	(0.611)	(0.626)
Panel B: Health Utilization Outcomes					
Formal prenatal care	0.065	0.066	0.065	0.060	0.061
	(0.086)	(0.086)	(0.085)	(0.083)	(0.083)
Receipt of 4+ prenatal visits	0.061	0.052	0.057	0.037	0.029
	(0.141)	(0.143)	(0.142)	(0.138)	(0.139)
Prenatal care initiation	-1.635**	-1.653**	-1.633**	-1.505**	-1.529**
	(0.737)	(0.737)	(0.724)	(0.715)	(0.702)
Delivery in a health facility	0.079	0.074	0.078	0.078	0.072
	(0.084)	(0.085)	(0.082)	(0.083)	(0.083)
Delivery by health professionals	0.075	0.131	0.074	0.073	0.069
	(0.079)	(0.080)	(0.078)	(0.079)	(0.077)
Control Variables					
Sports	No	Yes	No	No	Yes
Internet	No	No	Yes	No	Yes
Flush toilet	No	No	No	Yes	Yes
Observations	1,616	1,519	1,677	1,677	1,677

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

Notes: Standard errors (reported in parentheses) are adjusted for clustering on the province of mother's birth. The results of specification in column (3) of Table 3 are repeated in column (1), and the same specification is used in other columns with additional control variables.

Table 7: IV Estimates of Other Potential Mechanisms

Potential Mechanisms	IV (T) 18-29 (1)	IV (YOB) 18-29 (2)	IV (T) 18-25 (3)	IV (YOB) 18-25 (4)
Panel A: Husband Characteristics				
Husband Education	-0.785	-0.909	-0.696	-0.748
	(1.197)	(1.074)	(1.291)	(1.082)
Husband Completed Primary School	0.057	0.055	0.051	0.027
	(0.198)	(0.181)	(0.198)	(0.182)
Husband Occupation	-0.135	-0.054	-0.122	-0.039
(Agricultural Sector and No Work)	(0.138)	(0.138)	(0.158)	(0.154)
Panel B: Mothers Characteristics				
Ever Smoke	-0.173	-0.173	-0.136	-0.112
	(0.201)	(0.204)	(0.206)	(0.192)
Current Smoke	-0.310*	-0.298*	-0.274*	-0.217*
	(0.166)	(0.171)	(0.181)	(0.166)
Occupation	-0.300*	-0.164	-0.351**	-0.187
(Agricultural Sector and No Work)	(0.162)	(0.145)	(0.175)	(0.156)
Observations	1,677	1,677	927	927

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

Notes: Standard errors (reported in parentheses) are adjusted for clustering on the province of mother's birth. Instrumental variables are discrete treatment dummy in models (1) and (3), and mother's year of birth dummies for those exposed to the CSL in models (2) and (4).