

# Education and Consanguineous Marriage

Pelin Akyol  
Bilkent University  
[pelina@bilkent.edu.tr](mailto:pelina@bilkent.edu.tr)

Naci Mocan  
LSU, NBER and IZA  
[mocan@lsu.edu](mailto:mocan@lsu.edu)

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## ABSTRACT

At least one of every five marriages is consanguineous (between couples who are second cousins or closer) in the Middle East and North Africa, and the rate is higher than 50 percent in some parts of the world. Consanguineous marriage generates serious health problems for the offspring, most of which cannot be offset by interventions and investments after birth. High prevalence of consanguinity, coupled with high fertility rate in developing countries constitutes an economic problem with its associated medical costs and its impact on human capital. Using data from Turkey and leveraging an education reform which increased mandatory schooling by three years, we find that the reform made women less likely to find consanguineous marriage an acceptable practice, and that the reform reduced women's propensity to marry a first cousin or a blood relative. Women who are exposed to the reform marry older, are closer in age to their husbands, are less likely to be in an arranged marriage, and are less likely to have met their husbands through their family, relatives or neighbors. The reform changed women's preferences in favor of an educated husband, it reduced women's probability of having being forced into marrying someone they did not want to marry, and made women less likely to agree that only a son can ensure the continuation of the family blood line. These results indicate that educational attainment can alter behaviors and attitudes which may be rooted in culture. Policies which increase female education can be a vehicle through which the prevalence of consanguineous unions and the related health risks can be diminished. For example, in Turkey, there would have been 56,000 additional children born to consanguineous marriages each year in the absence of the education reform.

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## Education and Consanguineous Marriage

### I. Introduction

It has been estimated that more than 10 percent of the world's population is related as second cousins or closer (Bittles and Black 2010), and that more than one billion people in North Africa, the Middle East and parts of Asia live in areas where at least 20 percent of marriages are consanguineous, which is defined as a union between couples who are second cousins or closer (Romeo and Bittles 2014).<sup>1</sup> The rate of consanguineous marriage is as high as 50 percent in some regions of the world (Hamamy et al. 2011, Tadmouri et al. 2009). As we describe in Section II, the underlying cultural and religious factors are likely dominant forces that determine the prevalence of consanguineous marriage in a country, although the change in this prevalence over time and across regions suggests that other factors, including economic ones, are important as well.

Using data from Turkey, where 20 percent of marriages are consanguineous, we investigate the impact of education on individuals' propensity to marry their first cousins and to marry blood relatives, as well as education's influence on people's tendency to approve such marriages. We leverage a Turkish education reform which went into effect in 1997. For political reasons, the reform was implemented very quickly and rather unexpectedly, and it increased the mandatory years of education from 5 to 8 years. Students who had completed the fifth grade in the Summer of 1997 have been exempted from the mandate of the reform, while younger cohorts were required to complete at least eight years of schooling. Using a nationally-representative micro data set, which contains detailed information on marriage characteristics and marital preferences, we confirm the well-documented finding that the reform had a significant impact on educational attainment. Our results show that the reform made women less likely to find consanguineous marriage as an acceptable practice, and that the reform reduced women's propensity to marry a first cousin or a blood relative. The reform increased age at first marriage for women, and reduced the age difference between married couples. Women who received more education due to the mandate of the reform are less likely to be in an arranged marriage, and they are less likely to have met their husbands through networks their family, relatives or neighbors. Importantly, we provide

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<sup>1</sup> The word consanguinity is derived from the Latin words of *con* (common, or the same) and *sanguineus* (blood)

evidence that the reform reduced women's propensity of being in a marriage to which they were forced by their families. Put differently, the exposure to the reform reduced the tendency of women getting married without giving consent. The reform also changed women's preferences in favor of an educated husband, and it made women less likely to agree with the statement that only a son can ensure the continuation of the family blood line. Although the reform increased men's educational attainment as well, it had no significant impact on men's preferences or on men's behavior in these dimensions.

We make contributions to several areas of investigation. First, we add to a growing body of research on nonpecuniary benefits of educational attainment. While there is a large literature concentrating on private returns to education, nonpecuniary benefits of education and the associated social returns have not been investigated as extensively.<sup>2</sup> Examples of this line of inquiry include the impact of education on civic participation (Dee 2004; Milligan, Moretti and Oreopoulos 2004), on criminal proclivity (Hjalmarsson, Holmlund and Lindquist 2015; Machin, Marie and Vujčić 2011), and on production of health (Chou et al. 2010; Lleras-Muney 2005). Within this literature, we contribute to a strand of research which focuses on the evolution of cultural traits, and specifically to research that focuses on the influence of education on the formation of beliefs and preferences. Education impacts beliefs and attitudes in a number of dimensions, ranging from religiosity and superstition (Becker, Nagler and Woessmann 2017; Mocan and Pogorelova 2017; Glaeser and Sacerdote 2008) to immigration (Cavaille and Marshall 2019). Education can also alter preferences and attitudes that directly impact women's well-being. There is evidence that educational attainment makes women more intolerant of practices that are harmful for their well-being, and that education makes individuals more likely to challenge authority (Cannonier and Mocan 2018; Friedman et al. 2016).<sup>3</sup> We add to this literature by investigating the extent to which education impacts preferences for and the practices of consanguineous marriage. In many societies around the world, the practice of consanguineous

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<sup>2</sup> See Card (2001) and Oreopoulos (2007) as examples research estimating the impact of education on wages.

<sup>3</sup> A broader literature has focused on the impact of female education on various behaviors and outcomes ranging from fertility to infant health, to consumption of deleterious substances (Osili and Long 2008; Chou et al. 2010).

marriage is part of the fabric of culture. Nevertheless, our results reveal that the propensity to approve this practice and the propensity to be actually in a consanguineous marriage are malleable and that these tendencies are influenced by women's educational attainment.

Second, our results are important for research on the determinants of infant health. A large literature in economics has demonstrated that infant health is influenced by in-utero exposure to environmental hazards. For example, fetal exposure to air pollution is shown to cause infant mortality (Greenstone and Hanna 2014; Currie and Neidell 2005; Chay and Greenstone 2003). Almond, Edlund and Palme (2009) find that in-utero exposure to radiation lowers school performance of children and reduces future earnings, likely by hindering cognitive development. Along the same lines, Sanders (2012) shows that exposure to ambient pollution in-utero has a detrimental effect on test scores in high school. Low birth weight, which is a significant predictor of future health and educational attainment (Bharadwaj, Lundborg and Rooth 2018; Currie 2009), is impacted by pregnant women's exposure to motor vehicle emissions (Currie and Walker 2011), toxic air emissions from industrial plants (Currie et al. 2015), and by carbon monoxide pollution (Coneus and Spiess 2012).

Similar to the deleterious effects of these environmental hazards, medical literature has documented substantial health risks to the offspring of consanguineous marriages, including premature birth, low birth weight, infant mortality, and serious congenital diseases. These effects, however, are larger in consanguineous marriage in comparison to those generated by environmental hazards. We provide the details in Section II. Furthermore, while the negative long-run impact of some undesirable birth outcomes, such as low birth weight, can be counteracted by parental investments in childhood (Heckman 2006; Cunha and Heckman 2008), permanent health problems such as congenital heart failure and cerebral palsy, which are prevalent in children of consanguineous parents, are very difficult and costly to counterbalance using ex-post interventions. This means that the reduction in consanguineous marriage, generated by an increase in education, can be a vehicle through which improvements in child health can be achieved. This is especially true in developing countries where high rates of consanguinity, low education, and public health problems related to high infant and child mortality and morbidity co-exist, but public

policy attempts to discourage such marriages are not pursued because consanguineous marriage is considered to be a product of tradition and religion.<sup>4</sup>

Third, our results provide evidence on the empowerment effect of female education. Education can empower women through a number of direct channels, such as the impact on labor market opportunities and wages, and access to leadership positions in society (Duflo 2012). Education can also empower women by altering women's preferences and attitudes regarding issues that impact their well-being, which can ultimately influence their decision-making.<sup>5</sup> Under the assumption that consanguineous marriage is not the optimal marital decision for most women, education empowers them as it becomes a conduit through which women switch away from such marriages. We show that if women's level of education is increased, they became more likely to choose their marriage partners from outside of their circle of family and relatives. This means that more educated women prefer somebody other than their first cousin as their spouse. Edlund (2018) argues that cousin marriage is not a voluntary choice for women. Even if her argument is not fully applicable in the context of Turkey because of the legal and cultural environment, and even if one is prepared to believe that all Turkish women are allowed to freely choose their husbands from the pool of all available candidates, that education makes women less likely to pick a cousin for a husband is evidence for empowerment. Our data reveal that seven percent of women are married to their husbands against their free will. That is, these women married their spouses under the influence of their families despite the fact that they did not want to get married to that particular person. We find that the reform had an impact even on these marriages and that women who are treated by the reform are substantially less likely to get married to somebody without their consent. We also find that the reform changed women's beliefs that only a son can ensure the continuation of the family blood line. These results provide evidence for a significant degree of empowerment of women, generated by the education reform.

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<sup>4</sup> It is well-established that more educated individuals are better producers of health because education yields to improvement in allocative or productive efficiency (Grossman 2006; Rosenzweig and Schultz 1982; Grossman 1972), and that an increase in maternal education improves child health (Grépin and Bharadwaj 2015; Chou et al. 2010; Makate and Makate 2016). Our results, however, underscore education as a policy lever to improve child health through a different preventative mechanism.

<sup>5</sup> An example is the impact of education on fertility preference and fertility behavior of women (Keats 2018; Osili and Long 2008).

Finally, these results are potentially important for economic development. This is because human capital is an ingredient of development (see Hanushek and Woessmann 2020 for a review of this literature). Improvement in child health, due to reduced incidence of consanguineous marriage, caused by increased educational attainment, is expected to have a positive impact on human capital and economic development.<sup>6</sup> In addition, family formation and sorting of individuals into families can have an impact, through a number of mechanisms, on economic development (Fernández 2003; Fernandez and Rogerson 2001). Thus, education-triggered modifications in the way people sort themselves into families can have long-term macroeconomic implications as well.

The rest of the paper is organized as follows. Section II provides the historical background of consanguineous marriage and the health risks associated with such marriages. Section III describes the Turkish education reform details, and Section IV presents the conceptual framework and empirical implementation. Section V describes the data, Section VI presents the results and the robustness analyses. Section VII provides a summary and the conclusion.

## II. Consanguineous Marriage

### *Background*

A consanguineous marriage is defined as a union between two people who are second cousins or closer.<sup>7</sup> There is substantial variation between countries in the prevalence of such marriages, with rates ranging 0.2 percent in the U.S. to 3.9 percent in Japan, between 10 and 40 percent in many counties in the Middle East, North Africa and West Asia, and reaching 45-50 percent in parts of China, Afghanistan, India, Saudi Arabia and Syria (Hamamy et al. 2011, Global Consanguinity website.)

Although consanguinity is more wide-spread among countries with majority-Muslim populations, it is not confined to Muslim nations, nor is it an exclusive product of Islam. For

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<sup>6</sup> At the macro-level, Diebolt and Perrin (2013) add to the unified growth theory the role played by women and gender equality, arguing that women's empowerment is a key factor of economic development. To the extent that education empowers women, education has this indirect effect on development as well.

<sup>7</sup> This corresponds to an inbreeding coefficient ( $F$ ), which is equal to 0.0156 or higher. This, in turn, signifies that parental couples share 1/32 of their genes inherited from common ancestors and that their offspring has a probability of 1/64 (or 0.0156) of having identical gene copies of all loci, inherited from

instance, as detailed in Bittles (1998) and Bittles and Black (2010), the rules of marriage in Islam are similar to those in the Judaic instructions stated in Leviticus 18:7-18, even though there are differences. As an example, uncle-niece marriages are forbidden in Islam, whereas they are allowed in Judaism. Buddhism permits first-cousin marriages, while the rules are more complex in Hinduism where the interplay between religion and local customs has generated substantial heterogeneity in regulations (Bittles and Black 2010).<sup>8</sup> Close-kin marriages are permissible for Roman Catholics with the proviso that couples receive Diocesan dispensation. The Protestant Reformation accepted the guidelines in Leviticus 18:7-18, which make first cousin marriages permissible for Protestants (Goody 1983).<sup>9</sup>

Until the early 20<sup>th</sup> century, the practice of first-cousin marriage was accepted in Europe and it was frequently exercised, especially among the elites.<sup>10</sup> Sabean, Teuscher and Mathieu (2007) point out that despite differences in religious denominations between European countries, the prevalence of first-cousin marriage has risen markedly everywhere in Europe in the 18<sup>th</sup> century, and then it has declined rapidly since the 1920s. The rise and decline of consanguinity in Europe over the last three centuries and its current uneven distribution between regions, as well as the variation in the prevalence of consanguinity between locations within countries, underline the importance of regional traditions and socio-economic variables in determining the propensity for consanguineous marriage.<sup>11</sup> Similarly, that consanguineous marriage has persisted over centuries, and that it is still widespread in many parts of the world (despite its detrimental effects on the

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both parents. In cases of first cousin marriage  $F$  goes up 0.0625 and in case of uncle-niece marriages practiced in South India,  $F$  becomes 0.125 (Hamamy 2012).

<sup>8</sup> As detailed in Bittles (1998), the Aryab Hindus of northern India analyze seven generations on the groom's family and five generations of the bride's side before a consanguineous marriage is permitted. On the other hand, marriages between first cousins are favored and uncle-niece marriages are prevalent among the Dravidian Hindus in south India.

<sup>9</sup> Orthodox churches, on the other hand, do not allow for consanguineous marriage.

<sup>10</sup> For example, Queen Victoria of England married Prince Albert, her mother's brother's son. Kuper (2002) states that "[Her marriage to her cousin] was, and remains a Hanovarian tradition. George I had married his father's brother's daughter, and George IV his father's sister's daughter. George V and Elizabeth II carried on this tradition, both marrying second cousins" (Kuper 2002, p. 166).

<sup>11</sup> See Global Consanguinity website ([consang.net](http://consang.net)) for detailed information on the variation in consanguinity rates within countries.

offspring and the related costs for both the offspring and the family) suggest that consanguinity is associated with benefits to families.<sup>12</sup> Thus, the determinants of the formation of consanguineous marriages and endogamy (marriage within the local community) have recently been investigated as a rational decision made by individuals given the economic and institutional constraints (Bahrami-Rad 2019; Mobarak et al. 2013; Do, Iyer and Joshi 2013; Dow, Reed and Woodcock 2016).<sup>13</sup>

### ***Health Risks of Consanguineous Marriage***

It has been shown that the probability of prematurity and prenatal mortality is higher for the newborns of consanguineous parents (Naderi 1979). For example, in-hospital neonatal mortality is more than twice as likely in infants whose parents are first cousins in comparison to parents who are not blood-related (Charafeddine et al. 2012). Similarly, Jaber et al. (1997) report that the neonatal mortality rate is almost twice as high among first cousin marriages, and Magnus et al. (1985) find that neonatal mortality among the offspring of consanguineous parents is about 2.5 times higher than infants born to genetically unrelated parents. The same pattern holds for post-neonatal, infant and under-5 mortality rates for first cousin marriages (Hussain et al, 2001, Hotchkiss and King 1999).

Stoltenberg et al. (1999a) report that the risk of early death (stillbirth plus infant death) is twice as high for the offspring of first cousins. Similarly, Stoltenberg et al. (1998) find the risk of infant death twice as high in children with consanguineous parents. Jaber et al. (1997) report that the infant mortality rate is almost five times higher among consanguineous couples in comparison

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<sup>12</sup> For example, Johow, Willführ and Voland (2019) show that although marriages between cousins were very rare among the landless population in the 18<sup>th</sup> and 19<sup>th</sup> centuries in Krummhörn, Germany, the rate of cousin marriage was 5-10 percent among large-scale farmer marriages and that consanguineous marriages were a wealth retention/consolidation strategy, as consanguinity is found to be associated with increased intergenerational transmission of land holdings.

<sup>13</sup> More generally, economists have investigated, theoretically and empirically, the determinants of marriage practices (Fenske 2015; Gould, Moav and Simhon 2008; Edlund 1999) dowry payments and bride price (Ashraf et al. 2020; Ambrus, Field and Torero 2010; Botticini and Siow 2003), and the decisions surrounding inheritance (La Ferrara 2007; Bernheim and Severinov 2003; Chu 1991).

to infants of couples who are genetically unrelated. Pederson (2002) finds an increase in infant mortality of 15 additional deaths per 1,000 live births among the progeny of first cousins.<sup>14</sup>

Holding constant a vector of family and pregnancy attributes, babies born to consanguineous parents are lighter than those of unrelated parents. The difference ranges from two-to-three percent (Mumtaz et al. 2007; Magnus et al.1985) to six percent (Al-Sekait 1989). The odds of being low birth weight (<2.5 kg at birth) is more than four times higher for the offspring of consanguineous parents (Bellad et al. 2012)<sup>15</sup>

Medical literature has established that the mutation of recessive genes, inherited from a common ancestor, increases the likelihood of serious recessive disorders in the offspring.<sup>16</sup> As a result, there is a long list of congenital anomalies and disorders which are prevalent in the progeny of consanguineous marriages (Oniya et al. 2019; Harlap et al. 2008; Bittles 2003; Naderi 1979).<sup>17</sup> These disorders range from hearing loss to blindness, from childhood glaucoma to a number of neurodegenerative conditions. Consanguinity also increases the risk of congenital heart defects and of cerebral palsy in newborns (Erkin et al. 2008; Khalid et al. 2006; Sinha et al. 1997), and severe mental retardation (Bener and Hussain 2006; Fernell 1998). Birth defects and congenital malformations rate is more than twice as high among the offspring of first cousins (Tadmouri et al. 2009; Stoltenberg et al. 1999b; Jaber et al. 1998; Magnus et al. 1985). Mete et al. (2020) adjust for potential endogeneity of consanguineous marriage and show that these unions cause lower cognition, lower height-for-weight in the offspring and that these children are

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<sup>14</sup> Environmental pollution too leads to infant mortality with non-trivial but modest impact. For example, Currie and Neidell (2005) find that a one-unit reduction in carbon monoxide (CO) concentration in the air would prevent 34 deaths per 100,000 live births. In the sample they analyze the mean value of CO is 2 ppm, which is also the average ambient CO level in the U.S. (<https://www.epa.gov/air-trends/corabon-monoxide-trends>). Thus, a one-unit reduction of CO would reflect a 50% decrease from a low baseline (the EPA standard is not to exceed the CO level of 9 ppm more than once a year). Chay and Greenstone (2005) analyze the impact of total suspended particulate (TSP) concentration on infant mortality rate and report an elasticity of 0.35, which translates into 5-8 fewer infant deaths per 100,000 live births for a one-unit reduction in TSP (average TSP=64)

<sup>15</sup> Smoking is the most important risk factor of low birth weight (Almond et al. 2005, Grossman and Joyce 1990, Sexton and Hebel 1984). Smoking during pregnancy lowers birth weight up to six percent, which indicates that consanguinity has about the same impact on birthweight as smoking.

<sup>16</sup> The probability of homozygosity, the receipt of identical alleles of a given gene from each parent, is higher for recessive genes for the offspring in case of consanguineous marriages.

more likely to be stunted. Learning and reading disorders are more prevalent among children of consanguineous marriages (Eapen et al. 1998; Abu-Rabia and Maroun 2005). In short, a large body of medical evidence underlines that consanguineous marriage constitutes a substantial risk factor for the offspring and that it is a public health concern.

### III. The 1997 Education Reform

In August 1997, a newly formed government in Turkey passed a law to increase mandatory education from five to eight years (Law No: 4306). Prior to the enactment of this law, students had to complete five years of elementary school education, but attendance to middle school (grades 6-8) was voluntary. The reform combined elementary and middle school education and required all students, who were covered by the mandate of the law, to obtain a middle school diploma. Students who had completed the fourth grade or lower in the Summer of 1997 had to comply with the new law and had to continue their education until they have completed eight years of schooling, while those who had already completed the fifth grade in Summer 1997 were exempt.

Although most children who were born in 1986 would have enrolled in the first grade in 1992 and would have completed the fifth grade in Summer 1997 barring grade repetition, some children who were also born in the same year would have completed only the fourth grade in 1997, and therefore would have been impacted by the reform. This is because of the imperfect compliance with a law that regulates school starting age in Turkey (Kırdar, Dayıođlu and Koç 2018; Cesur and Mocan 2018; Dinçer, Kaushal and Grossman 2014).<sup>18</sup> In addition, some families whose children were exempt from the law (those born in 1986 and completed the fifth grade in 1997), may have decided to send their children to school for an additional three years to obtain the middle school diploma, to prevent their kids from being in a disadvantaged position in

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<sup>18</sup> The law that regulates the school starting age in Turkey states that a child may start the first grade in the Fall if she is 72 months old at the end of that calendar year. This implies that children born in 1986, especially those born towards the end of that year could have started school in 1992. The age cut-off, however, is loosely enforced and children can start school even if they are a few months younger than the 72-month cut-off. Thus, those who were born in early 1986 could start the first grade in Fall 1991, rather than Fall 1992.

comparison to the immediately younger cohorts.<sup>19</sup> Thus, the extent to which the reform impacted the cohort of 1986 is unclear.

The speed with which the law was passed was because of domestic and international politics. In 1997, Turkey was engaged in negotiations for the membership to the European Union (EU), and increasing the mandatory years of education was considered the right move to increase the chances of EU membership (Dulger 2004). The law was also an attempt to limit the religious education in the country.<sup>20</sup> The reform did not involve any modifications to the curriculum; that is, neither the content nor the composition of courses were affected by the reform (Dulger 2004). The Ministry of Education incorporated a number changes to increase enrollment, including hiring additional teachers, adding new classrooms to existing schools, starting a bus system to transport students from rural localities to urban schools, as well as system of free lunches and books to low income children (Ministry of National Education (MONE) 2001; Dulger 2004). The capacity of boarding schools was also expanded to facilitate the enrollment of rural children in urban areas (Dulger 2004; World Bank 2005). Compulsory education is free in Turkey. Thus, the reform did not involve any change in the cost of education for families. Although non-compliance is subject to fines, it is not strictly enforced. As a result, although the proportion with at least a middle school diploma rose above 90 percent, full compliance is not achieved. Additional details regarding increased enrollment, employment of new teachers and so on can be found in Erten and Keskin (2018), Kırđar, Dayıođlu and Koç (2018, 2015).

#### IV Conceptual Framework and Empirical Implementation

Following the discussion in the introduction, an individual's propensity for consanguineous marriage ( $M$ ) in Equation (1) is impacted by individual characteristics such as age and gender ( $X$ ), malleable traits such as religiosity and political views ( $R$ ), as well as labor market

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<sup>19</sup> Therefore, we follow the previous research and exclude those born in 1986 from the benchmark model (Cesur and Mocan 2018; Kırđar, Dayıođlu and Koç 2018; Mocan and Pogorelova 2017; Fort, Schneeweis and Winter-Ebmer 2016; Battistin et al. 2009), although as we show that including them does not alter the results.

<sup>20</sup> More specifically, a previous government, which had a religious bent, resigned in June 1997 and the new secular government passed the education reform law on August 18, 1997. Details of this point and the political landscape in Turkey in 1997 can be found in Cesur and Mocan (2018) and on pp. 80-83 of Cesur and Mocan (2013).

activity and relevant market wages ( $W$ ). Local cultural traditions ( $C$ ) also influence the proclivity for consanguineous marriage. Alternatively,  $M$  represents various marriage characteristics, such as age at first marriage and the manner in which the individual met his/her spouse.  $M$  also characterizes individuals' preferences for several attributes of a spouse and the marriage, such as the desirability of an educated spouse, the importance of shared religious beliefs between husband and wife, and the acceptability of the practice of marrying a blood relative. Individuals' educational attainment ( $Educ$ ) can directly influence  $M$  through a number of channels, including by altering time discounting (Becker and Mulligan 1997; Perez-Arce 2017), by influencing risk aversion via the rise in cognition (Dohmen et al. 2010; Harrison, Lau and Rutström 2007) and by altering attitudes towards matters that are related to women's well-being (Cannonier and Mocan 2018).

$$M = f_1(X, R, W, C, Educ) \quad (1)$$

Equation (2) indicates that educational attainment is a function of personal characteristics of the individual ( $X$ ), religiosity and political views ( $R$ ), as well as cultural attributes ( $C$ ). Educational attainment is also influenced by exposure to the reform ( $T$ ) because those who are treated by the reform are required to obtain additional years of education.

$$Educ = f_1(X, R, C, T) \quad (2)$$

Because an individual's educational attainment is endogenous, estimation of Equation (1) using OLS would produce a biased estimate of the impact of education on consanguineous marriage.<sup>21</sup> The education reform leveraged in this paper mandated some students to receive three additional years of schooling while it exempted other students from this requirement (based on the grade the students had completed when the law was passed). Thus, exposure to  $T$  in equation (2) is exogenous, and therefore the reform can, in principle, be used as an instrument for educational attainment in an effort to estimate Equation (1) (Aydemir et al. 2020; Cesur and Mocan 2018;

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<sup>21</sup> For example, risk aversion, which is shown to be related to educational attainment (Harrison, Lau and Rutström 2007) can also impact the propensity for consanguineous marriage. Similarly, other difficult-to-observe personal attributes (e.g. cognitive ability) or family attributes (e.g. the family's attitudes towards female education and women's role in the society) can influence both  $M$  and  $Educ$  in Equations (1) and (2). More specifically, unobservable factors that influence an individual's educational attainment can be correlated with her proclivity for consanguineous marriage.

Dursun, Cesur and Mocan 2018). This instrumental variables procedure, however, is not advisable in this particular context because of likely violation of the exclusion restriction. This is because previous research has shown that exposure to this reform in Turkey had a significant impact on the educational attainment of *both* women and men (Mocan 2014; Resul and Mocan 2018; Kırdar, Dayıođlu and Koç 2018). We confirm this finding in our data as well. That the reform influenced the educational attainment of both sexes prevents us from using this instrumental variables strategy because our outcome variables are related to various aspects of marriage. More specifically, an increase in education, triggered by the reform, may have an impact on women’s propensity to marry by altering their preferences or by changing costs and benefits of marriage. But, by the same token, the same observed change in the propensity to marry can be the result of the change in the behavior, or the preferences of the opposite sex, because the same education reform increased men’s education as well. Thus, exposure to the reform, although exogenous, cannot be convincingly used as an instrument for female (male) educational attainment because the instrument, education reform, can plausibly impact female (male) marriage outcomes indirectly, through its impact on male (female) education.<sup>22</sup> We, therefore, focus on estimating the reduced-form impact of the reform, depicted by Equation (3) below.

Two additional considerations are important. First, education can have an indirect effect on marriage outcome and marital preferences ( $M$ ) through its impact on personal attributes such as religiosity and political views ( $R$ ) (Cesur and Mocan 2018; Becker, Nagler and Woessmann 2017; Mocan and Pogorelova 2017). Second, it has been well-established that education impacts labor force participation and wages.<sup>23</sup> This means that vectors  $R$  and  $W$  are functions of education, which in turn implies that the reduced form Equation (3) excludes these components.

$$M = f_4(X, C, T) \quad (3)$$

We focus on Equation (3) to investigate the impact of the reform on consanguineous marriage and related outcomes and preferences. The empirical counterpart of this formulation is presented by Equation (4) which portrays the specific models estimated in the paper.

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<sup>22</sup> See Kırdar, Dayıođlu and Koç (2018) who make same argument

<sup>23</sup> See Card (1999) and Meghir and Rivkin (2011) for excellent reviews.

$$M_i = \alpha_0 + \alpha_2 T_i + \alpha_3 T_i \times (Yob_i - 1986) + \alpha_4 (1 - T_i) \times (Yob_i - 1986) + \alpha_5 FE'_i + \varepsilon_i \quad (4)$$

The dependent variable  $M$  in Equation (4) is an indicator to represent whether the individual is married to a first cousin. Alternatively,  $M$  stands for other related outcomes such as whether the person is married to a blood relative, age at first marriage, the age difference between husband and wife, whether the person is in an arranged marriage, whether the person was forced into marriage against her own free will, and whether the person believes that spouse's educational attainment, spouse's political views, and compatibility of religious views are important aspects of a marriage. Using the same specification, we also investigate whether education reform had an impact on the extent to which the individual finds consanguineous marriage acceptable. Finally, we analyze if married individuals met their spouses through family and neighbors, or through other avenues such as friend networks, workplace connections, internet and so on, and we investigate if the extent to which the person agrees with the statement that only a son can ensure the continuation of the family blood line.

$T_i$  is a binary variable, equal to one, if the individual has been treated by the reform; i.e., born after 1986. As described in the Section III, the extent to which the cohort of 1986 has been affected by the reform is unclear. Thus, following the approach of Cesur and Mocan (2018), Mocan and Pogorelova (2017), Fort, Schneeweis and Winter-Ebmer (2016), and Battistin et al. (2009), this particular cohort is excluded from the main analysis, although we adding this cohort to the sample does not influence the results. Our main analysis sample includes individuals who were born within eight years before or after the pivotal cohort of 1986. This bandwidth for the benchmark models was chosen based on the procedure of Imbens and Kalyanaraman (2012). We show in the robustness section that the results are not sensitive to the increase or decrease in the size of this window.

The variable  $Yob$  represents the year of birth. Thus, the model accounts for potentially differential trends in the outcomes of both the treatment and control cohorts. Local cultural characteristics are accounted for by a set of fixed effects ( $FE$ ). They include region of current residence indicators, region of childhood fixed effects, an indicator of whether the individual spent his/her childhood years (up to age 15) in a village, and the interaction between the indicators of

childhood region and growing up in a village.<sup>24</sup> These variables intend to capture the impact of economic factors and the extent of religiosity and traditional cultural values at the local level, including the prevalence of inbreeding in the geographic region in which the individual resides, and well as exposure to such values while growing up in the childhood region.<sup>25</sup>

Although region of residence and region of childhood dummies account for differences in customs related to marriage practices between regions, variations in personal heritage are also important. For example, minority populations in Turkey that speak Kurdish or Arabic at home have arguably different customs and traditions than those that speak Turkish. The survey does not contain a question about the primary language spoken at home. It, however, contains a question about whether the survey respondent speaks a second language. The ability to speak a second language may represent different traits, based on the region of residence. For example, in Eastern Turkey, two languages being spoken may imply Turkish and Kurdish, whereas speaking two languages in the Western part of the county may mean Turkish and English. To provide a more granular account for such differences, we included to the models a dummy to indicate whether the individual speaks a second language and its interaction with region of residence dummies.<sup>26</sup>

The model is estimated separately for men and women. The error term  $\varepsilon$  captures the impact of individual-specific idiosyncrasies that influence graduation from middle school. Standard errors are calculated in two ways. They are clustered at the childhood region-by birth cohort level, and also at the birth cohort level.<sup>27</sup> We also report the p-values adjusted for multiple hypothesis testing, using the improved Benferroni correction method of Simes (Simes 1986; Newson 2010; Benjamini and Yekutieli 2001).

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<sup>24</sup> Age 15 is significant because it is the age at which a typical student graduates from the middle school.

<sup>25</sup> The design of the data collection permits identification of 12 regions of current residence, while the region of childhood is identified at a more granular level, with 26 regions.

<sup>26</sup> The ability to speak a second language may be a function of education as much as it is a function of the local culture, which would make this variable endogenous. Dropping the variable from the model, however, had no impact on the results.

<sup>27</sup> Clustering by childhood region-by birth cohort is sensible to the extent that the effectiveness of the reform varied by region, especially in the early years of the reform's implementation. Standard errors, clustered by birth cohort, are bootstrapped.

We employ the same formulation when we demonstrate the impact of the reform on educational attainment ( $Educ_i$ ). In this specification, the dependent variable is a dichotomous indicator which takes the value of one if individual  $i$  has at least a middle school diploma (8 years of schooling), and zero otherwise.

## V. Data and Descriptive Statistics

We use data from the Turkish Family Structure Survey (TFSS) of 2016, which is a nationally representative survey, conducted by the Turkish Statistical Institute and the Ministry of Family and Social Policies between June 1 and September 26, 2016. The TFSS is administered in 17,239 households. Those who are older than 15 in each household are surveyed, generating information on 35,475 individuals. The household questionnaire of the survey contains information on the dwelling and household conditions, and the individual questionnaire includes information about the basic demographic characteristics such as age, sex, education, and marital status. Because the primary purpose of the survey is to gather information about the family structure, key questions include those on lifestyles and the value judgments concerning the family life, marriage characteristics and preferences. It is important to note that the survey *does not* include refugees who moved to Turkey from Syria in large numbers since 2011.

Table 1 presents the descriptive statistics of the analysis sample. Columns (1) and (2) display information about all women, and columns (3) and (4) pertain to ever married women. Columns (5)-(6), and (7)-(8) are related to all men, and to ever married men, respectively. The variable *Middle School Degree* is a dichotomous indicator that takes the value of one if the person has a middle school diploma, which is obtained after eight years of education. Recall that the education reform mandated students to attain at least this particular level of education. The odd-numbered columns of Table 1 display the means and standard deviation of variables for those who are treated by the reform (born after 1986), and the even numbered columns pertain to the control group, consisting of those who escaped the mandate of the reform (those born before 1986). For both men and women the proportion with a middle school degree is substantially greater among those who were exposed to the mandate of the reform in comparison to those who were not. This is true regardless of whether the person is ever married. Figures 1 and 2 display the proportion of women and men, respectively, who have a middle school diploma in each cohort. The number zero on the horizontal axis signifies the pivotal cohort: those born in 1986. The values on the

horizontal axis identify the distance of the person's year of birth from 1986. Individuals born in 1987, 1988 and so on (where the horizontal axis takes the values of 1, 2, and so on) constitute the treatment group, and those with negative values on the horizontal axis (born before 1986) are in the control group.

As evident from the figures, the reform increased the propensity to obtain a middle school diploma for both men and women, and the impact was stronger for women. That this Turkish reform had a significant impact on middle school completion for both men and women has been demonstrated by previous work using a variety of data sets (Torun 2018; Cesur and Mocan 2018; Dursun et al. 2018; Aydemir and Kirdar 2017; Dursun and Cesur 2016; Kirdar et al. 2015; Mocan 2014). Thus, the information displayed in the first row of Table 1 and in Figures 1 and 2 are consistent with those reported by previous research.<sup>28</sup>

Figure 3 presents the proportion of ever married women who have a middle school diploma, and Figure 4 displays the same information for men. A comparison between Figures 1-2 and 3-4 shows that while there was a steady rise in the proportion of all women and all men with middle school education after the reform (Figures 1 and 2), this proportion leveled off for younger cohorts in the ever-married sample (Figures 3 and 4). This implies that non-compliance with the reform is more prevalent among the ever-married individuals of younger cohorts.

Table 1 shows that about nine percent of the sample is married to a first cousin, and that about 20 percent are married to a blood relative (which consists of cousins and other blood relatives from either the mother's or father's side). These rates are consistent with those reported by earlier surveys (Kaplan et al. 2016, Tunçbilek and Koç 1994). Although there is no significant overall difference in this rate between the treatment and control groups, Figures 5 to 8, coupled with Figures 3 and 4, depict a more complete and accurate picture. Specifically, Figures 5 to 8 reveal an increase in the propensity of first cousin and blood relative marriages among the younger cohorts.<sup>29</sup> Figures 5 to 8 are, of course, based on the ever-married sample, and as mentioned above,

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<sup>28</sup> We also calculated the proportion of individuals with at least a high school diploma. These proportions were the same between the treatment and control groups in the ever married men sample (0.52 vs. 0.53), but the proportion with high school diploma was higher for the treated groups in all other samples (0.55 vs. 0.37 for all women, 0.40 vs. 0.35 for ever married women, 0.63 vs. 0.54 for all men), indicating that the reform had a positive spillover effect on high school education.

<sup>29</sup> Figures 5 to 8, as well as all other figures related to outcomes, present outcomes net of exogenous controls, which are residuals from Equation (4).

non-compliance with the reform is more prevalent among ever-married individuals. This means that some of those who are in the treatment group of the ever-married sample are in fact not treated by the reform and that these individuals are the ones who have higher rates of first cousin and blood marriage. To be exact, one quarter of individuals in the treated group of ever married women do not have a middle school diploma. These women married two years younger in comparison to women who are also in the treatment group but who have received a middle school diploma (19 years of age vs. 21). Non-compliers are almost 2.5 times more likely to have married to a first cousin (14.2 percent vs. 5.9 percent), or a blood relative (35.4 percent vs. 14.8 percent).<sup>30</sup> The strong correlation between non-compliance and high propensity to marry a first cousin or blood relative suggests that this pattern (refusal to go to middle school, or dropping out of school, and marrying a blood relative) is likely driven by the individual's or her family's attachment to customs and traditional values. Because we classify these individuals as having been treated by the reform, we would tend to underestimate the reform's impact on consanguinity.

It is also important to note that the sample size is smaller in younger groups, which is particularly the case in the ever-married sample. This is the result of the fact that individuals need to be both younger and be married to be included in this group. For example, in Figure 8 the observation pertaining to men born in 1994 (when the horizontal axis takes the value of 8), is calculated based only on 18 men in this group. Similarly, in Figure 7, there are only 121 ever-married women who were 22 years old during the survey year of 2016 (who were born in 1994). We nevertheless include in the regressions all individuals who are within the 8-year bandwidth and give them equal weight.

Table 1 shows that there are differences in the second language rates between the treatment and control groups, especially in the sample of all women. However, any difference between the control and treatment groups is explained by cohort effects. Specifically, regressions where second language dummy is regressed on cohort trends and the treatment dummy reveal that the coefficient of the treatment dummy is always small (about 0.014) and never different from zero. This is even true in simple models that omit all fixed effects. Appendix Figures A.1 presents this information

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<sup>30</sup> The non-compliance rate among the treated ever-married men (12.7 percent) is half the rate of ever-married women. The difference between compliers and non-compliers in consanguinity among ever-married men is similar to those found in ever-married women. Ever married men who have not received a middle school diploma are more likely to have married a first cousin (20.9 percent vs. 7.5 percent) or to have married a blood relative (39.5 percent vs. 16.7 percent).

graphically and reveals no jump in the second language rates attributable to exposure to the reform. As explained in the robustness section, dropping the *Second Language* variable has no impact on the inference.

Table 1 also presents the descriptive statistics of five marriage characteristics: age at first marriage, the age difference between husband and wife, whether the union was an arranged marriage, whether the person was forced into marriage against her own free will, and whether the person met his/her spouse through the family, relatives, or neighbors. This information is, of course, provided only by those who are married, and the latter two variables pertain to the individual's current marriage. If the individual was divorced before the current marriage, the latter two questions pertain to the first marriage. *Arranged Marriage* is an indicator that takes the value of one if the person was married through the initiative of a matchmaker. This variable takes the value of zero, if the person married the spouse (with or without the consent of the family) without an intermediary, or eloped. *Forced into Marriage* is a dichotomous indicator which equals one if the person was forced by the family to marry his/her spouse, despite the fact that he/she did not want to marry that particular person. Less than five percent of women in the treatment group are in marriages to which they did not consent. The rate is twice as high among women in the control group. The variable *Met through Family/Relatives/Neighbors* is another indicator which takes the value of one if the person met his/her spouse through family, relatives or neighbors; and it is zero if the future spouse was met through the network of school, work, friends, or through the internet or a dating agency. The propensity to have found a spouse through family, relative and neighbor networks is lower among those who are exposed to the reform. Figures 9-13 pertain to these five variables for women. Appendix Figures A.2 display the same information for men.

The bottom section of Table 1 displays preferences regarding attributes in a spouse. *It is OK to Marry a Blood Relative* takes the value of one if the individual declared that it is acceptable to marry a close blood relative such as a first cousin. *Spouse's Education is Important* equals one if the person believes that is somewhat important, important or very important for the spouse to be well-educated, and zero if the person believes that this spousal attribute is unimportant or very unimportant. Similarly, *Spouse's Religious Sect is Important* and *Spouse's Political Views are Important* are variables that reveal the extent to which these attributes are somewhat important, important, or very important in a spouse. The proportion of ever married women who agreed with these statements are displayed in Figures 14-17 by birth cohort, and Appendix Figures A.3 presents

the same information for all women. *Only a Son can ensure the Continuation of the Family Blood Line* takes the value of one if the survey respondent agreed or strongly agreed with the statement. Appendix Figures A.4 presents the proportion of ever married women and men who agreed with this statement.

## VI. Results

Table 2 presents the estimation results of Equation (4) by gender, and demonstrates that the reform has generated an increase in the propensity of having at least a middle school education by almost 14 percentage points for all women, and about 13 percentage points for all men in our sample (column 1).<sup>31</sup> Table 2 also shows that the impact of the reform on educational attainment is similar between all women and ever married women; and that the same is true for men. Also evident from Table 2 is that the reform had a positive impact on high school completion as well, but that it had no discernable effect on college education. These results on the impact of this reform on educational attainment are consistent with those reported by other researchers who employed a variety of different data sets (Torun 2018; Cesur and Mocan 2018; Kırdar, Dayıođlu and Koç 2018; Mocan 2014)

Table 3 presents the reduced form (intent-to-treat) estimates obtained from Equation (4). Columns (1) and (2) display the estimated effect of the reform on the probability of marrying a first cousin and marrying a blood relative, respectively, for ever married individuals. Panel A pertains to females, and Panel B displays the results for males. Recall that marriage to a first cousin is a subset of marriages to blood relatives, as the latter includes marriages to individuals who are related by blood but who are not first cousins. Entries in parentheses report the standard errors clustered at the childhood region-by-birth cohort level. Childhood region is relevant because it is where the individual lived until age 15 and was exposed to the education reform. Using the region of residence instead did not alter the standard errors appreciably. P-values, adjusted for multiple hypothesis testing are reported in {curly brackets}. Entries in [square

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<sup>31</sup> These magnitudes are very similar to those reported by Dursun, Cesur and Mocan (2018) who used Turkish Statistical Institute's Health Survey, and the Tobacco Survey of the same Institute. They are slightly smaller than those reported by Mocan (2014), who used a large sample from Turkish Household Labor Force Survey, and those reported by Kırdar, Dayıođlu and Koç (2018). Torun (2018), who also used THLS, reported an increase in the propensity to complete at least a middle school by 17 pp for females, and 11 ppt for males.

brackets] are the bootstrapped p-values of the estimated coefficients, obtained from clustering the standard errors at the birth cohort level. Columns (1) and (2) show that the reform decreased women's propensity to marry a first cousin by 3.6 percentage points (about 42 percent from the baseline), and that it decreased women's propensity to marry a blood relative by 5.6 percentage points (28 percent from the baseline). On the other hand, the reform had no impact on men's proclivity for consanguineous marriage, indicated by small and statistically insignificant point estimates in Panel B. For example, columns (1) and (2) reveal that the coefficient of the reform is 0.013 in the model that explains men's propensity to marry a first cousin, and it is 0.003 when the dependent variable is being married to a blood relative and they are highly insignificant.

That the reform had an impact on women's propensity for consanguineous marriage, but that it had no impact on men is surprising. One explanation for this finding can be provided by the fact that, as displayed in Table 1, husbands are on average four years older than the wives, which indicates that the first four cohorts of women who were impacted by the reform are married to four cohorts of men who missed the reform by a few years. More specifically, in Figure 5 the first cohorts of women fully impacted by the reform were born in years 1987-1990. They correspond to time periods 1, 2, 3 and 4 on the horizontal axis. These women are typically married to men who belong to cohorts -1, -2, -3 and -4 in Figure 6, and as evident from the figure, the proportion of men married to first cousins is lower in these particular cohorts. This means that the insignificant effect of the reform on men is likely because about half of the men in the control group (those born between 1982-1985) are indirectly impacted by the reform by the virtue of the fact that the reform reduced the propensity for consanguineous marriage for women these men tend to marry. This in turn implies that the results in columns (1) and (2) of Panel B in Table 3 reflect a downward bias of the reform's impact on men's propensity for consanguineous marriage.

To make this point more clearly, we shifted the data points in Figure 6 forward by four years and superimposed them on Figure 5. That is, we matched the 1982 cohort of men with the 1986 cohort of women; the 1983 cohort of men with the 1987 cohort of women, and so on. The idea behind this exercise is to match the cohorts of men and women who are likely marry each other given that husbands are four years older than their wives on average. The result, displayed in Figure 18, shows that the proportion of first cousin marriages are not significantly different between men and women within most of these cohorts that are matched by the husband-wife age difference. It is also noticeable that there is a drop in Figure 18 when the horizontal axis is positive.

This region includes women who were treated by the reform and the corresponding cohorts of men who were in these women's marriage pool.<sup>32</sup> This procedure is meaningful to the extent that the reform influenced women's attitudes and behavior regarding consanguineous marriage and that the consanguineous marriage of men is influenced as a result. This conjecture is supported by the data because, as we demonstrate below, the reform influenced women in a number of domains related to marriage preferences, but the reform had no impact on men's attitudes or behavior in any outcome analyzed.

Figure 19 displays the same information as in Figure 18, but it pertains to blood relative marriages. That is, to obtain Figure 19 we moved the cohorts of men in Figure 8 up by four years and superimposed them on Figure 7. Once again, the assumption here is that the cohorts of men born between 1982 and 1985 are de facto impacted by the reform because these men's marriage pool (younger women who are exposed to the reform) has altered its behavior towards consanguine marriage. Figure 19 is similar to Figure 18, and running a pooled regression using the cohort-matched sample of Figure 19 indicated that the reform reduced the propensity to marry a blood relative.<sup>33</sup>

Column (3) of Table 3 reveals that the reform increased age at first marriage for women by about half a year. This could be the result of preferences changing in favor of delaying marriage; it could also be a mechanical result of "incapacitation" because of staying in school longer. To the extent that those who are still in school are less likely to get married, exposure to the reform may have delayed age at marriage mechanically. As Table 2 demonstrates, the reform not only increased the propensity to receive a middle school diploma, it also had a positive impact on high school graduation. Recall that the reform increased educational attainment of men also, but panel B of Table 3 shows that the reform had no statistically significant impact of men's age at first

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<sup>32</sup> When we ran the regression for the propensity for marrying a first cousin in this pooled sample shown in Figure 18, we found that the coefficient of the reform was -0.020 ( $p=0.084$ ,  $N=9,068$ ), and that the impact of the reform was not different between men and women (the interaction term of the reform indicator and gender indicator was very small and highly insignificant). This regression included the cohort of 1986 as displayed in Figure 18. Dropping this cohort produced the impact of the reform on first cousin marriage as -0.024 ( $p=0.069$ ,  $N=8,562$ ).

<sup>33</sup> When we ran the model in this pooled sample shown in Figure 19, we found that the coefficient of the reform was -0.026 ( $p=0.097$ ,  $N=9,068$ ), and that the impact of the reform was not different between men and women (the interaction term of the reform indicator and gender indicator was very small and highly insignificant). This regression included the cohort of 1986 as displayed in Figure 19. Dropping this cohort produced the impact of the reform on first cousin marriage as -0.025 ( $p=0.170$ ,  $N=8,562$ ).

marriage. Column (4) in Panel A of Table 3 shows that the reform reduced the age gap between husbands and wives by 0.42 years for ever married women. Given that the reform had no impact of men's behavior, (see Panel B where none of the estimated coefficients is different from zero), this finding suggests that the narrowing of the husband-wife age difference is driven by women delaying their age at first marriage.

As shown in Table 1, about 52 percent of ever married women and 43 percent of ever married men got married through an arranged marriage, where an informal match-maker (a relative, a family friend, or a friend) introduced the future bride and groom to each other, typically with the consent of the families. Column (5) of Table 3 shows that women who were exposed to the reform are about seven percentage points (about 13 percent) less likely to have an arranged marriage orchestrated by a match-maker. On the other hand, the reform has no impact on men's propensity to get married through a match-maker.

Column (6) of Table 3 shows that the reform reduced women's likelihood of being married to someone who they did not want to marry by 2 percentage points (29 percent).<sup>34</sup> In other words, the reform reduced women's propensity for having been forced by their family to marry a particular person. This is a strong impact given that the prevalence of this outcome among married women is only seven percent.

Finally, the last column of Table 3 reveals that the reform altered women's propensity to meet their future husbands via their family, neighbors or relatives. The left-out category of this dependent variable includes meeting the spouse through friends, school, the workplace, or on the internet. Thus, this result, consistent with those of columns 5 and 6, indicates that the reform increased women's propensity to make their marriage decisions independently.

Table 4 presents the results of the analyses where we investigate the impact of the reform on women's marriage preferences. Panel A displays the results for ever married women, and Panel B reports the results for all women. The results for men, displayed in Appendix Table A.1, reveal that the reform had no impact on the outcomes displayed in Table 4 for men.<sup>35</sup>

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<sup>34</sup> While the estimated coefficient is not statistically significant when the standard errors are clustered at the childhood region-by-birth year, they are significant with a p-value of 0.028 when the standard errors are clustered by birth year. Later in the paper we show the robustness of this result.

<sup>35</sup> It has been shown that an increase in education, when the baseline education is low, exerts little-to-no impact on men's behavior and preferences in developing countries, although it impacts women. For example, Cesur and Mocan (2018) find that the same Turkish education reform has an impact on women's

In Panel A of Table 4, column (1) presents the estimates of the education reform on the extent to which ever married women find a union between two blood relatives acceptable. The reform reduced the acceptability of such marriages by 3.8 percentage points for ever married women although the p-value obtained from bootstrapped standard errors clustered by birth cohort are larger than conventional levels. This translates into a 25.3 percent decline in women's approval of marriages to blood relatives. It could be the case that cognitive dissonance might alter women's responses to this question. More specifically, women might indicate their approval of marriages to blood relatives because they themselves are (or were in the past) married to a blood relative. Therefore, we also estimate the model using all women, including those who were never married. The results reported in column (1) of Panel B show that neither the coefficient nor the standard error changes appreciably suggesting that the impact is not confounded by marital status.

Column (2) of Table 4 reveals that the reform changed ever married women's preferences in favor of more educated husbands. On the other hand, the point estimates in columns (3) and (4) are small and not different from zero. This indicates that the reform did not alter the extent to which women believe that it is important for a married couple to belong to the same religious sect (column 3) or the extent to which they think that a wife and her husband should share the same political views (column 4).

In summary, the results reveal that the reform reduced acceptability of consanguineous marriage to women, and that it lowered women's likelihood of marrying a first cousin or a blood relative. The reform increased women's age at first marriage, reduced the age difference between husband and wife, and made women more likely to declare that education is a desirable attribute of a husband. The reform also caused women to make their marriage decisions more independently from the influence of their families. Specifically, the reform reduced women's propensity to get involved in an arranged marriage, reduced their propensity for marrying somebody against their will (having been forced into marriage by their family), and it made women more likely to meet their spouse through school, friends, workplace, the internet or other avenues, as opposed to meeting their spouse via family, relatives or neighbors.

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religiosity and the propensity to vote for religious parties, but had no impact on men on these dimensions. Similarly, Cannonier and Mocan (2018) find that an education reform, which targeted primary school age children in Sierra Leone, altered women's attitudes on matters that impact women's health, on the number of desired children, and on attitudes regarding violence against women. The same reform, however, had no impact on men along these dimensions.

### *Robustness Checks and Placebo Tests*

To investigate the sensitivity of the results, we implemented a number of exercises. First, we estimated the models by including linear and quadratic terms in age, rather than differential age trends in the treatment and control groups, which did not alter the conclusions. Second, recall that those born in 1986 are not included in the analyses because, as detailed in the data section, it is unclear whether they are treated by the reform. As a sensitivity check, we added this cohort to the analysis sample and considered it as part of the treated group. The results did not change appreciably.<sup>36</sup>

The empirical specifications effectively compare individuals who differ in age by eight years. There was no sudden change in the country, other than the education reform, that could have impacted a cohort of individuals differently from another cohort. However, by design, those who are treated by the reform are younger than those who are not treated. It can be argued that the results may be driven by this age effect because younger individuals may be more rebellious against social norms, and that people may conform to cultural norms and traditions as they get older. That we find a significant effect for women, but not for men, argues against this conjecture and indicates that the results are unlikely to be driven by an across-the-board age effect. Nevertheless, as a third exercise, we estimated the models of Table 3 using different bandwidths, which are displayed in Appendix Table A.2. The table presents the results obtained from models which are based on bandwidths of 6, 7, 9, and 10 years. It also displays the results of the same exercise for the two outcomes of Table 4 that are significantly impacted by the reform (*It is OK to Marry a Blood Relative* and *Spouse's Education is Important*).

The sample size gets smaller as the bandwidth becomes narrower, which is expected to negatively impact the precision of the estimates. On the other hand, control and the treatment groups become arguably more dissimilar as the bandwidth gets larger. Nevertheless, the estimated coefficients are rather stable across different bandwidths, indicating that while narrowing and widening the age intervals of the treatment and comparison groups changes the sample composition, it has no meaningful impact on the results.

We also implemented placebo tests by imposing incorrect reform years on the data. The first cohort that was fully impacted by the reform is the cohort of 1987. We ran regression on the

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<sup>36</sup> Similarly, assigning the value of 0.5 to this cohort did not change the results.

same sample, but assumed that the first affected cohort was 1988, 1990 or 1991. Similarly, we moved the reform year back in time, taking the cut-off year as 1985, 1984, or 1983. In the six regressions we ran (based on these six false reform years) where the dependent variable was middle school completion, the point estimate of the reform was negative in three regressions (one being statistically significant), and positive in the other three (one being significant). Thus, the use of placebo reform years eliminates the true effect of the reform on educational attainment.

We re-estimated regressions by employing the same sample of ever married women, and by using as dependent variables the six seven marriage attributes that are significantly impacted by the reform (Panel A of Table 3) and the two marital preferences where reform had a statistically significant impact in Table 4 (*It is OK to Marry a Blood Relative* and *Spouse's Education is Important*). We estimated these models six times using six placebo reform years. Of the 54 coefficients generated from this exercise, seven coefficients flipped signs (in comparison to the results reported in Panel A of Table 3, and columns 1 and 2 of Table 4), and only 1 was statistically significant.

In an alternative exercise, we moved the reform years back and forth as described above, but each time we kept the eight year window on both sides of the false reform dates. This procedure changed the sample composition in comparison to the sample used in Tables 3 and 4. Of the 54 coefficients estimated, only 14 were significant, and 13 coefficients had the opposite signs than those reported in Tables 3 and 4.

Recall that the models contain a variable to indicate if the person speaks a second language and its interaction with region of residence dummies. It can be argued that being able to speak a second language is not a function of the existing local culture but a function of the education reform. Exposure to the education reform would not impact the ability to speak Kurdish or Arabic as a second language, but it may have impacted the ability to speak English because the middle school curriculum (grades 6 to 8) includes English classes. To guard against the possibility of endogeneity of this variable, we drop it from the model. The results do not change.<sup>37</sup> In addition to this exclusion, dropping from the models the region of residence fixed effects as well as the

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<sup>37</sup> The raw means of this variable is different between the control and treatment groups for some groups (see Table 1). However, this difference is explained by age trends, which are included in all models. Specifically, controlling for age trends eliminates the impact of the reform on speaking a second language.

region of childhood fixed effects produced coefficient estimates that were larger in absolute value, but the statistical significance of the impact of the reform was not altered.<sup>38</sup>

### *Potential Channels*

Education expands individuals' health knowledge which can lead to a change in their health behavior.<sup>39</sup> Health complications of consanguineous marriage cannot be learned in school in Turkey because neither the middle school curriculum nor the high school curriculum includes health education.<sup>40</sup> On the other hand, the more educated will have better cognitive skills, and educational attainment may allow more efficient access to health information. The data set we use does not contain any information on health knowledge. Thus, we cannot test whether those who are exposed to the reform have better knowledge about the health effects of an action or behavior (consanguineous marriage, smoking, vaccination, etc.). However, that exposure to three additional years of education alters women's preferences but that it has no impact on men suggests that either (i) increased cognitive skills, due to additional schooling, is not an important driver of the results, or (ii) the increase in schooling at this low margin is sufficient enough to register a change in women's preferences and behaviors, although it is not powerful enough to generate an impact for men.

Another explanation may involve being "outside of the home" during the adolescent years. Exposure to the mandate of the reform compelled individuals to attend school when they were between the ages of 12 to 15. This might help women create new friendship networks which could not have been possible otherwise.<sup>41</sup> Attending school and being able to spend time outside

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<sup>38</sup> For example, the coefficient of the reform in the regression to explain marriage to a first cousin (without any covariates except for age trends) was -0.046 (se=0.022). The same coefficient in marriage to a blood relative regression was -0.067 (se=0.033)

<sup>39</sup> See Grossman (2008, 1972) for the theoretical framework regarding how education can impact health and the references cited in Altindag and Mocan (2014) for empirical applications.

<sup>40</sup> Although the department of education introduces it sporadically as an elective class.

<sup>41</sup> As shown elsewhere (Kırdar, Dayıođlu and Koç 2018) and in Table 2 of this paper, the reform also had a spillover effect as it increased high school education as well. This means that some females, who are treated by the reform, were exposed to these influenced for additional years beyond the three years mandated by the reform.

of the home during the adolescent years could have allowed females to get exposure to new ideas and experiences other than those provided by their family and relatives.<sup>42</sup>

Although we cannot test whether increased cognition, increased health knowledge, or the expansion of the social circle is the driver of the impact, there is evidence that the net result of the reform is the empowerment of women. This is reflected by two outcomes. First, as discussed earlier, the reform made women less likely to go along with the wishes of the family and marry somebody they don't want to marry. That is, the reform made women more resilient in terms of resisting the pressure of the family regarding the marriage decision. Second, we analyzed the responses to a survey question gauging the extent to which women agree with the statement that "*Only a son can ensure the continuation of the family blood line.*" As displayed at the bottom of Table 1, the proportion of women (ever-married women) who agree with this statement is 0.226 (0.242). Appendix Figure A.4 displays this information, net of exogenous covariates, by cohorts of ever married women and ever married men, respectively. Table 5 displays the impact of the reform on the propensity to agree with this statement. The results for the benchmark model with the bandwidth of eight years is displayed in the table along with the results obtained from using other bandwidths, as was done in the robustness analyses of Table A.2 in the Appendix. As shown in Panel A of Table 5, the reform reduced married women's propensity to agree with the statement that *only a son can ensure the continuation of the family blood line* by 7 percentage points in the benchmark model. This impact, which represents a 29 percent decline in the sentiment, is statistically significant and robust to the variations in bandwidth. Panel B shows that the impact is smaller in magnitude in the sample of all women (4 percentage points), but it still translates to an 18 percent decline in the propensity to agree with the statement. Panels C and D reveal that consistent with the results reported earlier, the reform does not influence men's beliefs regarding the continuation of the family blood line as a function of the sex of the progeny.

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<sup>42</sup> When the reform law was passed in 1997, the labor force participation rate of women ages 15–24 was 32%, while the labor force participation rate for men was 63%. This difference indicates that girls and young women had a much higher propensity to have more limited exposure to social life outside of the home, compared to boys and young men.

## VII. Summary and Discussion

Consanguineous marriage is a remarkably common phenomenon, especially in developing nations. In most countries of the Middle East and North Africa the rate of consanguineous marriage is more than 25 percent, and it is as high as 50 percent in some parts of the world. As detailed in Section II, although such inbreeding is more prevalent in Muslim societies, it is not strictly a function of religion. The variation in consanguinity between countries which adhere to the same religion, and the change in the prevalence of consanguineous marriage over time indicate that the intensity of this practice is the result of the interplay between religion, cultural norms, institutions and economic conditions.

In this paper, we use data from Turkey, where 20 percent of marriages is consanguineous. The nationally-representative data set contains detailed information on individuals' marriage attributes and marital preferences, along with their personal characteristics. We leverage an education reform, which increased the mandatory schooling by three years for students who completed the 4<sup>th</sup> grade or who were in lower grades in Summer 1997, but exempted older students (those who completed the 5<sup>th</sup> grade) from the mandate of the reform. We confirm the result of previous research that this reform generated an increase in the probability of having at least a middle school education (which requires completion of eight years of schooling). We find that the reform made women less likely to find consanguineous marriage as an acceptable practice, and that the reform lowered women's propensity to marry a first cousin or a blood relative. We also find that exposure to the reform made women delay their first marriage, reduced the age difference between husbands and wives, and changed women's preferences in favor of an educated husband. The reform had no significant impact on men's preferences or on men's behavior in these dimensions, even though the reform increased men's education as well.

Edlund (2018) argues that consanguineous marriage is not a voluntary choice for women in traditional Muslim societies. Women may be denied the right to decide their own marriage, and they may be forced into these arrangements by their fathers, or more generally, by their families. To the extent that women's decisions to marry a cousin or a blood relative are under the influence of dominant males of the patriarchal family as suggested by Edlund (2018), our results indicate that education increases women's autonomy in marriage decisions.

That education leads to more independence for women is further supported by our findings that women who were treated by the reform are less likely to be in an arranged marriage, and that

they are more likely to have met their husbands through networks outside of their family, relatives or neighbors. Furthermore, a unique feature of our data set is the ability to determine whether the individuals got married to their spouses voluntarily (by their consent) or whether they were forced into it by their family. Seven percent of women and three percent of men are in such marriages. We find evidence that exposure to the reform reduced women's probability of having been married against their will by 2 percentage points.<sup>43</sup> These findings indicate that the reform increased women's autonomy, as exposure to the reform enhanced their ability to make marriage decisions independent of their families.

We also find that the reform made women less likely to agree with the idea that only a son can ensure the continuation of the family blood line, which implies that the reform altered women's beliefs and attitudes in favor of females. Taken together, these results indicate that exposure to the education reform increased women's inclination to make marriage decisions that are consistent with their own preferences, instead of going along with the wishes of the family, or the customs of the society. Put differently, the reform had an empowerment effect on women.<sup>44</sup>

These results are potentially important for a number of reasons. First, they contribute to our understanding of non-pecuniary effects of educational attainment. They demonstrate that education alters women's preferences, and that it impacts behavior in a setting where such behavior (marrying a first cousin or a blood relative) is part of the culture of the society.<sup>45</sup>

The results also have implications for child health. The practice of consanguineous marriage is associated with increased mortality and morbidity and serious health consequences for the offspring. As summarized in Section II, it has been shown that the probability of a premature birth is higher for babies of consanguineous parents. Prenatal and neonatal mortality are also significantly higher for the newborns of such couples, and the same is true for post-neonatal

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<sup>43</sup> Although this point estimate is non-significant at conventional levels, arguably because of limited variation of the variable in the sample, the effect is robust to variations in bandwidth and other variations in model specifications.

<sup>44</sup> Although in a different context, these findings resemble the results of Jensen and Oster (2009), who find that exposure to the Cable TV in India reduced women's preference for sons, and increased women's autonomy (their ability to go out without permission, ability to participate in household decision making.)

<sup>45</sup> The persistence of consanguineous marriage in developing nations, may signal the existence of economic benefits generated by such marriages in the form of wealth accumulation and consolidation, and network creation. If the returns to nepotism and in-group favoritism are non-trivial in the society, this can help preserve in-marriage as a social norm (Akbari et al. 2019).

mortality, infant mortality and under-5 mortality rates for the progeny of first cousin marriages. Infants born to consanguineous parents are lighter at birth and they suffer from a number of health problems as children, including being stunted and having learning disabilities. The detrimental impact of low birth weight on future outcomes (Currie 2009) can, in principle, be counterbalanced by investment into these children after birth (Heckman 2006; Cunha and Heckman 2008). There are, however, a number of other serious permanent health problems and disorders generated by consanguinity, including deafness, blindness, childhood glaucoma, congenital heart defects and cerebral palsy.

Although the harmful health effects of consanguineous marriage are well-documented in the medical literature, public policy attempts to discourage these marriages are not pursued because such attempts are presumed to create a backlash in the target populations.<sup>46</sup> Along the same lines, as summarized by Modell and Darr (2002), several experts in the medical and social sciences argue that consanguineous marriage is engraved in the fabric of the society in many countries, and therefore it would be inappropriate to discourage it at the population level. Thus, a typical policy recommendation is to identify at-risk families and provide them with genetic counseling.<sup>47</sup> Given this hands-off approach, policies that increase female education can be a vehicle through which the prevalence of consanguineous unions and the related health risks can be diminished. For example, a back-of-the-envelope calculation reveals that in Turkey about 200,000 children are born each year to parents who are blood relatives, and about half of these children are progeny of first cousins. In the absence of the education reform, there would have been 56,000 additional children born the parents who are blood relatives and 36,000 of these children would be to first cousin marriages.<sup>48</sup> Without the reform there would have been at least

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<sup>46</sup> An example of such a situation is the incident in the U.K. in February 2008, where the environment minister Phil Woolas told the *Sunday Times* about the increased risk of genetic problems and birth defects among the children of first cousin marriages. He underlined that such marriages are a cultural, not a religious, issue. Nevertheless, these statements prompted the Muslim Public Affairs Committee to call on the Prime Minister Gordon Brown to fire Mr. Woolas as they were interpreted as being Islamophobic. ([http://news.bbc.co.uk/2/hi/uk\\_news/7237663.stm](http://news.bbc.co.uk/2/hi/uk_news/7237663.stm))

<sup>47</sup> These recommendations emerged following the two meetings of experts, organized by the Regional Office of the Eastern Mediterranean of the World Health Organization in 1994 and 1996. Modell and Darr (2002) summarizes the discussion at these meetings and the recommendations that emerged from them.

<sup>48</sup> Consanguineous marriages may be associated with higher fertility rates (some of which may be due to replacement fertility because of the infant mortality-enhancing effect of consanguineous marriage). The reduction in fertility due to the decline in consanguinity is not accounted for in this number.

580 additional infant deaths per year.<sup>49</sup> Furthermore, there would be permanent birth defects and serious congenital malformations among the more than 55,000 surviving children of consanguineous parents each year.

High rate of consanguinity, coupled with high fertility rate in some developing countries, produces large cohorts of children born to consanguineous couples. For example, using 14 countries in the Middle East and North Africa, where data on the number of births and the rate consanguinity are available,<sup>50</sup> we estimate that there are 3 million children born in these nations each year to consanguineous marriages.<sup>51</sup> If female educational attainment impacts marriage preferences and decisions in most countries in the same way as it does in Turkey, education can be a potent policy tool to improve child health. Finally, given the importance of human capital in economic development (Hanushek and Woessmann 2020), the associated improvements in physical health and cognition can have non-trivial effects on economic development.

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<sup>49</sup> This calculation makes use of the information that 20 percent of marriages are consanguineous in the country, the infant mortality rate is 9 deaths per 1,000 live births, and that infant mortality rate is 2.5 times higher among the offspring of consanguineous marriages.

<sup>50</sup> The data can be downloaded from <https://population.un.org/wpp/Download/Standard/Fertility/>

<sup>51</sup> These countries are Turkey, Algeria, Egypt, Libya, Morocco, Tunisia, Iraq, Jordan, Kuwait, Lebanon, Omar, Qatar, Sudan, and Saudi Arabia.

## Figures

Figure 1: Proportion of All Women with at least a Middle School Degree by Birth Cohort

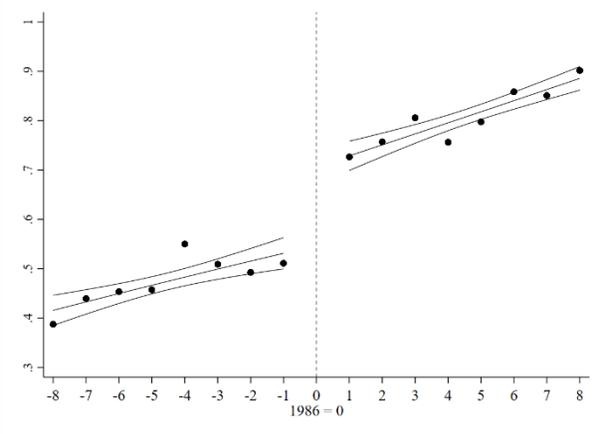


Figure 2: Proportion of All Men with at least a Middle School Degree by Birth Cohort

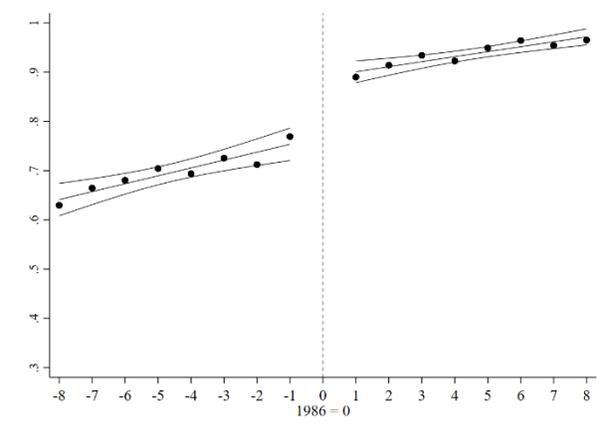


Figure 3: Proportion of Ever Married Women with at least a Middle School Degree by Birth Cohort

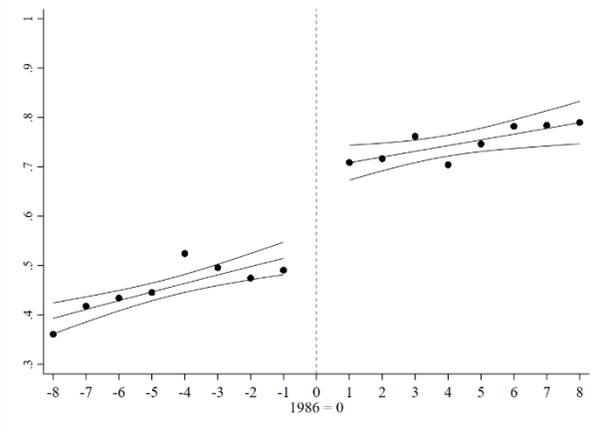


Figure 4: Proportion of Ever Married Men with at least a Middle School Degree by Birth Cohort

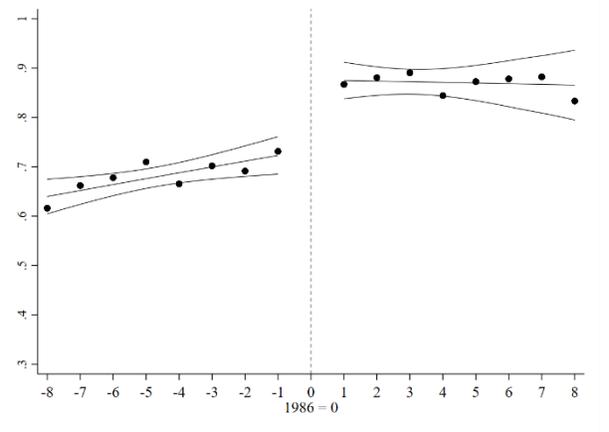


Figure 5: Proportion of Women Married to a First Cousin by Birth Cohort

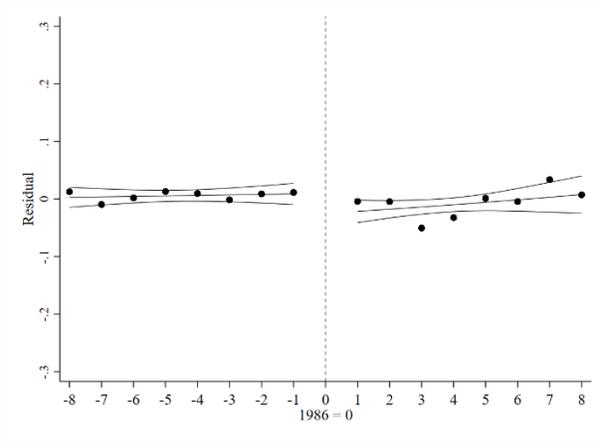


Figure 6: Proportion of Men Married to a First Cousin by Birth Cohort

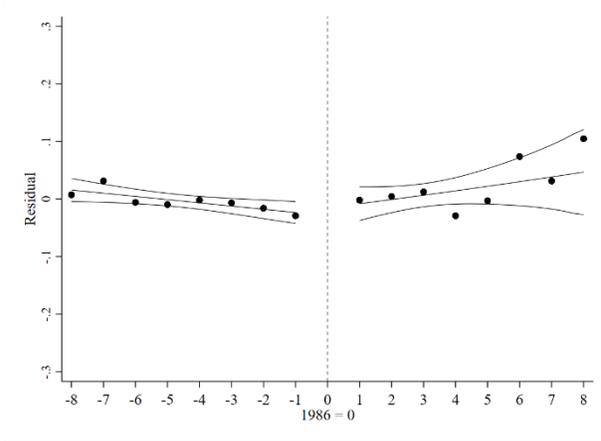


Figure 7: Proportion of Women Married to a Blood Relative by Birth Cohort

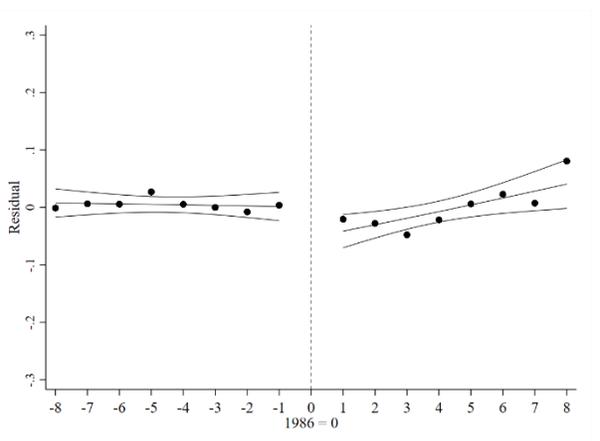


Figure 8: Proportion of Men Married to a Blood Relative by Birth Cohort

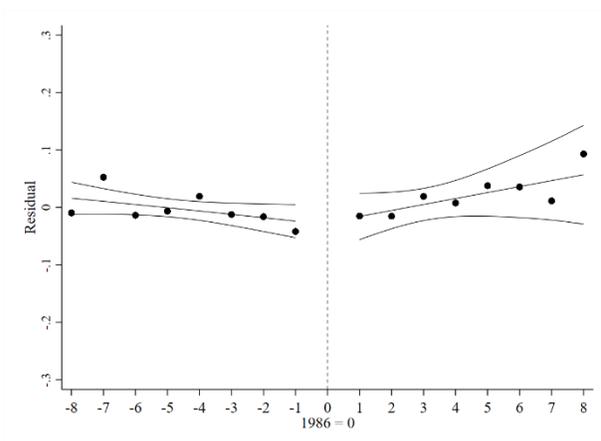


Figure 9: Age at First Marriage for Women by Birth Cohort

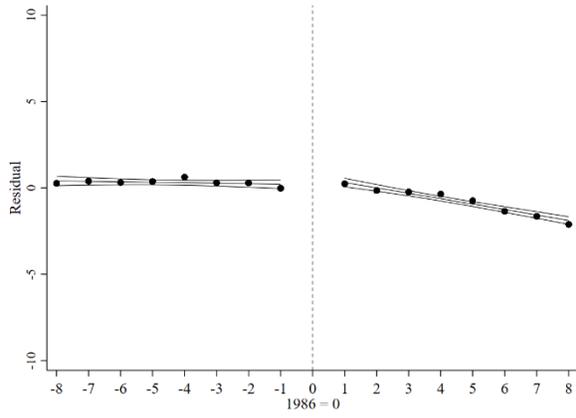


Figure 10: Age Difference for Women between Husbands and Wives by Birth Cohort

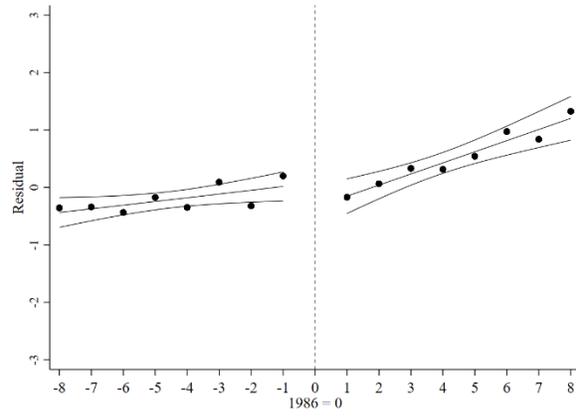


Figure 11: Proportion of Women by Birth Cohort who are in an Arranged Marriage

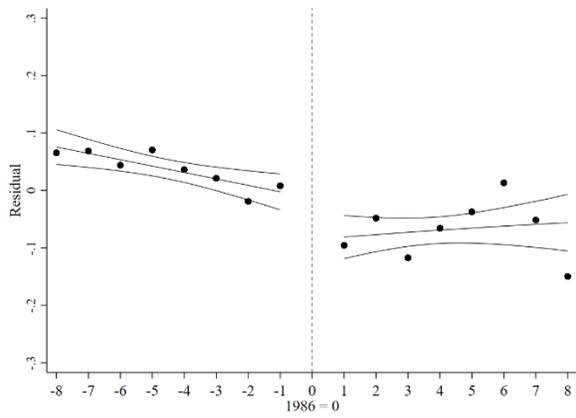


Figure 12: Proportion of Women by Birth Cohort who are Forced into Marriage

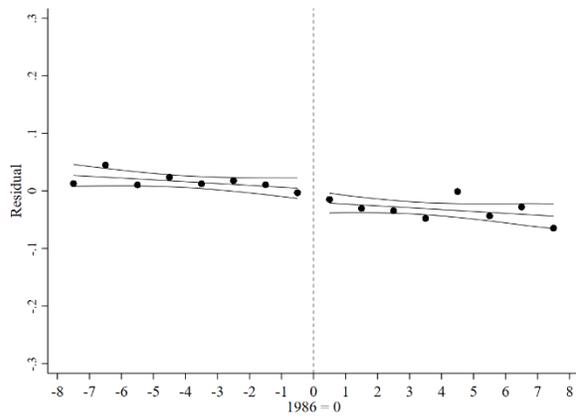


Figure 13: The Proportion of Women by Birth Cohort who met their Spouses through Family/Relatives/Neighbors

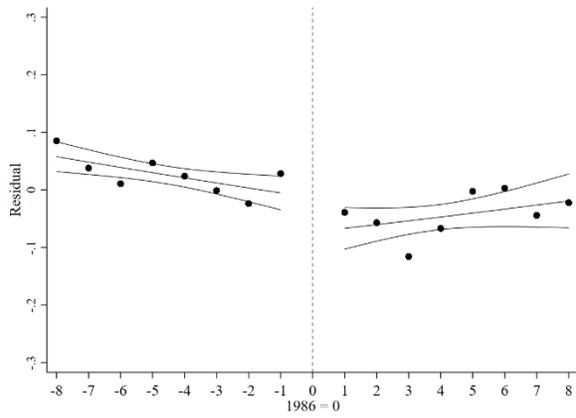


Figure 14: Proportion of Ever Married Women by Birth Cohort who Declare that it is OK to Marry a Blood Relative

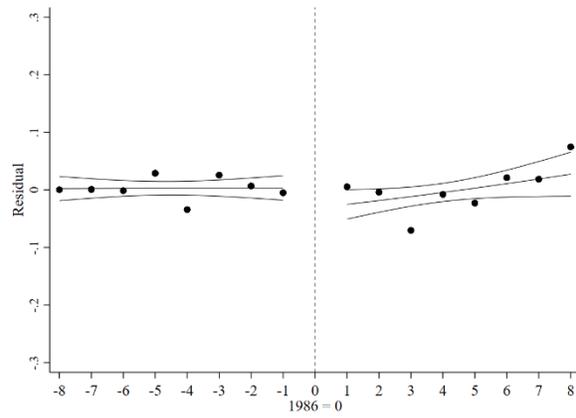


Figure 15: Proportion of Ever Married Women by Birth Cohort who Declare that Spouse's Education is Important

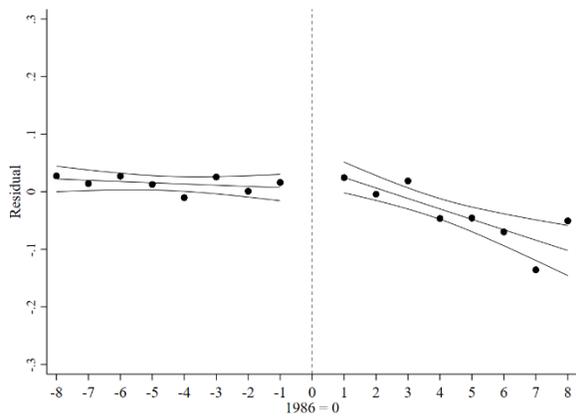


Figure 16: Proportion of Ever Married Women who States Spouse's Religious Sect is Important

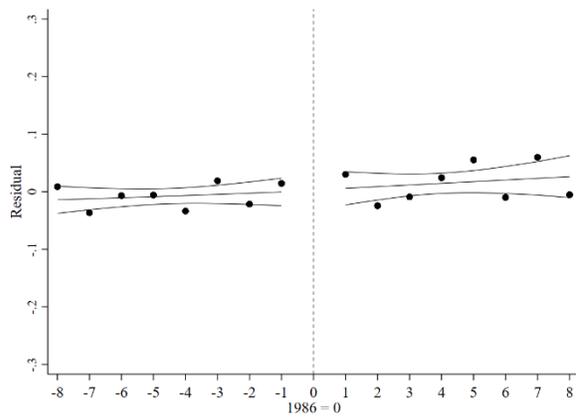


Figure 17: Proportion of Ever Married Women who States It is Important to have Similar Political Views with Spouse

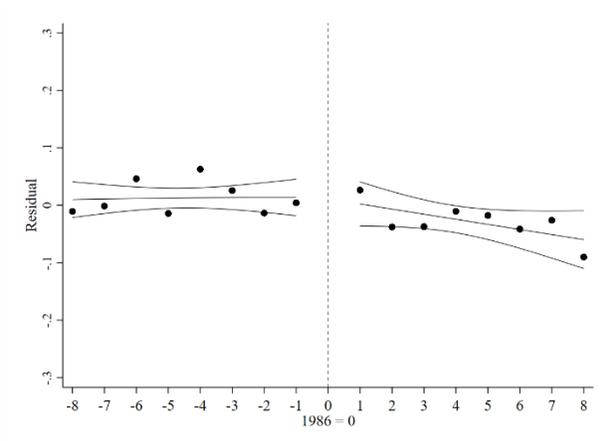


Figure 18: Proportion of Women and 4-year older Men Married to a First Cousin by Birth Cohort

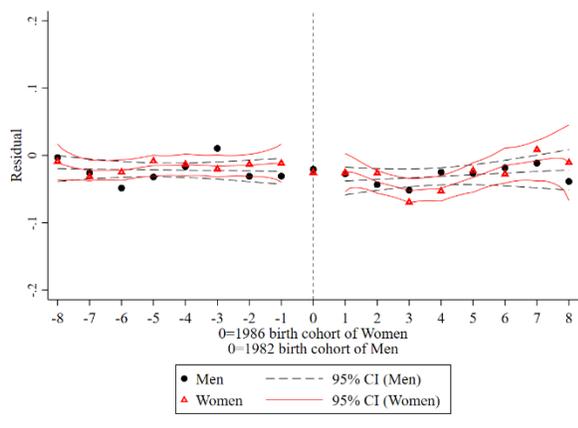
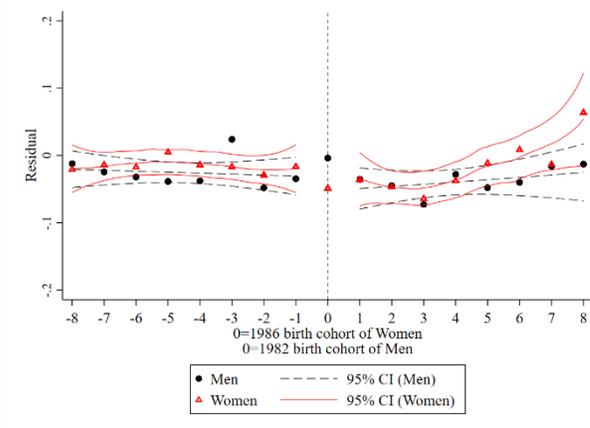


Figure 19: Proportion of Women and 4-year older Men Married to a Blood Relative by Birth Cohort



**Table 1: Descriptive Statistics by Exposure to the Education Reform**

VARIABLES	Ever Married							
	All Women		Women		All Men		Ever Married Men	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control
Middle School Degree	0.806 (0.008)	0.474 (0.009)	0.741 (0.011)	0.454 (0.009)	0.936 (0.006)	0.695 (0.009)	0.872 (0.013)	0.679 (0.010)
Second Language	0.409 (0.010)	0.312 (0.008)	0.363 (0.012)	0.300 (0.008)	0.410 (0.011)	0.366 (0.010)	0.383 (0.019)	0.371 (0.010)
Married to a First Cousin			0.08 (0.007)	0.091 (0.005)			0.092 (0.011)	0.076 (0.006)
Married to a Blood Relative			0.202 (0.010)	0.203 (0.007)			0.196 (0.015)	0.184 (0.008)
<b>Marriage Characteristics</b>								
Age at First Marriage			20.535 (0.074)	21.42 (0.077)			23.351 (0.096)	25.368 (0.078)
Age Difference btw Husband and Wife			4.653 (0.095)	4.004 (0.073)			2.071 (0.116)	3.048 (0.078)
Arranged Marriage			0.46 (0.013)	0.555 (0.009)			0.365 (0.019)	0.457 (0.011)
Forced into Marriage			0.046 (0.005)	0.087 (0.005)			0.033 (0.007)	0.039 (0.004)
Met through Family/ Relatives/ Neighbors			0.607 (0.012)	0.673 (0.009)			0.571 (0.019)	0.626 (0.010)
<b>Marriage Preferences</b>								
It is OK to Marry a Blood Relative	0.118 (0.006)	0.141 (0.006)	0.151 (0.009)	0.145 (0.006)	0.144 (0.008)	0.167 (0.007)	0.21 (0.016)	0.179 (0.008)
Spouse's Education is Important	0.855 (0.007)	0.861 (0.006)	0.821 (0.009)	0.858 (0.006)	0.795 (0.009)	0.769 (0.008)	0.768 (0.016)	0.765 (0.009)
Spouse's Religious Sect is Important	0.809 (0.008)	0.816 (0.007)	0.839 (0.009)	0.825 (0.007)	0.698 (0.010)	0.704 (0.009)	0.746 (0.017)	0.717 (0.010)
Similar Political Views are Important	0.57 (0.010)	0.591 (0.009)	0.56 (0.012)	0.59 (0.009)	0.446 (0.011)	0.441 (0.010)	0.468 (0.019)	0.437 (0.011)
Only a Son can Ensure the Continuation of the Family Blood line	0.206 (0.008)	0.243 (0.008)	0.238 (0.010)	0.245 (0.008)	0.394 (0.011)	0.353 (0.010)	0.371 (0.019)	0.343 (0.010)
Number of Observations	2,602	3,265	1,657	3,038	1,990	2,509	673	2,159

The data are from the 2016 Turkish Family Structure Survey. The treatment group consists of those who are born between 1987-1994. The control group consists of those who are born between 1978-1985. 1986 cohort is excluded as it is uncertain the extent to which this cohort is exposed to the reform.

**Table 2: The Effect of Exposure to the Education Reform on Educational Outcomes**

	(1)	(2)	(3)	(4)	(5)	(6)
	<b>All Women</b>			<b>Ever Married Women</b>		
VARIABLES	Middle School	High School	College	Middle School	High School	College
Reform	0.139*** (0.027) [0.0140]	0.043* (0.023) [0.0826]	0.031 (0.026) [0.409]	0.138*** (0.030) [0.0170]	0.071*** (0.025) [0.0434]	0.024 (0.026) [0.164]
Number of Observations	5,867	5,867	5,867	4,695	4,695	4,695
	<b>All Men</b>			<b>Ever Married Men</b>		
VARIABLES	Middle School	High School	College	Middle School	High School	College
Reform	0.128*** (0.024) [0.0010]	0.086*** (0.031) [0.0066]	0.037 (0.031) [0.132]	0.143*** (0.033) [0.0014]	0.138*** (0.039) [0.0140]	0.029 (0.036) [0.0706]
Number of Observations	4,499	4,499	4,499	2,832	2,832	2,832

The reform variable is equal to one if the respondent was born between 1987 and 1994 and equal to zero if the respondent was born between 1978 and 1985. The 1986 cohort is excluded from the sample as exposure to the reform is unclear for this cohort. The entries in parentheses are standard errors of the estimated coefficients, clustered by childhood region-by-birth cohort; \*  $p < 0.1$  \*\*  $p < 0.05$  \*\*\*  $p < 0.01$ . P-values related to bootstrapped standard errors, clustered by birth cohort level, are given in brackets. All regressions control for trend in the outcome variable separately for treatment and control groups, region of current residence and region of childhood fixed effects, an indicator if the person grew up in a village, and the interaction between the latter two variables, an indicator if the person speaks a second language, and the interaction of second language with region of residence fixed effects. See the text for details.

**Table 3: The Effect of Exposure to the Education Reform on Marriage Characteristics**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>Panel A: Ever Married Women</b>							
VARIABLES	Married to a First Cousin	Married to a Blood Relative	Age at First Marriage	Age Difference	Arranged Marriage	Forced into Marriage	Met through Family/Relatives/Neighbors
Reform	-0.036** (0.017) {0.047} [0.024]	-0.056** (0.024) {0.047} [0.002]	0.460* (0.235) {0.086} [0.066]	-0.439* (0.242) {0.088} [0.124]	-0.072** (0.031) {0.086} [0.107]	-0.020 (0.016) {0.210} [0.0282]	-0.060** (0.029) {0.086} [0.134]
Number of Observations	4,695	4,695	4,695	4,695	4,341	4,341	4,695
<b>Panel B: Ever Married Men</b>							
VARIABLES	Married to a First Cousin	Married to a Blood Relative	Age at First Marriage	Age Difference	Arranged Marriage	Forced into Marriage	Met through Family/Relatives/Neighbors
Reform	0.013 (0.022) {0.927} [0.393]	0.003 (0.034) {0.927} [0.863]	-0.343 (0.214) {0.547} [0.309]	0.073 (0.264) {0.848} [0.883]	0.029 (0.040) {0.848} [0.217]	0.003 (0.014) {0.848} [0.871]	-0.012 (0.045) {0.848} [0.805]
Number of Observations	2,832	2,832	2,832	2,832	2,645	2,645	2,832

The Reform variable is equal to one if the respondent was born between 1987 and 1994 and equal to zero if the respondent was born between 1978 and 1985. The 1986 cohort is excluded from the sample as exposure to the reform is unclear for this cohort. The entries in (parentheses) are standard errors of the estimated coefficients, clustered by childhood region-by-birth cohort; \*  $p < 0.1$  \*\*  $p < 0.05$  \*\*\*  $p < 0.01$ . P-values, adjusted for multiple hypothesis testing, are displayed in {curly brackets}. P-values, related to bootstrapped standard errors clustered by birth cohort, are given in [square brackets]. All regressions control for trend in the outcome variable separately for treatment and control groups, region of current residence and region of childhood fixed effects, an indicator if the person grew up in a village, and the interaction between the latter two variables, an indicator if the person speaks a second language, and the interaction of second language with region of residence fixed effects. See the text for details.

**Table 4: The Effect of Exposure to the Education Reform on Marriage Preferences**

	(1)	(2)	(3)	(4)
<b>Panel A: Ever Married Women</b>				
VARIABLES	It is OK to Marry a Blood Relative	Spouse's Education is Important	Spouse's Religious Sect is Important	Similar Political Views are Important
Reform	-0.038* (0.022) {0.087} [0.210]	0.039* (0.021) {0.192} [0.111]	0.002 (0.023) {0.924} [0.949]	-0.003 (0.030) {0.924} [0.921]
Number of Observations	4,695	4,695	4,695	4,695
<b>Panel B: All Women</b>				
VARIABLES	It is OK to Marry a Blood Relative	Spouse's Education is Important	Spouse's Religious Sect is Important	Similar Political Views are Important
Reform	-0.032* (0.019) {0.097} [0.209]	0.011 (0.019) {0.553} [0.465]	-0.013 (0.021) {0.553} [0.669]	-0.016 (0.027) {0.553} [0.481]
Number of Observations	5,867	5,867	5,867	5,867

The Reform variable is equal to one if the respondent was born between 1987 and 1994 and equal to zero if the respondent was born between 1978 and 1985. The 1986 cohort is excluded from the sample as exposure to the reform is unclear for this cohort. The entries in (parentheses) are standard errors of the estimated coefficients, clustered by childhood region-by-birth cohort; \*  $p < 0.1$  \*\*  $p < 0.05$  \*\*\*  $p < 0.01$ . P-values, adjusted for multiple hypothesis testing, are displayed in {curly brackets}. P-values, related to bootstrapped standard errors clustered by birth cohort, are given in [square brackets]. All regressions control for trend in the outcome variable separately for treatment and control groups, region of current residence and region of childhood fixed effects, an indicator if the person grew up in a village, and the interaction between the latter two variables, an indicator if the person speaks a second language, and the interaction of second language with region of residence fixed effects. See the text for details.

**Table 5: The Effect of Exposure to the Education Reform on the Propensity to Agree with the Statement that “Only a Son can Ensure the Continuation of the Family Blood line”**

	(1)	(2)	(3)	(4)	(5)
	<i>Bandwidth</i>				
	<i>10</i>	<i>9</i>	<i>8</i>	<i>7</i>	<i>6</i>
<b>Panel A: Ever Married Women</b>					
Reform	-0.048** (0.024) [0.053]	-0.053** (0.025) [0.054]	-0.068** (0.027) [0.015]	-0.071** (0.029) [0.043]	-0.072** (0.031) [0.031]
Observations	5,589	5,148	4,695	4,188	3,661
<b>Panel B: All Women</b>					
Reform	-0.038* (0.021) [0.097]	-0.032 (0.022) [0.127]	-0.041* (0.024) [0.079]	-0.051** (0.026) [0.093]	-0.052* (0.028) [0.075]
Observations	7,201	6,506	5,867	5,134	4,398
<b>Panel C: Ever Married Men</b>					
Reform	0.028 (0.040) [0.347]	0.014 (0.041) [0.701]	0.007 (0.043) [0.859]	0.014 (0.044) [0.734]	-0.020 (0.046) [0.685]
Observations	3,417	3,141	2,832	2,491	2,173
<b>Panel D: All Men</b>					
Reform	-0.027 (0.028) [0.286]	-0.028 (0.028) [0.282]	-0.043 (0.030) [0.109]	-0.036 (0.033) [0.148]	-0.043 (0.037) [0.379]
Observations	5,516	5,013	4,499	3,910	3,342

The Reform variable is equal to one if the respondent was born between 1987 and 1994 and equal to zero if the respondent was born between 1978 and 1985. The 1986 cohort is excluded from the sample as exposure to the reform is unclear for this cohort. The entries in (parentheses) are standard errors of the estimated coefficients, clustered by childhood region-by-birth cohort; \*  $p < 0.1$  \*\*  $p < 0.05$  \*\*\*  $p < 0.01$ . P-values, related to bootstrapped standard errors clustered by birth cohort, are given in [square brackets]. All regressions control for trend in the outcome variable separately for treatment and control groups, region of current residence and region of childhood fixed effects, an indicator if the person grew up in a village, and the interaction between the latter two variables, an indicator if the person speaks a second language, and the interaction of second language with region of residence fixed effects.

## APPENDIX

Figure A.1: Proportion of Individuals with Second Language

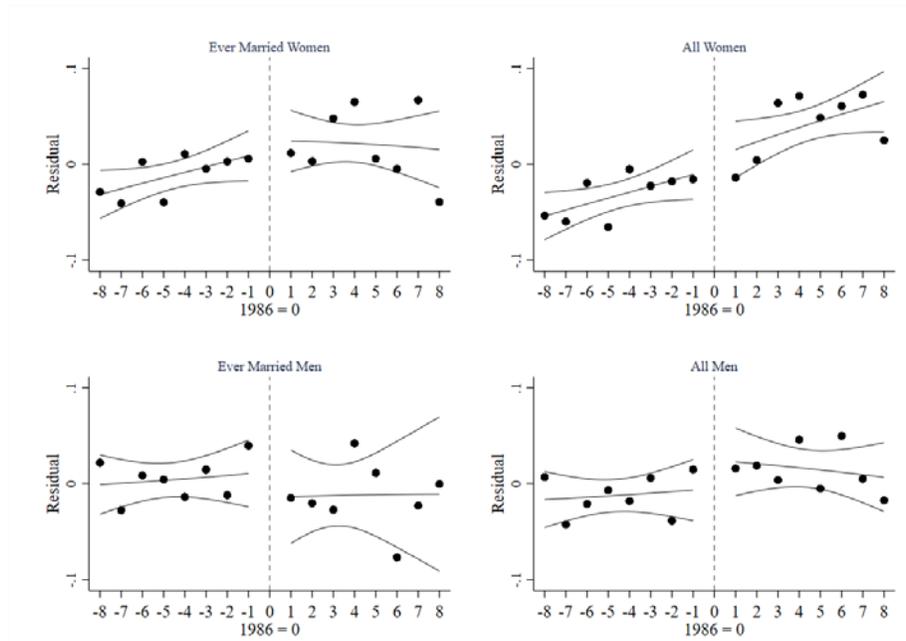


Figure A.2: Marriage Characteristics of Men by Birth Cohort

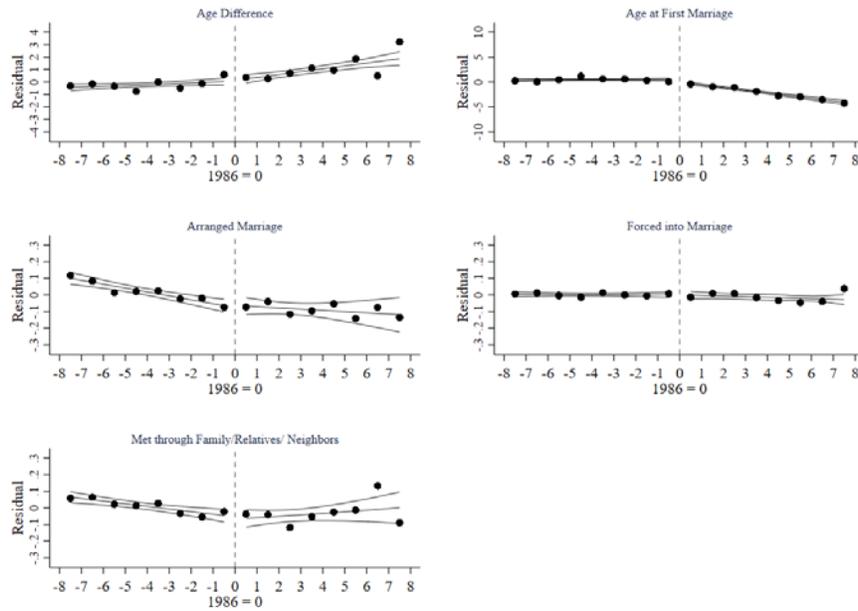


Figure A.3: Marriage Preferences of All Women by Birth Cohort

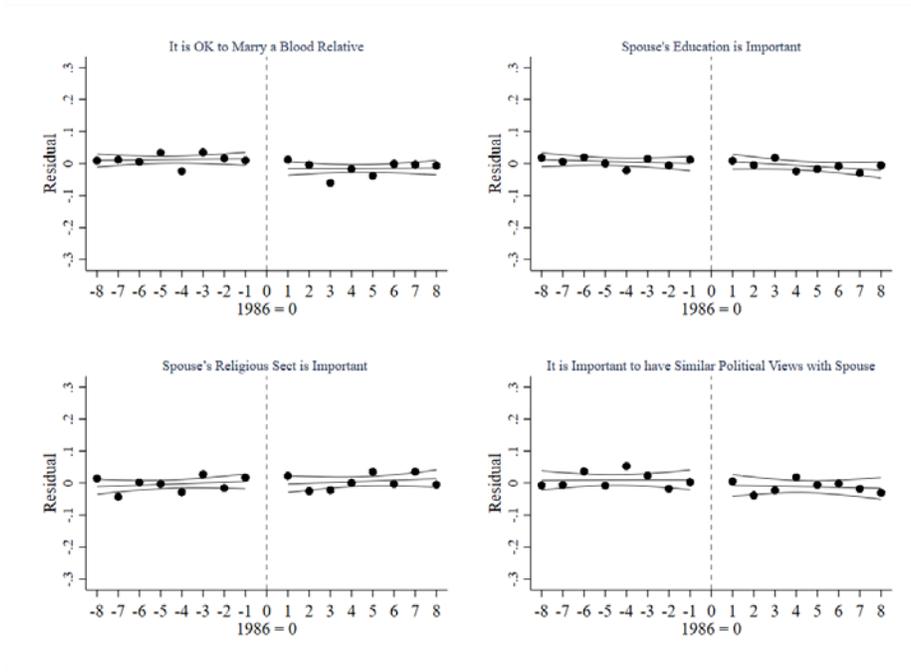
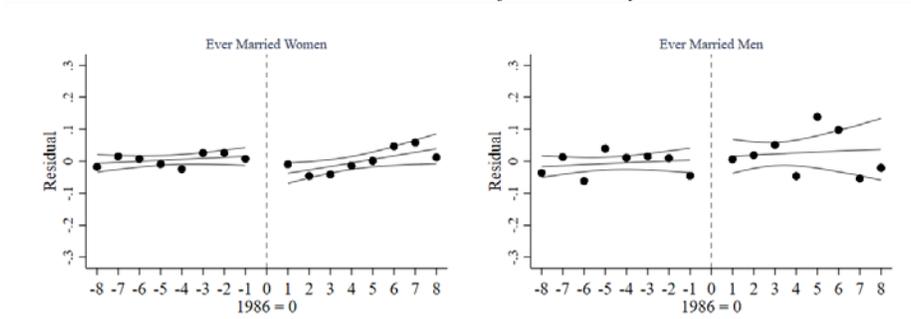


Figure A.4: Proportion of Ever Married Women and Men who Agree with the Statement that “Only a Son can Ensure the Continuation of the Family Blood line”



**Table A.1: The Effect of Exposure to the Education Reform on Marriage Preferences for Men**

	(1)	(2)	(3)	(4)
<b>Panel A: Ever Married Men</b>				
VARIABLES	It is OK to Marry a Blood Relative	Spouse's Education is Important	Spouse's Religious Sect is Important	Spouse's Political View is Important
Reform	0.007 (0.031) [0.751]	0.020 (0.036) [0.535]	0.004 (0.039) [0.875]	0.004 (0.042) [0.948]
Number of Observations	2,832	2,832	2,832	2,832
<b>Panel A: All Men</b>				
VARIABLES	It is OK to Marry a Blood Relative	Spouse's Education is Important	Spouse's Religious Sect is Important	Spouse's Political View is Important
Reform	0.000 (0.022) [0.995]	0.023 (0.028) [0.392]	-0.001 (0.030) [0.952]	0.009 (0.031) [0.865]
Number of Observations	4,499	4,499	4,499	4,499

The Reform variable is equal to one if the respondent was born between 1987 and 1994 and equal to zero if the respondent was born between 1978 and 1985. The 1986 cohort is excluded from the sample as exposure to the reform is unclear for this cohort. The entries in (parentheses) are standard errors of the estimated coefficients, clustered by childhood region-by-birth cohort; \*  $p < 0.1$  \*\*  $p < 0.05$  \*\*\*  $p < 0.01$ . P-values, related to bootstrapped standard errors clustered by birth cohort, are given in [square brackets]. All regressions control for trend in the outcome variable separately for treatment and control groups, region of current residence and region of childhood fixed effects, an indicator if the person grew up in a village, and the interaction between the latter two variables, an indicator if the person speaks a second language, and the interaction of second language with region of residence fixed effects. See the text for details.

**Table A.2: The Effect of Exposure to the Education Reform on Marriage Characteristics and Marital Preferences for Ever Married Women**

	<i>Bandwidth</i>			
	<i>10</i>	<i>9</i>	<i>7</i>	<i>6</i>
<b>Panel A: Married to a Cousin</b>				
Reform	-0.032** (0.015) [0.036]	-0.033** (0.016) [0.016]	-0.040** (0.018) [0.026]	-0.025 (0.020) [0.152]
Number of Observations	5,589	5,148	4,188	3,661
<b>Panel B: Married to a Blood Relative</b>				
Reform	-0.048** (0.021) [0.007]	-0.051** (0.022) [0.001]	-0.042* (0.025) [0.023]	-0.040 (0.026) [0.107]
Number of Observations	5,589	5,148	4,188	3,661
<b>Panel C: Marriage Age</b>				
Reform	0.372* (0.208) [0.142]	0.429* (0.222) [0.069]	0.472* (0.253) [0.063]	0.472* (0.268) [0.162]
Number of Observations	5,589	5,148	4,188	3,661
<b>Panel D: Age Difference btw Husband and Wife</b>				
Reform	-0.339 (0.218) [0.190]	-0.465** (0.229) [0.0814]	-0.458* (0.257) [0.122]	-0.537** (0.267) [0.111]
Number of Observations	5,589	5,148	4,188	3,661
<b>Panel E: Arranged Marriage</b>				
Reform	-0.080*** (0.028) [0.037]	-0.081*** (0.030) [0.040]	-0.091*** (0.033) [0.026]	-0.100*** (0.035) [0.032]
Number of Observations	5,158	4,757	3,879	3,398
<b>Panel F: Forced into Marriage</b>				
Reform	-0.024* (0.014) [0.024]	-0.023 (0.015) [0.008]	-0.018 (0.017) [0.017]	-0.022 (0.018) [0.012]
Number of Observations	5,158	4,757	3,879	3,398
<b>Panel G: Met through Family/Relatives/ Neighbors</b>				
Reform	-0.053** (0.027) [0.126]	-0.059** (0.028) [0.097]	-0.070** (0.032) [0.080]	-0.084** (0.034) [0.125]
Number of Observations	5,589	5,148	4,188	3,661
<b>Panel H: It is OK to Marry a Blood Relative</b>				
Reform	-0.030 (0.019) [0.312]	-0.042** (0.021) [0.126]	-0.026 (0.023) [0.304]	-0.018 (0.026) [0.480]
Number of Observations	5,589	5,148	4,188	3,661
<b>Panel I: Spouse's Education is Important</b>				
Reform	0.022 (0.019) [0.326]	0.029 (0.020) [0.146]	0.050** (0.023) [0.019]	0.041* (0.024) [0.037]
Number of Observations	5,589	5,148	4,188	3,661

See Notes to Table A.1.

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