



Motherhood, Sex of the Offspring, and Religious Signaling

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Abstract: Using Turkey's 2013 Demographic and Health Survey, I find that among married women, having a single child as opposed to no children is associated with an approximately five-percentage-point increase in the likelihood of religious veiling. Furthermore, the likelihood of religious veiling increases as the number of a woman's children increases. Robustness checks show that these associations are rather stable across the Muslim world. In addition, I use the sex of a woman's first child as a natural experiment and find that in Turkey, having a son versus a daughter increases the likelihood of religious veiling by 2.2 percentage points. In contrast, having a child and the sex of the first child have no significant effects on unobservable religious behaviors, traditional values, and gender norms. These results are consistent with the hypothesis derived from signaling theory that women use veiling strategically to foster family reputation.

Keywords: signaling theory; religion; Islam; religious veiling; natural experiments; causal methods

SIGNALING theory, developed simultaneously in biology (Zahavi 1975) and in economics (Spence 1974), tackles a key issue with communication: how an interpreter of a message (the receiver) can establish that the agent emitting the message (the signaler) is conveying the truth when the signaler might have an incentive to misrepresent (Gambetta 2009). Simultaneously, the theory tackles the problem of how the signaler can persuade the receiver that the signal is conveying the truth.

In its most stylized form, the theory deals with interdependent situations in which a signaler and a receiver interact. There is asymmetric information. There are various "types" of signalers. The signaler knows which type they are, and the receiver does not. The receiver, however, observes signals. Signals are actions taken by the signaler. Depending on the incentive structure and the distribution of signaler types in the population, the signal may convey truthful information about the unobservable type of the signaler. The signal may be separating (different types of signalers emit different signals), pooling (all types emit the same signal), or partially separating (all types send the same signal but in varying frequencies or intensities). The receiver interprets the signal and acts accordingly. The action of the receiver in combination with the type of the signaler, in turn, affects the payoffs of the signaler and the receiver. Whether the signal is (partially) separating or pooling depends on the differential costs and benefits of the signal for different types of signalers. A detailed treatment of signaling theory can be found in most game theory textbooks (e.g., Gibbons 1992).

In addition to animal behavior, morphology, and microeconomics (in which the theory originated), ideas from signaling theory are applied in a wide array

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of disciplines, from sociology to international relations (see Gambetta 2009 for an overview). A particularly fruitful application of the theory is costly religious practice (e.g., Sosis and Alcorta 2003; Carvalho 2012; Patel 2012; Hall et al. 2015; Aksoy and Gambetta 2016). Patel (2012) analyzes veiling, various forms of religious dresses and head covers, as a costly signal.¹ Veiling informs others on a woman's piety and modesty. Piety and modesty are unobservable but valuable traits in social relations in general, but particularly in the marriage market and the job market. Hall et al. (2015) show experimentally that those who emit costly religious signals are perceived to be more trustworthy, even by people who believe in a different religion than the signaler. Carvalho (2012) models veiling as a commitment device that limits temptation to break religious norms. In Carvalho's (2012) model, too, veiling may serve as a signal, broadly defined, for it conveys a message to the community or ill-intentioned men that the woman has committed herself to her religion. Aksoy and Gambetta (2016) test some predictions of those models of veiling and find empirical support.

In most applications of signaling theory, the focus is on what the signal tells the receiver about some unobservable trait of the signaler. In the above mentioned models of veiling (Carvalho 2012; Patel 2012; Aksoy and Gambetta 2016), for example, the veil signals a reputation for piety and modesty for the veiled woman. Yet, there are strong reasons to believe that in humans, individual reputation extends beyond the self, particularly to the other members of one's family. Actions of other family members affect the reputation of the individual, and an individual's actions affect the reputation of his or her family. Family reputation, in turn, affects very important outcomes for all family members. These outcomes include social approval and trust in the community, prospects in the marriage market, and chances in the job market (Hoodfar 1997; Singerman 1997; Clark 2004). This social aspect of individual reputation in humans is largely ignored in most applications of signaling theory. In this study, I show that having a child as well as the sex of one's child have profound effects on the religious signaling of the mother.

Veiling originated in Mesopotamia long before the inception of any organized monotheistic religion (Lerner 1986; David 2011). It was then emulated in ancient Greece and later on in all Abrahamic religions (David 2011). In modern times, however, the practice remains widespread primarily among Muslims. In the West, the veil is now seen as an affront to Western values (Helbling 2014; Adida, Laitin, and Valfort 2016). In fact, certain forms of veiling are banned in several European countries. When it is seen through a signaling lens, however, the veil does not necessarily imply an ideological conflict or religious fundamentalism. It may simply be a signal used by women to convey some information about their and their families' reputation. As I will show below, a woman can take up the veil if the potential benefits of a pious reputation increase, even if her religiosity, ideology, or values remain unchanged.

Hypotheses

In the Muslim world, piety and modesty are valuable but unobservable traits which are sought after in social relations, in the marriage market (Patel 2012), and in

the job market (Clark 2004). A reputation for piety also fosters social acceptance and approval by one's community (Carvalho 2012). Once a family has a child, there is a greater need for the family's reputation to be good. This is because the community monitors individuals and individuals' families continuously, and future success of adolescents in the marriage and job market depends strongly on family reputation. Singerman (1997), for example, reports that traditional values of a bride or groom's family are often taken as a sign of the bride or groom's good character and suitability for marriage. Veiling is generally thought to be a strong signal of piety and modesty (Patel 2012; Aksoy and Gambetta 2016), both for the veiled woman and for her family alike. Ethnographic studies report indeed that women may veil to protect the family's reputation, honor, and good name (Hoodfar 1997). Hence, I predict that having a child increases the likelihood that a woman wears the veil (hypothesis 1). Note that if having a child increases the importance of a good family reputation, then having more children increases this importance even further. Consequently, the likelihood of veiling should increase as the number of children increases. In addition, as the child grows up, he or she approaches the marriage or the job market and a good family reputation becomes more and more important. I thus also predict that the older the child of a woman, the higher the likelihood that the woman wears the veil (hypothesis 2). Section A of the online supplement presents a simple formal model that predicts those effects.

I also expect that the sex of a woman's child will affect the intensity of the woman's religious signaling. Potential benefits of a reputation for piety and modesty may differ between the two sexes. Generally, men have higher stakes in the job market than women (Oswald and Powdthavee 2010). Hence, as far as their children's prospects in the job market are considered, mothers of boys may have stronger incentives to invest in a pious reputation than mothers of girls. On the other hand, one may argue that in the marriage market, a reputation for piety and modesty may be more important for females than for males. But then mothers of girls are in a different position than mothers of boys: girls are able to signal piety and modesty by veiling themselves, but boys lack this alternative. See section A of the online supplement for a formal treatment of this idea. Hence, when prospects in the job market and the marriage market are considered, mothers of boys may have stronger incentives to invest in a good reputation than mothers of girls. I thus expect that the likelihood of wearing the veil will be higher among mothers of boys than mothers of girls (hypothesis 3).

Past research suggests that having a son versus daughter makes people have more conservative political orientations (Warner 1991; Washington 2008; Oswald and Powdthavee 2010), but also see Lee and Conley (2016). Although a general increase in conservatism because of having a son is consistent with the signaling idea presented above, hypothesis 3 is more specific. The hypothesis does not predict that having a son versus daughter will cause an increase in religiosity or conservative values in general. Rather, it predicts that outward displays of religiosity, particularly the likelihood of veiling, will increase.

Empirical Context

I test my hypotheses primarily using data from Turkey. Using the Pew World Muslims Survey, I also test hypothesis 1 with data from 25 countries. The Pew data, however, do not allow me to test hypothesis 2 and 3. Because of this empirical focus, in this section I provide some contextual information on religion and veiling in contemporary Turkey.

Traditionally, Turkey has been a constitutionally secular state, although a vast majority of Turkish citizens define themselves as highly religious (KONDA Research & Consultancy 2007). Veiling had been banned in public offices, including courts, military facilities, Parliament, and public universities. Political Islam has long been in the Turkish political arena, but the 2002 general elections marked a significant turning point in Turkish politics (Aksoy and Billari 2017). In 2002, the Justice and Development Party (AKP) won the national elections with an explicit Islamist platform. Since then, the compulsory de-veiling laws have been relaxed, and religion increased its presence and importance in the public life. This political shift is accompanied by a fast growing veiling fashion industry (Gökarıksel and Secor 2010a,b). In the 1980s and 1990s, veiling styles were limited to lengthy overcoats and large scarves with rather muted colors (Gökarıksel and Secor 2010b). Recently, however, more colorful and diverse veiling styles have become widespread, particularly among young, urbanized, and educated women. Since the 2000s, the *türban* has become a symbol of religious politicization and of religious expression, whereas the headscarf represents a more traditional religious form (Saktanber and Çorbacioğlu 2008). Aksoy and Gambetta (2016) show that pious women may use the *türban* instead of the traditional headscarf to signal their piety and modesty. Although differences between the various veiling styles are important, in the Turkish data set that I use veiling is measured as a binary variable.

Studying religious signaling and veiling in Turkey is interesting for the following reasons. Despite the aforementioned rising influence of political Islam (Aksoy and Billari 2017), Turkey is still one of the most liberal Muslim-majority countries. In modern Turkey, formal regulations on veiling are far less strong compared with other Muslim-majority countries. Thus, veiling is primarily a decision of the woman or of her family rather than a legal obligation (Aksoy and Gambetta 2016). Secondly, the coexistence of multiple “types” (e.g., religious and secular) makes religious signaling particularly important in this context. If veiling was universal, then its signaling value would be nonexistent (Patel 2012).

Data and Methods

Data

I use Turkey’s 2013 Demographic and Health Survey (THDS) as the primary data source. TDHS targeted a representative sample of all households in Turkey with a weighted, multistage, stratified cluster sampling approach. Women between the ages of 15 to 49 living in the randomly sampled households were interviewed (Hacettepe University Institute of Population Studies 2014). The response rates

were 93 percent at the household level and 90 percent at the individual level. In addition to a rich set of measures of demographic behavior and attitudes, the survey included a question on whether the respondent covered her head when outside the home. To my knowledge, Turkey is the only country in the Muslim world that included a question on veiling in its demographic and health surveys. TDHS is also one of the most detailed and reliable sources of individual-level demographic and social behavior in Turkey.

In addition to TDHS, I use the Pew Research Center (2013) World Muslim's Survey for robustness checks. The Pew survey was conducted from 2011 to 2012 in 26 Muslim countries: Afghanistan, Albania, Algeria, Azerbaijan, Bangladesh, Bosnia and Herzegovina, Egypt, Indonesia, Iran, Iraq, Jordan, Kazakhstan, Kosovo, Kyrgyzstan, Lebanon, Malaysia, Morocco, Niger, Pakistan, Palestinian Territories, Russia, Tajikistan, Thailand, Tunisia, Turkey, and Uzbekistan. Morocco has to be excluded from the analysis because some data are completely missing in this country as a result of administrative error (Pew Research Center 2013). The survey employs stratified area probability sampling that yields nationally representative samples in the majority of the countries.

These data sets are available from the Hacettepe University Institute of Population Studies and Pew Research Center, but restrictions apply to the availability of these data, which were used under license for the current study and so are not publicly available. Data are, however, available from the author upon reasonable request and with permission from the Hacettepe University Institute of Population Studies and Pew Research Center.

Analysis Strategy

I test hypothesis 1 using TDHS with two approaches. The first approach is a propensity score matching (Rosenbaum and Rubin 1983). My ultimate aim is to compare women who have children with otherwise very similar women who are yet to have a child. For this purpose, I restrict my analyses to women who were married at the time of the TDHS. In Turkey, only about 2.7 percent of annual births happen outside marriage. This one of the lowest figures among Organisation for Economic Co-operation and Development countries. Additionally, a Kaplan–Meier survival estimate obtained using TDHS shows that the probability of remaining childless after about 10 years into one's marriage is virtually zero (see Figure 1). Hence, in Turkey, effectively all married women have at least one child sooner or later.

The propensity score matching procedure is implemented as follows. I firstly match married women who have a single child at the time of the survey with married women who do not yet have a child by then. To obtain the propensity scores, I first predict the probability of having no child versus having a single child using a logistic regression model. This logistic regression model includes the following predictor variables: education, age, wealth, employment status, whether the women lives in an urban area as opposed to a rural area, ethnicity (Turkish, Kurdish, Arabic, or other ethnicity), geographical region (north, east, south, west), the ideal number of children, whether the respondent performs the religious salah

Kaplan–Meier Survival Estimate

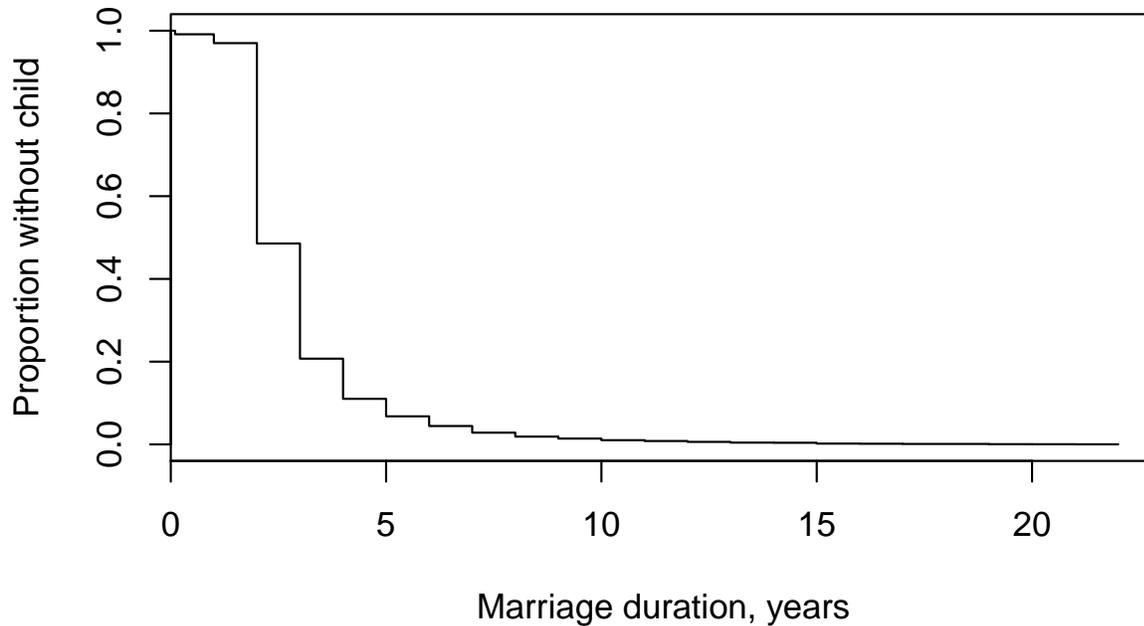


Figure 1: Probability of remaining childless throughout one’s marriage in Turkey.

rituals regularly, whether the respondent fasts regularly, and a “traditional values” score, which is the average of six binary items that measure a number of gender values and norms. The items are as follows: “the important decisions in the family should be made only by men,” “men should also do the housework like cooking, washing, ironing, and cleaning,” “it is better to educate a son than a daughter,” “women with children should not work outside the home,” “women should be more involved in politics,” and “women should be virgin when they get married.” The second and the fifth items are reverse coded before calculating the average score. After the propensities are estimated in this first step, each woman in the control group (no child) is then matched with a woman in the treatment group (one child) who has a very similar propensity score.

Figure 2 below presents diagnostics for the procedure to match women who had no children at the time of the survey with women who had a single child. The figure shows absolute mean differences in the covariates between the treated and control cases before and after matching. There are sizable differences between the treated and control cases before matching, particularly with respect to age, the ideal number of children, and the traditional values score—the average of the six items that measure gender norms and values. Those differences disappear after matching. I thus conclude that the matching of childless women with mothers of

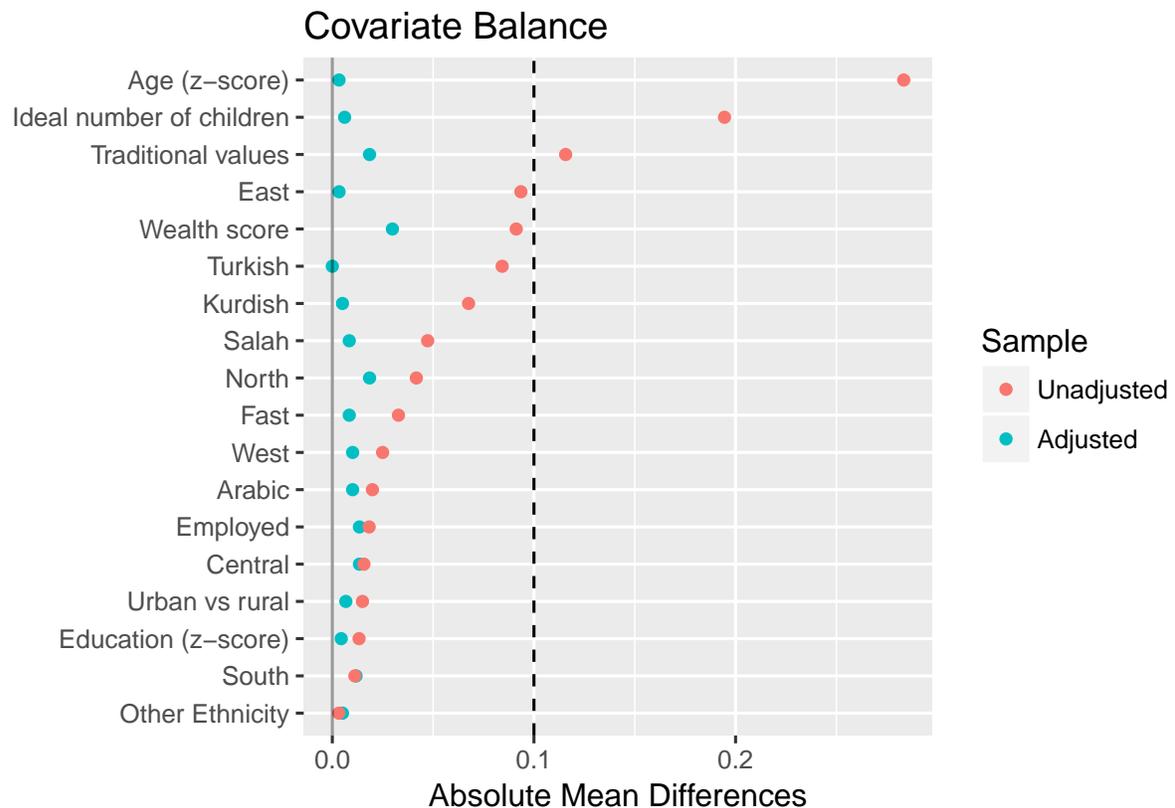


Figure 2: Covariate balance checks before and after propensity score matching between married women with one child and married women with no children.

one is successful, and I can obtain a treatment and a control group that are balanced in all key covariates. After the matching stage, I then estimate and compare the likelihood of veiling in the no child and in the one child groups. I estimate an average treatment effect for the controls (ATC)—that is, how much having a child would affect the probability of wearing the veil for a childless and married woman.

I further aim to ascertain whether there is a “dose–response” relationship between the number of children and the likelihood of veiling. For this purpose I match, using the same procedure explained above, (1) married women who had two children at the time of the survey with married but yet childless women and (2) married women who had three or more children at the time of the survey with married but yet childless women. Matching is less successful in these two cases, as it is difficult to find women who have more than one child by the time of the survey and are very similar to childless women in all key covariates. Figure 3 shows that there are differences in covariates even after matching, particularly with respect to age. Hence, the results regarding the comparison of childless women with mothers of two or more should be interpreted with caution because of a lack of satisfactory covariate balance. Nevertheless, I control for all of the covariates used in the first matching stage also in the analysis stage.

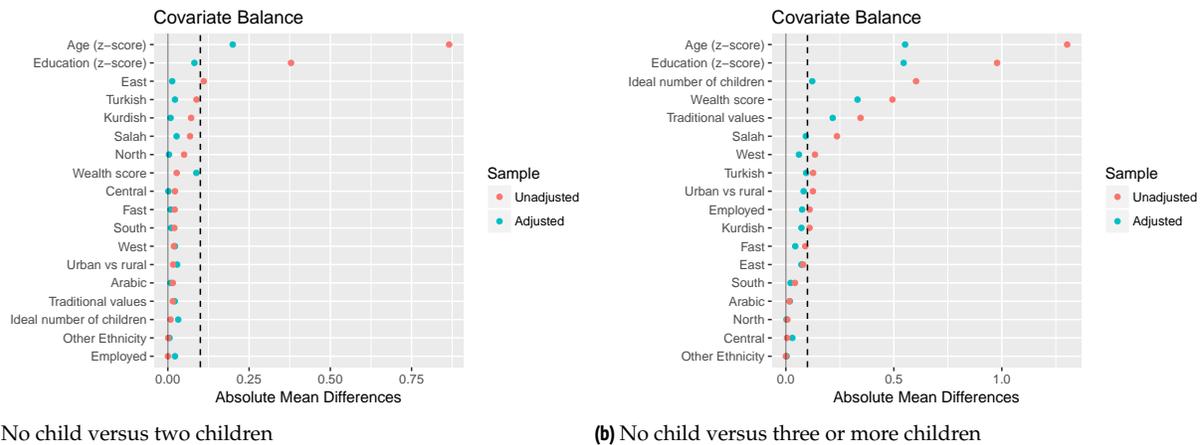


Figure 3: Covariate balance checks before and after matching adjustment. No child versus two children (left panel); no child versus three or more children (right panel).

The second approach I use to test hypothesis 1 consists of conventional logistic regression models that predict the probability of veiling using dummy indicators of one child versus no child, two children versus no child, and three or more children versus no child. In these logistic regression models, I control for the same set of predictors used in the propensity score matching procedure described above (also see section B of the online supplement). After ascertaining that the propensity score matching and regressions with covariate adjustment approaches give virtually identical results, I use logistic regressions with covariate adjustment to test hypothesis 2. Furthermore, I use the same covariate adjustment strategy to analyze the Pew data as a robustness check. Because there are 25 countries in the Pew survey, I fit a single multilevel logistic regression model to the whole data, with random effects for countries (Snijders and Bosker 2012). In this model, I control for urbanicity (vs. rural), income (country-specific z-scores), education (country specific z-scores), a religiosity measure constructed from six items (Cronbach's $\alpha = 0.69$) and the prevalence of veiling in one's district (see section C of the online supplement for further details).

Both propensity score matching and regressions with covariate adjustment rely on observed covariates and cannot account for unobserved omitted variables. Hence, one cannot fully establish causality with those strategies. Nevertheless, testing the same hypothesis in two different data sets with different sets of controls, different data analysis approaches, and a dose-response relationship (should there be one) should give us some indication of the robustness of the findings.

I have a stronger identification strategy for testing hypothesis 3. I use the sex of the first child as a natural experiment. Biologically, the sex of a child is expected to be random. There is no evidence for sex-selective abortion or for excess female infant mortality for first children in Turkey (Altindag 2016). In the TDHS data, the proportion of males among first births is 52.7 percent. Although this is slightly higher than the global expectation of 51.5 percent, in countries that are similar to Turkey in terms of climate and latitude (such as Malta, Greece, and Portugal), the

sex ratio is generally skewed towards more boys with 51.7 percent (Grech, Savona-Ventura, and Vassallo-Agius 2002). The male ratio of 52.7 percent found in the TDHS data is not statistically significantly different from 51.7 percent ($z = 1.57, p = 0.116$). In addition, Figure 4 compares women whose first child is a girl with women whose first child is a boy with respect to a number of key covariates. None of the differences is statistically significant at the 0.05 level. I thus conclude that in Turkey, the first child's sex serves as a natural experiment.

Note that in a natural experiment, both observed and unobserved pre-treatment covariates are expected to be balanced in the treatment and the control groups. Hence, I do not expect an omitted variable bias when I test the effect of the sex of the first child on veiling probability. I, however, cannot rule out reverse causality with data alone (i.e., veiling effecting the sex of the first child). Nevertheless, it is very difficult to find a credible causal mechanism through which veiling affects the sex of the first child. As Figure 4 shows, inner religiosity and gender values and norms are not associated with the sex of the first child.

There are reasons to expect that the total number of sons or the total number of daughters a mother has will not be random. This is because some couples may exhibit a son-biased stopping decision—that is, they may use contraception after having a son. There is evidence for this in Turkey (Altindag 2016). Moreover, the sex of older siblings seems to have an effect on the survival of the second or later offspring (Altindag 2016). Consequently, the sex of children born in the second parity or later will not serve as a natural experiment as the sex of the first child does. In addition, when I test hypothesis 3, I do not control for the total number of children. This is because the total number of children is likely affected by the sex of the first child because of the above-mentioned son-biased stopping rule (Gelman 2007). Unfortunately, the Pew survey does not include information on the respondents' children's sex and age.

In TDHS, missing data constitute less than 1.7 percent of all cases, hence I safely use listwise deletion (Allison 2001). In the Pew survey, missing data are more prevalent: they constitute ~11 percent of all cases. I use multiple imputation with chained equations (Van Buuren 2007) to impute the missing data. Section C of the online supplement shows that the results obtained with multiple imputation are rather similar to the results obtained with listwise deletion.

Results

Hypothesis 1 is strongly supported: having children is associated with a significant increase in the likelihood of wearing the veil. Figure 5 shows the estimated marginal effects. Note that the estimates in Figure 5 are obtained after controlling for a number of key covariates such as education, age, wealth, ethnicity, ideal number of children, religiosity, urbanicity, and the gender values and norms, with propensity score matching and regressions with covariate adjustment. In Turkey, 57.9 percent of married and childless women veil. Having one, two, and three or more children increase the probability of wearing the veil by 5.2 ($z = 2.49, p = 0.013$), 10 ($z = 4.40, p < 0.001$), and 12.7 ($z = 4.79, p < 0.001$) percentage points, respectively. As a comparison, a single standard deviation (~4.2 years) increase in education

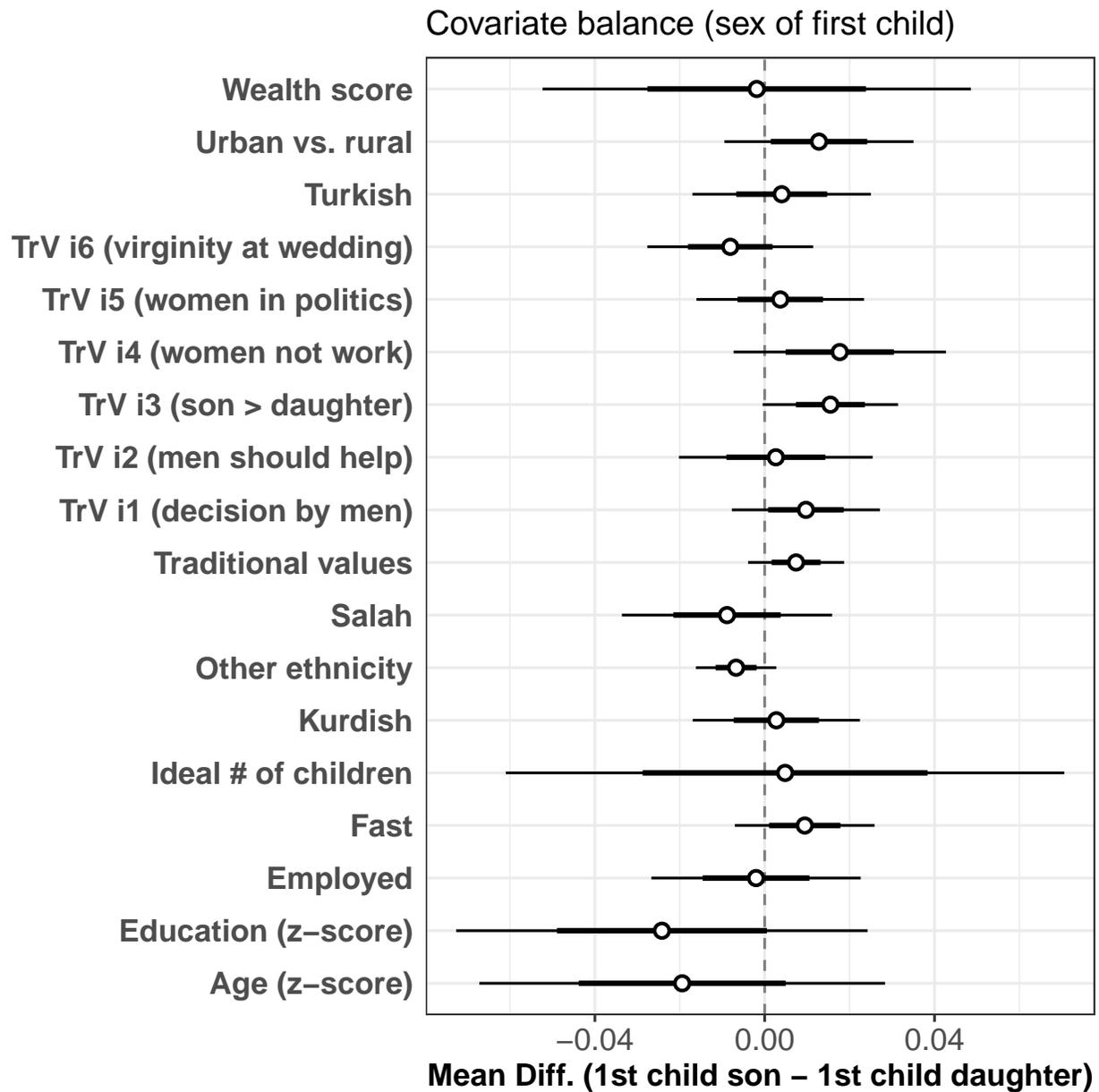


Figure 4: Covariate balance between treatment (first child male) and control (first child female) groups ($N = 6,241$). Thick lines show ± 1 standard errors (68 percent confidence interval), and thin lines show ± 1.96 standard errors (95 percent confidence interval).

is associated with a 7-percentage-point decrease in the probability of veiling (see section B of the online supplement). Hence, the effect of having a child on veiling is rather large.

There is a clear dose-response relationship between the number of children and the likelihood of wearing the veil. The results obtained with propensity score matching are very similar to the results obtained with logistic regressions with

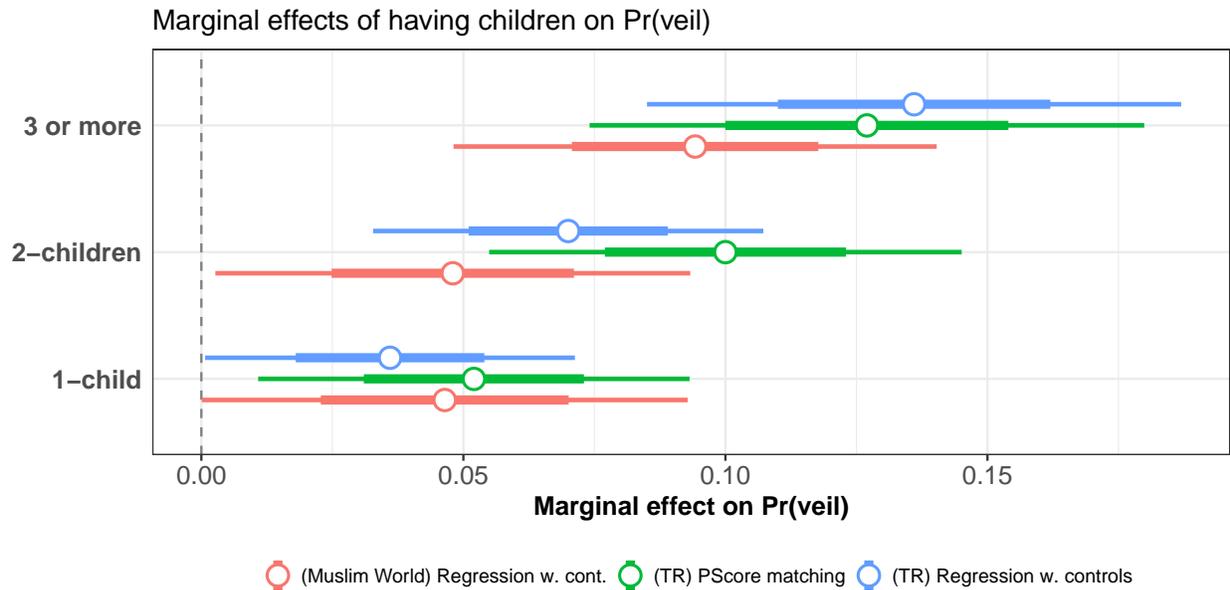


Figure 5: Marginal effects (average treatment effect for controls) of having one, two, or three or more children as opposed to having no children on the probability of veiling. Results are obtained after controlling for several variables (see section Data and Methods), either with propensity score matching or covariate-adjusted logistic regressions. Thick lines show ± 1 standard errors (68 percent confidence interval), and thin lines show ± 1.96 standard errors (95 percent confidence interval). Turkey estimates are obtained using Turkey's 2013 Demographic and Health Survey ($N = 6,721$). Muslim world estimates are obtained using the Pew World Muslims survey ($N = 11,035$). The Pew estimates are obtained after controlling for random effects for 25 countries and a number of other control variables (see Data and Methods).

covariate adjustment. Using a completely different data set with a different set of control variables, I obtain remarkably similar estimates in the 25 countries of the Muslim world. I also test whether the effect of having children on veiling varies across the 25 Muslim countries by adding random slopes in the model. Results show that there is not enough evidence in the data against the stability of effects in the Muslim world (likelihood ratio $\chi^2(3) = 2.22, p = 0.529$).

Hypothesis 2 is supported too (Figure 6). For every year increase in the age of the first child, the probability of wearing the veil increases by about 0.6 percentage points ($z = 5.65, p < 0.001$). This result is obtained after controlling for the aforementioned variables, including the age of the mother. There is no significant interaction between the sex and age of the first child.

Hypothesis 3 is also supported (Figure 6): the probability of veiling is about 2.2 percentage points higher when the first child of a woman is a boy as opposed to a girl (76.1 percent versus 73.9 percent). The effect size corresponds to the effect of about a two-year decrease in education. The effect of having a son versus daughter remains virtually identical after controlling for a number of key covariates, including education, age, wealth, employment status, ethnicity, ideal number of children, whether the respondent performs the religious salah rituals regularly, whether the respondent fasts regularly, urbanicity, and the gender values and norms of the

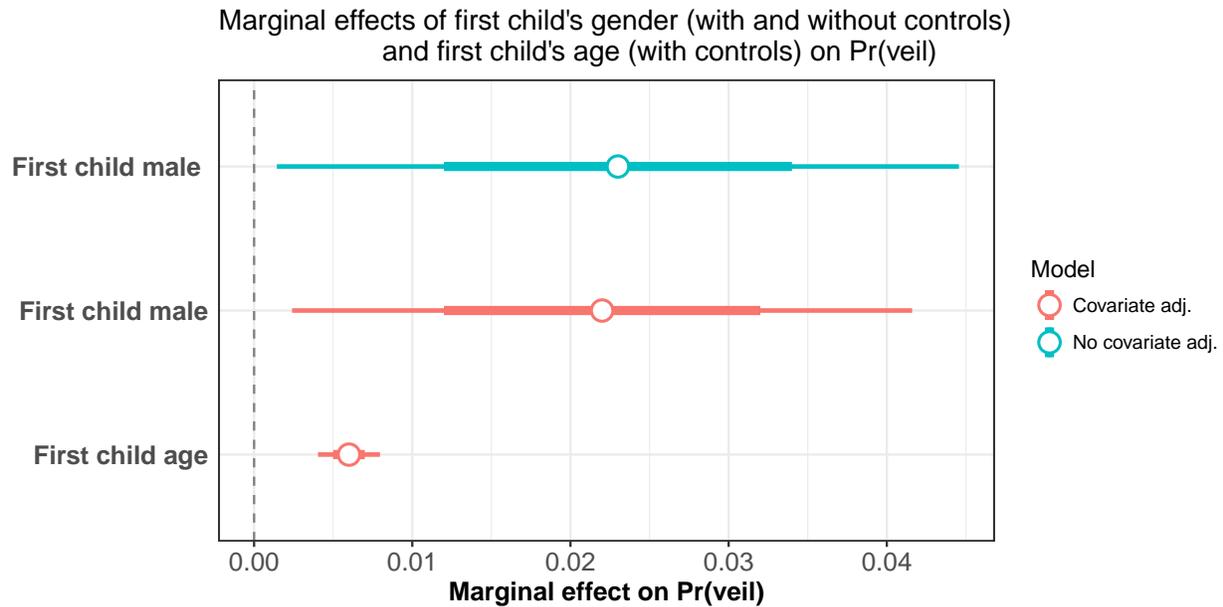


Figure 6: Marginal effects of the sex of the first child (boy versus girl) and the age of the first child on the probability of wearing the veil. Thick lines are ± 1 standard errors (68 percent confidence interval), and thin lines are ± 1.96 standard errors (95 percent confidence interval). The figure shows the effect of first child's sex with and without controls and the effect of first child's age with controls. ($N = 6,241$).

respondent. This is reassuring because in proper natural experiments, the treatment is expected to not correlate with the covariates, and hence controlling for the covariates should not change the estimated treatment effect. With or without controlling for covariates, the effect of the sex of the first child is statistically significant ($z = 2.05, p = 0.040$ without controls; $z = 2.28, p = 0.022$ with controls).

Alternative Explanations and Robustness Checks

In this section, I first test whether having a child and the sex of the first child affect religiosity and traditional values in general. Figure 7 shows that having a child versus none does not have a significant effect on religiosity and traditional values of mothers. This analysis also shows that because traditional values and religiosity are not affected by having a child, controlling for them in the analyses that predict veiling does not bias the results (i.e., traditional values and religiosity are not intermediate outcomes in the child–veiling association). Note also that the sex of the first child does not affect religiosity and traditional values either (Figure 4).

Including divorced, widowed, and separated women in the analysis results in virtually identical estimates for the effect of having a child (marginal effect [ME] = 0.04, $z = 2.37, p = 0.018$) and of the sex of the first child (ME = 0.02, $z = 2.30, p = 0.022$) on veiling probability. Similarly, using an entropy balancing method up to the third moment (Hainmueller and Xu 2013) instead of propensity score matching results in effectively identical estimates for the effect of having a

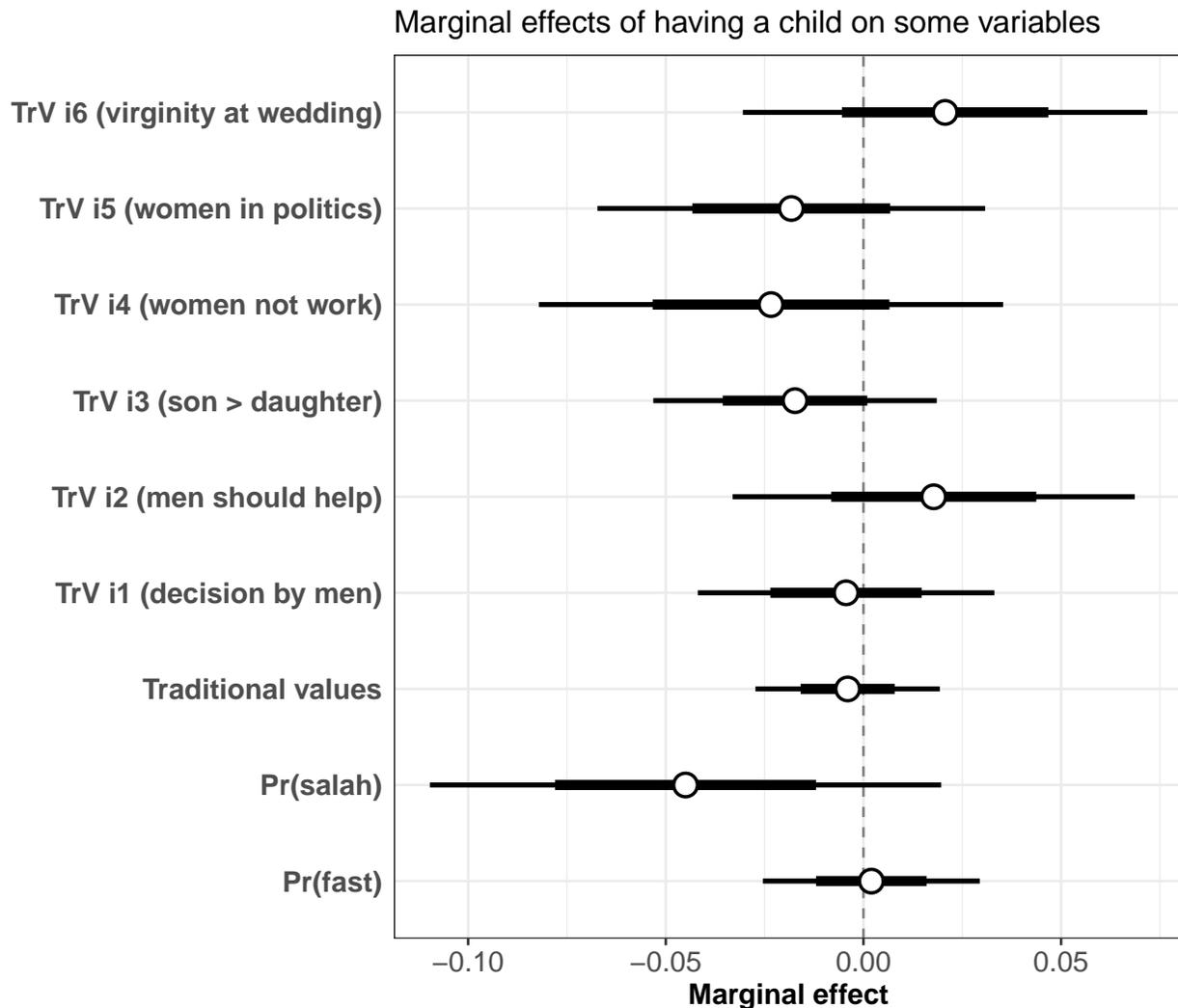


Figure 7: Marginal effects of having a child on religiosity and gender values. Thick lines are ± 1 standard errors (68 percent confidence interval), and thin lines are ± 1.96 standard errors (95 percent confidence interval). Estimates are obtained with propensity score matching for childless married women and married mothers of one on several covariates ($N = 1,024$).

single (ME = 0.05, $z = 2.02$, $p = 0.044$), two (ME = 0.11, $z = 3.61$, $p < 0.001$), and three or more children (ME = 0.16, $z = 1.68$, $p = 0.095$) on veiling probability. There is no statistically significant interaction between the sex of the first child and total number of children a woman has on the probability of veiling (interaction $b = 0.01$, $z = 0.19$, $p = 0.850$). The sex of the first child does not affect the probability of being divorced (ME = 0.00, $z = 0.57$, $p = 0.568$). Finally, there is no evidence in the data that the effect of the sex of the first child ($LR \chi^2(1) = 0.00$, $p = 1.000$) and of having a child ($LR \chi^2(1) = 0.00$, $p = 1.000$) on veiling probability vary across the 81 provinces of Turkey. These latter results are obtained by fitting multilevel logistic regression models with random effects at the province level.

Discussion

I find that motherhood and the sex of the offspring are strongly associated with outward expressions of religiosity but have no associations with unobservable religious behaviors, traditional values, and gender norms. These results are consistent with the conjecture that women use the veil strategically to foster family reputation. Signaling theory and other game theoretic models provide important insights into the underlying mechanisms of costly religious practices. Those models often consider the costs and benefits of religious practices for the practitioner alone. My results contribute to this literature by suggesting that the signaling value of such religious practices increases after having an offspring and varies by the sex of the offspring. This important role of the family in religious signaling, in turn, helps explain the persistence of costly religious practices such as veiling.

Before closing, I will address firstly an empirical and then a theoretical limitation and suggest avenues for future research. Firstly, I can establish the robustness of the association between the number of children a woman has and the likelihood of veiling using data from 25 countries. The positive effect of having a son versus daughter and of the age of one's child on veiling probability I document in this study, however, is limited to 2010's Turkey. In Turkey, religion's presence in the public domain has increased dramatically in the last decade. It is likely that the importance of a reputation for religiosity and the signaling value of the veil may have increased in the last decade too. Turkey is also different from other Muslim-majority countries in various ways. Whether the sex and age of a woman's child affect veiling in similar ways in other countries and contexts remains to be explored.

Theoretically, I argue that women who give birth to a child and to a son versus daughter are subsequently more likely to take up the veil in order to foster family reputation. This suggests that veiling serves as a signal of piety even after years of not veiling. If the receiver is a stranger, they would not know when exactly a woman has taken up the veil so the signal would work. The community, however, monitors its members and would know that the woman has taken up the veil at a later time. Hence, one may think that if the receiver is a community member, the veil may not serve as a reliable signal of piety. In the formal model presented in the online supplement (section A), there is a partially-pooling equilibrium. In this equilibrium, the pious type veils with some positive probability and the nonpious type does not veil at all. Hence, wearing the veil, no matter how late, is enough to separate the pious type from the nonpious. In other words, wearing the veil even after years of not veiling is better in terms of signaling piety than not veiling at all. Whether this indeed applies in real life and how receivers perceive a veil taken up recently are open issues. This point is related to the more general issue of a signal's reliability in revealing the underlying trait. I leave a detailed analysis of the reliability of the veil as a signal of piety to future work.

Veiling predates all organized monotheistic religions. It was later on adopted in Christianity, Judaism, and Islam. In contemporary Western societies, however, the practice is associated exclusively with Islam. The persistence of veiling among Muslims is often interpreted as an ideological affront to Western values and an indicator of religious fundamentalism. Some forms of veiling are banned in several

Western countries. The signaling models of veiling, however, suggest that the veil is only a noisy proxy of religiosity. The current study, for example, shows that having a child and the sex of one's first child affect the probability that a woman veils without affecting the woman's values, norms, and religiosity.

Notes

- ¹ As an aside, I use the term "veiling" to refer to a broad range of head covers and conservative dresses, including the headscarf, *al-amira*, *türban*, *khimar*, *hijab*, *shayla*, *niqab*, and *burqa*. Except *niqab* and *burqa*, all those styles leave the face open.

References

- Adida, Claire L., David D. Laitin, and Marie-Anne Valfort. 2016. *Why Muslim Integration Fails in Christian-Heritage Societies*. Cambridge, MA: Harvard University Press. <https://doi.org/10.4159/9780674088962>.
- Aksoy, Ozan, and Francesco C. Billari. 2017. *Political Islam, Marriage, and Fertility: Evidence from a Natural Experiment*. Oxford University. Working Paper.
- Aksoy, Ozan, and Diego Gambetta. 2016. "Behind the Veil: The Strategic Use of Religious Garb." *European Sociological Review* 32:792–806. <https://doi.org/10.1093/esr/jcw035>.
- Allison, Paul D. 2001. *Missing Data*. Thousand Oaks, CA: Sage.
- Altindag, Onur. 2016. "Son Preference, Fertility Decline, and the Nonmissing Girls of Turkey." *Demography* 53:541–566. <https://doi.org/10.1007/s13524-016-0455-0>.
- Carvalho, Jean-Paul. 2012. "Veiling." *Quarterly Journal of Economics* 128:337–370. <https://doi.org/10.1093/qje/qjs045>.
- Clark, Janine A. 2004. *Islam, Charity, and Activism: Middle-Class Networks and Social Welfare in Egypt, Jordan, and Yemen*. Bloomington, IN: Indiana University Press.
- David, Graeber. 2011. *Debt—The First 5000 Years*. Brooklyn, NY: Melville House.
- Gambetta, Diego. 2009. "Signaling." In *The Oxford Handbook of Analytical Sociology*, edited by Peter Hedstroem and Peter Bearman, pp. 168–194. Oxford: Oxford University Press.
- Gelman, Andrew. 2007. "Letter to the Editors Regarding Some Papers of Dr. Satoshi Kanazawa." *Journal of Theoretical Biology* 245:597–599. <https://doi.org/10.1016/j.jtbi.2006.11.005>.
- Gibbons, Robert. 1992. *Game Theory for Applied Economists*. Princeton NJ: Princeton University Press.
- Gökarıksel, Banu, and Anna Secor. 2010a. "Between Fashion and Tesettür Marketing and Consuming Women's Islamic Dress." *Journal of Middle East Women's Studies* 6:118–148. <https://doi.org/10.2979/MEW.2010.6.3.118>.
- Gökarıksel, Banu, and Anna Secor. 2010b. "Islamic-ness in the Life of a Commodity: Veiling-Fashion in Turkey." *Transactions of the Institute of British Geographers* 35:313–333. <https://doi.org/10.1111/j.1475-5661.2010.00384.x>.

- Grech, Victor, Charles Savona-Ventura, and P. Vassallo-Agius. 2002. "Unexplained Differences in Sex Ratios at Birth in Europe and North America." *BMJ* 324:1010–1011. <https://doi.org/10.1136/bmj.324.7344.1010>.
- Hacettepe University Institute of Population Studies. 2014. "2013 Turkey Demographic and Health Survey."
- Hainmueller, Jens, and Yiqing Xu. 2013. "ebalance: A Stata Package for Entropy Balancing." *Journal of Statistical Software* 54:1–18. <https://doi.org/10.18637/jss.v054.i07>.
- Hall, Deborah L., Adam B. Cohen, Kaitlin K. Meyer, Allison H. Varley, and Gene A. Brewer. 2015. "Costly Signaling Increases Trust, Even across Religious Affiliations." *Psychological Science* 26:1368–1376. <https://doi.org/10.1177/0956797615576473>.
- Helbling, Marc. 2014. "Opposing Muslims and the Muslim Headscarf in Western Europe." *European Sociological Review* 30:242–257. <https://doi.org/10.1093/esr/jct038>.
- Hoodfar, Homa. 1997. *Between Marriage and the Market: Intimate Politics and Survival in Cairo*. Berkeley, CA: University of California Press.
- KONDA Research & Consultancy. 2007. "Religion, Secularism and the Veil in Daily Life." http://konda.com.tr/wp-content/uploads/2017/03/2007_09_KONDA_Religion_Secularism_and_the_Veil_in_Daily_Life_Survey.pdf.
- Lee, Byungkyu, and Dalton Conley. 2016. "Does the Gender of Offspring Affect Parental Political Orientation?" *Social Forces* 94:1103–1127. <https://doi.org/10.1093/sf/sov098>.
- Lerner, Gerda. 1986. "The Origin of Prostitution in Ancient Mesopotamia." *Signs: Journal of Women in Culture and Society* 11:236–254. <https://doi.org/10.1086/494218>.
- Oswald, Andrew J., and Nattavudh Powdthavee. 2010. "Daughters and Left-Wing Voting." *Review of Economics and Statistics* 92:213–227. <https://doi.org/10.1162/rest.2010.11436>.
- Patel, David S. 2012. "Concealing to Reveal: The Informational Role of Islamic Dress." *Rationality and Society* 24:295–323. <https://doi.org/10.1177/1043463112440683>.
- Pew Research Center. 2013. "The World's Muslims: Religion, Politics and Society. PEW Survey Report." <http://www.pewforum.org/files/2013/04/worlds-muslims-religion-politics-society-full-report.pdf>.
- Rosenbaum, Paul R., and Donald B. Rubin. 1983. "The Central Role of the Propensity Score in Observational Studies for Causal Effects." *Biometrika* 70:41–55. <https://doi.org/10.1093/biomet/70.1.41>.
- Saktanber, Ayşe, and Gül Çorbacıoğlu. 2008. "Veiling and Headscarf-Skepticism in Turkey." *Social Politics: International Studies in Gender, State & Society* 15:514–538. <https://doi.org/10.1093/sp/jxn018>.
- Singerman, Diane. 1997. *Avenues of Participation: Family, Politics, and Networks in Urban Quarters of Cairo*. Cairo: American University in Cairo Press.
- Snijders, Tom A. B., and Roel J. Bosker. 2012. *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling*. London: Sage, 2nd edition.

- Sosis, Richard, and Candace Alcorta. 2003. "Signaling, Solidarity, and the Sacred: The Evolution of Religious Behavior." *Evolutionary Anthropology* 12:264–274. <https://doi.org/10.1002/evan.10120>.
- Spence, Andrew Michael. 1974. *Market Signaling: Informational Transfer in Hiring and Related Screening Processes*. Cambridge, MA: Harvard University Press.
- Van Buuren, Stef. 2007. "Multiple Imputation of Discrete and Continuous Data by Fully Conditional Specification." *Statistical Methods in Medical Research* 16:219–242. <https://doi.org/10.1177/0962280206074463>.
- Warner, Rebecca L. 1991. "Does the Sex of Your Children Matter? Support for Feminism among Women and Men in the United States and Canada." *Journal of Marriage and the Family* pp. 1051–1056. <https://doi.org/10.2307/353008>.
- Washington, Ebonya L. 2008. "Female Socialization: How Daughters Affect Their Legislator Fathers' Voting on Women's Issues." *American Economic Review* 98:311–332. <https://doi.org/10.1257/aer.98.1.311>.
- Zahavi, Amotz. 1975. "Mate Selection-A Selection for a Handicap." *Journal of Theoretical Biology* 53:205–214. [https://doi.org/10.1016/0022-5193\(75\)90111-3](https://doi.org/10.1016/0022-5193(75)90111-3).

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