The Costs and Benefits of Cousin Marriage

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Abstract

Marriage between blood relatives is widely practiced, accounting for fifty percent of marriages in many Muslim societies, yet the underlying reasons for consanguinity and its causal impact on health and society are still poorly understood, largely due to the difficulty of adequately addressing the endogeneity of marriage partners. We use variation in an individual's supply of cousins suitable for marriage—where marriageability is based on the cousin's sex and age—to predict who marries a cousin in an instrumental variables estimation strategy. We find that marrying a cousin has negative effects on the health of offspring, but that there also substantial social and economic benefits of cousin marriage including productivity gains for men when they work alongside their fathers-in-law, less early marriage of girls, and greater cohesion with the extended family. Consanguinity also affects political beliefs, intensifying loyalty to tribe over nation.

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1 Exhibits (short paper)

1. First stage figure
2. Outcomes: Age at marriage, Brideprice/Mahar
3. Outcomes: 'how woman is treated', proximity & interaction w/ fam
4. Outcomes: Attitudes indices (gender, tribal, xenophobic)

Appendix?

- Descriptive statistics (maybe split by married to cousin / not)
- First stage table
- Sanity check table (knew husband before marriage)
- Additional outcomes (democracy, civic, science, views on CM)
- Husband characteristics, income
- Intensive/extensive margin checks

2 Introduction

Consanguinity, or marriage between blood relatives, is widely practiced and socially favored in many societies, most commonly those with large Muslim populations. The most popular form of consanguineous marriage is between first cousins, accounting for 22% of marriages in Egypt, about 33% in Iraq and Yemen, and over 40% in Pakistan and Iran (Abbasi-Shavazi et al., 2008; Weinreb, 2008; Bittles, 2011). This paper investigates the causal impact of cousin marriage on the health of offspring, as well as the factors that influence individuals to choose cousin marriage in spite of the potential health risks to their children. We focus on Oman where 31% of first marriages are to a first cousin.

Marrying within the family confers many potential benefits that could explain why the practice is favored in certain societies. The hypothesized motives for cousin marriage include the desire to ensure the wife is treated well, to maintain closeness to one's daughter in a setting with patrilocal exogamy, to keep assets within the family, and to enable more efficient forms of bride price payment either through exchange marriages or informal credit arrangements. However, there is a dearth of rigorous empirical evidence to disentangle these potential motives.

Meanwhile, consanguineous marriage also entails costs, most notably the potential for major health problems among offspring. Parental consanguinity results in a higher expected level of homozygosity in offspring, which in turn leads to the increased expression of deleterious recessive genes. However, the extent to which this poses measurable health risks is largely unknown. Exactly how much consanguineous marriage increases homozygosity depends on societal factors such as the distribution of genes in the population, which in turn depends on the patterns of consanguinity over many generations. Moreover, even a calculation of how much cousin marriage increases genetic similarity is insufficient to quantify the effect of cousin marriage on outcomes of interest such as child survival.

A number of empirical studies in the population genetics literature have produced compelling statistics documenting the correlation between adverse health and consanguineous marriage. However, the degree to which consanguinity has a causal role in these outcomes is unclear. The major limitation in drawing inferences from such studies is that the choice of marriage partner is endogenous, which can lead to biases in naive comparisons between those who marry within versus outside of the family. For instance, it is difficult to know whether consanguinity causes poor infant health or whether the individuals who enter into consanguineous marriages differ along other dimensions associated with health problems among offspring. Although one can control for observable characteristics such as parental literacy,

it is likely that unobservable differences between consanguineous and non-consanguineous couples confound even conditional comparisons. For this reason, omitted variables are likely to have led to biased empirical estimates in the existing literature.

We overcome this fundamental obstacle through novel data collection that enables instrumental variables (IV) estimation, which we argue is well suited to determining whether there is a causal link between consanguinity and the outcomes of interest. Our IV strategy takes advantage of differences among people in the availability of "marriageable cousins," that is, first cousins of the opposite sex who are of the appropriate age to marry given norms on husband-wife age gaps. In essence, this technique compares two individuals who, due to variation in the age and sex composition of their extended family, quasi-randomly differ in their propensity to marry a cousin but are otherwise identical. To isolate the exogenous component of the variation in cousin sex and age composition, our regression estimates condition on the number of sisters, the number of brothers, the number of female cousins close in age (i.e., in the same age range we use to calculate marriageable male cousins), and other variables; these factors could influence an individual's number of marriageable cousins but also might directly affect economic and health outcomes.

Our results show a number of interesting patterns. We find suggestive evidence of moderate health risks to marrying inside the family, at least in settings such as Oman where there is a high prevalence and long history of cousin marriage. Consanguinity appears to be causally associated with an increase in child illness, including respiratory problems and incidence of diarrhea, though we find no detectable change in the likelihood of survival, either in utero or during childhood.

A point worth noting is that the effect of marrying a cousin on child health is fundamentally a combination of both genetic and non-genetic effects. As discussed below, there appear to be several non-genetic channels through which cousin marriage might improve child health (e.g., stronger ties to extended family). The overall negative health effects we find suggest that these benefits are outweighed by the genetic risks, at least for the child health outcomes examined.

Many people who marry blood relatives are aware of the genetic risks. Thus, they are presumably making a tradeoff between this cost and other benefits of cousin marriage. Indeed, we find evidence for several benefits of cousin marriage. First, the woman's family lives closer to her and interacts more with her. Second, there appear to be productivity gains with the husband being more likely to work with his father-in-law and earning more money. Third, a girl who marries a cousin is less likely to be married at a young age. Delayed

marriage is likely beneficial to girls in a society where the median age of marriage is 16. Cousin marriages are arranged at the same age but entails a longer engagement period; in extended families it is likely easier to monitor and verify the unwed girl's chastity during the engagement, which eliminates a main reason for early marriage. Fourth, we find there are lower upfront payments (bride price, or mahar) in cousin marriages. One explanation, consistent with other recent results, is that informal contracts to pay the bride price over time are more enforceable within families, and we indeed find that there are subsequently fewer transfers from the girl's family to the couple (Do et al., 2009; Kuhn et al., 2009). However, our results taken in full also suggest that part of why there is lower bride price may be that cousin marriages confer benefits differentially to the bride's family. Finally, we examine whether there is less mistreatment of wives in cousin marriages, but we do not find this pattern in the data.

Our findings on both the health costs of consanguinity and the economic and social benefits have important implications in the Middle East, northern Africa, South Asia, and the worldwide diaspora of these societies. Understanding the degree to which consanguinity adversely affects infant and child health will help policymakers design appropriate policies on genetic counseling and health care (World Health Organization, 2006; Raz and Atar, 2004). In addition, current policy debates about banning consanguinity, for example as applied to the Pakistani community in the United Kingdom, would be informed by a better assessment of the actual health risks (Dyer, 2005).

On the flip side, understanding the economic benefits that lead families to choose consanguineous marriage highlights the potential welfare losses from banning cousin marriage. More broadly, understanding the reasons for consanguinity sheds light on some of the market failures that individuals face, such as imperfect information in the labor market and credit market. Marrying within the extended family is part of the much more general phenomenon in low- and middle-income countries of social networks substituting for formal institutions, providing insurance, credit, and the like (Rosenzweig and Stark, 1989; Townsend, 1994; La Ferrara, 2003).

Finally, our empirical analysis also examines how consanguinity affects political beliefs and identity. Much of the discussion about consanguinity in the Western popular press is not about the health risks, but about how it might strengthen clan loyalties at the cost of weakening attachment to one's nation (Tierney, 2003; Kurtz, 2001; Sailer, 2003). The argument is that marrying within extended family members hampers efforts at nation-building and democratization, since individuals rely more on their family networks and have less

need for a strong state and are less trustful of their countrymen. We find some evidence consistent with this hypothesis: Cousin marriage leads individuals to self-identify with their tribe more than their nation, though we do not find significant effects on levels of trust of non-family-members. These findings complement a previous literature in economics on how culture and loyalty to kin affect political development (Miguel, 2004; Greif, 2006).

In the remainder of the paper, we first provide background information on the practice of consanguinity and its hypothesized costs and benefits in section 3. Section 4 describes the data, and section 5 lays out our instrumental variables strategy based on the supply of marriageable cousins. Section 6 presents the empirical results on the health effects of cousin marriages, potential reasons that explain consanguinity's popularity and persistence, and the implications for political identity. Section 7 offers concluding remarks.

3 Background

3.1 Patterns of consanguinity

Consanguineous marriage is common in many societies, particularly those in the Middle East, North Africa and Central Asia with large Muslim populations, and in the Dravidian Hindu populations of South India. Reported rates of marriage between couples related as second cousins or closer is over 20% in countries such as Algeria, Egypt, Turkey, Iran, Iraq, Saudi Arabia, and exceeds 50% in many places (Bittles, 2001, 2011).

Globally, marriage between first cousins is the most common form of consanguineous union. In such marriages the progeny would be expected to have inherited identical alleles in at least 6.25% of gene loci, usually expressed as a coefficient of inbreeding of $F = 0.0625$. The exact rate of identical alleles will depend on the history of consanguinity in the community, so it is important to note that coefficients of inbreeding in highly consanguineous societies could be substantially higher because of the cumulative effects of successive generations of intrafamilial marriage. In addition, in many small endogamous communities, even couples who believe themselves to be unrelated may in fact share past common ancestors (Overall and Nicholls, 2001; Bittles, 2005).

In Oman, in a survey of married couples giving birth at a large obstetrics clinic, 24% of husbands and wives were first cousins, and another 12% were second cousins (Rajab and Patton, 2000). Another 20.4% of marriages were between more distant relatives within the same tribe. Note that uncle-niece marriage is not practiced under Islam and is essentially non-existent in Oman and the rest of the region (Bittles, 2011).

By comparison, in the United States and Europe consanguinity historically has had a low prevalence, but this situation is changing with increasing numbers of migrants from countries in Asia and Africa where intra-familial marriage is prevalent (Bittles, 2003a). There is no single agreed upon explanation for the strong tradition of consanguinity in specific populations, but in general terms it is congruous with the customs of arranged marriage and community endogamy. In addition, whereas the Christian Roman Catholic and Orthodox Churches require dispensation for first cousin marriages, they are freely permitted within Islam, Judaism, Buddhism, Zoroastrianism and the Christian Protestant tradition (Bittles, 2003a).

3.2 Previous literature on the reasons for consanguinity

There is a large and prominent literature in anthropology on mate choice and kinship (Dumont, 1957; Lave, 1966; Levi-Strauss, 1969; Goode, 1963; Eckland, 1968; Goody, 1976). Among the postulated motives for consanguineous marriage are that it strengthens family ties and helps keep wealth consolidated in the family.[1] Consanguinity is believed to be especially valued by families as a way to keep land consolidated (Rabino-Massa et al., 1988). Another motivation for consanguinity is that it makes smaller dowry or bride-price possible (Reddy, 1988; Barth, 1954; Hampshire, 2001; Bittles, 1994; Hussain, 1999). Marrying within the extended family can also simplify the process of finding a spouse, particularly in isolated areas (Roberts, 1975). Another hypothesis is that it leads to a more harmonious relationship between the wife and her in-laws or husband (Bittles, 1994; Hussain, 1999; Holy, 1989). Anthropology research in Pakistan suggests that "a mother-in-law who is a relative is less apt to mistreat and overwork her daughter-in-law," (Pastner, 1978).

There have been a small number of quantitative studies in the population genetics literature that investigated people's motives for consanguinity. These studies asked individuals their reason for marrying in the family and used a list of possible answers provided by the researcher (Hussain, 1999; Qidwal et al., 2003). The most common answers people gave for their preference for consanguineous unions were 'cultural reasons' or 'the security of knowing the mate was in the family.' Few respondents chose the more specific reasons offered such as 'financial reasons' or 'more trust within the family.' These findings could be interpreted in two quite different ways, either that specific reasons are not important or that

[1]Many of the best known examples of consanguinity in the West seem to have been based on these motives. European monarchy used consanguineous marriages to strengthen alliances, and the Rothschild banking family famously practiced intrafamilial marriage in order to keep its business secrets within the family (Ferguson, 1998).

there are limitations to inferring motives by analyzing self-reported reasons.

In the economics literature, three recent papers examine marriage among family members. Jacoby and Mansuri (2010) examine the practice of exchange marriage ("watta satta") in Pakistan in which two brother-sister pairs simultaneously marry. They show that such marriages allow for reciprocal threats, in which abuse of a wife is deterred by the threat that the husband's sister will, in turn, be mistreated. Empirically, the authors find that women in watta satta marriages experience significantly less estrangement, domestic abuse and episodes of major depression. Do et al. (2009) study Bangladesh and find that dowries are lower in consanguineous marriages. The interpretation is that ex ante transfers such as dowries are the alternative when the bride and groom's families cannot commit to make ex post investments in the couple; within extended families, ex post investments can be more credibly committed to, obviating the need for a large dowry. Kuhn et al. (2009) also examine consanguinity in Bangladesh, in particular the drop in consanguinity among families that benefited from the construction of a flood-protection embankment. Similar to Do et al. (2009), they argue that ex post payments are more credible within families, so consanguineous marriages are particularly attractive for credit-constrained households.

Our work complements this existing work, and makes several distinctive contributions. First, we test several previously unexamined hypotheses about the benefits that consanguinity might confer such as productivity gains from husbands working with their father-in-laws and a lower rate of early marriage. Second, in addition to examining the causes of consanguinity, we examine its health effects on offspring, where our contribution derives from a novel strategy to overcome the omitted variable problem that exists in the literature. Third, we explore the political implications of consanguinity, namely how it affects an individual's self-identification with clan versus state.

3.3 Previous literature on consanguinity and health

The major health risk associated with inbreeding is the increased expression of recessive genetic conditions. As consanguineous spouses are more genetically similar than unrelated couples, their offspring will have a higher rate of homozygosity, in which both alleles at particular genetic loci are identical. Several thousand deleterious conditions are known to have a recessive mode of inheritance, although in most populations these disorders are present only at low frequencies (Online Mendelian Inheritance in Man, 2011).

Because of their higher levels of homozygosity, the children of a consanguineous union are more likely to inherit the same mutant alleles from each parent. Therefore typically,

recessively inherited single gene diseases that are rare in the general population are more commonly reported in consanguineous offspring, and this phenomenon also generalizes to recessive multigene conditions (Alwan and Modell, 2003; Bittles, 2003b).

Another potential risk of inbreeding is that low genetic diversity may impair the function of an individual's immune system. The crucial genes are those of the major histocompatibility complex (MHC), which encode proteins involved in the body's response to pathogens and foreign proteins. Different MHC genes respond to different antigens, so having a larger array of MHC alleles implies that an individual is protected against a larger array of diseases (Thomas, 1992; Frank, 2002). Children whose parents are more genetically similar would be expected to have less variation among their MHC genes and thus a less adaptable immune system, leading, for example, to a greater susceptibility to major infectious diseases (Hill, 1996; Thursz et al., 1997).

The hypothesized effect of consanguinity on reproductive outcomes is more nuanced, and it also is more difficult to disentangle genetic effects on fecundity from the couple's choices about childbearing. Based on studies conducted in an endogamous religious isolate in the United States, it was suggested that low MHC diversity might serve to inhibit conception or result in inefficient embryonic development and periconceptual miscarriage (Ober et al., 1992, 1999). On the other hand, genetic compatibility between mother and fetus could lead to fewer prenatal losses because of lower rates of blood-group incompatibility and preeclamptic toxemia (Bittles et al., 2002).

Many medical and epidemiological studies have examined the relationship between consanguinity and fetal, infant and child health. The evidence on the link between consanguinity and reproductive loss is mixed, with some studies showing that consanguinity was associated with higher rates of miscarriage and stillbirth while others reported no statistically significant correlations (Schull et al., 1970; Rao and Inbaraj, 1977; Al-Awadi et al., 1986; Stoltenberg et al., 1999; Bittles et al., 2002; Schull and Neel, 1972; Tunçbilek and Koç, 1994). Net fertility has been found to be higher among inbred couples, which may partly be a compensatory response to a higher actual or perceived risk of prenatal and postnatal mortality (Bittles et al., 2002). Fertility rates, of course, are strongly influenced by age at marriage and use of contraception, and consanguineous marriages tend to be associated with a younger age at marriage and lower use of contraception (Hussain and Bittles, 1998; Tunçbilek and Koç, 1994; Bittles et al., 1993). Note that age of marriage is an important channel through which consanguinity also could affect prenatal loss and infant mortality since maternal gynecological immaturity is a risk factor for these outcomes.

Infant and childhood mortality have been among the most studied health outcomes with a significant positive correlation often demonstrated even after controlling for family background characteristics (Bittles and Makov, 1988; Bittles et al., 1991; Bittles and Neel, 1994; Hussain and Bittles, 1998; Stoltenberg et al., 1999; Hussain and Bittles, 1999, 2000; Hussain et al., 2001). Several studies explore in more detail the underlying health disorders that lead to mortality, as well as non-fatal morbidity and disabilities associated with consanguinity. For example, excess infant mortality among consanguineous couples in the Pakistani community in the United Kingdom was found to be largely due to deaths from single gene disorders and congenital malformations (Stoltenberg et al., 1999; Hutchesson et al., 1998). High levels of deafness, childhood neurodegenerative disorders and mental retardation also have been reported, and there is preliminary evidence of a link between consanguinity and adult-onset diseases, including ischemic heart disease and breast cancer (Sundstrom et al., 1999; Devereux et al., 2004; Yaqoob et al., 1995; Durkin et al., 1998; Shami et al., 1991; Liede et al., 2002).

3.4 Previous literature on consanguinity and political identity

Pundits have argued, especially in the last decade, that consanguinity could be an impediment to nation-building in Iraq, Afghanistan, and the rest of the region. The benefits of cousin marriage discussed above mean that individuals rely more on kin and may have less of a need for and hence less allegiance to the state. Epitomizing this view, Kurtz (2001) wrote in the *National Review*, "In the modern Middle East, networks of kin are still the foundation of wealth, security, and personal happiness. That, in a sense, is the problem. As we've seen in Afghanistan, loyalty to kin and tribe cuts against the authority of the state." And in a *New York Times* column headlined, "Cousin marriages hinder U.S. efforts in Iraq," John Tierney (2003) quotes an Iraqi sociologist: "In a modern state a citizen's allegiance is to the state, but [for Iraqis who marry their cousins, it] is to their clan and their tribe."

The view in the popular press, while often made provocatively, builds on scholarship in anthropology and political science showing that kinship structures can have important implications for people's attitudes toward political authority and, in turn, on political structures (Fox, 1983; Lindholm, 1986). Economists have also studied the link between clan loyalty and politics. For example, Miguel (2004) compares Kenya where there is strong identification with one's tribe to Tanzania, where nation-building policies have created more loyalty to the nation and more trust between members of different tribes. As a result, communities in Tanzania have had more success in providing local public goods. Similar in spirit, Greif

(2006) argues that family structure helps explain the economic structure in Europe, where an emphasis on nuclear families, as opposed to broader clan structures, led to the rise of corporations, self-governing private institutions that served functions that kinship structures served in more clan-based societies. Moreover, this European cultural system may have fostered a belief in democracy and been beneficial to economic growth.[2] While it is not the main focus of our study, we contribute to this literature by how cousin marriage influences loyalty to tribe, trust in others, and views on democracy.

4 Data

Our research design entails constructing as an instrumental variable the supply of marriageable cousins available to an individual. To implement this strategy, we conducted a survey of women in the Dakhliya region of Oman in which we collected information about the universe of the respondent's cousins, as well as other information. We conducted the survey in three villages in the wilayat (district) of Bid Bid in 2007 and five villages in the wilayat of Nizwa in 2009. Figure 1 is a map of Oman indicating the locations of Bid Bid and Nizwa. Both are rural areas and are similar in their level of development. The sample of survey respondents comprised all women between ages 25 and 50 in these villages. In Bid Bid, this sampling rule yielded 876 women of whom 780 agreed to be interviewed (89% response rate); in Nizwa, 846 of the 857 women agreed to be interviewed (99% response rate). Of these 1637 respondents, we drop 34 due to missing data on a key variable such as age, ever married, or marriage to a first cousin.

One of the core survey modules asked the respondent to enumerate all of her aunts and uncles and then all of her first cousins, and we collected data on each cousin's age, sex, and survival until age 12. These data enable us to calculate the respondent's marriageable male cousins, our instrumental variable. The reported total number of cousins ranged from 0 to 138. We trim the bottom and top 1% of this distribution, i.e., those with 0 cousins or those with more than 97 cousins. Since having zero cousins is highly unlikely in a high-fertility country such as Oman, these data may represent non-response for this module of the survey, and in the case of those with more than 97 cousins, the details about their cousins, such as age, are likely less accurate. Trimming these 66 respondents reduces the sample to 1538.

[2]In related work, Greif and Tabellini (2010) compare China and Europe, arguing that China historically was organized around clan and Europe around cities that cut across lineages, and that these cultural systems have been transmitted, creating distinct institutional patterns that persist today.

We also collected basic demographic and family background information, including the respondent's age, her father's education and landholding, and the age and gender of each of the respondent's siblings, which we use to construct control variables. Table 1 shows the summary statistics for these variables.

The other modules of the survey focused on the outcomes of interest. First, we collected information on marriage outcomes, including the respondent's relationship with her husband. We restrict our attention to first marriages. As seen in Table 1, 89% of the sample has been married, and 27% of the sample married a first cousin, or 31% conditional on ever being married. Another 19% married a second cousin or other relative, and the remaining 42% married a non-relative.

Second, we collected information on the respondent's fertility history, including live births, miscarriages, and stillbirths. The mean number of live births reported is 5.5, and 40 percent of the sample has had a miscarriage or stillbirth.

Third, we collected information on child health for each of the respondent's children. In the analysis, we use only the subsample of children under age 15 at the time of the survey to reduce recall error. About a third of the children experienced severe diarrhea, 4% had respiratory problems, and 12% had a blood disorder (which are often recessive conditions, such as thalassemia). We also asked a subjective question about overall health and collected information on child mortality. Note that the mortality rate in the sample is quite low, at 2%.

Fourth, we asked questions related to the potential economic and social benefits of cousin marriage such as marriage payments, intrafamily transfers, time spent with family, and social and political attitudes. To highlight a few of the descriptive facts, 23% of respondents live over 10 kilometers from their parents, and 50% see their parents daily. The average age of marriage is 17.5 years, and 44% of women were married by age 16. On attitudes, on average 87% of respondents think that men make better leaders, and 26% think that priority in education should go to boys. Only 18% of the sample says you can trust non-family, and 9% report that they identify more with their tribe than with Oman as a country.

5 Empirical strategy

Our empirical goal is to estimate the causal effects of cousin marriage. The standard regression to do so is the following:

$$Y_{ij} = \alpha + \beta \cdot MarriedToCousin_i + X_{ij} \cdot \gamma + \varepsilon_{ij} \tag{1}$$

Each observation is a woman i, or for the child health outcomes, each observation is a child j born to woman i. The main regressor is whether the woman is married to a first cousin, and the outcome could be a marriage outcome (e.g., bride price), economic outcome (e.g., income), or child health measure (e.g, mortality). For example, a significant estimate β when the outcome is child mortality would suggest that cousin marriage leads to a higher rate of child mortality. However, the coefficient β suffers from omitted variable bias if marrying a first cousin is correlated with other factors that affect children's health. Those who marry a cousin may be poorer or richer than those who do not, more or less educated, or different on any number of traits. The previous literature addresses this problem by controlling for family background traits, X_{ij} and typically finds a significant positive association between child health problems and cousin marriage, often with a large effect size. However, the concern in interpreting these results is that even after adding control variables, the estimates may be severely biased due to unobserved factors.

We employ an instrumental variables approach to estimate the effects of cousin marriage, aiming to solve the omitted variable problem that affects most of the previous literature. The strategy is to use quasi-random variation in how many marriageable first cousins a woman has.[3] For example, if more of a woman's first cousins are male, then all else equal, she has more potential cousin-husbands. Similarly, if the norm in a society is that husbands are older than wives, then male cousins older than a woman are especially viable cousin-husbands. The (testable) premise of the IV strategy is that the larger this pool of potential cousin-husbands, the more likely a woman is to marry a cousin.

One simple way to construct the instrumental variable is to use the number of male cousins somewhat older than the woman. To gauge the typical husband-wife age gaps in Oman, Figure 2 plots the histogram of the age difference between husbands and wives, separately for the Bid Bid and Nizwa subsamples of ever married women. (We use the age-gap distribution within cousin marriages, but obtain similar results using all marriages.) As can be seen, the age distributions are similar in both samples. Most women are younger than their husbands, and most of the mass is in the range of a zero to six year age gap. Thus, one can construct this variable $CousinsInAgeBand$ by counting the respondent's male cousins zero to six years older than her. Note that we include only cousins who survived until age 12, i.e., those who were likely to be in the respondent's pool of potential husbands when her

[3]This statistical approach is related to work in anthropology on potential mates analysis (PMA). PMA examines mate choices as among a pool of possible choices (Leslie, 1985). For example, an explanation given for the positive correlation between consanguinity and remoteness and negative correlation with village size is that a larger fraction of one's potential mates are blood relatives in small, remote areas (Roberts, 1975).

marriage was arranged.

While counting up cousins in a certain age range is conceptually simple, as seen in Figure 2 women marry men outside this age band, and they are not as likely to marry someone, say, one year older than them as they are to marry someone three years older than them. Thus, a more precise way to construct the instrument, and the one we use in practice, is to construct a weighted sum of male cousins, where the weights are based on how suitable the cousin is to marry based on his age. We construct the weights from the smoothed density of age differences between husbands and wives for the sample, as shown in Figure 3. Each male cousin is given his age-based weight, and these weights are summed across all of the woman's male cousins. We normalize the weights so that a cousin who is 3 years older than the respondent, which is the modal husband-wife age gap, has a weight of 1. Not surprisingly, this instrument, which we denote $MarriageableCousins$, is highly correlated with the version based on a fixed age range, but should (and does) have more predictive power about cousin marriage.

The first stage regression is then,

$$MarriedToCousin_i = \alpha + \delta \cdot MarriageableCousins_i + FamilyTraits_i \cdot \lambda + X_i \cdot \gamma + u_i \quad (2)$$

It is important to control for other demographic characteristics of the family in the first stage because not all of the variation in $MarriageableCousins$ is quasi-random. For example, if fertility is higher in a woman's extended family, then $MarriageableCousins$ will be higher; but total fertility might persist across generations and be correlated with child health. Therefore, we control for the respondent's number of siblings, her father's wealth, and her age, among other variables (the vector $FamilyTraits$).

We use the variation in cousin marriage induced by the instrument to estimate effects of cousin marriage, where the second stage is given by equation 1 above. The identifying assumption (exclusion restriction) is that conditional on $FamilyTraits$, $MarriageableCousins$ is correlated with the outcomes only through its effect on whether the mother married a first cousin. Because the instrument varies at the respondent level and not child level, standard errors will be clustered by respondent for the child-level outcomes.

Several points about how to interpret the IV estimates merit discussion. First, like IV estimates in general, our estimates represent a local average treatment effect, and to the extent there are heterogeneous effects, we will not estimate the average effect for our population. For example, those who select into cousin marriage despite having a limited supply of marriageable cousins might have especially large benefits of cousin marriage, so

the average beneficial effects might be higher than the local beneficial effects we estimate.

Second, while our IV approach aims to isolate the causal effect of cousin marriage, it does not isolate the causal biological effect. The *biological* effects of inbreeding are intrinsically wrapped up with *behavioral* effects of cousin marriage. For example, if marrying a cousin induces a couple to live closer to family, and living close to relatives is beneficial to child health, then this channel is part of the causal effect of cousin marriage on child health. This point receives little discussion in the genetics and medical literature, but is important in interpreting the effects of cousin marriage and in thinking about policy counterfactuals such as the implications of a ban on cousin marriage.

Third, our identification strategy estimates the effect of a woman (our respondent) marrying a cousin. If by marrying a cousin, she marries a different type of individual (e.g., taller, richer, less educated), some of the effects on her marital or child-health outcomes may be for this reason. In principle, one could empirically estimate the effect of cousin marriage versus the counterfactual of both individuals marrying non-relatives and measure population-level effects of this re-shuffling in the marriage market, but it would be very difficult to do in practice: One would need a large sample from a closed marriage market and then would need to instrument for both the men's and women's marriage choices. More importantly, if individuals prefer different traits in consanguineous spouses than non-consanguineous spouses, it will be fundamentally impossible to decompose the effect of marrying a cousin into the effect of being a blood relative per se and the effect of the spouse's characteristics. Again, though, the relevant counterfactual is the one we estimate, where when an individual shifts away from cousin marriage, more than just her genetic similarity to her spouse may change.

Finally, our identification strategy induces variation in a specific form of consanguinity, namely marriage between first cousins (which is the most common form). The counterfactual marriage outcomes of those induced by the instrument to marry a cousin are a mix of marriage to non-relatives, marriage to other relatives, and not being married. Thus, our main estimates are not comparing cousin marriage to marriage between non-relatives. We can use our estimates, though, to construct such a counterfactual. We can use the coefficient of inbreeding as a metric of genetic similarity and make the simplifying assumption that marriage to a first cousin implies $F = .0625$, marriage to a second cousin implies $F = .01563$, and so forth based on a standard genetic calculation. Then, the effect of a 0.0625 reduction in the coefficient of inbreeding is equivalent to a shift from cousin marriage to non-consanguineous marriage. In other words, our estimates are an "intent-to-treat" (ITT) estimate, and they can be expressed in a "treatment-on-the-treated" (TOT) form if one is interested in con-

sidering marriage to non-relatives as the benchmark. It is also important to note that a shift away from consanguinity in a society such as Oman will still likely be characterized by traditional arranged marriages and marriages within geographically small marriage markets where "non-relatives" share many common ancestors. It is, in essence, an out-of-sample prediction to consider the counterfactual where Omani marriages closely resemble the typical U.S. or European marriage.

6 Results

6.1 First stage

We begin by examining the non-parametric relationship between the instrument and the propensity to marry a cousin, shown in Figure 5. Having a larger supply of suitable cousins to marry indeed creates variation in whether the respondent actually marries a cousin. The number of (age-weighted) marriageable cousins has a fairly linear positive relationship with the probability of marrying a cousin. For values of $MarriageableCousins$ greater than 5, the average likelihood of cousin marriage tapers off and becomes very noisy. It is not too surprising that there are "diminishing returns" to the supply of marriageable cousins, since an individual marries only one cousin (nor is it surprising that the pattern is noisy at the tail of the distribution). Based on the non-parametric pattern, in the remainder of the analysis we topcode $MarriageableCousins$ at 5.[4]

Table 2, column 1 presents the basic first stage regression of $MarriedToCousin$ on $MarriageableCousins$, where the only control variables are dummy variables for village (and therefore wilayat) and five-year age categories. The instrument has strong predictive power, with the coefficient implying that having one more male cousin at the "sweet spot" for marriage of 3 years older increases the probability of marrying a cousin by .067 percentage points (or about 25% of the mean).

Controlling for family demographics is critical in order for the exclusion restriction to hold. For example, having more older male cousins might reflect being from a family with higher fertility, which would cause bias. In column 2, we add in controls for whether the respondent's father had any schooling, whether he had a large landholding, the respondent's

[4]The right-hand side panel shows the analogous relationship using the alternative instrument of $CousinsInAgeBand$, and we see a similar pattern. For each discrete value of the instrument, the average of $MarriedToCousin$ is plotted. The rate increases monotonically in the range of zero to four marriageable cousins and then becoming noisier at the tail of the distribution. We topcode $CousinsInAgeBand$ at 4 in the analysis.

number of brothers, and number of sisters, and the respondent's birth order. With these added controls, the coefficient on the instrument remains stable and in fact becomes slightly more precisely estimated. One noteworthy pattern is that the total number of sisters the respondent has is a negative predictor of cousin marriage. The likely reason for this pattern is that one's sisters are "competition" for the same marriageable male cousins and also that parents have a preference for some but not all of their daughters to marry a cousin.

In column 3 we add in a further control: We construct and include the female analog of *MarriageableCousins*, which will control for factors such as where the respondent falls in the age distribution of her cousins. While the results indicate that the number of female "marriageable" cousins is not a predictor of cousin marriage, the variable is highly correlated with the number of male marriageable cousins (correlation coefficient of 0.68); after all, this correlation is precisely why we include it as a control variable. As seen in column 3, the coefficient on the instrument is essentially unchanged with this added control—each marriageable cousin increases the likelihood of cousin marriage by 7.25 percentage points. The standard error on the instrument increases but the coefficient remains highly significant, with an F-statistic of 70. The first-stage specification in column 3 is the main one we use in the paper.[5]

As a check on the validity of our exclusion restriction, we estimate the "effect" of our instrumental variable on various predetermined characteristics, conditioning on our standard set of covariates (those in column 3). Reassuringly, we find in all cases that there is no relationship between the instrument and these background characteristics, suggesting that our specification indeed isolates the exogenous component of the supply of marriageable cousins. The results of this placebo test are reported in Appendix Table 2.

An important question is what counterfactual marriage outcomes are crowded out when having a larger supply of suitable cousin-husbands induces a woman to marry a cousin. To explore this, we estimated the specification in column (3) with the other possible marriage outcomes—married to a second cousin, married to another relative, married to a non-relative and never married—as the dependent variable. Figure 6 summarizes the results, breaking down the total effect of the instrument on cousin marriage into the different counterfactual outcomes. In 63.4% of cases, the counterfactual marriage is to a non-relative, in 36.2% of cases it is to a more distant relative than a first cousin, and the remaining 0.4% of the effect is due to the instrument increasing the likelihood of ever being married.

It is also useful to express the different forms of marriage according to their degree of

[5]Appendix Table 1 shows the first-stage results using the alternative instrument, *CousinsInAgeBand*.

inbreeding (e.g., cousin marriage has $F = 0.0625$), with the caveat that in highly endogamous societies such as Oman, the degree of inbreeding between both relatives and non-relatives is likely higher than the Mendelian benchmark. We can then run a first-stage equation where the coefficient of inbreeding is the dependent variable, necessarily restricting the sample to ever married women (column 4 of Table 2). The coefficient of inbreeding is divided by 0.0625 so that a one unit change is equivalent to a shift from marrying a non-relative to marrying a cousin. In unreported results, when we estimate the specification in column 3 on the ever-married subsample, the coefficient on the instrument is 0.081. The ratio of this coefficient and that in column 4 is 1.08; thus, one would scale up our second-stage effect sizes by 8% to obtain the effect of marrying a cousin compared to a non-relative (TOT estimate); our unscaled estimates give the effect of marrying a cousin versus the actually-observed counterfactual (ITT estimate).

Similarly, we can use "any consanguineous marriage" as the dependent variable in the first stage, without distinguishing between the degree of inbreeding in different forms of consanguinity. The coefficient on the instrument is 0.046 (t-statistic=4.70), implying that the likelihood of entering into a consanguineous marriage increases by 4.6 percentage points with each additional marriageable first cousin.

6.2 Effect of cousin marriage on child health and pregnancy outcomes

The first set of outcomes we examine are related to child health. As described above, the hypothesis is that inbreeding will have deleterious effects on child health, but because of potential non-biological benefits of cousin marriage, the net effect is theoretically ambiguous. The top panel of Table 3 shows the OLS (or probit for binary outcomes) relationship between four measures of child health, as well as mortality. Contrary to the previous literature we do not find patterns in the OLS/probit regressions once we condition on our standard covariates.

The bottom panel shows the IV relationship between the outcomes and $MarriedToCousin$. (Note that we report the reduced-form results in Appendix Tables 3 to 5.) Cousin marriage is associated with higher rates of diarrhea and respiratory problems among children, consistent with the link in the medical literature between consanguinity and immunological vulnerability. We do not find an effect on infant mortality, but given the low rate of infant mortality, we do not have statistical power to detect anything but a very large effect.

Table 4 examines fertility and pregnancy outcomes. In the OLS and probit results, the likelihood of miscarriage or stillbirth is higher in cousin marriages, significant at the 10%

level. In the IV estimation, we do not find a significant effect of cousin marriage on total fertility, either pregnancies or live births. The point estimates suggest that cousin marriages have the same number of pregnancies but fewer live births, consistent with more miscarriages or stillbirths, and the point estimate on miscarriages and stillbirths is also positive, but not statistically significant.

Thus, we find evidence that the progeny in cousin marriages experience health problems, namely diarrhea and respiratory problems, at a higher frequency, but there is no detectable effect on child mortality. We also find suggestive but not conclusive evidence of a higher rate of prenatal loss in cousin marriages.

6.3 Effect on timing of marriage

We now turn to testing several hypotheses about what benefits cousin marriage might provide. One potential benefit of cousin marriage, which to our knowledge has not be tested before, is it might facilitate later marriage. In our sample, the median age of marriage is 16, and 28% of the sample is married by age 14. Marriage at such early ages has been found to have negative consequences for girls, e.g., worse treatment in marriage (Ambrus and Field, 2008).

One main motivation for early marriage is that virginity is highly valued in the marriage market, and a girl's chastity is more credible when she is younger. Akin to other examples where asymmetric information is lower within networks, extended family members may be able to monitor and observe a girl's chastity better. Thus, the hypothesis is that better information about prospective spouses may lead to less early marriage in consanguineous marriages. As evidence of the better information about the future spouse, we find that cousin marriage is associated with the woman knowing her husband's family much better before marriage (Table 5, column 1).

Note that previous work on consanguinity has shown that consanguinity is associated with a lower age of marriage for girls (Bittles, 1994). However, if more traditional families favor both consanguinity and early marriage, the correlation does not reveal the true causal effect.

As shown in Table 5, we find that cousin marriage reduces the likelihood of a girl marrying by age 16. Note that in unreported results, we find essentially a zero coefficient on marrying by age 18, suggesting that the marriage is delayed by one or two years. Indeed, the IV point estimate for age at marriage suggests that marrying a cousin delays marriage by about .8 years, though the result is not significant.

An alternative interpretation might be that delayed marriage is a signature of certain women being less desirable in the marriage market; they turn to cousin marriage as a last resort, so their marriage takes place later. One way to test between this interpretation and one in which the delayed marriage is preferred is to examine the length of the engagement. Table 5 shows that the engagement length is longer in cousin marriages, by close to the same amount as the delay in marriage. In other words, cousin marriages are associated with the same age when the marriage is arranged, but there is a longer engagement period. It is only the actual marriage (and cohabitation with her husband and presumably consummation of the relationship) that occurs later, suggesting that rather than these women being "lemons" in the marriage market, postponing the marriage is a choice.

6.4 Effect on interaction with extended family and treatment of wives

Another potential benefit of cousin marriage is very straightforward: The wife might be able to interact more with her parents and siblings. Not only might this provide pure consumption value, it might be of assistance in child care (one channel through which cousin marriage could improve child health) and help ensure that the woman is treated well in her marriage. In a system of patrilocal exogamy, the girl's family typically doesn't see her often if she leaves the village or region. However, since extended families tend to live near each other, cousin marriage strengthens the already strong tendency in rural Oman to marry within the village or at least district. As shown in Table 6, cousin marriage increases the likelihood that a woman sees her parents on a daily basis, and in unreported results, she is also more likely to see her siblings daily. The non-IV probit result indicates that the respondent is more likely to live within 10 kilometers of her parents if she marries a cousin. We find a similar coefficient in the IV regression, but it is not statistically significant.

In addition, a woman may have closer ties to her in-laws because they are also her aunt and uncle. Indeed, we find that in cousin marriages, a woman sees her in-laws more often and lives closer to them. These stronger ties to the extended family could result in better treatment of women (Jacoby and Mansuri, 2010). We explore this in Table 7. We actually do not find improvements in autonomy (ability to make purchases without her husband's approval) or a reduction in arguments between the spouses. The probit results do suggest a higher rate of life satisfaction, and we find a consistent but imprecise coefficient in the IV regression.

Table 7 also reports the woman's views about consanguinity. In the OLS regressions,

not surprisingly, those who marry a cousin are more likely to believe it promotes marriage harmony and strengthens ties to family and less likely to cause health risks for offspring. Somewhat more surprisingly, these results are not just driven by selection into cousin marriage, but are born out in the IV regressions as well. One could imagine finding the opposite pattern that being in a cousin marriage makes the health risks more salient, but in fact, marrying a cousin lessens concerns about health risks and it increases the woman's perceptions about the benefits of cousin marriage.

In short, cousin marriage enables a woman to interact more with her parents and siblings, which presumably both she and they enjoy and benefit from. There is also more interaction with in-laws. While these do not translate into measurable improvements in treatment and marital harmony, marrying a cousin increases a woman's regard for cousin marriage as a way to build strong family ties and achieve marital success.

6.5 Effect on income and employment

One of the most oft-cited explanations for consanguinity, at least historically, is economic, namely that there are productive efficiencies from keeping wealth within a small circle and from working with family members. There is considerable work in economics examining the hypothesis that because moral hazard problems may be less severe with family labor, family labor is more productive (Benjamin, 1992). The notion that individuals would choose spouses in order to capture this productive gain is a logical extension of this reasoning. Table 8 explores this hypothesis. As seen in column (1), cousin marriage causes a woman to have a higher-earning husband. Part of this effect seems to be due to the husband working with his father-in-law, as seen in column (2). In the raw means, for women in cousin marriages, in 5.3% of cases, her husband has worked with her father-in-law, but this is true in only 0.6% of cases outside of cousin marriages. Thus, a potentially large benefit of cousin marriage, which to our knowledge has not been studied quantitatively before is via this income and employment channel.

A related hypothesis is that land can be consolidated in the family through consanguineous marriages. In our qualitative fieldwork, we did not find that the returns to scale in land use were perceived to be high, so perhaps not surprisingly, we do not see a difference in landholding in cousin marriages (Table 8, column 4).

6.6 Effect on marriage payments

Next we examine upfront marriage payments in cousin marriages versus other marriages. In Oman, the norm is bride-prices (*mahar*), or transfers from the groom's family to the bride's family before the marriage, usually in cash and sometimes in-kind. We find that the mahar is 42% lower in cousin marriages (Table 9, column 1). This finding is consistent with previous work suggesting that intrafamily marriages help overcome credit constraints, and more generally that kinship networks provide access to credit (La Ferrara, 2003; Kuhn et al., 2009; Do et al., 2009). Further evidence in support of this explanation is that ex post payments from the bride's family to the couple are less common in cousin marriage; in effect, the groom's family may be making more net payments to the couple ex post to supplement the smaller ex ante payment.

However, our point estimates cannot reject that both sets of parents reduce transfers in cousin marriage, so an alternative explanation is that the total price paid by the groom's family, encompassing both the mahar and later transfers, is in fact lower in cousin marriages.[6] While some of the benefits of cousin marriage such as higher income might accrue to both families, resulting in an ambiguous effect on the equilibrium price, some of the benefits arguably are larger for the bride's family, most notably the reduction in early marriage and the higher frequency of interaction between the bride and her natal family. Thus, we conjecture that the lower mahar found in our setting is a combination of the informal credit explanation but also a truly lower transfer to the bride's family in cousin marriages because of non-pecuniary benefits of cousin marriage enjoyed by the bride's family.[7]

6.7 Effect on beliefs and identity

Finally, we examine how consanguinity affects attitudes about gender and how it shapes political views. Both of these types of outcomes matter for the individual herself, but they also speak to potential society-wide externalities of cousin marriage. Table 10 shows the effect of cousin marriage on attitudes about equality between men and women. One of the hypotheses about cousin marriage is that by being traditional and somewhat insular, it might perpetuate traditional views. We ask four questions about whether men are better leaders, whether men are better at business, whether priority in schooling should be given

[6]Note that our findings run counter to other work suggesting that ex post transfers are efficient but often not enforceable, which would suggest they would be higher in cousin marriages (Anderson, 2003).

[7]Another explanation is that older brides are less valued, but a bride who is 0.8 years older, which is the age-of-marriage delay we estimate in cousin marriages, probably does not translate into a 40% reduction in the price.

to boys, and whether job priority should be given to men. In all cases, the point estimates suggest that cousin marriage leads women to believe less in equality for women, and for two of the four outcomes, the effect is significant at the 1% level. Thus, one potential negative consequence of cousin marriage is that it perpetuates traditional views about the superiority of men.

Table 11 examines how cousin marriage affects political attitudes. The hypothesis is that cousin marriage might foster allegiance to one's tribe and distrust of others. The insularity of cousin marriage also might cause less tolerance of foreigners and a weaker support for democracy. We find suggestive support for these hypotheses. Entering into a cousin marriage causes a woman to identify more with her tribe rather than with Oman, and while not significant, the point estimate also suggests it leads to less trust of non-family members. In addition, we find that the pattern of favoring "us" over "them" extends further afield, with cousin marriages causing people to be more likely to favor Omanis over foreigners for jobs. While statistically insignificant, the point estimate also suggests that cousin marriage might have the effect of weakening support for democracy. While these simple questions cannot gauge the magnitude of this potential societal cost of cousin marriage, they do suggest that this externality of consanguinity may be real and that how consanguinity affects political identity deserves further study.

7 Conclusion

To be written

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Figure 1: Map of Bid Bid and Nizwa, Oman

Figure 2: Distribution of husband-wife age gaps

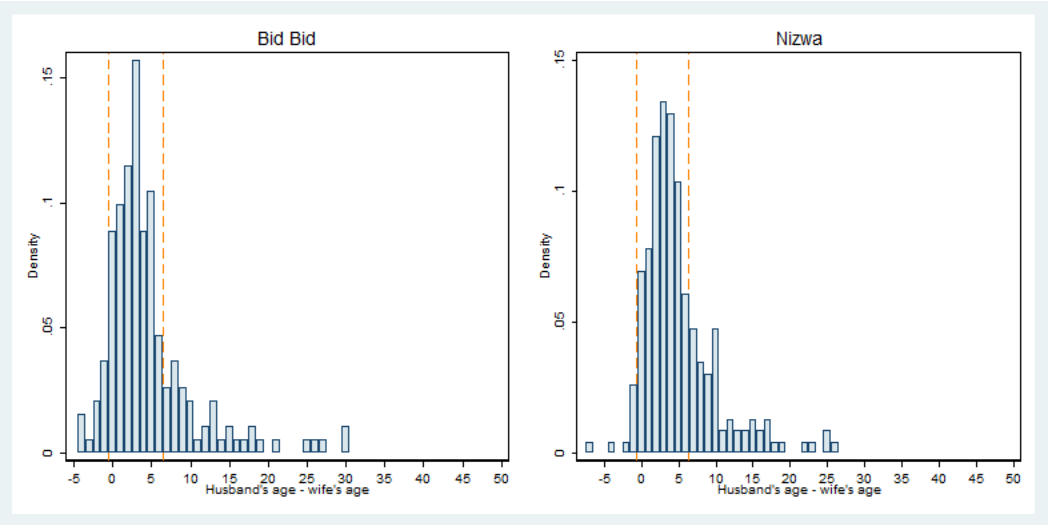
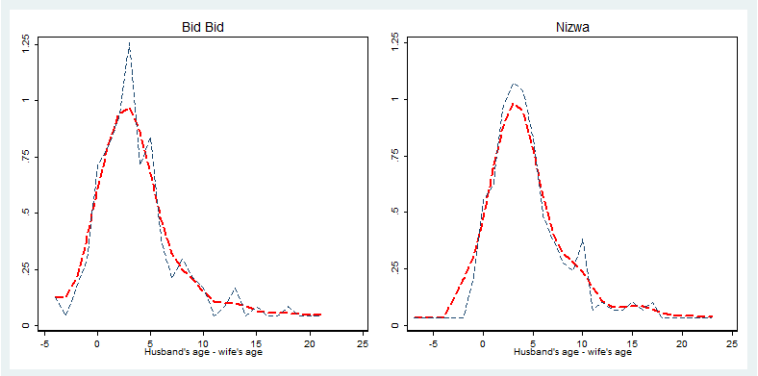


Figure 3: Smoothed distribution of husband-wife age gaps, used as measure of how "marriageable" a male cousin is



Note: The dashed line is the raw frequency of the husband-wife age gap, and the solid line is the smoothed frequency, which is used as the age-gap-specific weight applied to each male cousin as a measure of his marriageability.

Figure 4: Distribution of instrumental variable

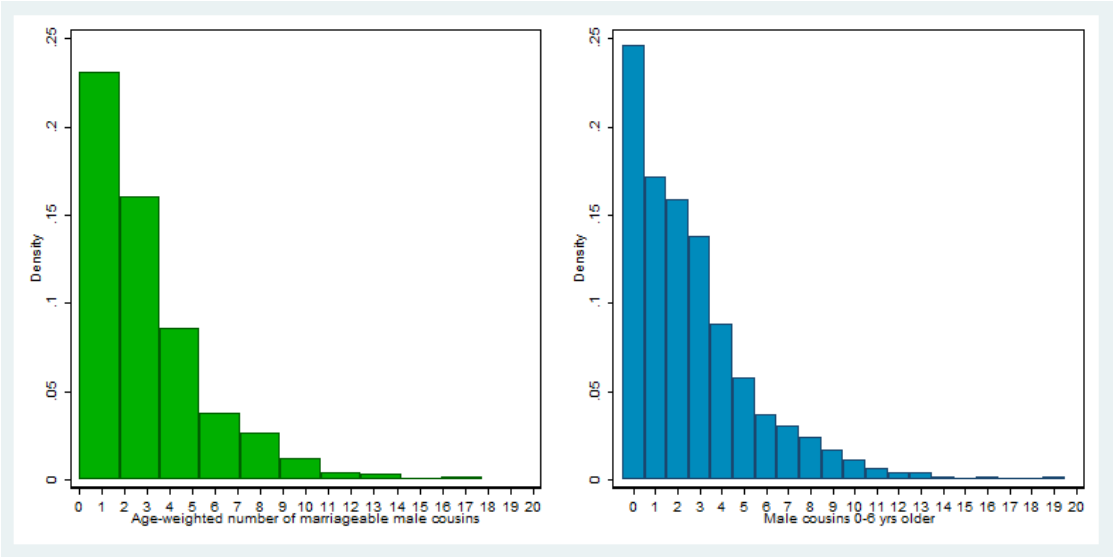
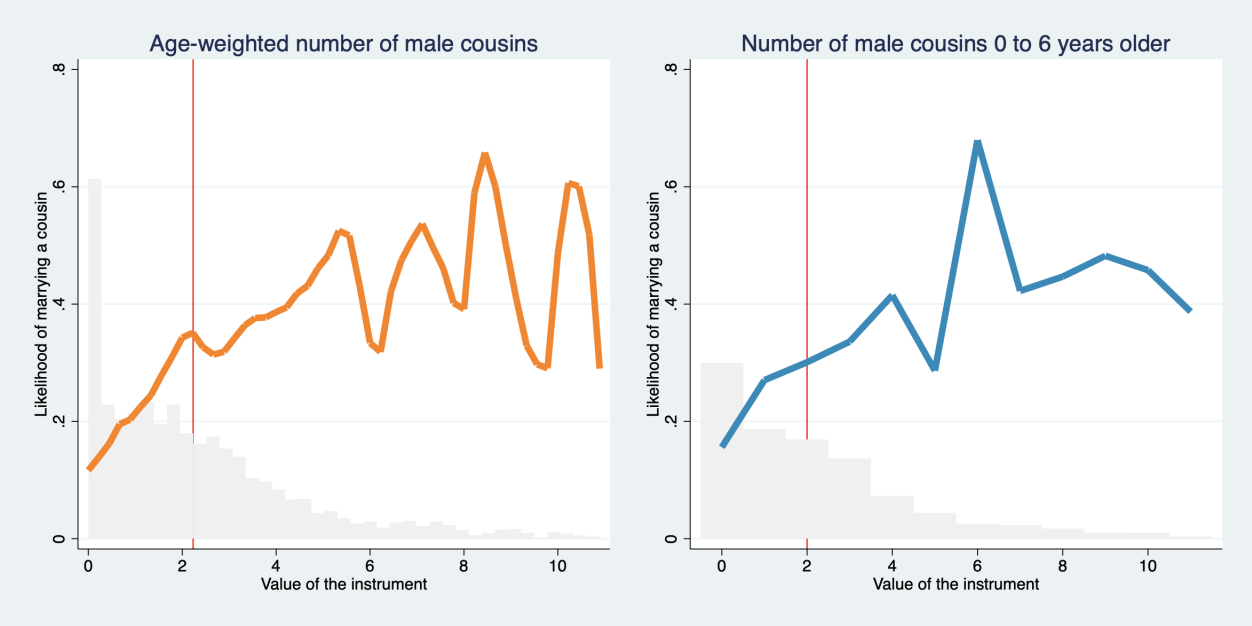


Figure 5: Non-parametric relationship between marriageable cousins and cousin marriage



Note: The vertical dashed line indicates the sample median of the instrumental variable.

Figure 6: Marriage outcomes that IV-induced cousin marriages displace

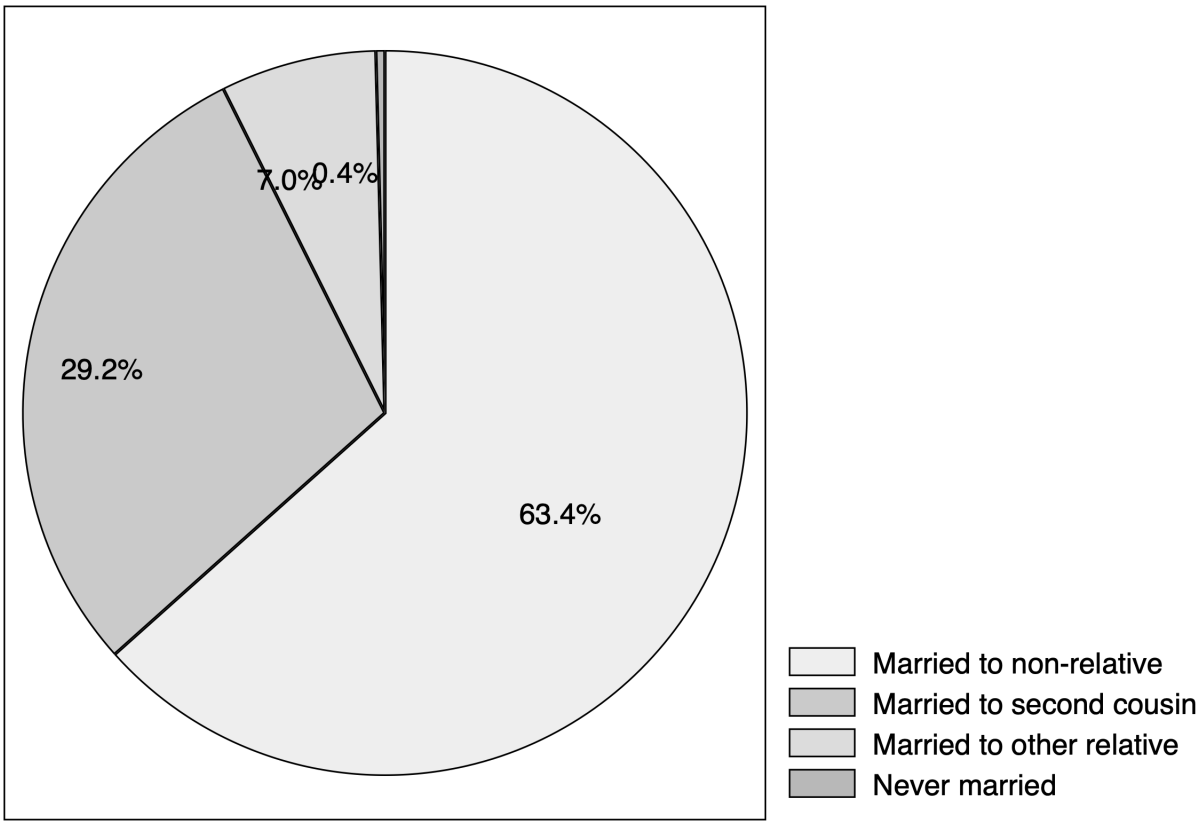


Table 1a: Summary statistics – explanatory variables

Variable	Mean	Std. Dev.	Min.	Max.	N
Age	33.58	6.88	25	50	1538
Ever married	0.89	0.32	0	1	1538
Married to cousin	0.27	0.44	0	1	1538
Married to second cousin	0.1	0.3	0	1	1538
Married to other relative	0.09	0.29	0	1	1538
Married to non-relative	0.42	0.49	0	1	1538
Father had any educ	0.21	0.41	0	1	1527
Father's land >5000 rials	0.37	0.48	0	1	1538
Brothers	4.16	2.29	0	14	1538
Sisters	4.06	2.41	0	14	1538
Total cousins	32.7	19.41	1	97	1538
Male cousins 0-6 yrs older	2.03	1.56	0	4	1538
Marriageable cousins	2.42	1.73	0	5	1538
Female cousins 0-6 yrs older	2.48	2.75	0	22	1538
Female marriageable cousins	2.65	2.64	0	18.7	1538

Table 1b: Child health outcomes

Variable	Mean	Std. Dev.	Min.	Max.	N
Had diarrhea age 0-2	0.36	0.48	0	1	4195
Blood disorder	0.12	0.32	0	1	4207
Overall health	3.31	0.70	1	4	4183
Child died	0.02	0.14	0	1	8041

Table 1c: Summary statistics – respondent-level outcomes

Variable	Mean	Std. Dev.	Min.	Max.	N
Live births	5.47	3.2	1	15	1278
Age at first birth	18.52	4.32	10	35	1276
Pregnancies	5.65	3.74	0	19	1383
Any miscarriage/stillbirth	0.4	0.49	0	1	1282
Miscarriage/stillbirths as % of pregnancies	0.11	0.26	0	6	1282
>10km from parents	0.23	0.42	0	1	1267
>10km from in-laws	0.28	0.45	0	1	1063
See parents daily	0.5	0.5	0	1	707
See in-laws daily	0.26	0.44	0	1	710
Age at marriage	17.52	4.54	9	35	1360
Married by 16	0.44	0.5	0	1	1538
Engagement (yrs)	0.56	1.29	0	15	794
Knew husb's family	2.24	1.7	0	4	679
Mahar (log)	7.62	1.04	3	9.21	1284
Money from parents	0.42	0.49	0	1	586
Money from in-laws	0.13	0.33	0	1	518
Marriage harmony	1.63	0.69	0	3	791
Strong family ties	1.61	0.72	0	3	792
Health risks	2.21	0.71	0	3	792
Can make purchases	0.85	0.35	0	1	668
How often argue	1.59	0.71	1	4	717
V. satisfied w/ life	0.9	0.3	0	1	789
Men are better leaders	0.87	0.34	0	1	791
Men better at business	0.63	0.48	0	1	792
Priority in educ to males	0.26	0.44	0	1	791
Job priority to men	0.89	0.31	0	1	1495
Identify more with tribe	0.09	0.29	0	1	771
Trust non-family	0.18	0.39	0	1	1477
Strong belief in democracy	0.84	0.37	0	1	791
Job priority to Omanis	2.64	0.54	0	3	790

Table 2: First stage using *MarriageableCousins*

	(1) Married to cousin	(2) Married to cousin	(3) Married to cousin	(4) Coeff of inbreeding
Marriageable cousins	0.0666***	0.0690***	0.0725***	0.0744***
	[10.06]	[10.32]	[8.38]	[8.21]
Father had any educ		-0.0337	-0.0334	-0.0273
		[-1.19]	[-1.18]	[-0.88]
Father's land >5000 rials		-0.0234	-0.0229	-0.0269
		[-0.88]	[-0.85]	[-0.96]
Brothers		0.000147	0.000290	0.000754
		[0.03]	[0.06]	[0.14]
Sisters		-0.0145***	-0.0145***	-0.0137***
		[-2.96]	[-2.95]	[-2.66]
Birth order		-0.00999*	-0.00979*	-0.0113**
		[-1.85]	[-1.82]	[-1.99]
Female marriageable cousins			-0.00401	-0.00442
			[-0.66]	[-0.67]
R-squared	0.067	0.076	0.075	0.074
N	1538	1527	1527	1363

Notes: Coefficient of inbreeding is divided by 0.0625 so that a one unit change is equivalent to the difference between marriage to a first cousin and to a non-relative. Marriage between first cousins is assigned $F = 0.0625$, marriage between second cousins is assigned $F = 0.01563$, marriage to another non-relative is assumed to average $F = 0.01$, and marriage to a non-relative is assumed to be the $F = 0$.
Robust t-statistics in brackets. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Table 3: Effect of cousin marriage on child health

Panel A: OLS

	(1) Had diarrhea age 0-2	(2) Blood disorder	(3) Overall health	(4) Child died
Married to cousin	0.0326	-0.0172	0.00227	0.000840
	[0.0223]	[0.0148]	[0.0396]	[0.00471]
Model	Linear	Linear	Linear	Linear
Observations	4165	4177	4153	7993

Panel B: IV

	(1) Had diarrhea age 0-2	(2) Blood disorder	(3) Overall health	(4) Child died
Married to cousin	0.151*	-0.0458	0.126	0.00792
	[0.0846]	[0.0639]	[0.153]	[0.0192]
Model	Linear IV	Linear IV	Linear IV	Linear IV
Observations	4165	4177	4153	7993

Notes: Sample includes children who are (or would have been) age 15 and younger. All regressions include as controls those in the specification in column (3) of Table 2, as well as the total family size and dummy variables for the child's sex. Columns (1) to (3) also include dummies for the child's age and birth order. *Respiratory problems* is only available for the Nizwa subsample. Since the year of birth is unavailable if a child died (an oversight in the survey), column (4) includes all children, not just those under age 15, and does not controls for age or birth order. Standard errors clustered by respondent (mother). $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Table 4: Effect of cousin marriage on childbearing outcomes

Panel A: OLS

	(1) Pregnancies	(2) Live births	(3) Age at first birth	(4) Any miscarriage/stillbirth
Married to cousin	0.0365	-0.210	0.00353	0.0479
	[0.170]	[0.143]	[0.234]	[0.0297]
Model	Linear	Linear	Linear	Linear
Observations	1374	1269	1267	1273

Panel B: IV

	(1) Pregnancies	(2) Live births	(3) Age at first birth	(4) Any miscarriage/stillbirth
Married to cousin	-0.0643	-0.653	1.394	0.0554
	[0.772]	[0.646]	[1.062]	[0.127]
Model	Linear IV	Linear IV	Linear IV	Linear IV
Observations	1374	1269	1267	1273

Notes: All regressions include as controls those in the specification in column (3) of Table 2. Robust standard errors. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Table 5: Effect of cousin marriage on timing of marriage

Panel A: OLS

	(1) Age at marriage	(2) Married by 16	(3) Engagement (yrs)	(4) Mahar (log)	(5) Money from parents	(6) Money from in-laws
Married to cousin	-0.115	-0.00522	0.403***	-0.209***	-0.0535	-0.0579*
	[0.218]	[0.0245]	[0.130]	[0.0478]	[0.0449]	[0.0304]
Control mean	17.5	.43	.45	7.67	.45	.15
Observations	1351	1527	786	1277	583	515

Panel B: IV

	(1) Age at marriage	(2) Married by 16	(3) Engagement (yrs)	(4) Mahar (log)	(5) Money from parents	(6) Money from in-laws
Married to cousin	0.739	-0.219**	0.974*	-0.418**	-0.463***	-0.135
	[0.949]	[0.108]	[0.514]	[0.203]	[0.160]	[0.111]
Control mean	17.5	.43	.45	7.67	.45	.15
Observations	1351	1527	786	1277	583	515

Notes: All regressions include as controls those in the specification in column (3) of Table 2. *Engagement length* and *Knew husband's family* are only only available for the Nizwa subsample. Robust standard errors. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Table 6: Effect of cousin marriage on proximity to and interaction with family

Panel A: OLS

	(1) >10km from parents	(2) >10km from in-laws	(3) See parents daily	(4) See in-laws daily
Married to cousin	-0.100***	-0.104***	0.0792**	0.110***
	[0.0233]	[0.0282]	[0.0396]	[0.0374]
Model	Linear	Linear	Linear	Linear
Observations	1258	1055	701	704

Panel B: IV

	(1) >10km from parents	(2) >10km from in-laws	(3) See parents daily	(4) See in-laws daily
Married to cousin	-0.142	-0.277**	0.506**	0.434**
	[0.108]	[0.131]	[0.237]	[0.216]
Model	Linear IV	Linear IV	Linear IV	Linear IV
Observations	1258	1055	701	704

Notes: All regressions include as controls those in the specification in column (3) of Table 2. *See parents daily* and *See in − laws daily* are only only available for the Nizwa subsample. Robust standard errors. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Table 7: Effect of cousin marriage on how woman is treated

Panel A: OLS

	(1) Can make purchases	(2) How often argue	(3) V. satisfied w/ life
Married to cousin	-0.0162	-0.0199	0.0431*
	[0.0298]	[0.0564]	[0.0227]
Model	Linear	Linear	Linear
Observations	664	711	782

Panel B: IV

	(1) Can make purchases	(2) How often argue	(3) V. satisfied w/ life
Married to cousin	0.0419	-0.0981	0.126
	[0.182]	[0.314]	[0.142]
Model	Linear IV	Linear IV	Linear IV
Observations	664	711	782

Notes: All regressions include as controls those in the specification in column (3) of Table 2. All outcomes are only only available for the Nizwa subsample. Robust standard errors. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Table 8: Effect of cousin marriage on employment and income

Panel A: OLS

	(1) Husband's income (log)	(2) Husb. works w/ your father	(3) Husband employed	(4) Value of land owned
Married to cousin	0.110***	0.0426***	0.0342**	-0.0861
	[0.0422]	[0.0154]	[0.0163]	[0.0979]
Model	Linear	Linear	Linear	Linear
Observations	1023	707	1247	1294

Panel B: IV

	(1) Husband's income (log)	(2) Husb. works w/ your father	(3) Husband employed	(4) Value of land owned
Married to cousin	0.366**	0.104	-0.0125	0.315
	[0.164]	[0.0728]	[0.0756]	[0.410]
Model	Linear IV	Linear IV	Linear IV	Linear IV
Observations	1023	707	1247	1294

Notes: All regressions include as controls those in the specification in column (3) of Table 2. *Husband works with respondent's father* is only only available for the Nizwa subsample. Robust standard errors. $^{*}p < 0.10,^{**} p < 0.05,^{***} p < 0.01$

Table 9: Effect of cousin marriage on age of bride-price and intrafamily transfers

Panel A: OLS

	(1) Mahar (log)	(2) Money from parents	(3) Money from in-laws
Married to cousin	-0.209***	-0.0535	-0.0579*
	[0.0478]	[0.0449]	[0.0304]
Model	Linear	Linear	Linear
Observations	1277	583	515

Panel B: IV

	(1) Mahar (log)	(2) Money from parents	(3) Money from in-laws
Married to cousin	-0.418**	-0.463***	-0.135
	[0.203]	[0.160]	[0.111]
Model	Linear IV	Linear IV	Linear IV
Observations	1277	583	515

Notes: All regressions include as controls those in the specification in column (3) of Table 2. Data on transfers to and from parents and in-laws are only only available for the Bid Bid subsample. Robust standard errors. $^{*}p < 0.10,^{**} p < 0.05,^{***} p < 0.01$

Table 10: Effect of cousin marriage on gender views

Panel A: OLS

	(1) Men are better leaders	(2) Men better at business	(3) Priority in educ to males	(4) Job priority to men
Married to cousin	-0.0302 [0.0280]	-0.0504 [0.0386]	0.0302 [0.0354]	-0.00727 [0.0180]
Model	Linear	Linear	Linear	Linear
Observations	783	784	783	1484

Panel B: IV

	(1) Men are better leaders	(2) Men better at business	(3) Priority in educ to males	(4) Job priority to men
Married to cousin	0.219 [0.173]	0.626** [0.274]	0.448* [0.234]	0.0797 [0.0812]
Model	Linear IV	Linear IV	Linear IV	Linear IV
Observations	783	784	783	1484

Notes: All regressions include as controls those in the specification in column (3) of Table 2. *Men are better at business*, *Men are better leaders* and *Priority in education for males* are only only available for the Nizwa subsample. Robust standard errors. $^{*}p < 0.10,^{**} p < 0.05,^{***} p < 0.01$

Table 11: Effect of cousin marriage on identity and political views

Panel A: OLS

	(1) Identify more with tribe	(2) Trust non-family	(3) Job priority to Omanis	(4) Strong belief in democracy
Married to cousin	-0.0145	-0.0284	-0.0109	-0.0293
	[0.0221]	[0.0227]	[0.0359]	[0.0286]
Model	Linear	Linear	Linear	Linear
Observations	763	1466	782	783

Panel B: IV

	(1) Identify more with tribe	(2) Trust non-family	(3) Job priority to Omanis	(4) Strong belief in democracy
Married to cousin	0.256	-0.142	0.503**	-0.0733
	[0.174]	[0.107]	[0.241]	[0.169]
Model	Linear IV	Linear IV	Linear IV	Linear IV
Observations	763	1466	782	783

Notes: All regressions include as controls those in the specification in column (3) of Table 2. *Identify with tribe more than nation* and *Job priority to Omanis* are only only available for the Nizwa subsample. Robust standard errors. $^{*}p < 0.10,^{**} p < 0.05,^{***} p < 0.01$

Appendix Table 1: First stage using *CousinsInAgeBand*

	(1) Married to cousin	(2) Married to cousin	(3) Married to cousin	(4) Coeff of inbreeding
Male cousins 0-6 yrs older	0.0646*** [8.77]	0.0674*** [9.08]	0.0665*** [7.68]	0.0678*** [7.49]
Father had any educ		-0.0351 [-1.23]	-0.0351 [-1.23]	-0.0268 [-0.86]
Father's land >5000 rials		-0.0224 [-0.84]	-0.0225 [-0.84]	-0.0276 [-0.98]
Brothers		-0.000652 [-0.13]	-0.000673 [-0.13]	-0.000264 [-0.05]
Sisters		-0.0148*** [-3.01]	-0.0148*** [-3.01]	-0.0143*** [-2.76]
Birth order		-0.00920* [-1.70]	-0.00925* [-1.71]	-0.0109* [-1.90]
Female cousins 0-6 yrs older			0.00116 [0.22]	0.0000697 [0.01]
R-squared N	0.055 1538	0.063 1527	0.062 1527	0.059 1363

Notes: Coefficient of inbreeding is divided by 0.0625 so that a one unit change is equivalent to the difference between marriage to a first cousin and to a non-relative. Marriage between first cousins is assigned $F = 0.0625$, marriage between second cousins is assigned $F = 0.01563$, marriage to another non-relative is assumed to average $F = 0.01$, and marriage to a non-relative is assumed to be the $F = 0$. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Appendix Table 2: Placebo test – "Effect" of instrument on family background variables

	(1) Any educ	(2) Age of menarche	(3) Father had any educ	(4) Father's land >5000 rials
Marriageable cousins	0.00747 [0.00624]	0.00931 [0.0258]	0.00477 [0.00755]	0.00808 [0.00806]
Model	Linear	Linear	Linear	Linear
Observations	1522	1506	1527	1538

Notes: Columns (1) and (2) include as controls those in the specification in column (3) of Table 2. Columns (3) and (4) omit *Father's land* $>$ 5000 *Rials* and *Father has any education* (and instead uses them as the dependent variable). Robust standard errors. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Appendix Table 3: Reduced-form results

	(1) Had diarrhea age 0-2	(2) Blood disorder	(3) Overall health	(4) Child died
Marriageable cousins	0.0134*	-0.00402	0.0111	0.000668
	[0.00748]	[0.00566]	[0.0136]	[0.00162]
Model	Linear	Linear	Linear	Linear
Observations	4165	4177	4153	7993

	(1) Pregnancies	(2) Live births	(3) Age at first birth	(4) Any miscarriage/stillbirth
Marriageable cousins	-0.00514	-0.0534	0.116	0.00457
	[0.0621]	[0.0532]	[0.0875]	[0.0105]
Model	Linear	Linear	Linear	Linear
Observations	1374	1269	1267	1273

	(1) Age at marriage	(2) Married by 16	(3) Engagement (yrs)	(4) Mahar (log)	(5) Money from parents	(6) Money from in-laws
Marriageable cousins	0.0596	-0.0159**	0.0545*	-0.0333**	-0.0461***	-0.0134
	[0.0763]	[0.00758]	[0.0286]	[0.0165]	[0.0157]	[0.0111]
Control mean	17.5	.43	.45	7.67	.45	.15
Observations	1351	1527	786	1277	583	515

Appendix Table 4: Reduced-form results

	(1) >10km from parents	(2) >10km from in-laws	(3) See parents daily	(4) See in-laws daily
Marriageable cousins	-0.0111	-0.0222**	0.0310**	0.0263**
	[0.00864]	[0.0105]	[0.0140]	[0.0124]
Model	Linear	Linear	Linear	Linear
Observations	1258	1055	701	704

	(1) Can make purchases	(2) How often argue	(3) V. satisfied w/ life
Marriageable cousins	0.00248	-0.00595	0.00704
	[0.0109]	[0.0193]	[0.00806]
Model	Linear	Linear	Linear
Observations	664	711	782

	(1) Husband's income (log)	(2) Husb. works w/ your father	(3) Husband employed	(4) Value of land owned
Marriageable cousins	0.0317**	0.00651	-0.00105	0.0257
	[0.0139]	[0.00449]	[0.00643]	[0.0336]
Model	Linear	Linear	Linear	Linear
Observations	1023	707	1247	1294

Appendix Table 5: Reduced-form results

	(1) Mahar (log)	(2) Money from parents	(3) Money from in-laws
Marriageable cousins	-0.0333**	-0.0461***	-0.0134
	[0.0165]	[0.0157]	[0.0111]
Model	Linear	Linear	Linear
Observations	1277	583	515

	(1) Men are better leaders	(2) Men better at business	(3) Priority in educ to males	(4) Job priority to men
Marriageable cousins	0.0122	0.0350***	0.0250**	0.00580
	[0.00951]	[0.0129]	[0.0121]	[0.00591]
Model	Linear	Linear	Linear	Linear
Observations	783	784	783	1484

	(1) Identify more with tribe	(2) Trust non-family	(3) Job priority to Omanis	(4) Strong belief in democracy
Marriageable cousins	0.0133	-0.0104	0.0280**	-0.00409
	[0.00869]	[0.00785]	[0.0122]	[0.00956]
Model	Linear	Linear	Linear	Linear
Observations	763	1466	782	783