For Better or Worse? Fertility Challenges and Marital Dissolution

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Abstract

In the economic approach to marriage and divorce, unanticipated shocks during a marriage can have a destabilizing effect on the union. The bearing and raising of children is a key source of well-being for the vast majority of marriages around the world. We argue that fertility challenges are one such shock that change a couple's expected gains from marriage and result in higher odds of divorce. Using Demographic and Health Survey data from close to a million women across 63 developing countries, we investigate how a permanent change in potential family size brought on by infertility impacts the risk of marital dissolution. We find that infertility increases the likelihood that the respondent reports her current marital status as dissolved by 50 percent. The increase in marital dissolution is especially sizable for couples who were childless due to infertility as compared to couples for whom infertility strikes after having at least one living child. We supplement this analysis by looking at two additional fertility challenges: the death of the first-born child and a first-born daughter. We find that the death of a child destabilizes the marital union, however the effect size is much smaller than the effect of infertility. Since our setting is one of developing countries, we can investigate if the impacts of a given fertility challenge is lessened in nations where polygamy is prevalent. The presence of another wife should provide partial insurance against an unexpected bad fertility outcome. We find that both infertility and the death of the first-born child are less destabilizing in nations where polygamous unions are common. This study contributes to the nascent literature on marital dissolution in the developing world and the role of polygamy in marital dissolution.

Keywords: Divorce, Fertility, Marital Dissolution, Children, Infertility, Polygamy

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1 Introduction

Marriage is a nearly ubiquitous socio-economic phenomenon, especially in the developing world. A key motive for marriage is the desire to have and raise children. Previous research finds that the presence of children increases marital well-being of both the husband and the wife (Conzo et al., 2017; Kohler et al., 2005; Margolis and Myrskylä, 2011). Parents have strong preferences over their desired number of offspring and to a lesser extent their sex composition.[1] If the couples' preferences for children are not met, it can lead to distress and diminish the utility within the marriage and may ultimately result in the marriage ending.

Becker et al. (1977) present the canonical economic model of divorce. The key to understanding Becker's theory of marriage and divorce is the recognition that when two people marry they are each made better off by the arrangement (otherwise they could have remained single). In other words, marriage creates a surplus.[2] Thus, when a divorce occurs something internal or external to the marriage must have changed which reduced the expected value of the marriage surplus relative to the expected utility stream obtained upon divorce. Furthermore, in order for marital stability to be impacted this change must have been unanticipated by the couple, as anticipated changes should be factored into the initial decision to marry. These unanticipated events (be they discovering incompatible values, health shocks, improvements/reductions in earning potential or changes in divorce laws, social norms or other policy parameters) serve to reduce the net present value of the marriage relative to what the couple could obtain on their own or remarried. In this approach to marriage, such shocks have a destabilizing effect on the union.

This is a challenging theory to test because it requires the econometrician to identify an unanticipated event in the course of the union that changes the costs of remaining in the marriage. We argue that fertility challenges are one such event and posit that they should destabilize marriages. Furthermore, the larger the fertility challenge the more detrimental it should be for the union. In this paper, we study the effect of fertility challenges on marital stability using a large representative sample of women across 63 developing countries.

Our primary analysis investigates the relationship between infertility and marital dissolution. We argue that the inability to conceive additional children serves as an unanticipated biological event that greatly reduces the benefits from marriage and may result in its failure. Using the Demographic and Health Surveys for close to a million marriages, we estimate the effect of infertility on divorce and separation. Our results suggests that couples where the wife reports that she is unable to have additional children experience a sizable increase in the likelihood of marital dissolution. Specifically, infertility

[1] For the women in our data, over 98% state that they want at least one child and 55% desire more than three children. Additionally, 82% of those who want at least one child desire at least one son.

[2] The marital surplus is derived from any of the following sources: companionship, division of labor to exploit comparative advantage, extended access to credit, sharing of collective goods (including children), risk pooling, and government policies and social norms that favor married couples (Weiss, 1997).

increases the likelihood that the respondent reports her current marital status as dissolved by 50%.

We should point out from the outset that we do not claim that our measure of infertility is completely exogenous. In order to address the potential of nonrandom selection into infertility, we begin by controlling for a large and rich set of controls related to the woman's background, the match quality of the union, and the health of the woman. Our findings are unchanged by the inclusion of these controls. Additional heterogeneity and robustness analyses further reinforce a causal interpretation of the main result. In particular, we find that the effect of infertility on marital dissolution is much stronger for couples who are childless (full infertility) as compared to those who have at least one child (subfecundity) prior to the onset of infertility. We also find that the effect of subfecundity on marital dissolution is stronger for younger women as compared to older women. This supports our hypothesis as younger women have longer reproductive horizons left and therefore subfecundity should lead to greater deviation from desired family size. Although each piece of the analysis does not grant a causal interpretation of the effect of infertility on marital dissolution by itself; taken together, the weight of the evidence supports the hypothesis that deviations from the desired fertility size have a negative effect on marital stability.

As further validation, we examine the relationship between marital dissolution and two additional fertility challenges that have been studied earlier but in more limited settings: death of the first-born child and gender of the first-born child. The death of a child can cause significant emotional stress and may lead to a deviation from the desired family size. Death of the first-born child has been shown to influence marital disruptions in developed countries (e.g.: Rogers et al. (2008); van den Berg et al. (2017); Finnäs et al. (2018)). Another feature of fertility preference which has been documented in the literature for both developing and developed countries is that some parents, especially fathers, prefer sons over daughters (Mason and Taj, 1987). As such, the birth of a daughter may cause a deviation from the desired family composition. In some, but not all, studies it has been shown to destabilize marriage (e.g.: Dahl and Moretti (2008); Blau et al. (2017)). We test the robustness of the findings of the earlier single nation studies for these relatively weaker fertility challenges in a large sample of developing countries. Results indicate that the death of the first child is associated with a small increase in the likelihood of divorce. We do not find any effect of the gender of the first-born on marital dissolution.

This paper makes the following contributions to the literature. First, we focus on the impact of fertility challenges on marital stability. Though there exists research testing the effect of unanticipated events on marital stability, much of the empirical literature uses pecuniary shocks and is restricted to the developed world. Most recent studies use explicit measures of earning shocks. By and large their results suggest that shocks conveying information about the individual characteristics, such as getting laid off, are more likely to affect divorce rates than one-time external changes.[3] Studies on the impact

[3] Charles and Stephens (2004) study the effect of job loss and disability on divorce rates. They find that job loss increases the divorce hazard, but disability does not. Additionally, the increase in divorce rates is only found for layoffs and not for plant closings. Nunley and Seals (2010) find that negative and temporary household income shocks increase the probability of divorce while permanent income changes do not affect divorce rates. Singleton (2012) finds that work-

of unanticipated event on marital dissolution which focus solely on developing countries are far fewer in number and are limited to a single nation. Using the variation in conditional cash transfers received through Progresa in Mexico, Bobonis (2011) finds an increase in the marital turnover among women who received unexpected transfers. Unlike deviations in earnings, shocks to fertility are likely to be more permanent in nature and may have potentially larger consequences for marriage.[4] While others have used the death of the first-born and first-born daughter, we are the first to study if infertility leads to marital dissolution. The inclusion of infertility to the literature on the role of unanticipated events on marital stability is important because infertility is the largest and most permanent fertility challenge among those studied and should correspondingly have the largest effects on marital dissolution.

Second, the paper contributes to the nascent literature on the determinants of divorce in developing countries. Divorce has important socio-economic implications on the welfare of the family but remains an understudied topic in the developing world. Previous literature finds that parental divorce has negative effects on children's schooling, poverty, and employment (Chae, 2016; Amato and Cheadle, 2005; Amato and Keith, 1991) and is detrimental for the welfare of women (Lorenz et al., 2006; Holden and Smock, 1991). Furthermore, divorce is surprisingly prevalent in developing countries. Summarizing the crude divorce rates in developing countries, Anukriti and Dasgupta (2017) note that the crude divorce rate ranges from 2.4 in Ethiopia to 6.9 in Botswana. For comparison, the United States had a crude divorce rate of 3.5 in 2006, while it was 2.4 for United Kingdom. Even though many countries in the developing world have divorce rates comparable to the developed world, there does not exist a comprehensive understanding of the drivers of divorce in the developing country context. This study contributes in that direction.

Finally, beyond studying the above fertility challenges and their consequences for marital stability, we explore the role of polygamy as a buffer against the negative consequences of fertility challenges. We are able to accomplish this because we have a large and heterogeneous sample of developing countries with wide-ranging marital norms. As mentioned earlier, the impact of a given fertility challenge on the union depends, in part, on the magnitude of the event (i.e. how a large of deviation from desired family size and composition). In non-polygamous societies if additional biological children are desired, the only option is to separate from the current union and enter in a new union. In polygamous relationships other wives can help reduce the impact of the negative fertility event. As such, we expect a given fertility challenge to be less costly in societies that practice polygamy. In line with this prediction, we find that polygamy plays a protective role for marital stability in the event of a negative fertility challenge. Specifically, we find that an infertile woman in a country with no polygamy is more than twice as likely to experience marital dissolution, than her counterpart in a country where half of the unions are polygamous in nature.

preventing (and not work-limiting) disability of males is associated with lower earnings and higher probability of divorce. Hankins and Hoekstra (2011) exploit the random variation in the amount of cash prize in the Florida lottery and find that large cash transfers do not have an impact on divorce. Using the British Household Panel Survey, Doiron and Mendolia (2012) find couples where husband faces job loss are more likely to divorce.

[4] Zhang (2017) finds that exposure to the one-child policy, which limited the fertility of couples in China, was found to have a positive relationship with divorce rates.

Additionally, the negative effect of the death of the first-born child is also greatly reduced by the presence of polygamy. To the best of our knowledge, this is the first paper that investigates this mechanism and contributes to the strand of literature that examines the consequences of polygamy, which is extremely limited in its current scope (Anukriti and Dasgupta, 2017).

The article proceeds as follows. Section 2 describes the data and sample construction, including the measurement of infertility and marital status. Section 3 discusses the empirical strategy and Section 4 shows our main findings, robustness checks, and sub-sample analysis. Section 5 presents our polygamy results and section 6 concludes.

2 Data and Sample

We use individual-level data from the Demographic and Health Surveys (DHS) which are nationally-representative household surveys providing information on a wide-range of topics related to health, marriage, fertility, and other demographic information for a sample of women across a large number of developing countries. Our analysis uses the third through seventh phases of the DHS which span the years 1992-2015.[5] The survey is usually conducted every five years in a country, so a given country will appear multiple times in our sample. Although individual countries can opt out of certain modules of the survey, the questionnaires are generally comparable across countries and over time allowing us to conduct a comprehensive analysis for countries with a range of marital norms.

The DHS offers several features which are crucial to this study. A key advantage of the DHS is that it provides information on reproductive behavior of women allowing us to create a consistent measure of infertility for a large sample of women across an array of developing countries. Additionally, the DHS surveys contain information on current marital status which allows us to construct a common measure of marital dissolution. Moreover, there is a rich set of information on the predictors of marital stability such as age at first marriage and spouse-related attributes such as education level of the current partner, which are important controls for our analysis.

We use all possible DHS in the analysis but the surveys need to meet the following sample restrictions. First, we excluded surveys (country-years) where only married women were interviewed. Second, we excluded surveys where infertility status was not asked to all respondents.[6] Furthermore, two surveys that had missing information on key control variables (age at first marriage and women's education) were also excluded from the analysis. The final analysis sample consists of 151 DHS surveys from 63 countries conducted between 1993 and 2015, and covers all regions of the developing world.

[5] We cannot include the initial two phases of the DHS because divorced women were not interviewed about their desire for future children which is the variable we use to measure infertility.

[6] Specifically, we exclude surveys where one of the following is true: information on infertility was not collected for anyone in the survey, divorced women were not interviewed about their infertility status, or information on infertility was only collected for women with children.

To construct our analysis sample, we exclude women who did not answer the infertility question. Additionally, women who were sterilized were also omitted from the analysis. We restrict the estimation sample to women aged 15-44 years.[7] We exclude the oldest women because the DHS does not identify the timing of the onset of infertility and it is possible that older women may be conflating infertility with menopause. The later would not be an unanticipated event and should have no impact on marital stability. Details on the countries, year of survey and number of observations in our estimation sample can be found in appendix table A.1.

2.1 Measure of Infertility

The medical literature defines infertility as the failure to conceive after a year of regular intercourse without contraception. It can further be divided into primary infertility, which is the case when a woman has never been able to conceive, and secondary infertility, when the woman has had at least one successful pregnancy. We refer to primary infertility as full-infertility and secondary infertility as subfecundity in this paper.

Our measure of infertility is constructed from a question asked to all women, except those who have never engaged in sexual intercourse, about self-reported desire for future children. Their response can fall into the following categories: a) wants children within 2 years, b) wants children after 2+ years, c) wants children but is unsure of timing, d) undecided, e) wants no more children, f) is sterilized, and g) is declared infecund. Those who report being infecund were coded as infertile.[8] Women who were pregnant at the time of the survey were coded as fertile regardless of their response to the question on desire for future children.

A similar measure of infertility has been used as an instrument to study the impact of children on maternal labor supply in developing countries. These papers argue that, besides age, infertility status is not associated with a large set of pre-determined characteristics and is arguably random (Agüero and Marks, 2011; Aguero and Marks, 2008). Agüero and Marks (2011) also rule out the possibility that measurement errors (classical or not) in the self-reported infecundity variables might bias results. They also show that the presence of other household members does not affect the reporting of the infertility status when using DHS data. Jensen (2012) further finds that infertility is not associated with women's education or household expenditure.[9]

[7] In appendix Table A.2, we add 45-49 year old women back to the sample. As expected, the estimates are slightly attenuated suggesting that infertility matters less for marital stability for older women.

[8] There is another question in the DHS where women can self-report that they are infertile. In a limited number of surveys the DHS asks women who are not actively using contraceptives why not and they can state that they are unable to have children as a response. We do not use this question because it is not available for all surveys in the main sample. See Agüero and Marks (2011) for a more detailed discussion of these two different ways of measuring infertility in the DHS.

[9] A potential issue is that the infertility is self-reported which could introduce measurement error in the analysis. We cannot compare the self-reported measures with medically tested measures of infertility in the DHS. However, we do not expect this to be a concern in the analysis as self-reported measures of infertility are highly correlated with biological measures. Cates et al. (1985) study 25 countries and show that the proportion of couples who self-reported to be infertile and became pregnant in the future is small.

Figure 1 plots the average number of children by self-reported infertility status as defined above. Regardless of age, infertile women have fewer children than their fertile counterparts and the gap grows over the reproductive period. By the end of their reproductive period infertile women have 0.9 fewer children than fertile women. This suggests that our measure of infertility does indeed reflect difficulties in conceiving children. Also shown in figure 1 is the infertility rate by age. There is a clear relationship between age and infertility. Only 0.4% of women in our sample below the age of 20 years are infertile, whereas the corresponding number for women above 40 years is 7.5%. As such it will be important to control for age in all regressions.

2.2 Measure of Marital Status

The DHS asks each women her *current* marital status and the number of marital unions she has been in (exactly one or more than one). We restrict our main analysis sample to those women who have been in exactly one marital union – where a marital union is married or living together.[10] We do this for two reasons. First, we only observe the current marital status of the respondent and not their marital histories. Since we do not know the timing of the onset of infertility, we could be attaching the fertility shock to the wrong union in case of multiple unions. For instance one marital trajectory could be the following: a women was married, became infertile, got divorced, then re-married and hence appears as infertile and married in the dataset. By focusing on the sample of women who have been in only one union, we mitigate this measurement error problem. Second, we are able to attach all the match quality information to the correct union for this sample. For instance, the DHS only asks age when union began for the first union and husband's education is only available for the most recent partner. One downside of this restriction is that our sample is no longer representative of all women. As a robustness check, we repeat our analysis on the sample without the restriction of being in only one union.

Each women's current marital status is reported under the following categories: a) never-married, b) married, c) living together, d) widowed, e) divorced, and f) not living together.[11] As shown in panel A of table 1, close to 90% of the women in our sample are currently married or living together. In 80.5% of such unions, women report being married and the remaining 19.5% report being in a living together relationship. Overall 8.2 percent of respondents report their current marital status as dissolved. Of these women, 28.5% report their marital status as divorced and the rest report not living together. 2.4% of the women in our sample are widow.

Panel B of table 1 shows the heterogeneity in marital dissolution across the developing world. It varies widely across regions of the world ranging from 2.3% of ever-married women reporting a dissolved marital status in South Asia as compared to 14.2% in Latin America. The share of marital dissolution that take

[10] Among women in a marital relationship, 84% report having been in exactly one union.

[11] Some surveys interview ever-married sample only (e.g.: Jordon) and a few surveys do not have one or more of the above marital categories (e.g. India does not have living together category).

the form of divorce as opposed to not living together also varies. In Central Asia, 82% of dissolution take the form of divorce while the corresponding number is 60% in East Asia, close to 35% in South Asia and Sub-Saharan Africa, and only 10% in Latin America.

Because our data encompasses a wide range of countries with large variation in cultural norms surrounding marital dissolution, we treat not living together and divorced as equivalent forms of marital dissolution. As show in the statistics above not living together is a more common form of marital separation than divorce. Most marital unions are formal marriages as opposed to living together with the notable exception of Latin America where half of all couples live together and to a lesser degree Sub-Saharan Africa where 14% of couples in a marital union live together. Therefore, we treat living together and married as equivalent forms of being in a marital union. Importantly, the DHS treats living together as equivalent to married and not living together as equivalent to divorced when collecting data on several marital and reproductive variables.[12] We will explore the robustness of our results to alternative definitions marital transition.

2.3 Sample Description

Summary information about the analysis sample is presented in table 2. Our final analysis sample consists of 969,293 women of which 55% belongs to sub-Saharan Africa, 25% to Latin America, 9% to East Asia, 5% to Europe Central Asia, and 6% to South Asia. Based on our measure of infertility, about 2 percent of the sample reports being infertile. Of these infertile women, approximately 18% are fully infertile (i.e., they have zero children), while 82% are sub-fecund, (i.e., they have at least one child). Consistent with our setting, the women in our sample have limited education. 38.5% of the sample report any education above primary education level. About 60% of the sample resides in rural areas.

We have some more variables that speak to the quality of the match and other predictors of marital stability. The average woman in the sample marries at 18.85 and became sexually active at 17.7 years. About 9.4 percent of the women have more education than their husbands and 24.5% have less education than their husbands. About 46% of the husbands have education beyond primary school education. Note that our setting is one of high fertility where a large premium is placed on children. In our sample, the average woman has 2.6 living children and desires over 4 children.

3 Empirical Strategy

In our main analysis, we examine the relationship between infertility and marital dissolution using the following specification:

[12] DHS recode manual specifies that currently married includes married women and women living with a partner, and formerly married includes widowed, divorced, separated women and women who have lived with a partner but are not now living with a partner. Moreover, various marital variables such as age at first union are recorded for both married and living together women.

$$Y_{is} = \alpha + \beta Infertile_{is} + \delta D_{is} + \mu_s + \gamma X_{is} + \epsilon_{is} \quad (1)$$

where i and s represent the woman and the DHS survey (i.e. country-by-year) respectively. Y_{is} is a measure of marital dissolution. In our main specification, Y_{is} is an indicator which equals 1 if the woman reports her current marital status as divorced or not living together. $Infertile_{is}$ is our variable of interest. It is a dummy variable which equals 1 if the woman reports that she is unable to have children in the future due to infertility and 0 otherwise. In some specifications, we split the infertility variable into full infertility (infertile women with zero children) and subfecundity (infertile women who have at least one child). We hypothesize that women who cannot have additional children will be more likely to be un-partnered at the time of survey and that this effect will be larger for women experiencing full infertility as full infertility reflects a more substantial deviation from desired family size. All specifications include as a control duration since union formation, D_{is}, calculated as the difference between a woman's current age and her age when the union began. As discussed earlier, infertile women are older than their fertile counterparts and couples who have been married for longer have had a longer time for the union to dissolve. Hence, we control for duration since union formation. μ_{is} are the set of 151 survey fixed effects. These fixed effects allow for the latent probability of marital dissolution to vary across countries and time periods within a country. β is our parameter of interest which is the effect of infertility on marital dissolution. In all specifications, standard errors are clustered at the survey level. Sample weights provided by the DHS were used to weight all regressions.

Identification of β in the above equation relies on the assumption that no other omitted variables exist that are correlated with both infertility and marital dissolution. In other words, infertility should serve as an unanticipated event after the couple is married and should not be related with other variables that may predict divorce. It is possible that infertile women or women who are more likely to become infertile obtain poorer matches on the marriage market and that the poor match, as opposed to infertility, leads to marital dissolution. To guard against this threat to identification, we include a set of match quality variables in X_{is}. In the set of match quality controls, we include dummies for the woman's age when the union began, dummies for the education level of her husband (no education, primary education, secondary education, more than secondary education), an indicator for if husband has greater education than the wife, and an indicator for if the wife has greater education than the partner. A higher age at marriage and lower education gap between the couple has been shown to increase the quality of marriage and marital stability (Lefgren and McIntyre, 2006; Jensen and Thornton, 2003; Schwartz and Han, 2014).[13]

In addition to the match quality controls, we include a host of background characteristics in X_{is}. It

[13] Mansour and McKinnish (2014) find that age gap between the couple is an important indicator of the match quality. However, we are unable to include it in our set of match quality controls because the DHS only collects husband's age for women who are currently married.

is well established that infertility increases with a woman's age (see Dunson et al. (2004); Buck et al. (1997)). However, the medical literature is not in agreement about what other factors, if any, influence infertility. Fertility has been found to be unrelated to education, race, occupation, father's social class, and parity(Joffe and Barnes, 2000; Wilcox and Mosher, 1993; Wilcox and Marks, 1994; Aguero and Marks, 2008; Agüero and Marks, 2011; Jensen, 2012). Nevertheless, to guard against non-random selection into infertility, we include the following controls for individual-level background characteristics: dummies for the education level of the wife, dummies for her age at first intercourse, an indicator for if the woman had pre-marital sex, and the number of siblings of the wife as a proxy for childhood poverty and desire for a large family. We also include an indicator for whether the current place of residence is rural and an indicator for whether the childhood place of residence was rural.

An additional concern is that infertility could be capturing poor health of the woman and that poor health directly impacts marital stability. Some evidence suggests that indicators of poor health such as sexually transmitted diseases, smoking, drinking, and obesity are associated with infertility (Augood et al., 1998; Gesink Law et al., 2006; Grodstein et al., 1994; Hassan and Killick, 2005). However, Buck et al. (1997) summarize the epidemiological literature and conclude that there is no clear evidence on the effect of life-style factors like smoking, alcohol and caffeine consumption, BMI, and drug use on secondary infertility. To address such concerns in our analysis, in some specifications we control for indicators of current health (body mass index indicators, had any sexually transmitted disease in past 12 months, had genital ulcer in past 12 months, and recent visit to a health facility in past 12 months) and respondent's height as a measure of cumulative health status.

4 Results

4.1 Main Findings

Table 3 presents results for the effect of infertility on marital dissolution. Column 1 presents our most parsimonious regression in which the only controls are survey fixed effects and the duration since first marriage. The results suggest a large destabilizing effect of infertility on the marital union. Specifically, infertile women are 4.7 percentage points more likely to report their current marital status as dissolved when compared to their fertile counterparts. We note that only 8.2 percent of the sample reports their current marital status as dissolved, thus the findings are economically as well as statistically significant. This finding, of a very large impact of infertility on divorce suggests that if the desire for number of children is not met it strains the marriage and leads to divorce. This result aligns with earlier qualitative evidence that childlessness is often a cause of divorce (Zeitzen, 2008; Olaniyi, 2015; Alam et al., 2000).

To further support our main finding, it is instructive to consider several potential threats to the validity of a causal interpretation. For instance, we do not know the timing of the onset of infertility, it

is possible that a women's infertility status (or her likelihood of becoming infertile) is known prior to the marriage. If so infertile women may match to lower quality partners and the poor match, not infertility, increases the likelihood of marital dissolution.[14] If, however, infertility is revealed during the marriage, then the inclusion of match quality controls should not alter our findings. In column 2 we include an array of match quality controls. The estimated β is only slightly attenuated by the inclusion of match quality controls. This suggests little relationship between self-reported infertility and quality of the match. In results not shown we investigate if infertility impacts the likelihood of being ever married. In a regression that controls for a woman's age, education, and survey fixed effects we find that infertile women are 5.6 percentage points more likely to be never married and the estimate is statistically significant at 1 percent level. This finding lends credence to the argument that fertility potential is valued in the marriage.

Infertile women may be different than their fertile counterparts which would threaten the causal interpretation of our findings. However, if as the medical literature suggests infertility is more or less randomly assigned then inclusion of individual covariates should not alter our finding. In column 3, we add individual-level controls. We find the estimate of the impact of infertility on marital dissolution is basically unchanged after including flexible controls for age at first intercourse, level of education of the women, her number of siblings, religion, her current place of residence, and her childhood place of residence. After including these controls, the match quality variables conform with existing literature. We find that husband's education is protective and that partners with educational mismatch are more likely to end their unions. Women with higher education are more likely to experience disruption in the union. This is our preferred specification, which indicates that infertility increases the probability of marital dissolution by 4.1 percentage points, a 50% increase over the mean rate of marital dissolution. The estimates remain remarkably consistent as we move from column 2 to 3 suggesting that our measure of infertility is not correlated with key background characteristics of the woman.

We are particularly concerned that infertility is proxying for poor health and that poor health could directly influence marital stability. As cited above, some medical literature suggests a relationship between poor health and infertility. A consistent set of health indicators is not available for the full sample.[15] For a subsample of surveys, we have anthropometric measures of health (height and categorical body mass index indicators for underweight, overweight, and obese) as well as information on whether the women visited a health clinic in the last year and if she reported having a sexually transmit disease or genital ulcers in past 12 months. In column 4 we first re-estimated our preferred specification for the subsample of surveys that report health measures for all women. Again we find a sizable negative impact

[14] There is limited evidence of this in the raw data. For instance, husband's average years of education is 4.23 years for fertile women and 4.08 for infertile women. Age at first union is 18.8 years for infertile women and 18.6 years for fertile women.

[15] Many DHS surveys only collect anthropometric information for women who have given birth in the last five years, resulting in disproportionally missing health controls for the infertile women. As a selection rule, we excluded surveys where more than 90% of childless women had missing anthropometric information. Our results are robustness to alternative selection rules.

of infertility on marriage. Column 5, adds all available health controls. The estimated effect of infertility is nearly identical following the inclusion of health controls suggesting that infertility is not proxying for the included health measures. To preserve sample size, for the remainder of the analysis we will focus on specification which excludes health controls, although all findings are robust to the specification that includes health controls.

4.2 Robustness to Alternative Measures of Marital Transitions

Our baseline results suggest that infertility can have potentially large negative consequences for marital stability. In this section, we investigate the robustness of our results to alternative sample restrictions and definitions of marital transitions. These results are presented in Table 4. Column 1 reproduces the estimate from our preferred specification for comparison.

Our main definition of marital dissolution takes on a value of 1 if a woman reports being currently divorced or not living together, and 0 otherwise. Hence, we are implicitly treating widows as currently being in a union. Widows are not currently in a union and these relationships may have dissolved if the partner had not died. As such treating widowed women as currently in a union is a potential source of measurement error which would bias our estimates towards zero.[16] In Column 2 of table 4, we exclude widows from our sample and find that the estimated effect of infertility on marital dissolution increases from .041 to .050 indicating that the original estimates were somewhat attenuated.

We restricted our sample to women who have been in a single union to minimize the measurement error in the matching of women to their most recent partners and to reduce the odds that the infertility event occurred prior to the current union. However, one drawback of restricting to women with exactly one union for our primary estimation sample is that the sample of one union women is not representative of all women which can influence the interpretability of our results.[17] In column 3, we re-estimate our main regression adding back to the sample women who have been in multiple marital unions. The results show that the effect of infertility on marital dissolution is slightly attenuated, but remains large and similar to our main estimate, reassuring that any sample selection concerns are negligible.

We next examine the issue of potential measurement error in martial transitions. Thus far we have been following the DHS definitions and treating living together and married as similar forms of marital unions. We have also been treating divorced and not living together as similar measures of marital dissolution. However, living together may not be equivalent to marriage and not living together may not be equivalent to divorce. As discussed in the data section, living together is a highly common phenomenon for some countries in our sample. Additionally, countries with high rates of living together also have high

[16] We note that even after conditioning on age and the other individual controls infertile women are 7 percentage points more likely to be widows and the estimate is significant at 1 percent level.

[17] In results not reported, we test if infertility affects the number of unions a woman has been in. We do not find that infertility impacts the probability of being in a single union after controlling for survey fixed effects, match quality controls, age, and other individual level controls.

rate of not living together. We conduct three tests to show that our results are robust to focusing on more traditional marriage to divorce pathways.

We first exclude from the analysis sample countries with high rates of nontraditional marriages. Specifically, we exclude surveys where the share of total unions in living together relationships is more than 33% to focus on societies where marital institutions are stronger and transitions between marriage and divorce are clearer. Results in column 4 of table 4 show that our estimated effect increases by restricting to countries with relatively more traditional marriages (from 4.1 percentage points to 5.1 percentage points). This subsample of countries with more traditional martial arrangements have a significant lower marital dissolution rate (5.8% vs. 8.2% for the full sample) so the relative impact of infertility on marital dissolution is even larger.

We next consider an alternate measure of marital dissolution which takes a value 1 if the marital status is divorced and 0 for all other reported marital statuses, including not living together. Hence, we are considering only legal and definite disruptions in marriages as a measure of marital dissolution. Column 5 in table 4 presents these results for the full sample of countries. We note that marital dissolution is much less common if we limit the definition of marital dissolution to only divorce. Our results suggest that infertile women are almost twice as likely to be currently divorced as their fertile counterparts. In column 6, we re-estimate the model with divorce as an outcome for the sub-sample of surveys with low proportion of unions that are living together. We do this in part because we expect marital transitions to go from married to divorced and living together to not living together. So our estimated effects on divorce should get stronger if we exclude nations with high rates of living together. This is indeed what we find. Our results suggest that infertile women are more than twice as likely to be currently divorced as their fertile counterparts when we restrict our analysis to the subsample of countries with more traditional marital arrangements.

Altogether, these checks support the hypothesis that infertility has a significant and sizable impact on marital dissolution which is robust to the different definitions of marital transitions and sample selection criterions.

4.3 Difference by Severity of the Infertility Event

If the unmet desire for children among couples is responsible for the dissolution of the union, we should expect the magnitude of the effect to increase with the severity of the infertility shock. In particular, couples who are unable to have any children will be further away from their desired family outcomes than couples who were able to have some children before infertility struck. To investigate this, we divide our measure of infertility into full infertility and subfecundity. Full infertility means that the woman reports she is unable to have additional children and she has zero living children whereas subfecund women report being infertile but have at least one living child. Among the infertile women in our sample 18% are fully

infertile.

Table 5 shows results when the infertility measure is broken into full infertility and subfecundity as two mutually exclusive independent variables. Columns 1 shows our most parsimonious specification and we find very large effects of full infertility on marital dissolution. Being unable to bring children into the relationship raises the probably of the union ending by over 12 percentage points. This implies more than a 150% increase in the likelihood of marital disruption when compared to the sample mean. Columns 2 and 3 add a set of match quality controls and then individual level controls to the main specification. The coefficient on full infertility is remarkably stable after including a rich set of observable control variables. This suggests that full infertility is a shock to the marriage with very large negative consequences for the union. Regardless of the set of control variables, we find that the effect of infertility on marital dissolution is much greater for women who are fully infertile than those who are partially infertile or subfecund. According to the estimates in column 3, with the full set of controls, subfecundity increases the probability of marital dissolution by 2.4 percentage points, whereas full-infertility increases it by 11.8 percentage points. This finding of a much larger effect for full infertility when compared to subfecundity adds support to the interpretation of the main results, that failure to achieve the desired fertility levels leads to an increase in the probability of the marital union ending.

Another way to investigate if the relationship between infertility and marital dissolution increases with the severity of the infertility event is to look across age groups. It is likely that for younger women subfecunity is a more severe negative event as younger women are more likely to be in unions where their desired fertility has not been met.[18] There is an additional reason that the impacts of infertility on marital dissolution may be stronger for younger women. We do not know the timing of the onset of infertility, as such we may be picking up the effect of early menopause and not subfecundity among older women which would bias estimates downward.

We estimate our preferred specification with the individual and match quality control variables for three subsamples of women divided by age groups (ages 15-24, 25-34 and 35-44) in table 6. The estimates on the impact of full infertility on the odds of being currently unpartnered are similar across the age groups. This is perhaps unsurprising as full infertility results in a deviation from desired family that is independent of the age of the women. The estimated impact of subfecundity on marital dissolution decrease in magnitude as the sample ages. The effect of subfecundity on marital dissolution are about six times as large for women who know by the age of 24 that they are unable to have additional children when compared to the oldest group who may have become sub-fertile much later in life, perhaps, for some, after their fertility goals have been reached. Note that the effect of subfecundity and full infertility is similar for the youngest women. The differential finding by age groups are consistent with deviations from desired fertility size driving the marital dissolution as opposed to some omitted factor that is associated

[18] The average number of living children for subfecund women are 1.6 for 15-24 year olds, 2.6 for 25-34 year olds, and 3.6 for 35-44 year olds.

with both self-reported infertility and marital dissolution.

4.4 Secondary Fertility Challenges

In addition to studying the effect of infertility on marital stability, we also study the effect of two other fertility-related events which may cause deviations from the desired family size or composition: death of the first-born and undesired gender of the first-born. We note that other authors have documented that both of these fertility challenges destabilize the marriage, but we wish to study them in our setting for two reasons. First, we have a much larger sample of countries than the other studies allowing us to investigate external validity. While existing studies find that death of a child is detrimental to the marriage, these papers are all first world studies (see for instance Rogers et al. (2008); van den Berg et al. (2017); Finnäs et al. (2018); Lyngstad (2013)). The evidence on the impact of child gender on marital outcomes is mixed with some studies finding that daughters destabilize the marriage while other studies find no impact.[19] Second, we hypothesize that for the same sample of women the impacts of these fertility challenges on marital dissolution should be much smaller than the impacts of infertility because unlike infertility most couples can smooth out these fertility challenges by having additional children – especially in a setting with high fertility levels.

We explore the effect of other fertility challenges on marital stability for the subsample of our main analysis sample who have given birth at least once regardless of the birth outcome. This restriction eliminates about 8 percent of our sample and leaves us with a sample size of 873,713 women. Panel B of table 2 presents some descriptive statistics for this sample. The proportion of the women currently divorced or not living together is similar to the main analysis sample at almost 8%. This sample is slightly older and less educated than the main sample. Infant mortality is high in our setting. 12% of the sample reports their first-born child died. Of these deaths about two thirds occurred in the first 12 months of the birth. 49% of the sample has daughters as their first-born child consistent with the natural sex ratio at birth skewing slightly male.

Panel A of table 7 replicates our subfecundity estimates for the subsample of women who have given birth at least once. In our preferred specification in column 3, women who cannot have additional children are 2.7 percent points more likely to be unpartnered at the time of the survey.

In panel B of refsecondary, we show the results for the effect of death of the first-born child on marital dissolution. We focus on the first-born because there is evidence of endogenous fertility responses following the loss of a child (Finnäs et al., 2018). We focus on deaths that occurred in the first year

[19] Evidence from the United States suggests a destabilizing effect of first-born daughters on unions (Dahl and Moretti, 2008; Blau et al., 2017; Ananat and Michaels, 2008; Bedard and Deschenes, 2005; Mammen, 2008). By contrast, Diekmann and Schmidheiny (2004) do not find that daughters destabilize marriages for 18 developed countries. Leigh (2009) and Andersson and Woldemicael (2001) find no effect of firstborn's gender on the risk of divorce in Australia and Sweden respectively. For developing countries, some evidence suggests that daughters increase the risk of divorce (Bose and South (2003) (for India), Milazzo (2014) (for Nigeria), Odimegwu et al. (2017) (for 26 sub-Saharan African countries)).

of life to minimize the risk of reverse causality (Bhuiya and Chowdhury, 1997).[20] We do not know the timing of the marital separation: choosing a short window for the death of the child helps ensure that the death of the child occurred during the marriage. Additionally deaths that occur in the first year of life are arguably more exogenous since over time the cumulative effects of parental behavior can put the child at risk of death. Estimates in column 1, our most parsimonious specification, suggest that death of the first-born *increases* the probability that the woman is currently not in a marital union. However, the death of a child is not an entirely random event: variables that correlate with child mortality (such as low parental education) are strong predictors of marital stability. In columns 2 and 3, we add match quality and individual level controls sequentially. The estimate for the effect of death of the first-born on marital dissolution increase as we add controls. Column 3 of table 7 suggests that death of the first-born child increases the probability of marital dissolution by 0.30 percentage points.[21] This is a relatively small increase in the likelihood of dissolution, however, we note that this estimate is likely biased even after conditioning on controls as death of the child is not a random event.

The next fertility challenge we study is gender of the first-born child.[22] We show the estimated effect of having the first-born daughter on the likelihood of marital dissolution in Panel C of Table 7. Across a very large sample of countries, we find no meaningful effect of gender of the firstborn on marital dissolution. Estimate in Column 1 shows that having a first-born daughter is associated with a statistically insignificant 0.07 percentage point increase in the probability of divorce. Columns 2 and 3 present results adding variables related to the match quality and background characteristics of the mother. The estimates are identical which suggests that gender of the first-born child is close to random, as supported by the existing research (Dahl and Moretti, 2008; Bhalotra and Cochrane, 2010; Heath and Tan, 2018; Anukriti et al., 2016; Gupta, 1987). The effect is never statistically significant.

Overall, the results from the secondary fertility challenges reinforce our main finding. Fertility challenges that result in a deviation from the desired family size reduce the utility of marriage and lead to marital dissolution. The magnitude of this effect increases with the size and permanence of the fertility challenge. While losing a child does destabilize the marriage, the impact is much larger if the couple suffers from infertility and cannot have additional children to recover from the shock.

[20] As mentioned above, the majority of deaths occur in the first year of life. As such if we looked over other time frames we get similar findings. For instance if we looked at a deaths that occurred in the first 5 years of life we find a 0.40 percentage point increase in marital dissolutions.

[21] Infertility is more common for the sample that experienced death of the first-born child. 2.5 percent of the sample that reports the death of the first-born child is infertile as compared to 1.7 percent of the sample that does not report the death of the first-born child. To ensure that we are not simply picking up the impacts of infertility, as a robustness check we controlled for infertility while estimating the effect of death of the first-born child and continue to find an impact of death of the first-born on marital stability.

[22] We only use gender of the first-born as gender of the second-born is likely to be more endogenous than for the first-born. This has been noted previously in Dahl and Moretti (2008) while analyzing the effect of child's gender on marital outcomes.

5 Polygamy, Fertility, and Marital Dissolution

Given the large number of developing countries we have in our sample, we are able to explore the role, if any, that polygamy plays in buffering the union against a negative fertility challenge. In societies where polygamy is common men have additional channels available to meet their desired fertility levels: namely they can add another wife to the household or if they were already in a polygamous union the other wife/wives can increase their fertility. As such polygamy decreases the cost of remaining in the current union if the woman suffers a fertility challenge.[23]

A recent article in The Economist magazine as well as earlier ethnographic studies suggest that women can remain in polygamous unions even after facing fertility challenges (Zeitzen, 2008; Madhavan, 2002; Momeni, 1975; Chojnacka, 1980). For instance, Chojnacka (1980) writes "In a society in which a high premium is placed on children, and where a childless wife has little or no chance of continuing in a monogamous union, she may easily be driven out of the matrimonial home to face an uncertain future and insecurity. ....In a polygynous union, even when her function as a mother fails, she is still able to remain as a wife performing her second function as a labourer, and thus to secure her position in the community." Qualitative studies further document instances of women encouraging their husbands to take another wife if they cannot produce living children. However, to the best of our knowledge, no empirical study exists that investigate the relationship between polygamy, shocks to the marriage, and marital dissolution.

For a slightly over two-third of the surveys in our sample, the DHS asks respondents who are in marital union (currently married or living together) if they are in a polygamous union and the number of other wives the respondent's partner has. We use this question to generate an estimate of the polygamy rate which is the share of respondents in a given survey who report that their unions are polygamous. Table A.3 in the appendix shows the average polygamy rate by survey. It ranges from near zero in nations like Guyana and Nepal to more than 45% in Guinea and Burkina Faso. While polygamy is a widespread phenomenon in Africa, it is also present in some East Asian and Latin American countries. For the 101 surveys that collect polygamy information, the mean polygamy rate is 22.4%. The incidence of marital dissolution is slightly lower in this subsample at 6.6% vs. 8.2% for the entire sample.

To investigate if polygamy mutes the negative impact of a fertility challenge, we estimate the following regression:

$$Y_{is} = \alpha + \beta_0 FC_{is} + \beta_1 PolygamyRate_s + \beta_2 (FC * PolygamyRate)_{is} + \delta D_{is} + \mu_s + \gamma X_{is} + \epsilon_{is} \qquad (2)$$

where, as before, Y_{is} takes 1 if a women reports her current marital status as divorced or not living together. FC_{is} is a specific fertility challenge (infertility, death of the first-born son, first-born daughter).

[23] In addition to fertility challenges the wife may face, polygamous union should partially insure against other shocks to the woman such as health shocks or shocks to her earning potential.

$PolygamyRate_s$ is the share of unions in a given country-year that are polygamous in nature. Our variable of interest, β_2, is the interaction between a fertility challenge and the survey level polygamy rate. β_2 will tell us if the impact of a given fertility challenge on marital dissolution differs by the underlying polygamy rate.[24]

Table 8 presents results when the fertility challenge is infertility. Column 1 shows our preferred specification for the subsample of surveys for which we can compute a polygamy rate. If anything the impact of infertility on marital dissolution is larger for this subsample of countries. We note that a higher polygamy prevalence is negatively associated with the risk of marital dissolution which is consistent with polygamy providing insurance against unanticipated shocks. Column 2 presents the estimates from equation (2). Higher polygamy significantly moderates the negative effect of infertility. Specifically, conditional on our full set of controls, an infertile woman in country with no polygamy faces a 7 percentage points increase in her likelihood of marital disruption while her counterpart in a country with 50% polygamy rate (e.g. Benin) is only 3 percentage points more likely to experience marital dissolution if infertile.

Turning to the other fertility challenges, table 9 presents regression results for the secondary fertility challenges. Column 1 of Panel A reinforces the earlier finding that the death of a child has a small destabilizing impact on the marriage. Results, shown in column 2 of panel A, again suggest that polygamy plays a protective role for the union in response to a fertility challenge. For a woman who lives in a highly polygamous country (50%), the marital harm due to death of the first-born is completely mitigated. Panel B presents the results when first-born daughter is the fertility challenge. As before, we do not find any disrupting effects on the union due to a first-born daughter in this sample. Unsurprisingly, we find no differential impacts by polygamy rate.

While fertility challenges act as a negative event that weaken marital unions, our findings support the notion that polygamous unions provide insurance which lessen the impact of such negative shocks. Prior research documents large negative consequences of polygamy on societal violence, health of children, and marital satisfaction (Barash, 2016; Arthi and Fenske, 2018). Our findings offer quantitative evidence of a protective role of polygamy for marital stability. In societies where marriage and childbearing is the primary path to control of resources and social status, infertile women can continue to be in unions instead of potentially facing economic insecurity on their own.

[24] We use the polygamy rate in a country-year as opposed to if a given women reports that she is in a polygamous union because as mentioned above infertility status may affect if a woman is in a polygamous union. There is some evidence of this in our data. For surveys with polygamy information we estimated a regression where the dependent variable takes a value 1 if the respondent in a martial union is reports being in a polygamous union. The coefficient on infertility is 0.019 and statistically significant at 5% level in a model that also includes all of the individual controls plus age dummies. This suggests that infertile women are about 10% more likely to be in a polygamous union.

6 Conclusion

Economic theory predicts that unanticipated shocks in the course of a marriage can have a destabilizing effect on the marriage. We exploit non-pecuniary shocks that are more permanent in nature and can lead to potentially larger negative consequences for marriage than other pecuniary shocks studied in the literature. In particular, we investigate the relationship between fertility challenges faced by couples and the risk of marital dissolution using data for close to a million women from 63 developing countries. We find large negative effects of infertility on marital dissolution. Being unable to have additional children is associated with a 50% increase in the odds of a marital disruption. In addition, our findings show that the effect of a negative fertility event increases with the relative severity of the fertility challenge. Specifically, we find that the negative effect of infertility is strongest for women who are fully infertile as compared to those who have at least one living child before the onset of infertility.

We also study two secondary fertility challenges: the death of the first-born child, and a first-born daughter. Results suggest that the death of the first-born child has a small positive influence on the likelihood of the union breaking up, and we find no effect of the gender of the first-born on marital disruption for our setting. Our findings relate to the broader agreement in the literature that information about the partner (infertility) has a higher likelihood of affecting marital stability than one-time external shocks (first-born daughter).

Finally, we document a protective role of polygamy. We find that infertile women in countries with no polygamy are more than twice as likely to experience marital dissolution, than in countries where half of the unions are polygamous in nature. Additionally, we show that polygamy mitigates the adverse consequences of the death of the first-born child on marriage. While literature documents other harmful consequences of polygamy, to the best of our knowledge, we contribute some of the first evidence of its ability to mitigate against negative events that befall the woman.

Marital instability has been linked to lower socio-economic welfare of women and children in several contexts. While there is a large literature on divorce in the developed world, the literature on marital dissolution in developing countries is scarce despite the significance of this phenomenon. This paper meets this gap in the literature and sheds light on the critical role of fertility for marriage and its interdependence with the underlying marital customs such as polygamy.

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7 Figure and Tables

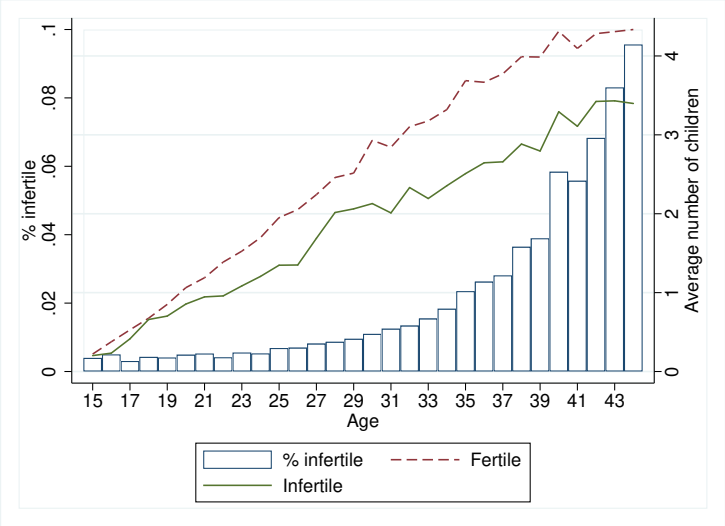

Figure 1: Infertility Information by Age

Note: The red dashed line shows the average number of children for fertile women in a specific age group and the green line shows the corresponding information for infertile women. The bars show the percentage of infertile women for a given age.

Table 1: Marital Dissolution Across Regions

Panel A (Full Sample)

	Mean	sd
Divorced or not living together	8.18	27.41
Divorced	28.50%	
Not living together	71.50%	
In marital union	89.45	30.72
Currently married	80.50%	
Living together	19.50%	
Widow	2.37	15.21
Observations	969293	

Panel B (By Region)

	East Asia		Central Asia		Latin America & Caribbean	
	Mean	sd	Mean	sd	Mean	sd
Divorced or not living together	4.2	21.9	6.3	11.5	14.2	50.0
Divorced	60.5%		81.8%		10.1%	
Not living together	39.5%		18.2%		89.9%	
In marital union	93.1	25.3	91.4	28.0	84.5	36.2
Currently married	94.9%		98.7%		50.5%	
Living together	5.1%		1.3%		49.5%	
Widow	2.7	16.2	2.3	15.1	1.2	11.0
Observations	99255		50744		236512	

	South Asia		Sub-Saharan Africa	
	Mean	sd	Mean	sd
Divorced or not living together	2.3	0.3	7.2	35.0
Divorced	34.9%		36.4%	
Not living together	65.1%		63.6%	
In marital union	95.0	21.8	90.0	30.0
Currently married	100.0%		85.7%	
Living together	0.0%		14.3%	
Widow	2.8	16.4	2.8	16.4
Observations	66411		516371	

Note: As Jordon is the only country in Middle East region (table A.1), it is combined here with Europe and Central Asia.

Table 2: Summary Statistics

Panel A: Full sample		
	Mean	sd
Infertility	1.96	13.87
Subfecundity (Children>0)	82%	
Full Infertility (Children=0)	18%	
Number of living children	2.57	1.98
Desired number of children	4.13	2.50
Current age	29.51	7.47
Age at first marriage	18.85	4.17
Age at first intercourse	17.71	3.57
Duration since first union	10.66	7.37
Respondent- more than primary education	38.52	48.66
Childhood place of residence-rural	55.18	49.73
Present residence-rural	59.62	49.07
No. of siblings	5.60	2.34
Husband- more than primary education	45.77	49.82
Wife has more education	9.39	29.17
Husband has more education	24.50	43.01
No premarital sex	66.38	47.24
Hindu	7.22	25.89
Muslim	29.86	45.76
Christian	46.11	49.85
Other religion	16.81	37.39
Observations	969293	
Panel B: Subsample who have given birth at least once		
Divorced or not living together	7.95	27.05
In marital union	89.52	30.62
Number of living children	2.86	1.88
Current age	30.23	7.22
Respondent- more than primary education	37.41	48.39
First born died in 12 mo.	7.96	27.06
First born died within 5 years	10.70	30.92
First born daughter	48.83	49.99
Subfecundity (Children>0)	1.82	13.38
Observations	873713	

Note: Summary statistics weighted by survey weights.

Table 3: Effect of Infertility on Marital Dissolution

	(1)	(2)	(3)	(4)	(5)
Infertility	0.047***	0.043***	0.041***	0.035***	0.034***
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)
Duration since first union	0.000	0.000***	0.001**	0.000	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Husband-primary ed		-0.022***	-0.053***	-0.052***	-0.047***
		(0.003)	(0.004)	(0.005)	(0.005)
Husband-secondary ed		0.021***	-0.041***	-0.039***	-0.034***
		(0.005)	(0.006)	(0.007)	(0.007)
Husband-higher ed		0.020***	-0.064***	-0.060***	-0.054***
		(0.006)	(0.007)	(0.010)	(0.010)
Wife has more education		0.039***	0.007**	0.010**	0.010**
		(0.003)	(0.003)	(0.004)	(0.004)
Husband has more education		-0.001	0.028***	0.026***	0.027***
		(0.002)	(0.003)	(0.004)	(0.004)
Woman-primary ed			0.027***	0.022***	0.027***
			(0.004)	(0.005)	(0.005)
Woman-secondary ed			0.039***	0.037***	0.044***
			(0.007)	(0.008)	(0.008)
Woman-higher ed			0.058***	0.054***	0.063***
			(0.009)	(0.010)	(0.010)
Match Quality Controls	N	Y	Y	Y	Y
Individual Controls	N	N	Y	Y	Y
Health Controls	N	N	N	N	Y
N	969293	969293	969293	463144	463144
R^2	0.04	0.06	0.06	0.06	0.06
Y-Mean	0.082	0.082	0.082	0.086	0.086
No. Surveys	151	151	151	94	94

Note: Standard error clustered at survey level. *** p<0.01, ** p<0.05, * p<0.1. The sample includes women between the ages of 15-44 years who have been in exactly one union. All regressions control for survey fixed effect. Match quality controls also include dummies for age at first marriage. Individual-level controls include dummies for age at first intercourse, indicator for woman having intercourse before marriage, number of siblings, dummies for education of the woman, dummies for religion, indicator variable for current place of residence being rural, and indicator for childhood place of residence being rural. Health controls include respondent's height, indicator variable for having visited the health facility in past 12 months, STD in past 12 months, genital ulcer in past 12 months, and dummies for four BMI categories: underweight, normal, overweight, and obese. Observations with missing information on the following controls were included back in the the sample with an indicator for the missing value: education of woman, partner's education, childhood place of residence, number of siblings, religion and age at first intercourse. All regressions weighted using sample weights.

Table 4: Alternative Marital Transitions/ Robustness

	Dependent var.=Marital Dissolution				Dependent var.=Divorce	
	(1) Main sample	(2) Exclude widows	(3) Include >1 union	(4) < 0.34 livtogth	(5) Main sample	(6) < 0.34 livtogth
Infertility	0.041***	0.050***	0.036***	0.051***	0.021***	0.028***
	(0.006)	(0.009)	(0.006)	(0.007)	(0.005)	(0.006)
Match quality Controls	Y	Y	Y	Y	Y	Y
Individual Controls	Y	Y	Y	Y	Y	Y
N	969293	946042	1145826	705470	969293	705470
R^2	0.06	0.07	0.06	0.04	0.05	0.03
Y-Mean	0.082	0.084	0.090	0.058	0.023	0.027
No. Surveys	151	151	151	111	151	111

Standard error clustered at survey level. See table 2 for details on control variables. All regressions weighted using sample weights. Columns 4 and 6 exclude surveys where the share of total unions in a living together relationship is greater than 33%.

Table 5: Effect of Subfecundity and Full Infertility on Marital Dissolution

	(1)	(2)	(3)
Full Infertility (Children=0)	0.125***	0.118***	0.118***
	(0.020)	(0.020)	(0.019)
Subfecundity (Children>0)	0.029***	0.026***	0.024***
	(0.006)	(0.006)	(0.006)
Match quality Controls	N	Y	Y
Individual Controls	N	N	Y
N	969293	969293	969293
R^2	0.05	0.06	0.06
Y-Mean	0.082	0.082	0.082

Standard error clustered at survey level. See table 2 for details on the sample and control variables. Subfecundity is 1 for women who are infertile and have at least one living child. Full infertility is 1 for women who are infertile and have zero living children. All regressions weighted using sample weights.

Table 6: Infertility and Marital Dissolution: Agewise

	(1)	(2)	(3)
	15-24	25-34	35-44
Full Infertility (Children=0)	0.116***	0.130***	0.107***
	(0.034)	(0.027)	(0.015)
Subfecundity (Children>0)	0.093***	0.040***	0.014***
	(0.016)	(0.010)	(0.005)
Match quality Controls	Y	Y	Y
Individual Controls	Y	Y	Y
N	283322	406849	279122
R^2	0.07	0.06	0.07
Y-Mean	0.084	0.078	0.085

Standard error clustered at survey level. See table 2 for details on the sample and control variables. All regressions weighted using sample weights.

Table 7: Secondary Fertility Challenges and Marital Dissolution

Panel A	1	2	3
Subfecundity (Children>0)	0.0327***	0.0292***	0.0266***
	(0.0058)	(0.0055)	(0.0057)
R-sq	0.05	0.06	0.06
Y-Mean	0.080	0.080	0.080
Panel B			
First born died in 12 mo.	-0.0012	0.0012	0.0029**
	(0.0017)	(0.0015)	(0.0014)
R-sq	0.05	0.06	0.06
Y-Mean	0.080	0.080	0.080
Panel C			
First born daughter	0.0010	0.0011	0.0010
	(0.0007)	(0.0007)	(0.0007)
R-sq	0.05	0.06	0.06
Y-Mean	0.0795	0.0795	0.0795
Match Quality Controls	N	Y	Y
Individual Controls	N	N	Y
Health Controls	N	N	N
N	873713	873713	873713
No. surveys	151	151	151

Note: Sample restricted to women with at least one birth. See table 2 for details on the control variables.

Table 8: Polygamy, Infertility and Marital Dissolution

	(1)	(2)
Infertility	0.052***	0.069***
	(0.006)	(0.009)
Survey average polygamy rate	-0.098***	-0.097***
	(0.010)	(0.010)
Avg. Polygamy rate X Infertility		-0.086***
		(0.029)
Match quality Controls	Y	Y
Individual Controls	Y	Y
N	620107	620107
R^2	0.05	0.05
Y-Mean	0.066	0.066
No. surveys	101	101

Standard error clustered at survey level. *** p<0.01, ** p<0.05, * p<0.1. All regressions weighted using sample weights. See table 2 for details on the control variables.

Table 9: Polygamy and Secondary Fertility Challenges

Panel A	(1)	(2)
First born died in 12 mo.	0.005***	0.009***
	(0.001)	(0.003)
Survey average polygamy rate	-0.093***	-0.090***
	(0.010)	(0.010)
Avg. Polygamy rate X First born died in 12 months		-0.018***
		(0.007)
R-sq	0.05	0.05
Y-Mean	0.06	0.06
Panel B	(1)	(2)
First born daughter	0.000	-0.000
	(0.001)	(0.001)
Survey average polygamy rate	-0.092***	-0.093***
	(0.010)	(0.010)
Avg. Polygamy rate X First born daughter		0.003
		(0.004)
R-sq	0.05	0.05
Y-Mean	0.06	0.06
Match quality Controls	Y	Y
Individual Controls	Y	Y
N	558379	558379
No. surveys	101	101

Note: Sample restricted to women with at least one birth. See table 2 for details on control variables. All regressions weighted using sample weights.

8 Appendix

Table A.1: List of Surveys and Years

Region	Country	Year/s	Observations
Central Asia	Albania	2008	3961
Central Asia	Armenia	2000 ,2005 ,2010	10195
Central Asia	Azerbaijan	2006	4386
Central Asia	Kazakhstan	1995 ,1999	4716
Central Asia	Kyrgyz Republic	1997 ,2012	7061
Central Asia	Moldova	2005	3730
Central Asia	Tajikistan	2012	5712
Central Asia	Ukraine	2007	3521
Central Asia	Uzbekistan	1996	2803
East Asia	Cambodia	2000 ,2005 ,2010 ,2014	37508
East Asia	Indonesia	2012	26682
East Asia	Philippines	1998 ,2003 ,2008 ,2013	27909
East Asia	Timor-Leste	2009	7156
Latin America & Caribbean	Bolivia	1993 ,1998 ,2003 ,2008	28114
Latin America & Caribbean	Brazil	1996	4010
Latin America & Caribbean	Colombia	1995 ,2000 ,2004 ,2009	38830
Latin America & Caribbean	Dominican Republic	1996 ,1999 ,2002 ,2007 ,2013	18734
Latin America & Caribbean	Guatemala	1995 ,1998	9711
Latin America & Caribbean	Guyana	2009	2308
Latin America & Caribbean	Haiti	2000 ,2005 ,2012	13593
Latin America & Caribbean	Honduras	2005 ,2011	18280
Latin America & Caribbean	Nicaragua	1997 ,2001	10519
Latin America & Caribbean	Peru	1996 ,2000 ,2003 ,2009 ,2010 ,2011 ,2012	92413
Middle East & North Africa	Jordan	1997	4659
South Asia	India	2005	54548
South Asia	Maldives	2009	4404
South Asia	Nepal	2011	7459
Sub-Saharan Africa	Benin	1996 ,2001 ,2006 ,2011	27661
Sub-Saharan Africa	Burkina Faso	1998 ,2003 ,2010	23092
Sub-Saharan Africa	Burundi	2010	4803
Sub-Saharan Africa	Cameroon	1998 ,2004 ,2011	16232
Sub-Saharan Africa	Central African Republic	1994	2910
Sub-Saharan Africa	Chad	1996 ,2004	8204
Sub-Saharan Africa	Comoros	1996 ,2012	3338
Sub-Saharan Africa	Congo	2005 ,2011	9151
Sub-Saharan Africa	Congo Democratic Republic	2007 ,2013	16034
Sub-Saharan Africa	Cote d'Ivoire	1998 ,2011	6832
Sub-Saharan Africa	Ethiopia	2000 ,2005 ,2011	22496
Sub-Saharan Africa	Gabon	2000 ,2012	6235
Sub-Saharan Africa	Gambia	2013	5944
Sub-Saharan Africa	Ghana	1998 ,2003 ,2008 ,2014	11755
Sub-Saharan Africa	Guinea	1999 ,2005 ,2012	14517
Sub-Saharan Africa	Kenya	1998 ,2003 ,2008	13678
Sub-Saharan Africa	Lesotho	2004	3884
Sub-Saharan Africa	Liberia	2006 ,2013	7443
Sub-Saharan Africa	Madagascar	1997 ,2003 ,2008	16906
Sub-Saharan Africa	Malawi	2000 ,2004 ,2010	25828
Sub-Saharan Africa	Mali	1995 ,2001 ,2006 ,2012	32335
Sub-Saharan Africa	Mozambique	1997 ,2003 ,2011	19542
Sub-Saharan Africa	Namibia	2000 ,2006 ,2013	7890
Sub-Saharan Africa	Niger	1998 ,2006 ,2012	17810
Sub-Saharan Africa	Nigeria	2003 ,2008 ,2013	45482
Sub-Saharan Africa	Rwanda	2000 ,2005 ,2010 ,2014	22972
Sub-Saharan Africa	Sao Tome and Principe	2008	1114
Sub-Saharan Africa	Senegal	2005 ,2010 ,2012 ,2014	26738
Sub-Saharan Africa	Sierra Leone	2008 ,2013	12174
Sub-Saharan Africa	South Africa	1998	3993
Sub-Saharan Africa	Swaziland	2006	1909
Sub-Saharan Africa	Tanzania	1996 ,1999 ,2004 ,2009	17031
Sub-Saharan Africa	Togo	1998 ,2013	9852
Sub-Saharan Africa	Uganda	1995 ,2000 ,2006	12718
Sub-Saharan Africa	Zambia	1996 ,2001 ,2007 ,2013	20998
Sub-Saharan Africa	Zimbabwe	1994 ,1999 ,2005 ,2010	16870

Table A.2: Infertility and Marital Dissolution: 15-49 year old

	(1)	(2)	(3)
Full Infertility (Children=0)	0.117***	0.108***	0.107***
	(0.014)	(0.015)	(0.014)
Subfecundity (Children>0)	0.020***	0.016***	0.014***
	(0.004)	(0.004)	(0.004)
Match Quality Controls	N	Y	Y
Individual Controls	N	N	Y
Health Controls	N	N	N
N	1072229	1072229	1072229
R^2	0.05	0.06	0.07
Y-Mean	0.083	0.083	0.083
No. Surveys	151	151	151

Standard error clustered at survey level. See table 2 for details on the sample and control variables. All regressions weighted using sample weights.

Table A.3: First-born's death and Marital Dissolution: Alternative time frames of death

Panel A	1	2	3	4	5
	Main sample			Sample with health controls	
First born died in 12 mo.	-0.0012	0.0012	0.0029**	0.0021	0.0025
	(0.0017)	(0.0015)	(0.0014)	(0.0020)	(0.0020)
R-sq	0.05	0.06	0.06	0.06	0.06
Panel B					
First born died within 5 years	-0.0004	0.0022*	0.0043***	0.0040**	0.0045***
	(0.0015)	(0.0013)	(0.0013)	(0.0016)	(0.0016)
R-sq	0.05	0.06	0.06	0.06	0.06
Panel C					
First born died (at any time)	-0.0000	0.0024*	0.0043***	0.0044***	0.0049***
	(0.0014)	(0.0013)	(0.0012)	(0.0016)	(0.0016)
R-sq	0.05	0.06	0.06	0.06	0.06
Y-Mean	0.080	0.080	0.080	0.084	0.084
Match Quality Controls	N	Y	Y	Y	Y
Individual Controls	N	N	Y	Y	Y
Health Controls	N	N	N	Y	N
N	873713	873713	873713	421061	421061
No. surveys	151	151	151	93	93

Note: Sample restricted to women with at least one birth. All regressions weighted using sample weights. See table 2 for details on the control variables.

Table A.4: Survey Level Marital Information

Country	Year	Marital dissolution rate	Marital union rate	Share of unions as living together	Polygamy rate
Central Asia					
Albania	2008	1.4	65.9	2.0	na
Armenia	2000	3.8	64.1	0.2	na
Armenia	2005	4.1	62.1	0.9	na
Armenia	2010	4.0	61.2	0.8	na
Azerbaijan	2006	4.0	62.4	0.3	na
Kazakhstan	1995	7.2	66.5	1.6	na
Kazakhstan	1999	8.8	62.9	1.2	na
Kyrgyz Republic	1997	6.5	69.5	1.7	na
Kyrgyz Republic	2012	6.1	64.0	0.4	na
Moldova	2005	6.8	66.4	6.9	na
Tajikistan	2012	2.9	67.4	0.1	na
Ukraine	2007	13.8	60.2	4.9	na
Uzbekistan	1996	3.0	70.3	0.6	na
East Asia					
Cambodia	2000	3.1	59.1	0.0	na
Cambodia	2005	4.2	60.0	0.3	na
Cambodia	2010	4.2	62.0	0.6	4.2
Cambodia	2014	3.8	67.7	0.5	2.9
Indonesia	2012	2.8	73.4	1.1	na
Philippines	1998	2.3	59.6	8.3	na
Philippines	2003	2.7	63.6	11.6	na
Philippines	2008	3.1	61.9	17.0	na
Philippines	2013	3.6	60.2	22.6	na
Timor-Leste	2009	1.8	60.2	4.5	2.0
Latin America & Caribbean					
Bolivia	1993	5.5	62.1	23.0	na
Bolivia	1998	5.7	59.4	23.1	na
Bolivia	2003	6.9	59.9	32.6	na
Bolivia	2008	6.9	60.0	39.2	na
Brazil	1996	7.7	60.1	22.6	na
Colombia	1995	11.6	54.7	45.5	na
Colombia	2000	12.7	51.2	51.5	na
Colombia	2004	12.7	47.9	62.2	na
Colombia	2009	13.3	49.1	67.8	na
Dominican Republic	1996	14.6	59.2	63.0	na
Dominican Republic	1999	16.6	56.6	64.8	na
Dominican Republic	2002	16.6	59.9	74.8	na
Dominican Republic	2007	18.1	56.7	78.8	na
Dominican Republic	2013	21.0	54.0	79.7	na
Guatemala	1995	6.1	64.4	34.6	na
Guatemala	1998	6.5	65.8	37.7	na
Guyana	2009	9.1	58.4	36.8	0.7
Haiti	2000	8.2	58.6	4.1	24.9
Haiti	2005	6.9	58.8	22.8	21.5
Haiti	2012	6.7	54.7	19.1	18.1
Honduras	2005	12.5	58.2	55.7	na
Honduras	2011	13.2	56.5	62.4	na
Nicaragua	1997	16.4	59.0	52.6	na
Nicaragua	2001	16.5	56.8	50.2	na

Table A.4 cont'd

Country	Year	Marital dissolution rate	Marital union rate	Share of unions as living together	Polygamy rate
Peru	1996	6.3	58.3	43.5	na
Peru	2000	6.6	56.1	47.4	na
Peru	2003	9.0	55.6	56.4	na
Peru	2009	8.9	57.1	60.1	na
Peru	2010	10.0	56.8	61.0	na
Peru	2011	10.2	56.3	62.6	na
Peru	2012	9.8	57.0	64.0	na
Middle East					
Jordan	1997	1.6	96.2	0.0	6.5
South Asia					
India	2005	1.5	74.8	0.0	1.8
Maldives	2009	7.7	91.2	0.0	na
Nepal	2011	0.8	75.8	0.0	4.0
Sub-Saharan Africa					
Benin	1996	2.7	76.5	8.6	49.5
Benin	2001	3.2	73.4	17.3	45.6
Benin	2006	2.6	75.3	8.3	43.0
Benin	2011	3.7	70.4	21.9	35.6
Burkina Faso	1998	1.0	80.4	5.3	54.6
Burkina Faso	2003	1.7	77.4	10.8	48.4
Burkina Faso	2010	1.3	79.4	4.3	42.3
Burundi	2010	4.6	57.7	28.0	6.2
Cameroon	1998	6.6	66.8	13.9	32.8
Cameroon	2004	5.9	67.2	22.1	30.3
Cameroon	2011	5.7	63.5	23.1	26.9
Central African Republic	1994	9.1	69.4	76.9	28.5
Chad	1996	5.0	78.2	5.1	39.2
Chad	2004	5.8	76.6	2.8	39.1
Comoros	1996	6.3	53.6	1.7	25.1
Comoros	2012	5.8	61.2	9.8	18.5
Congo	2005	11.9	56.4	66.9	15.8
Congo	2011	14.1	58.1	78.7	11.6
Congo Democratic Republic	2007	7.4	66.3	12.5	22.8
Congo Democratic Republic	2013	7.5	64.2	24.1	22.7
Cote d'Ivoire	1998	6.3	61.3	24.6	34.9
Cote d'Ivoire	2011	4.9	62.7	32.5	28.2
Ethiopia	2000	8.7	63.7	1.4	13.5
Ethiopia	2005	6.6	64.4	2.0	11.6
Ethiopia	2011	7.4	62.3	6.8	10.5
Gabon	2000	12.2	54.1	61.7	21.3
Gabon	2012	9.1	53.1	68.0	12.1
Gambia	2013	3.2	66.4	0.4	38.8
Ghana	1998	9.8	64.7	14.3	22.6
Ghana	2003	7.3	62.4	10.1	22.7
Ghana	2008	7.0	58.5	18.3	18.8
Ghana	2014	7.7	56.6	21.1	15.7
Guinea	1999	2.2	82.5	4.7	53.5
Guinea	2005	2.4	79.1	3.3	52.3
Guinea	2012	2.2	73.6	0.9	47.9

Table A.4 cont'd

Country	Year	Marital dissolution rate	Marital union rate	Share of unions as living together	Polygamy rate
Kenya	1998	4.9	61.3	3.9	16.1
Kenya	2003	5.9	60.0	8.7	16.8
Kenya	2008	6.1	58.4	6.5	13.5
Lesotho	2004	5.6	52.3	1.0	na
Liberia	2006	7.3	64.0	36.3	17.4
Liberia	2013	7.9	58.3	47.9	12.7
Madagascar	1997	11.6	62.8	22.3	3.4
Madagascar	2003	11.8	64.7	17.1	3.1
Madagascar	2008	10.7	69.3	11.5	3.3
Malawi	2000	8.0	71.5	1.9	17.1
Malawi	2004	8.4	71.1	6.6	15.6
Malawi	2010	9.3	67.5	12.4	14.5
Mali	1995	1.2	84.7	1.4	44.2
Mali	2001	1.8	83.5	1.3	42.5
Mali	2006	1.9	84.8	6.1	39.7
Mali	2012	1.0	84.6	1.9	34.9
Mozambique	1997	9.3	74.4	76.2	27.6
Mozambique	2003	13.0	70.3	78.8	26.1
Mozambique	2011	10.1	67.9	41.3	20.8
Namibia	2000	5.3	38.6	45.8	15.1
Namibia	2006	4.3	35.2	46.3	6.4
Namibia	2013	4.4	34.0	49.8	7.1
Niger	1998	3.1	84.2	0.1	37.7
Niger	2006	2.5	86.1	0.3	35.8
Niger	2012	2.5	88.5	0.2	36.2
Nigeria	2003	2.9	70.0	3.3	36.0
Nigeria	2008	1.9	70.6	2.0	32.9
Nigeria	2013	2.1	71.5	3.3	32.7
Rwanda	2000	9.5	48.5	36.6	12.1
Rwanda	2005	9.3	48.7	39.2	11.0
Rwanda	2010	5.5	50.5	29.4	8.3
Rwanda	2014	6.2	51.7	32.3	7.1
Sao Tome and Principe	2008	10.8	65.7	92.4	27.1
Senegal	2005	4.3	67.6	3.7	38.8
Senegal	2010	3.8	66.0	0.7	34.6
Senegal	2012	3.9	64.3	0.6	32.4
Senegal	2014	4.3	64.8	0.4	32.3
Sierra Leone	2008	3.5	74.9	12.5	38.1
Sierra Leone	2013	3.6	65.5	4.6	35.4
South Africa	1998	6.0	43.3	20.4	7.3
Swaziland	2006	3.2	41.3	22.6	21.8
Tanzania	1996	7.0	66.7	9.4	27.3
Tanzania	1999	7.6	65.8	7.2	na
Tanzania	2004	7.2	67.3	9.1	23.1
Tanzania	2009	8.8	63.2	4.9	21.5
Togo	1998	4.8	67.9	8.6	42.8
Togo	2013	4.2	66.3	19.8	32.5

Table A.4 cont'd

Country	Year	Marital dissolution rate	Marital union rate	Share of unions as living together	Polygamy rate
Uganda	1995	7.5	72.7	12.1	29.7
Uganda	2000	9.2	67.4	32.4	30.1
Uganda	2006	9.4	62.6	20.3	28.9
Zambia	1996	9.5	61.1	0.9	16.7
Zambia	2001	9.3	61.3	0.8	15.8
Zambia	2007	8.1	61.6	1.1	14.5
Zambia	2013	8.6	60.1	1.0	12.1
Zimbabwe	1994	7.8	61.8	0.0	18.4
Zimbabwe	1999	7.0	61.1	11.5	15.4
Zimbabwe	2005	7.7	57.7	2.5	12.0
Zimbabwe	2010	7.8	62.2	3.7	11.8

Note: Mean marital dissolution rate is the average share of women in a survey who report their marital status as divorced or not living together. Mean marital union rate is the average share of women in a survey who report their marital status as currently married or living together. Polygamy rate is the share of women in marital union who report being in a polygamous relationship in a given survey. Mean dissolution rate, marital rate, and polygamy rate have been calculated in the data before any sample restrictions and are weighted by sample weights. Share of unions as living together has been computed for the one union sample and is simply the share of women who report being in living together relationship divided by total women in a marital union in the survey.