Subjective Expectations of Husbands and Wives and Couples' Decision-Making Under Uncertainty

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Abstract Many decisions are taken jointly by multiple individuals. When outcomes are uncertain, decision-makers may have different subjective expectations ("beliefs") about the consequences of different choices. We develop a tractable empirical framework for identifying the relative influence of joint decision-makers' beliefs without assuming Pareto optimality when beliefs differ. We apply the framework to contraceptive choices in Nigeria, examining the relative weight couples place on wives' versus husbands' beliefs. We find that spouses have different subjective expectations, and that the weight placed on each spouse's beliefs varies across domains. Therefore, the optimal targeting of information interventions to husbands or wives is domain-dependent.

Keywords: subjective expectations, household decision making, contraception, Nigeria
JEL Classification: D83, D10, J13

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1 Introduction

Many important economic decisions are made jointly by multiple individuals, from whether to have a child or migrate to how much to invest in a business or whether to adopt a new technology. Economists have long recognized that people involved in such decisions may have different preferences, including within households, and a large literature studies how these preferences are aggregated into collective choices (Manser and Brown, 1980; McElroy and Horney, 1981; Chiappori, 1988; Almås et al., 2023).

Another widespread feature of economic decisions is that they are made under uncertainty (Manski, 2004). This has received renewed attention in recent years, with a rapidly growing literature on subjective expectations substantially advancing our understanding of how individual beliefs shape decisions under uncertainty (Bachmann et al., 2022; D'Acunto and Weber, 2024).

Yet despite the prevalence of situations in which multiple individuals make joint choices under uncertainty, we know remarkably little about how the beliefs of joint decision-makers differ and how they are combined when decisions are made jointly—hence whose beliefs matter for what, and which decision maker should be prioritised by information interventions. To answer these questions, we collect expectations data from each joint decision-maker—spouses in our application—and develop a tractable empirical framework for measuring the relative influence of different decision-makers' beliefs within a subjective expected utility (SEU) framework.

We focus on identifying the importance attached to an individual's *beliefs*, which is conceptually distinct from the importance attached to that individual's *preferences*. To fix ideas, consider a couple deciding whether to buy a flat in the city or a house in the countryside, weighing commuting time (lower in the city) against environmental amenities (higher in the countryside). If both spouses agree on the difference in commuting times and environmental amenities between the two options, and share the same preferences over these attributes, they will prefer the same option. Now suppose that commuting times and pollution levels are uncertain and the spouses hold different subjective expectations about their realizations in each location. Then, the spouses may disagree on their preferred location—*even if they have identical preferences* over outcomes—and the couple's joint decision will depend in part on the relative weight each spouse's beliefs receive. These "beliefs weights" are distinct from utility weights (the weight the couple places on achieving her versus his preferred outcomes). Importantly, there is no reason to assume that the couple places greater weight on the beliefs of the spouse with a higher utility weight. Beliefs weights reflect perceived relative "expertise" in how choices are likely to map into outcomes, which may stem from differences in knowledge or originate in gender norms or differences in persuasiveness. The weight assigned to each spouse's beliefs may also vary across domains. E.g., one spouse may have researched public transport options extensively, while the other has a better grasp of how pub-

lished pollution measures translate into experienced air quality. Or patriarchal social norms may give more authority to the beliefs of husbands in some domains irrespective of actual knowledge.

When joint decision-makers hold different subjective beliefs, their beliefs must somehow be aggregated for a joint decision. How these beliefs are aggregated is consequential. Theoretically, different aggregations correspond to different efficiency assumptions. Empirically, the chosen aggregation helps pin down whose expectations matter for the decision. We show that the relative importance of decision-makers' beliefs can nevertheless be identified under relatively weak assumptions, allowing researchers to estimate whose expectations matter for joint decisions even when decisions do not satisfy unrestricted Pareto efficiency.

Unrestricted Pareto efficiency loses much of its natural appeal when individuals disagree about the probabilities of uncertain outcomes. As noted by Gilboa et al. (2004), individuals may agree that a decision is desirable given their own beliefs even when those beliefs are mutually inconsistent with the objective probabilities of the outcomes—e.g., two gentlemen may agree to duel the other to the death when each believes with probability at least 85% that they personally would survive. Gilboa et al. (2004) therefore propose a restricted Pareto criterion, under which Pareto efficiency is required only when individuals share the same beliefs, and no efficiency assumption is made when individuals have different beliefs. We adopt this criterion to allow for potentially inefficient decisions arising from divergent beliefs. Gilboa et al. (2004) show that, under restricted Pareto efficiency, group subjective beliefs can be represented as a linear combination of individual beliefs, with weights summing to one, and group preferences as a linear combination of individual preferences. Applying this result to the standard linear subjective expected utility framework, we show that the estimated coefficient on each decision-maker's belief is directly proportional to the weight placed on that belief in the joint decision. The estimated model therefore provides direct information about the relative influence of each decision-maker's subjective expectations, separately for each outcome entering the joint decision—e.g, commuting time and air quality in our location decision example.

We apply this framework to contraceptive choice in Nigeria using rich subjective expectations data we specifically elicited from both spouses across multiple domains likely to matter for contraceptive decisions. We first document widespread differences in beliefs between spouses across all domains: contraceptive technology, functioning of the health system, and less tangible domains such as superstitions regarding long-term consequences of contraceptive use after discontinuation and regarding religious approval. Interestingly, this holds even though the overall marginal distributions of women's and men's beliefs are fairly similar in aggregate. In other words, women and men's beliefs do not differ greatly *on average*, but there is limited assortative matching of individual spouses on beliefs and limited persuasive communication on the topics covered.[1]

[1]This conclusion regarding similar beliefs distributions overall but low correlation within household echoes find-

Studying the respective roles of husbands' and wives' subjective expectations across domains proves empirically relevant. A clear pattern of gendered perceived expertise emerges: wives' beliefs about contraceptive technology and interactions with the health care system tend to receive more weight than husbands' beliefs. But for less tangible outcomes, like long-term fecundity consequences and approval by co-religionists, the couple places substantially more weight on the husband's beliefs than on the wives'.

These findings have implications for the targeting of interventions that differ by domain: holding all else constant, interventions addressing misconceptions about contraceptive efficacy or availability would be best targeted at women, whereas interventions aiming to correct misconceptions about social norms or dispel myths about long-term fertility consequences may be more effectively targeted at men.

We make three key contributions. First, we draw on theoretical results by Gilboa et al. (2004) to estimate a joint decision model that allows for different individual preferences *and* different individual beliefs, and that accommodates inefficient decisions arising when the individuals in the group hold different beliefs. In a pioneering study, Giustinelli (2016) uses subjective expectations data from matched parent–child pairs and estimates a model aggregating parental and child preferences and beliefs, under the assumption that the resulting decision is Pareto optimal.[2] Similarly, Walker et al. (2024) and Almås et al. (2024) assume Pareto efficient allocations between parents when modeling individual parental investments in child development in the presence of uncertain returns. Unrestricted Pareto efficiency is, however, a strong assumption, and it may not be desirable in the context of choice under uncertainty due to the possibility of incorrect beliefs (Gilboa et al., 2004). Several theoretical intra-household models dispense with Pareto efficiency entirely and are tailored to specific decisions involving asymmetric information (Friedberg and Stern, 2014; Ashraf et al., forthcoming; Apedo-Amah et al., 2026; Lowe and McKelway, forthcoming). These models study why information is or is not shared between spouses and/or the implications of beliefs divergence on the efficiency of decisions. By contrast, we take each spouse's beliefs as given and propose a general-purpose subjective expected utility framework applicable to a range of joint decisions when individual preferences and expectations potentially differ. By not presuming how beliefs are formed or why they may differ between spouses, we accommodate a range of belief for-

ings in Giustinelli (2016) and Walker et al. (2024), but differs from Ashraf et al. (forthcoming), where there are clear gender differences in knowledge regarding maternal mortality and morbidity risks.

[2]Depending on the self-reported process through which parents and child make decisions, Giustinelli (2016) models the decision as depending either (1) only on the child's beliefs and preferences (PR1), or (2) on the child's preferences and the beliefs of both child and parent (PR2), or (3) on the beliefs and preferences of both (PR3). The first two cases require no Pareto optimality assumption. Specification PR1 corresponds to our Equation (1) with either $\omega_j^k = 0$ and $\phi_j^k = 0$ for $j = 1,\ldots,J,C$ and either $k = h$ or $k = w$. Specification PR2 corresponds to our Equation (1) with $\phi_j^k = 0$ for $j = 1,\ldots,J,C$ and either $k = h$ or $k = w$. Both are constrained versions of our more general model (1) and are nested within it. In the third case (PR3), where both preferences and beliefs of parent and child are aggregated, unrestricted Pareto efficiency is assumed—an assumption we do not impose.

mation processes.[3] This flexibility is valuable as there is growing evidence of limited information transmission between spouses, but no single reason for it. For instance, the evidence sometimes points at strategic considerations (Ashraf et al., forthcoming; Apedo-Amah et al., 2026) and sometimes not (Friedberg and Stern, 2014; Delavande et al., 2025).

Our second contribution is to combine the subjective beliefs of husbands and wives across multiple domains within a subjective expected utility (SEU) model of the couple's joint decision, thereby shedding light on the relative importance of each spouse's beliefs across domains. A vast literature has studied intra-household differences in *preferences* and how each spouse's bargaining power contributes to aligning joint decisions with their own preferences (recently reviewed by, e.g., Almås et al., 2023). Differences between spouses in fertility and contraceptive preferences are also well documented (e.g., Doepke and Tertilt, 2018; Cassidy et al., 2021; Vouking et al., 2014). By contrast, fewer studies have collected subjective expectations from both husbands and wives.[4] Recent exceptions advance the frontier not only by collecting subjective expectations from both spouses but also by creating exogenous variation in one spouse's beliefs at a time (Ashraf et al., forthcoming; Conlon et al., 2021; Fehr et al., 2024; Delavande et al., 2025). To achieve this, each study focuses on a single domain: the risk of maternal mortality (Ashraf et al., forthcoming); the share of red balls in an urn (Conlon et al., 2021); the household's position in the income distribution (Fehr et al., 2024); or eligibility for social security benefits (Delavande et al., 2025).[5] We instead consider multiple domains simultaneously, collect subjective expectations from both spouses under each alternative in their choice set (up to eight alternatives depending on awareness of methods), and estimate a rich discrete choice model that incorporates all those domains. This granularity allows us to shed light on differences in the relative perceived "expertise" of each spouse across domains, as revealed by the couple's actual contraceptive choices.

Our third contribution is to document the subjective beliefs of women *and* their husbands about the many consequences of many possible contraceptive choices, and estimate the impact of these beliefs on contraceptive decisions. Prior work by Delavande (2008), Nakamura (2016), and Miller et al. (2025) has estimated individual subjective expected utility models of contraceptive choice

[3]For instance, in Ashraf et al. (forthcoming), wives are better informed but cannot credibly communicate maternal mortality risks to their husbands, because a wife could be overstating risks to influence fertility decisions in her preferred direction. This lack of credible communication leads to inefficient outcomes. The decision representation of Gilboa et al. (2004) that we adopt allows for *restricted* Pareto optimality, requiring efficient decisions only when spouses' beliefs align. Our framework is therefore compatible with inefficient decisions arising when beliefs diverge whether or not this is due to strategic considerations impeding the free flow of information between spouses.

[4]Surveys such as the Demographic and Health Surveys routinely collect *self-reported fertility preferences* (ideal number of children, preferences for delaying or stopping childbearing), which are distinct from beliefs about the consequences of specific decisions.

[5]Walker et al. (2024) do not experimentally vary either spouse's beliefs but measure both parents' beliefs in one domain—returns to and costs of investments in child development through speech—and show that higher female bargaining power enables mothers to shift fathers' investments toward their own preferred level.

in the United States, Japan, and Mozambique, respectively using data on women's beliefs. We instead model contraceptive choices as potentially depending on the preferences and beliefs of both spouses, thus offering new evidence on whose beliefs influence contraceptive choices.[6]

The rest of the paper is organized as follows. In Section 2, we present the context, survey, and document key data patterns. Section 3 introduces the model. Section 4 reports the main results, robustness checks, and counterfactual exercises, while Section 5 investigates parameter heterogeneity across households with different observable characteristics. Section 6 concludes.

2 Beliefs of Husbands and Wives

2.1 Context

Nigeria has a population of 238 million people, which is predicted to reach 477 million in 2100, namely the world's fourth largest after India, China and Pakistan (DESA, 2024). The total fertility rate was still 4.8 children per woman as of 2023, down from 5.7 twenty years earlier (this, and all figures stated in the rest of this paragraph, are taken from FMoHSW, NPC and ICF, 2024). During the same time period, contraceptive prevalence among married women aged 15-49 has gone from 11% to 20%, of which 5% (i.e., one-quarter) corresponds to the use of traditional methods such as cycle-awareness methods or withdrawal. Meanwhile, the incidence of so-called "unmet need" for contraception has gone from 18% in 2003 to 21% in 2023. In other words, about as many married Nigerian women of reproductive age are using some form of contraception as there are who say that they do not want to get pregnant in the next two years (or never (again)) and yet are not doing anything to prevent a pregnancy.

2.2 Data and Sample

Data Collection. To cover a diverse population in terms of variables that are likely to matter for contraceptive use decisions, we first selected five states based on the size of their population and across varying levels of "unmet need" for family planning among married women as of the Nigeria Demographic and Health Survey (DHS) 2018. In each of the five selected states (Akwa Ibom, Bauchi, Borno, Kano, and Oyo), 80 enumeration areas (EAs) were randomly selected using probability weights based on their predicted population (see geographical spread of survey locations in Figure 1).

[6] In addition, we incorporate traditional methods in the choice model. This matters for two reasons. In some Sub-Saharan African countries, including Nigeria, traditional methods are relatively common (used by 5% of married women, compared with 15% using modern methods; FMoHSW, NPC and ICF, 2024). Moreover, explicitly eliciting beliefs about traditional methods (cycle awareness, withdrawal, lactational amenorrhea) helps isolate beliefs about using *no method at all*, since traditional methods are treated as distinct contraceptive options in the survey instrument.

The National Population Commission of Nigeria, our survey implementation partner, then visited all households in the resulting 400 enumeration areas and screened all cohabiting women aged between 18 and 44 who were either in a monogamous union or had at most one co-wife.[7]

Based on the screening interviews, for the full survey we retained women at risk of unwanted or mistimed pregnancies based on stated fertility desires as well as women who, at the time of the screening interview, were pregnant and therefore were not asked whether they wanted to get pregnant within the next two years.[8] If they were no longer pregnant when recontacted for the main survey phase and consented to be interviewed, they were also interviewed for the main survey.

A 50% random sample of monogamous husbands and all polygynous husbands were invited for interview. Throughout this study, "husband", "partner", or "spouse" are used interchangeably, whether *de jure* or *de facto*. We did not restrict the number of wives per union, but, given our eligibility criteria, there are only 170 women out of 2,737 whose co-wife was also interviewed (and 75 women whose co-wife is also included in the main regression sample).

Data collection for the full survey took place between late July and early November 2022. See Section A-1 for further details about the data collection, sample construction, and definition of variables. Table A2 reports the average share of missing values overall across individuals, for each belief, and for each alternative. The response rate is high. Seventy eight percent of wives and 85 percent of husbands responded to all the relevant questions. For each belief individually, item non-response rates are also reasonably low, as they are below 2% for half the beliefs variables, and 7.9% at most (for expected costs, as perceived by wives).

Sample. Our raw sample comprises 2,737 matched couples. Among these, we retain those who have at least two choices in their awareness set, i.e., "no method" and at least one method known among the options we model, namely: implants, injections, contraceptive pills, male condom, lactational amenorrhea method (LAM), cycle-awareness methods, and withdrawal. In addition, we drop all observations for which no response was provided to at least one of the questions asked in order to construct the variables we use in our main specification. When one spouse says they have heard of an alternative but the other spouse says they have not, then only one spouse was asked

[7] Thirty percent of women in our main sample have a co-wife, and in Section 4.2 we report estimates obtained when excluding this sub-sample. But given the survey eligibility criteria explained in the next paragraph, very few co-wives of eligible women were also eligible for interview, so that only 4% of women have a co-wife also included in our main sample.

[8] We elicited fertility desires by first asking directly whether the respondent would personally want to have another child "if you could fully control whether you got pregnant, and could do so without you or your partner doing anything specifically to avoid you getting pregnant". This was followed by, if applicable: "Still imagining that you could fully control whether you got pregnant, and could do so without you or your partner doing anything specifically to avoid getting pregnant, how long would you personally like to wait before you get pregnant (again)?" In Valente et al. (2024b), we show that this approach may retain women who would not actually wish to avoid a pregnancy if asked completely anonymously, but that it is unlikely to exclude from the sample women who genuinely wish to avoid getting pregnant.

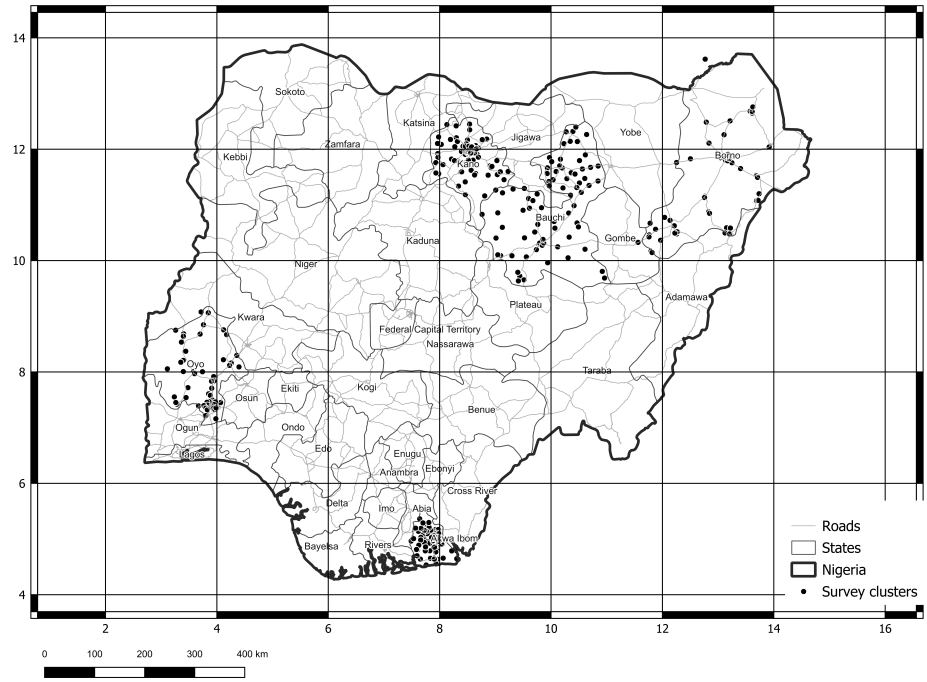


Figure 1: Data Collection Locations (Displaced)

Notes: Locations of the 392 survey enumeration areas included in Valente et al. (2022) and in which at least one woman was eligible for full interview. Coordinates are randomly displaced to preserve anonymity (between 0 and 2 kilometers for urban areas and 0-10 kilometers for rural areas).

alternative-specific questions about this alternative. In this case, in our baseline estimation we set all the alternative-specific variables to 0 for the spouse who was not asked about this alternative and control for two alternative-specific indicators: one dummy equal to 1 if the wife says she has not heard of the alternative, and zero otherwise, and a second dummy equal to 1 if the husband says he has not heard of the alternative, and zero otherwise.[9] In other words, we use the union of individual awareness sets as the couple's choice set. Point estimates are slightly less precisely estimated but similar in magnitude if we use the (smaller) intersection of awareness sets instead (see Table A6 discussed in Section 4.2).

We elicit the following alternative-specific variables (two variables per outcome, one for the wife and one for the husband), out of 20 (beans on a board) in the case of probabilities: probability of pregnancy in the next 12 months under this alternative; probability of managing to get pregnant in the next 12 months *following the discontinuation* of the alternative if both spouses wanted the wife to get pregnant (for the no method alternative, the question is asked about the next 12 months, if using no method at all and if both spouses wanted her to get pregnant); probability of the wife experiencing three types of side effects: nausea/vomiting/headaches, menstrual irregularities, other side effects, each asked about separately and then averaged over any non-missing answer for each of the three types of side-effects; probability that the respondent's libido/sexual pleasure or that of their husband/wife would be affected by the use of each method; probability that people of the same religion would approve of the couple choosing this alternative; probability of being able to obtain the method when needed (set to 100% for traditional methods and "no method"); expected total monthly costs (based on two separate questions, one on expected "health-related expenses" and another one on expected "other expenses" such as transport costs, cost of paying someone to replace you at work, etc.); expected waiting time at the point of service (as an interval in minutes).

Our main analytical sample comprises 1,726 couples. In Table A3, we present summary statistics of couples included in our main regression and couples who are excluded due to the sample restrictions described earlier. Three hundred and eighty-nine couples are excluded due to missing answers to a module asking the wife about her perceived chance of suffering some form of retaliation if she used contraception against her husband's will, 52 couples are excluded because they do not know any of the contraceptive methods we model demand for, and 5 couples are excluded because of husband's non-response regarding fertility desires, while the remaining observations are dropped due to non-response to at least one of the wife's or husband's beliefs questions for at least

[9]The coefficient estimates for these variables are reported in Appendix Table A6 which compares the full output from different models side-by-side. Coefficients are as expected, namely negative in both cases, and much larger in magnitude for the "not in wife's choice set" indicator. Only 8 women in the main regression sample stated using a method that, earlier in the interview, they said they had not heard of (possibly because they did not recognize the name we used for it at first), while 146 women use a method for which their husbands said "no" when asked, in their individual interview, whether they had heard of this method.

one of the known alternatives. Compared to the excluded couples, couples in our main regression sample are slightly older, have higher socio-economic status, are less likely to be Muslim, and are more likely to use contraception. In a robustness check (Section 4.2), we show that our conclusions are largely unchanged if we keep the full sample and impute missing values.

2.3 Key Data Patterns

To motivate our analysis, we highlight three key patterns observed in the data. We refer the interested reader to our companion paper for further detail (Valente et al., 2024a). In brief, we find that: (1) the beliefs distributions of women and men, taken each in isolation, share many similarities including systematic biases; (2) when comparing the beliefs held by each spouse in a given couple, however, we find large differences in beliefs; (3) the magnitude of the mismatch in beliefs of wife and husband is quantitatively at least as large as the mismatch in fertility preferences, which, unlike differences in beliefs, has received much attention.

Key facts about the marginal distributions of women's and men's beliefs We start by discussing key findings regarding the beliefs of the women and men in our sample, ignoring the matching of specific women with specific men within couples. Women as a whole and men as a whole hold broadly similar beliefs about pregnancy risks, both with and without contraception, and they both underestimate the risk of pregnancy when using no contraception (as in Miller et al., 2025, but much more so) and overestimate the risk of contraceptive failure (Figure 2). Women and men also both typically overestimate monetary costs (Figure 3).

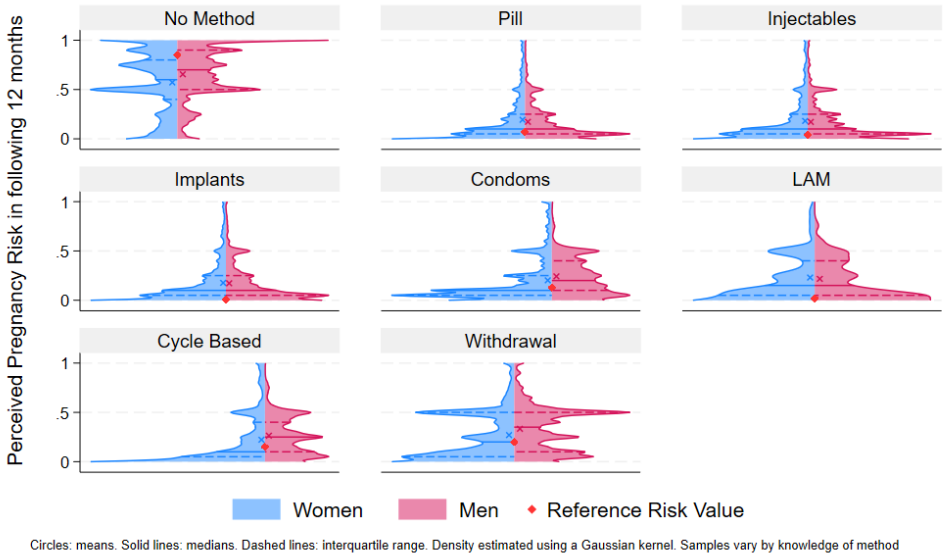


Figure 2: Distribution of Pregnancy Risk Beliefs

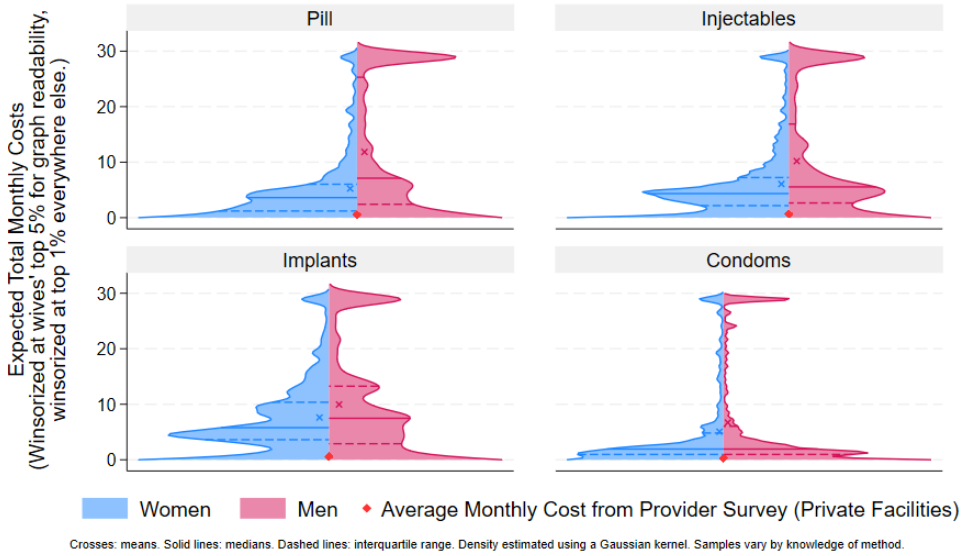


Figure 3: Distribution of Expected Monetary Costs

Intra-couple differences in beliefs Although the marginal distributions of beliefs are often similar for the overall sample of husbands and the overall sample of wives, there is limited correlation in the beliefs of spouses. This suggests that there is little communication, or at least limited persuasion of one spouse by the other around these topics, echoing recent findings of limited transmission of information between spouses in other domains (Ashraf et al., forthcoming; Conlon et al., 2021; Fehr et al., 2024; Delavande et al., 2025).

Figures 4, 6, and 7 plot key moments (mean, median, and 25th and 75th percentiles) in the distributions of the difference in wife's and husband's beliefs about pregnancy risks, probability of side effects, and probability of approval by people of the same religion, respectively. The similarity in the marginal distributions of women's and men's beliefs, which we illustrate in Figure 2 in the case of pregnancy risk, implies that, on average, the difference between the wife's subjective expectation and her husband's is close to zero (as shown by the black crosses in Figures 4, 6, 7). However, there is low intra-couple correlation of beliefs regarding pregnancy probabilities for a given alternative. In other words, wives who perceive a low chance of pregnancy absent contraception do not necessarily have husbands who perceive a low chance of pregnancy absent contraception, and wives who perceive a low failure rate with a given method do not necessarily have husbands who perceive a low failure rate with that method (Figure 4).

Another way of quantifying this low within-couple, within-alternative correlation is to compute the pairwise Pearson correlation coefficient between the perceived pregnancy risk of the wife according to each spouse, for each alternative in turn. As shown in Figure 5, these pairwise corre-

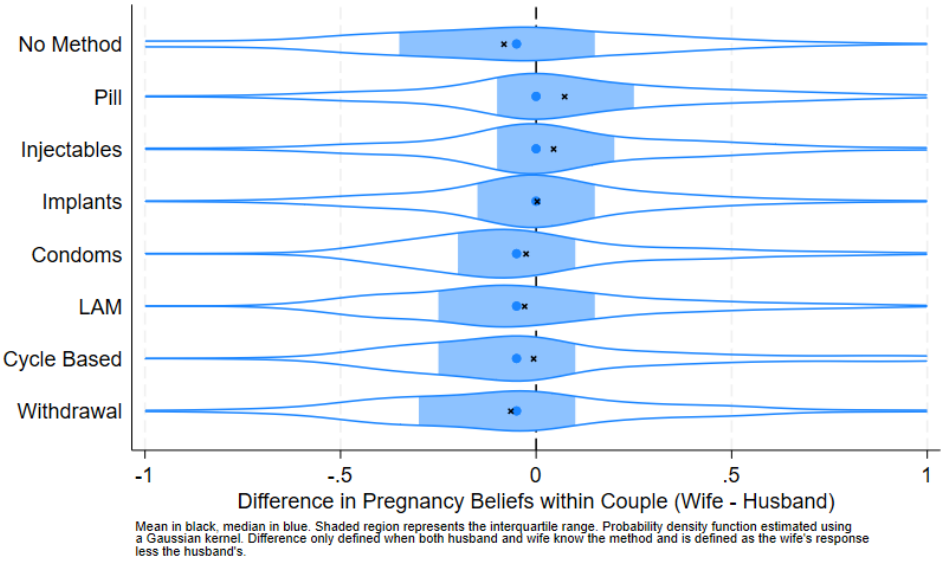


Figure 4: Wife's minus Husband's Beliefs: Pregnancy Risk While Using Alternative

lation coefficients are small in magnitude and often even negative.

For the perceived chance of the wife experiencing side effects, there are again large differences within couple for a given alternative, at least for methods where both the actual and perceived chance of side effects is substantial, namely the three hormonal contraceptive methods (pill, injectables and implants), as shown in Figure 6.

Turning now to a very different aspect of contraceptive choices, there are also large differences between spouses in perceived approval of each alternative by people of the same religion (Figure 7). Here we do not assume that co-religionists can observe contraceptive choices. By including this variable in our model, we seek to capture the utility associated with perceived social approval. This utility may arise because individuals anticipate social consequences if their choices become known, or because they have internalized the norms reflected in this perceived social judgment.

So far, we have discussed differences in husband's and wife's beliefs for a given alternative. But in our model, couples compare expected utilities under each alternative in their choice set and choose the alternative that gives the couple the highest utility, so that we also use variation in subjective expectations *between alternatives* within couple for identification. The pairwise correlation in spousal beliefs between alternatives is substantially higher than the correlation of spousal beliefs within alternative, so that the overall correlation coefficients computed over all alternatives and couples are higher than the within-alternative correlation coefficients. E.g., wives who believe that the chance of pregnancy is much lower when using one contraceptive method than with another alternative are more likely to have husbands who also believe that it is the case. But as shown in Figure 8, there are still marked intra-couple differences in the perceived relative merits

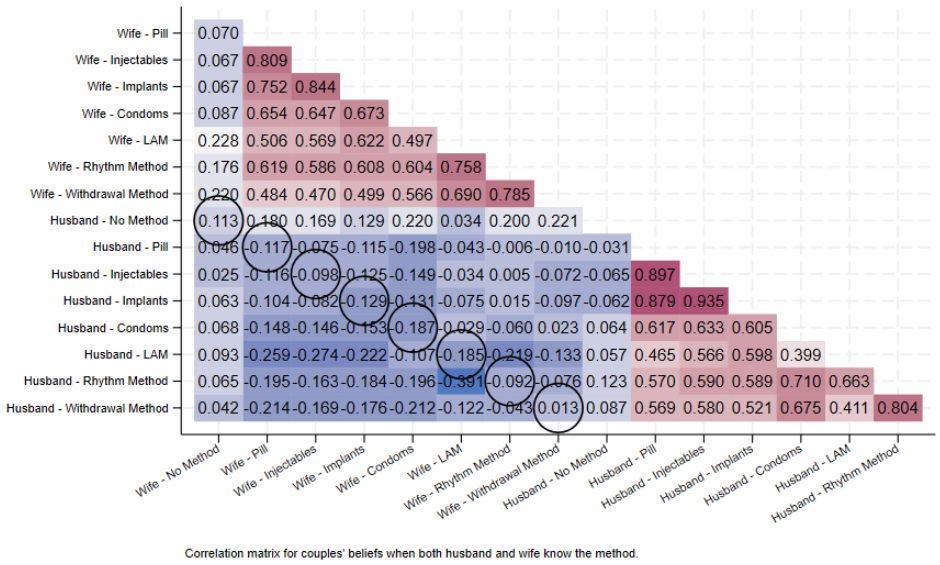


Figure 5: Husband-Wife Pairwise Correlation of Pregnancy Risk Beliefs *Within Alternative*

Definitions: Pregnancy: chances of pregnancy in the next 12 months if using the alternative. Pregnancy After: chances of pregnancy within 12 months of discontinuing the method. Side Effects: chances of experiencing side effects (average of three questions asking about nausea/vomiting/headaches; menstrual irregularities; and other side effects). Libido: chances that the respondent's libido/sexual pleasure or that of their spouse would be affected by the use of [method]. Religious Approval: chances of approval by people of the same religion. Obtaining: chances of obtaining [method] when needed. Total costs: sum of expected monetary direct costs and indirect costs (monthly). Waiting time: expected waiting time at the point of service to obtain method (response interval midpoint in minutes). Circled figures correspond to the correlation coefficient between the wife's belief and the husband's corresponding belief (e.g., 0.113 is the Pearson correlation coefficient between the wife's perceived chance of getting pregnant in the next 12 months without any contraception and the husband's perceived chance of his wife getting pregnant in the next 12 months without any contraception).

of each alternative, with overall correlation coefficients ranging from 0.09 (chance of managing to get pregnant after discontinuation) to 0.58 (side effects).

In Appendix A-4, we report correlation matrices separately for couples who are more or less "well-matched" in terms of educational attainment (Figure A1), age difference (Figures A2 to A6), and desired fertility (Figure A7), as these couples may find it easier to communicate around questions of fertility and contraception. We find little evidence of higher similarity of beliefs between spouses who are more similar except for beliefs about the probability that "[the respondent's] libido/sexual pleasure or that of [their] spouse would be affected by the use" of each method, and, to a lesser extent, for beliefs about the probability of pregnancy. This is especially striking when looking at couples in different quintiles of spousal age difference, where the correlation coefficient for libido/sexual pleasure interference decreases steadily across quintiles—0.540, 0.425, 0.336, 0.239, 0.190 from lowest- to highest age difference quintile.

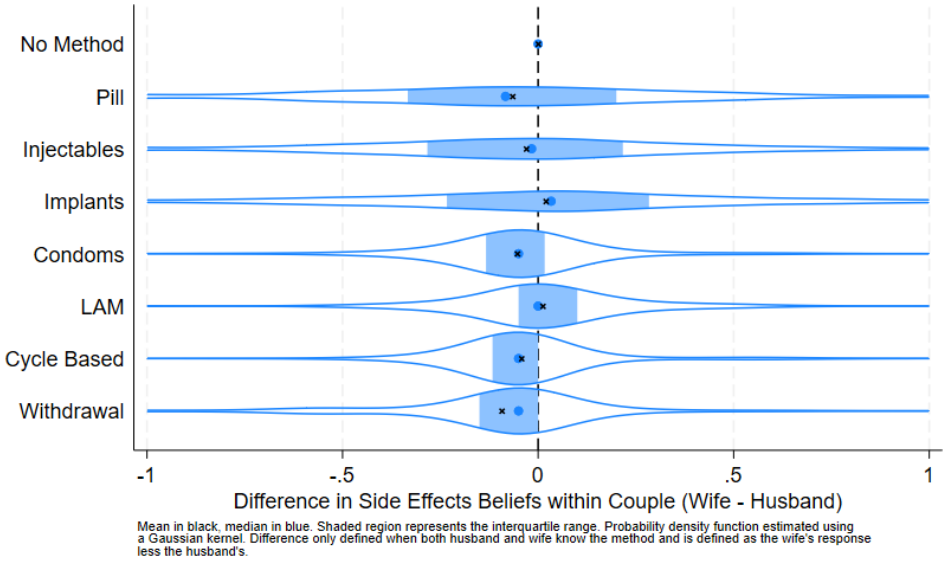


Figure 6: Wife's minus Husband's Beliefs: Side Effects

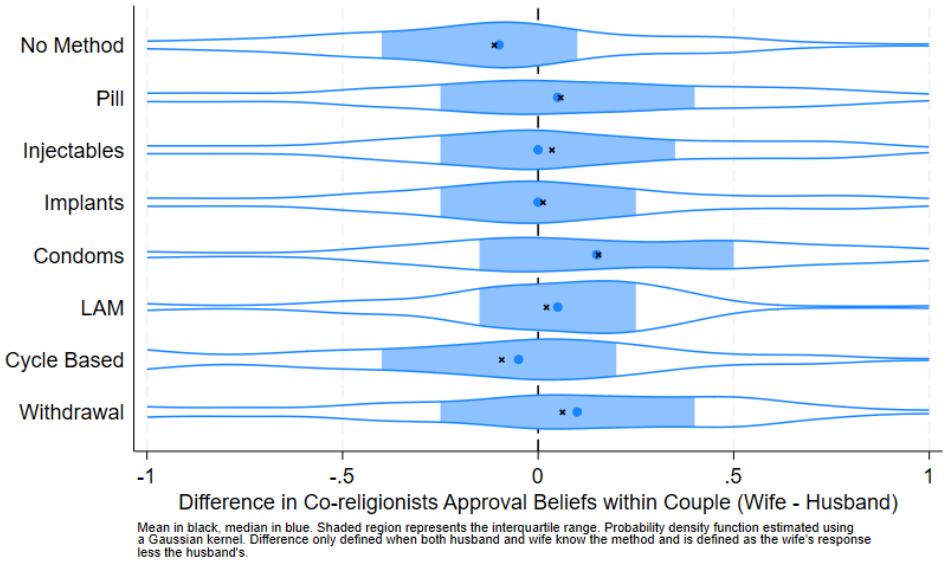


Figure 7: Wife's minus Husband's Beliefs: Co-religionists Approval

We also report correlations in beliefs by quintile of marriage duration (Figures A8 to A12). On the one hand, spouses who have been married for longer have had more opportunities to discuss and their beliefs may therefore have converged. On the other hand, it may be the case that spouses discuss fertility and family planning issues at the start of their marriage, reaching some alignment at that time, but then do not revisit these issues and hence drift further apart. The pattern of beliefs correlation across marriage duration suggests that the latter mechanism dominates. Again, the only detectable trends are for expected chances of pregnancy and expected chances of disruption to

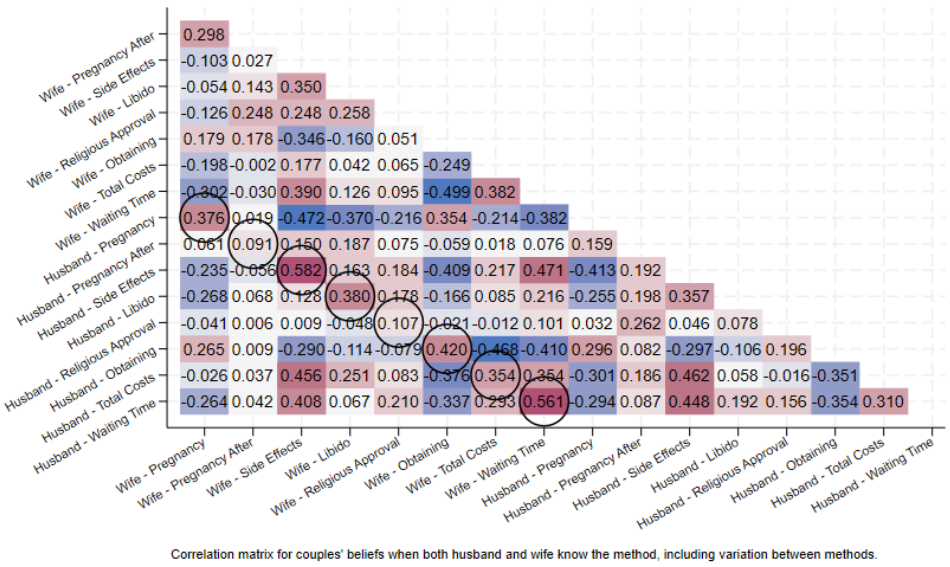


Figure 8: Husband-Wife Overall Pairwise Correlation of Beliefs

Definitions: Pregnancy: chances of pregnancy in the next 12 months if using the alternative. Pregnancy After: chances of pregnancy within 12 months of discontinuing the method. Side Effects: chances of experiencing side effects (average of three questions asking about nausea/vomiting/headaches; menstrual irregularities; and other side effects). Libido: chances that the respondent's libido/sexual pleasure or that of their spouse would be affected by the use of [method]. Religious Approval: chances of approval by people of the same religion. Obtaining: chances of obtaining [method] when needed. Total costs: sum of expected monetary direct costs and indirect costs (monthly, top-1% winsorized). Waiting time: expected waiting time at the point of service to obtain method (response interval midpoint in minutes). Circled figures correspond to the correlation coefficient between the wife's belief and the husband's corresponding belief (e.g., 0.376 is the Pearson correlation coefficient between the wife's perceived chance of getting pregnant in the next 12 months for a given alternative and the husband's perceived chance of his wife getting pregnant in the next 12 months for the same alternative). This captures both variation between couples for the same alternative as in Figure 5 and variation between alternatives within couples.

libido/sexual pleasure, for which we observe a systematic decrease in spousal beliefs concordance as marriage duration increases.

Differences in Fertility Desires Differences between the beliefs of husbands and wives regarding contraception and fertility outcomes are quantitatively large relative to intra-couple differences in fertility preferences, which have been discussed extensively both in the literature and in the policy debate. As a point of comparison to the correlation coefficients reported in Figure 8, the correlation between husband and wife's desire to have a(nother) child ever is 0.5. Furthermore, there is a 0.43 correlation between husband and wife's fertility desires as measured by a variable equal to: 0 if the spouse wants to have a(nother) child within two years, 1 if the spouse would like to delay pregnancy by at least two years but have another child afterwards, and 2 if the spouse does not want

anymore children. Except for the probability of side effects and expected waiting times, the correlation coefficients between husband's and wife's beliefs are therefore no larger—and sometimes smaller—than the correlation coefficients for measures of fertility preferences.

It is also worth noting the direction of intra-couple disagreement in stated fertility desires. While in 14% of couples he wants another child but she wants to stop, in 6% of couples it is the reverse. The largest category of couples is that where both spouses want to have another child at some point (50%), followed by those where neither spouse wants to have another child (18%). The remaining category (12%) comprises couples in which at least one spouse says that they are unsure or, in rare cases, that the wife cannot get pregnant (although women in this category at the time of listing were excluded from the full survey sample).

2.4 Testing Unrestricted vs. Restricted Pareto Optimality

We test for violations of unrestricted and restricted Pareto optimality using stated preferences data—unlike the data we use to estimate our demand model, which uses actual current contraceptive choice as dependent variable.

To elicit stated preferences, we asked each spouse separately: "If it was only up to you and no one else had a say or an opinion about what you did, please can you tell me which of the following options would be your preferred one right now?" The listed options comprise all the methods the respondent said they had heard of, as well as "using no method at all" and "no preference at all (indifferent between all the above)".[10] When both spouses state the same preference (i.e., both say the same method or both say "using no method at all"), we can test whether they are making efficient choices by comparing what they are currently doing to what they both independently say they would prefer doing. Thirty percent of couples state the same preference. But among those, 30% are not using this alternative, resulting in at least 9% (30% of 30%) of all couples making inefficient choices. Nine percent is a lower bound as here we only account for couples who have the *same* stated preferred alternative but do not use it. There are likely more couples who are making inefficient choices among the majority of couples (70%) who have different preferred alternatives.

As long as there is disagreement in the beliefs of husband and wife, this observed violation of unrestricted Pareto optimality is compatible with the assumption we maintain in the analysis: namely the assumption that, *if* spouses had the same beliefs, then they would make Pareto optimal

[10]When answering this question, respondents could have abstracted not only from the preferences of specific individuals such as their partners but also from those of society in general and co-religionists in particular. However, when estimating individual choice models in which the dependent variable is the stated preferred alternative, the coefficient associated with probability of co-religionists' approval remains positive and statistically significant (see Section A-2). This suggests that respondents did not systematically understand the question as asking them to abstract from the judgment or preferences of society at large.

choices. We therefore test for differences in husbands' and wives' beliefs in the sample of couples who have the same stated preferred alternative but are not using this alternative ("observationally inefficient couples"). We find that husbands and wives who are not making efficient choices have different beliefs (Column 1 of Table 1). If they had the same or at least very similar beliefs, then our restricted Pareto assumption would be difficult to maintain. This is however not the case as the differences in the beliefs of spouses are large (between 0.31 and 1.08 of a standard deviation in the distribution of wives' beliefs).

If we had a large enough sample of spouses with the same beliefs along all dimensions, we could also directly test our restricted Pareto optimality assumption. Under this assumption,[11] spouses with the same beliefs and who state the same preferred option should be using this option. Given the frequent divergence in beliefs within couple, we do not have such a sample. Instead, we can indirectly test the plausibility of our assumption by comparing differences in spousal beliefs among "observationally inefficient couples" (same individual stated preference, not chosen) vs "observationally efficient couples" (same individual stated preference, chosen). Provided the average husband–wife difference in beliefs among couples whose beliefs differ is not smaller in the sample of inefficient couples than in the sample of efficient couples, then restricted Pareto optimality implies that the average husband-wife difference in beliefs should not be smaller in the overall inefficient sample than in the overall efficient sample.[12] This is consistent with the data reported in Table 1. In addition, if at least *some* observationally efficient couples have the same beliefs ($P^E_{\text{NotS}} < 1$), then restricted Pareto optimality implies, as also found in Table 1, that the average husband-wife difference in beliefs is *larger* in the inefficient sample.

3 Model

Subjective expectations data are increasingly popular, as they allow the analyst to resolve the fundamental identification problem of disentangling preferences from expectations in the presence of uncertainty (Manski, 2004). A now standard approach is to incorporate these subjective ex-

[11] This would test the stronger version of the restricted Pareto optimality assumption which also makes the additional assumption that the utility weights are non-negative and add up to one (Footnote 19).

[12] Denote by diff the absolute value of husband-wife differences in beliefs. Let $P^k_S, k = E, I$, be the proportion of couples in sample k who have the same beliefs where E (and I) indicate the sample of couples making observationally efficient (or observationally inefficient) choices. Analogously, let $P^k_{\text{NotS}}, k = E, I$, be the proportion of couples in sample k who do not have the same beliefs. Recalling that we only consider here couples in which both spouses independently state the same preferred alternative, we have: $E(\mathsf{diff}^k) = E(\mathsf{diff}^k_S) \times P^k_S + E(\mathsf{diff}^k_{\text{NotS}}) \times P^k_{\text{NotS}} = E(\mathsf{diff}^k_{\text{NotS}}) \times P^k_{\text{NotS}}$, $k = E, I$, where the second equality follows since $E(\mathsf{diff}^k_S) = 0$ by definition. The restricted Pareto optimality assumption imposes that $P^I_S = 0$ ($\Leftrightarrow P^I_{NotS} = 1 - P^I_S = 1$): couples that share the same beliefs and preferred alternative, choose that alternative. Provided $E(\mathsf{diff}^I_{\text{NotS}}) \geq E(\mathsf{diff}^E_{\text{NotS}})$, this implies $E(\mathsf{diff}^I) = E(\mathsf{diff}^I_{\text{NotS}}) \geq E(\mathsf{diff}^E_{\text{NotS}}) \geq E(\mathsf{diff}^E_{\text{NotS}}) \times P^E_{\text{NotS}} = E(\mathsf{diff}^E)$. The equalities follow from $E(\mathsf{diff}^k) = E(\mathsf{diff}^k_{\text{NotS}}) \times P^k_{\text{NotS}}$, $k = E, I$ (see above). The first inequality follows from the assumption ($E(\mathsf{diff}^I_{\text{NotS}}) \geq E(\mathsf{diff}^E_{\text{NotS}})$) and the second inequality follows from $P^I_{NotS} = 1 \geq P^E_{\text{NotS}}$.

Table 1: Absolute Value of Differences in Beliefs by Observationally Efficient vs Observationally Inefficient

	Inefficient		Efficient		Difference	
	mean	sd	mean	sd		p-value
Diff. P(Pregnancy)	0.26	0.24	0.23	0.20	0.04***	(0.000)
Diff. P(pregnancy after disc.)	0.32	0.26	0.24	0.21	0.09***	(0.000)
Diff. P(side effect)	0.15	0.19	0.12	0.17	0.02***	(0.002)
Diff. P(affect libido/pleasure)	0.18	0.25	0.16	0.21	0.02**	(0.019)
Diff. P(coreligionists approval)	0.40	0.28	0.31	0.25	0.09***	(0.000)
Diff. P(obtain when needed)	0.13	0.20	0.10	0.16	0.04***	(0.000)
Diff. E(total costs)	5.18	15.15	3.52	10.74	1.67***	(0.004)
Diff. E(waiting time)	14.10	31.46	18.49	38.81	-4.39***	(0.008)
N	731		1661		2392	

Note: All subjective probabilities are denoted by $P(\cdot)$ and are expressed out of 1. Subjective expectations regarding average monetary costs and waiting times at the point of service are denoted by $E(\cdot)$. Monetary costs are converted from Nigerian Nairas to US dollars using the exchange rate at the start of data collection. The statistics in this table only use data from couples in which both husband and wife independently state the same preferred alternative. "Inefficient" refers to the subsample of couples who do not use the alternative they both prefer. "Efficient" refers to the subsample of couples who use the alternative they both prefer. T-test p-values are in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

pectations data into a discrete choice model in which individuals choose the alternative associated with the highest utility when taking into account all the expected consequences of choosing each alternative in their choice set. The combination of the choice the individual makes and their beliefs about the consequences of this choice provides information about how much the individual cares about each of the characteristics of each alternative.

When decisions potentially take into account the beliefs of more than one individual, however, an additional problem arises: how to aggregate the beliefs of the different decision-makers?

3.1 Aggregation of Preferences and Subjective Expectations

The aggregation problem. Let alternatives be indexed by m; groups (couples in our case) by c; "outcomes" (e.g., pregnancy within 12 months, experiencing side effects, ...) by j; and monetary costs by C. If the couple is modeled as a single agent, and if—following much prior work modeling choices using subjective expectations (e.g., Delavande, 2008; Zafar, 2013; Giustinelli, 2016; Delavande et al., 2022; Miller et al., 2025)—the utility from each alternative is assumed to be a linear bundle of the SEU associated with each outcome j, then the group's SEU function is given by:

$$\begin{aligned} \text{SEU}_{cm} &= \textstyle\sum_{j=1}^{J} \int u_j(e_j) dP_{cm}(e_j) + \beta_m^\top z_c - \alpha E_c(C_m) + \xi_m + \varepsilon_{cm} \\ &= \textstyle\sum_{j=1}^{J} \Delta u_j \cdot P_{cmj} + \sum_{j=1}^{J} u(e_j = 0) + \beta_m^\top z_c - \alpha E_c(C_m) + \xi_m + \varepsilon_{cm}, \end{aligned}$$

where $\Delta u_j \equiv u_j(e_j = 1) - u_j(e_j = 0)$ denotes the difference in the group's utility between the outcomes "event j happens" $(e_j = 1)$ and "event j does not happen" $(e_j = 0)$.[13] z_c denotes couples' alternative-invariant characteristics, ξ_m captures alternative-specific characteristics unobserved by us but relevant to the couple and ε_{cm} is an idiosyncratic method×couple-specific random component of utility. Note that the terms "alternative" and "method" are used interchangeably to refer to all possible choices, including the "no method" method.

In this additive random utility model (ARUM), the group chooses the alternative m yielding the highest utility, so that the probability of choosing method $\bar{m}$ among the couple's choice set M_c can be written as:[14]

$$
\begin{aligned}
&Pr(\bar{m} \mid z_c, \{P_{cm}(e_j), E_c(C_m)\}_{j\in 1,\ldots,n}^{m\in M_c}, M_c) \\
&= Pr\Bigg(\sum_{j=1}^{J} [\Delta u_j P_{c\bar{m}}(e_j = 1)] + \beta_{\bar{m}}^{\top} z_c - \alpha E_c(C_{\bar{m}}) + \xi_{\bar{m}} + \varepsilon_{c\bar{m}} > \\
&\sum_{j=1}^{J} [\Delta u_j P_{cm}(e_j = 1)] + \beta_m^{\top} z_c - \alpha E_c(C_m) + \xi_m + \varepsilon_{cm}, \forall m \in M_c, m \neq \bar{m} \Bigg).
\end{aligned}
$$

Because individual decision-makers may differ in utility as well as in perceived probabilities, to aggregate the subjective expectations and utilities of individuals to form the group's SEU, we need to make further assumptions.

One natural aggregation scheme would take a weighted average of husband and wife's expected utilities as in unitary or collective models of the household (see, e.g., Browning et al. (2006)). This would imply Pareto efficiency, which may not be desirable under uncertainty when beliefs differ.[15] In addition, as noted in the previous section, in our data at least 9% of all couples appear to make inefficient choices. We thus rely instead on the *restricted* Pareto optimality assumption introduced by Gilboa et al. (2004), which in our context states that *if* spouses had the same beliefs over two choices a and b and both spouses were indifferent between a and b, this would imply that the couple would also be indifferent between a and b. In this case, Gilboa et al. (2004) show that the couple's utility function is a linear aggregation of individual spouses' utility functions and the couple's beliefs are a linear aggregation of individual spouses' beliefs associated with these two choices (see their Theorem 1).

[13] For parsimony, we restrict the disutility of a given event (Δu_j) to be constant across methods. This may not hold if the perceived "severity" of an outcome (e.g., side-effects) varies with method, though the alternative-specific intercepts (ξ_m) would absorb part of such omitted heterogeneity.

[14] Note that the term $\sum_{j=1}^{J} u(e_j = 0)$ cancels out when comparing utilities across any two methods.

[15] As illustrated by Gilboa et al. (2004)'s duel example mentioned in the introduction. Put differently, "voluntary trade based on differences in tastes is commonly accepted as desirable, because tastes cannot be wrong. In contrast, voluntary trade based on incompatible beliefs may indicate that at least one agent entertains mistaken beliefs." (Gilboa et al., 2014).

Applying Gilboa et al. (2004) to our context. The choices in Gilboa et al. (2004) are "acts" in the Savage (1954) sense. In other words, they are a mapping from a given abstract state $s \in S$ to an outcome e on which utility depends, and beliefs are represented by a probability measure over the events in S. Applying these concepts to our context, we can think, for example, of a wife and her husband considering the choice between using no contraceptive method, the pill, or condoms. These are three "acts" or functions mapping states to outcomes ($a(s)$, $b(s)$, and $c(s)$, respectively)—i.e., three assignments whose consequences depend on uncertain states. Assuming for now that the only source of utility is whether the woman gets pregnant in the next year, we have two outcomes: "pregnancy" and "no pregnancy". The states can be interpreted as the complete biological and behavioral circumstances that are both outside the agents' control and relevant to the realization of outcomes.[16] Wife and husband each have beliefs about which state will be realized once the consequences of the acts unfold. The probabilities we elicit and that enter our model (P_{cm}) are directly defined over the outcomes j, e.g.: "pregnancy within 12 months", "side effects", ...—i.e., over the result of applying the "act" or deterministic mapping from state probabilities to outcomes and correspond to von Neumann-Morgenstern (VNM) lotteries.[17]

Additively separable individual utilities. In keeping with prior literature (e.g., Delavande, 2008; Zafar, 2013; Giustinelli, 2016; Delavande et al., 2022; Miller et al., 2025), we view the utility individuals derive from each outcome j (e.g., pregnancy within 12 months, experiencing side effects, ...) as an additively separable part of their utility bundle. This linearity means that the realization of outcome ℓ does not have repercussions for the utility contrast Δu_j for outcome $\ell \neq j$. In this case, assuming that the restricted Pareto condition holds for each outcome,[18] we can apply Gilboa et al. (2004)'s theorem to express the couple's utility from realized event e among the possible realizations of outcome j (e.g., "pregnancy" among possible outcomes pregnancy or no pregnancy) as $u_j(e) = \phi_j^w u_j^w(e) + \phi_j^h u_j^h(e)$ and the couple's "beliefs" that event e will happen under alternative "m" as $P_{cmj}(e) = \omega_j^w P_{mj}^{w_c}(e) + \omega_j^h P_{mj}^{h_c}(e)$.

Couple SEU as a function of husband's and wife's beliefs and preferences. For $k = w, h$, we refer to ϕ_j^k as the spouse's utility weight and to ω_j^k as the spouse's belief weight. Note that Gilboa et al. (2004)'s theorem requires the restricted Pareto optimality assumption but does not impose further restrictions on the values taken by the beliefs weights ω_j^k (or the utility weights ϕ_j^k), other

[16] Concretely, the states of the world could be combinations of the wife's and husband's biological fecundity in the next year, frequency of intercourse, state of contraceptive technology, ...

[17] As discussed in Gilboa et al. (2004), one can easily navigate between lotteries defined on outcomes as in VNM and probabilities defined on S as in Savage when the set of outcomes is finite.

[18] I.e., for each outcome j, if individual spouses have the same beliefs and are indifferent between alternatives a and b, then so is the couple. This implies that, if indifference between a and b holds for all j individually, then it also holds for the overall utility derived from alternatives a and b.

than implying that the ω_j^k add up to one, which allows us to replace ω_j^h with $1-\omega_j^w$ (and ω_C^h with $1-\omega_C^w$ when referring to expected costs).[19]

Still indexing alternatives by m, couples by c, outcomes by j and using ^{w} and ^{h} to denote wives and husbands, respectively, and applying Gilboa et al. (2004)'s theorem to our additively separable individual utility bundles we can write the couple's SEU as follows:

$$
\begin{aligned}
&\sum_{j=1}^{J} \Delta u_j \cdot P_{cmj} + \sum_{j=1}^{J} u(e_j=0) + \beta_m^\top z_c - \alpha E_c(C_m) + \xi_m + \varepsilon_{cm} \\
&= \sum_{j=1}^{J} \left[\underbrace{(\phi_j^w \Delta u_j^w + \phi_j^h \Delta u_j^h)}_{\equiv \Delta u_j} \cdot \underbrace{(\omega_j^w P_{mj}^{w_c} + \omega_j^h P_{mj}^{h_c})}_{\equiv P_{cmj}} \right] + \sum_{j=1}^{J} u(e_j=0) + \beta_m^\top z_c \\
&- \underbrace{\int \left[\phi_C^w a^w x + \phi_C^h a^h x\right] \left[\omega_C^w f_m^{w_c}(x) + \omega_C^h f_m^{h_c}(x)\right] dx}_{\equiv \alpha E_c(C_m)} + \xi_m + \varepsilon_{cm} \\
&= \sum_{j=1}^{J} \left[\boxed{(\phi_j^w \Delta u_j^w + \phi_j^h \Delta u_j^h)} \cdot \omega_j^w P_{mj}^{w_c} + \boxed{(\phi_j^w \Delta u_j^w + \phi_j^h \Delta u_j^h)} \cdot (1-\omega_j^w) P_{mj}^{h_c} \right] + \sum_{j=1}^{J} u(e_j=0) \\
&\quad + \beta_m^\top z_c - \boxed{(\phi_C^w a^w + \phi_C^h a^h)} \cdot \omega_C^w E^{w_c}(C_m) - \boxed{(\phi_C^w a^w + \phi_C^h a^h)} \cdot (1-\omega_C^w) E^{h_c}(C_m) + \xi_m + \varepsilon_{cm},
\end{aligned}
\tag{1}
$$

where $f_m^k(\cdot), k = w_c, h_c$, represents the probability density function for the subjective beliefs each spouse in couple c has on costs for method m (i.e., C_m) and $a^k, k = w, h$ is the (linear) disutility each attaches to monetary costs, and $E^k(C_m), k = h_c, w_c$ is the expected cost by spouse k. The expressions in red can be estimated (through a nested logit model in our case).

Noting that the part of the expressions in red that is highlighted by a box is common to the coefficients associated with each individual's belief, we use our estimates of the coefficients associated with each individual's beliefs to perform three tests: (1) test for equality of beliefs weights between individuals (by testing for equality of coefficients associated with the belief of the husband and that of the wife), (2) test for equality of relative (i.e., wives' relative to husbands') beliefs weights across domains and (3) compare the magnitude of husbands and wives' beliefs weights across different domains. We also report the beliefs weights ω_j^w implied by our estimates, which

[19] Under the additional assumption that the utility weights are non-negative and add up to one (see Gilboa et al. (2004) and related discussion in Harsanyi (1955)), a stronger restricted Pareto optimality assumption can be re-stated as follows: if both spouses had the same beliefs and both spouses preferred alternative a to alternative b, the couple would also prefer a to b. Without this additional assumption, indifference of both spouses implies indifference of the couple, but both individuals (weakly) preferring a over b does not necessarily imply that the couple should prefer a. For instance, with a negative utility weight, we could have a situation in which one spouse with positive utility weight is indifferent between a and b and the other spouse with negative utility weight prefers a to b, while the couple prefers b.

can be computed as $\omega_j^w = \text{belief coefficient}_w / (\text{belief coefficient}_w + \text{belief coefficient}_h)$, provided $(\text{belief coefficient}_w + \text{belief coefficient}_h) \neq 0$.[20]

In our baseline model, we assume constant model coefficients across couples. We relax this assumption in Section 5, in which we allow the coefficients associated with $P_{mj}^{w_c}$, $P_{mj}^{h_c}$, $E^{w_c}(C_m)$ and $E^{h_c}(C_m)$ to vary according to observable characteristics. This allows any of the beliefs weights ω_j^k, utility weights ϕ^k, and preferences (Δu_j^k and α^k) to vary according to these characteristics.

With further assumptions, one could quantify other objects of interest (e.g., disentangle individual preferences for alternative characteristics from utility weights). For instance, one could estimate individual preference parameters by modeling stated individually preferred alternatives as a function of individual beliefs, and then pin down utility weights by assuming the preference parameters to be the same in a model explaining stated and revealed preferred alternatives as in Giustinelli (2016). While potentially informative, this approach requires stronger assumptions. We therefore abstain from pursuing it here to avoid distracting from our main objective of comparing the weights of each spouse's beliefs in the couple's SEU. We refer the interested reader to Appendix Section A-2, where we report estimates from regressing individual stated preferred alternative on individual beliefs and explain how these could be used to identify utility weights and under what assumptions.

3.2 Empirical Specification

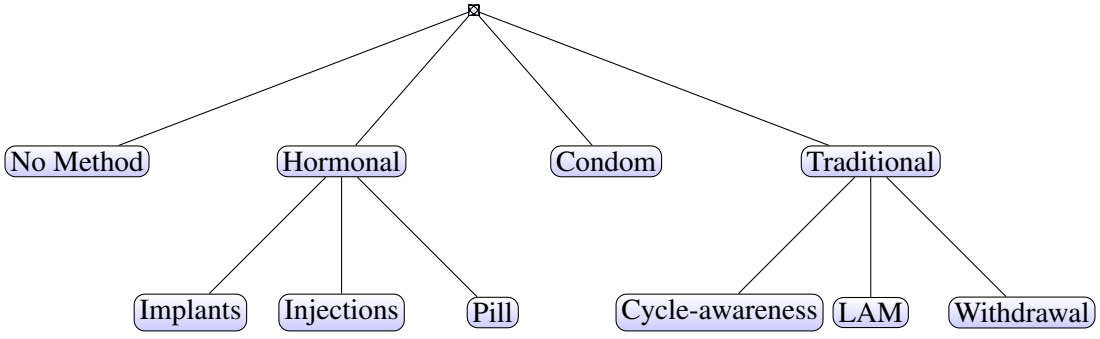
If we assume that the ε_{cm} are independent Type I Extreme Value random variables, then the probability of choosing $\bar{m}$ can be modeled as a conditional logit. A limitation of this model is its implied independence of irrelevant alternatives (IIA): the relative choice probabilities for any two alternatives do not depend on characteristics of other methods. This assumption is unlikely to be satisfied for methods that share many similarities, which is the case for the three hormonal methods and the three traditional methods. We relax the IIA assumption by adopting instead a nested logit, in which women are thought of as choosing between four independent top-level limbs (no method, condoms, traditional methods or hormonal methods) as well as choosing between three bottom-level branches (injections, implants, or the pill) within hormonal methods and three other bottom-level branches (cycle-awareness methods, withdrawal, LAM) within traditional methods, as depicted in Figure 9. Consequently, the random shocks affecting the choice between no method, condoms, traditional methods or hormonal methods are assumed to be independent, but random shocks affecting the choice between different hormonal methods are allowed to be correlated Type I Extreme Value random variables, as are the random shocks affecting the choice between different traditional methods (see Cardell, 1997).

[20] Once we obtain the ω_j^w, we can also recover the couple's utilities highlighted by a box.

In this nested logit model, we estimate (i) the effect of method-invariant variables (z_c) on the choice of broad type of method (no method, condoms, traditional methods or hormonal methods) using the variation between couples in these variables (e.g., education level, desire to limit vs. desire to space fertility, etc.) and (ii) the effect of alternative-specific variables ($P^{w_c}_{mj}$,$P^{h_c}_{mj}$, $E^{w_c}(C_m)$ and $E^{h_c}(C_m)$) using the variation in beliefs within wife (husband) between methods. The logit specification implies that any individual-specific additive "fixed effect" affecting beliefs over a given characteristic of methods (e.g., over a given $e_j = 1$ and/or over $E^k(C_m)$, $k = w,h$) is "factored-out" as long as it applies to all methods.[21] For instance, if a wife (husband) systematically underestimates or understates her (wife's) expected chance of pregnancy irrespective of the method used, this tendency to underestimate expected pregnancy risk could be systematically correlated with the choice of method without leading to bias in our estimates.

We also use our estimates to predict choice probabilities in a number of counterfactual scenarios to illustrate the magnitude of our estimates and compare the implications of changing wives' vs. husbands' beliefs. More specifically, the choice probability for option $\bar{m}$ is given by $Pr(\bar{m}|z_c, \{P^{w_c}_m(e_j), P^{h_c}_m(e_j), E^{w_c}(C_m), E^{h_c}(C_m)\}^{m\in M_c}_{j\in 1,\ldots,J}, M_c) = \frac{\exp(V_{\bar{m}}/\tau(\bar{m}))}{\exp(\text{IV}(\bar{m}))} \frac{\exp(\tau(\bar{m})\text{IV}(\bar{m}))}{\sum_n \exp(\tau_n \text{IV}_n)}$. The variable $V_{\bar{m}}$ denotes $\sum_{j=1}^{J}[(\phi^w_j \Delta u^w_j + \phi^h_j \Delta u^h_j) \cdot \omega^w_j P^{w_c}_{\bar{m}j} + (\phi^w_j \Delta u^w_j + \phi^h_j \Delta u^h_j) \cdot (1-\omega^w_j) P^{h_c}_{\bar{m}j}] + \beta^{\top}_{\bar{m}} z_c - \alpha^w E^{w_c}(C_{\bar{m}}) - \alpha^h E^{h_c}(C_{\bar{m}}) + \xi_{\bar{m}}$. IV_n denotes the "inclusive value" (i.e., expected utility) for nest n and is given by $\ln\left(\sum_{m\in B_n} \exp(V_m/\tau_n)\right)$, where B_n is the set of alternatives in nest n and $1-\tau^2_n$ is the correlation among alternatives in nest n. For limbs with only one alternative (condoms and no method), τ_n is equal to one, whereas the values of τ_n in the hormonal and traditional nests are estimated by the model. The notation $\text{IV}(\bar{m})$ and $\tau(\bar{m})$ correspond to the inclusive value and τ_n for the nest to which alternative $\bar{m}$ belongs.

Figure 9: Alternative Nests



[21] More specifically, denoting $P^{w_c}_{m1}$ the subjective probability that wife w associates with event $e_1 = 1$ when using method m, then adding a wife-specific γ_w to $P^{w_c}_{m1}$ for all methods m is canceled out in pairwise comparisons.

3.3 Belief Formation, Intra-household Decision Process, and Efficiency

Our modeling approach can accommodate a variety of belief formation and intra-household decision processes. Our baseline specification restricts these processes—whatever their nature—to be homogeneous across couples. But it is straightforward to allow these to vary across households with different observable characteristics by interacting the beliefs variables with these observable characteristics. We do so in Section 5, which allows couples with different observable characteristics to have different preferences, utility weights, and/or beliefs weights (without restricting which of these are potentially affected). Here we discuss some specific concerns and their implications in our setting.

Belief Formation. We measure the subjective beliefs of each spouse at one point in time, abstracting from the process through which each spouse has formed these beliefs. Doing so does not, in itself, restrict the way in which beliefs can be formed, and can even allow belief formation processes that lead to inefficient decisions provided these inefficiencies are only realized when the beliefs of spouses differ. For instance, Ashraf et al. (forthcoming) propose a model in which wives, although better informed, cannot credibly communicate to their husbands the fact that maternal mortality risk is high because this information favors the wives' preferred outcome (lower fertility). This leads to inefficient contraceptive decisions. These inefficient decisions can coexist with our restricted Pareto optimality assumption, since the latter only requires efficient decisions when the beliefs of husband and wife align. However, in our baseline model, the coefficients associated with each spouse's beliefs are constant across couples. This homogeneity does partially limit the way in which beliefs can be formed.[22] We relax this assumption when we depart from our baseline model and allow all the coefficients associated with each spouse's beliefs to vary by observable characteristics of the couple (Section 5).

Decision Process. We do not restrict the values of the utility weights or beliefs weights beyond assuming that the spouses' beliefs weights for each characteristic add up to one. This allows the possibility that only the preferences or beliefs of one spouse matter. Again, our baseline model does not allow parameter heterogeneity across couples, but in Section 5 we relax this assumption.

Threat of Violence. Pareto optimality, whether restricted or unrestricted, does not specify the bargaining process through which efficient outcomes are reached. It is therefore possible for the negotiation process to involve a degree of coercion, including threat of violence, without it invalidating our approach. In addition, we do not impose that utility weights are positive—so that

[22] For instance, it does not allow the process to differ depending on spousal differences in desired fertility.

we do not rule out situations in which husbands have no regard for the well-being of wives, for instance, which would result in a weight of zero on wives' utility. On the other hand, intimate partner violence (IPV) may also indicate that spouses are both achieving lower utility than they would if they cooperated, which would be a Pareto inefficient outcome. We did not collect data about *realized* IPV. Instead, we elicited the wife's beliefs about the risk that her husband would take actions to punish her for using contraception if she knew he did not want her to and did it anyway. We construct a principal component (PC) index based on eight questions about the wife's expected chance out of 20 (beans) that, if she used contraception against his will and he found out, her husband would: divorce her, get another wife, humiliate her, insult her, push/shake her, slap her, twist her arm/pull her hair, punch her/hit her with something. Throughout the analysis, we allow for choices between types of contraception (none, condoms, hormonal methods, and traditional methods) to depend on this "retaliation threat index". In addition, in Section 5 we estimate a variant of the model in which we allow spouses to have different logit coefficients (and hence any or all of: different utility weights, different beliefs weights and different preferences) according to whether the wife perceives a risk of retaliation above or below median.

4 Results

4.1 Main Estimates

For readability, we report the main model's (Equation 1) estimates in two tables. Table 2 reports the coefficients associated with the wives' and husbands' beliefs side by side. And Table 3 reports the coefficients associated with the alternative-invariant regressors, which capture the effect of the couple's characteristics on the probability of using an alternative in a given nest relative to using one in the hormonal methods nest. We restrict those coefficients to be homogeneous within nests and normalize the coefficient on hormonal methods to be zero since only differences in nest-specific coefficients on alternative-invariant variables are identified (see, e.g., Train, 2009). In addition, the model includes alternative-specific constants (with the intercept on "no method" normalized to zero) and returns estimates of τ_n, where $1-\tau_n^2$ is the correlation among alternatives in nest n, which are reported in Table A6.

We first note that the results reported in Table 2 make sense. Indeed, we find that couples are significantly less likely to choose an alternative that they believe to come with a higher chance of pregnancy, as would be expected given our survey eligibility criteria, less likely to choose alternatives associated with a higher perceived chance of side effects, more likely to choose methods that are expected to have a more reliable supply, less likely to choose alternatives that are expected to be more expensive to use, more likely to choose methods that are associated with a higher chance

of pregnancy *after discontinuation*, and that are perceived as having a higher chance of approval by people of the same religion. Second, we remark that, although we do not restrict the structural parameters in any way other than assuming that beliefs weights add up to one—e.g., we do not impose that the ω^w and ω^h are positive—whenever either the wife's belief or the husband's belief has a statistically significant coefficient, they have the same sign, which is consistent with both beliefs weights being positive. The only exceptions are the coefficients associated with expected waiting time at the point of service, which are marginally significant and very small in magnitude for the wife's, but insignificant and even smaller in magnitude for the husband's.

Test for equality of beliefs weights between husbands and wives. We reject the joint null hypothesis of equality of coefficients (e.g., $(\phi_j^w \Delta u_j^w + \phi_j^h \Delta u_j^h)\omega_j^k, k = w,h$) between husbands and wives across all outcomes (i.e., $j =$ pregnancy, side effects, etc.) with a p-value of 0.0001. Hence, under our restricted Pareto optimality assumption we reject the hypothesis of equality of beliefs weights between husbands and wives.

Test for equality of relative beliefs weights across outcomes. We also reject the joint null hypothesis of equality across all the ratios of wives' coefficients to husbands' coefficients with p-value 0.0175. Under our restricted Pareto optimality assumption this is equivalent to rejecting the hypothesis of equal relative beliefs weights between husbands and wives for all beliefs since $\left[(\phi_j^w \Delta u_j^w + \phi_j^h \Delta u_j^h)\omega_j^w\right] / \left[(\phi_j^w \Delta u_j^w + \phi_j^h \Delta u_j^h)\omega_j^h\right] = \omega_j^w / \omega_j^h$, for $j =$ pregnancy, side effects, etc..

Comparing the magnitude of husbands and wives' beliefs weights across different domains. The estimates for the coefficients associated with the wife's beliefs regarding the probability of pregnancy while using the alternative and the chance of side effects are larger in magnitude than the corresponding estimates for the husband's beliefs. Recall that the ratio of coefficients corresponding to the wives and the husbands' beliefs equals the ratio of beliefs weights implied by actual choices under the restricted Pareto optimality assumption (Equation 1). Since the sum of beliefs weights is assumed to be equal to 1, the wife's beliefs weights can be computed by dividing the coefficient associated with the wife's beliefs by the sum of the coefficients associated with the wife's and husband's beliefs (provided the latter is different from zero). Applying this logic to the results reported in Table 2, we first find that couples put a larger weight on the beliefs of wives than husbands regarding contraceptive technology (efficacy and side effects). The same holds true for features of alternatives that relate to the functioning of family health services (expected costs, probability of obtaining the method when needed). On the other hand, for less tangible outcomes such as those relating to the ability to conceive after discontinuation and to social norms (specifically, approval by people of the same religion), the couple choices reveal that they put a higher weight

on the beliefs of the husband. We can formally reject the null of joint equality of wives' and husbands' beliefs coefficients (and hence weights) for these two less tangible outcomes (p-value of a two-sided joint Wald test is 0.020). We can also reject the null of equality of wives' and husbands' beliefs coefficients for the three outcomes related to the health system (p-value: 0.0001). When testing the joint null hypothesis of equality of coefficients for contraceptive technology (pregnancy risk while using, side effects, effect on libido/sexual pleasure), we cannot reject the null of equality (p-value: 0.557) despite weights on wives' beliefs being larger than 50% where coefficients are statistically significant (57% and 56% for risks of pregnancy and side effects, respectively).

Table 2: Baseline Model: Coefficients Associated with Wives' and Husbands' Beliefs

Wives' Beliefs Coefficients (W) $\boxed{(\phi_j^w \Delta u_j^w + \phi_j^h \Delta u_j^h)} \cdot \omega_j^w$		**Husbands' Beliefs Coefficients (H)** $\boxed{(\phi_j^w \Delta u_j^w + \phi_j^h \Delta u_j^h)} \cdot (1-\omega_j^w)$		**Implied** ω_j^w
	Chosen Alternative		Chosen Alternative	
Contraception Technology		**Contraception Technology**		
Wife's P(pregnancy)	-0.086***	Husband's P(pregnancy)	-0.065***	0.57
	(0.013)		(0.014)	
Wife's P(side effect)	-0.060***	Husband's P(side effect)	-0.046***	0.56
	(0.015)		(0.017)	
Wife's P(affect libido/pleasure)	0.006	Husband's P(affect libido/pleasure)	-0.013	
	(0.014)		(0.017)	
Health Services		**Health Services**		
Wife's P(obtain when needed)	0.134***	Husband's P(obtain when needed)	0.042**	0.76
	(0.022)		(0.017)	
Wife's E(total costs)	-0.032***	Husband's E(total costs)	-0.006	0.85
	(0.006)		(0.005)	
Wife's E(waiting time)	0.004*	Husband's E(waiting time)	-0.001	
	(0.002)		(0.001)	
Intangible Outcomes		**Intangible Outcomes**		
Wife's P(pregnancy after disc.)	0.022	Husband's P(pregnancy after disc.)	0.043***	0.34
	(0.014)		(0.016)	
Wife's P(coreligionists approval)	0.012	Husband's P(coreligionists approval)	0.043***	0.21
	(0.008)		(0.009)	
Alternatives	9336	Alternatives	9336	
Couples	1726	Couples	1726	

Notes: This table reports baseline estimates for wives and husbands' beliefs coefficients. All estimates in this table and in Table 3 come from a single regression despite being presented separately for readability. See Column 1 of Appendix Table A6 for the full regression output. The implied weight ω_j^w is computed as $\omega_j^w = \frac{W}{W+H}$, provided a Wald test rejects the null that $W+H=0$. This is the case for all outcomes j (with p-values below 0.005) except for "P(affect libido/pleasure)" (p-value: 0.749) and "E(waiting time)" (p-value: 0.287). Standard errors clustered at the couple's level are in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

From the results in Table 3, we see that the age and education level of the wife have little effect on the probability of using one type of alternative over another. But we find that couples in urban areas are less likely to use traditional methods relative to hormonal methods, holding all else constant. In addition, women who have more children and women who have had a recent birth (namely, since the screening interview) are less likely to use condoms relative to hormonal methods. Muslim couples are less likely to use condoms and traditional methods relative to hormonal

methods, while there is no systematic difference between monogamous and polygynous couples. Women who have not done any work in the previous 12 months are more likely to use no contraception. Turning now to stated fertility desires, when the wife wants to delay (i.e., postpone beyond the next two years, but still have another child), the couple is more likely to use condoms and traditional methods relative to hormonal methods, but the couple is only less likely to use no method relative to using a hormonal method when the wife wants no more children. The husband's desire to restrict fertility, on the other hand, is associated with a large and significant reduction in non-use, whether the husband wants to stop having children with the wife or simply postpone pregnancy, but the husband's fertility desires do not significantly impact the choice between types of methods.

Table 3: Baseline Model: Coefficients Associated with Alternative-Invariant Variables

	No Method	Condoms	Traditional		No Method	Condoms	Traditional
Wife: 25-29	-0.488	-0.344	-0.696*	Muslim	-0.271	-1.118***	-0.704**
	(0.321)	(0.653)	(0.419)		(0.198)	(0.349)	(0.332)
Wife: 30-34	-0.064	0.302	-0.623	Polygynous	-0.047	-0.227	-0.134
	(0.315)	(0.625)	(0.418)		(0.210)	(0.442)	(0.360)
Wife: 35-39	-0.276	-0.178	-0.570	=1 if Second wife	-0.130	0.810	0.156
	(0.341)	(0.683)	(0.453)		(0.331)	(0.704)	(0.539)
Wife: 40-45	-0.097	-0.592	0.022	=1 if no work	0.982***	0.495	-0.338
	(0.358)	(0.774)	(0.480)		(0.246)	(0.607)	(0.418)
Wife: Primary	-0.212	-0.166	-0.215	=1 if work in past 12 months	0.204	0.600	0.543
	(0.243)	(0.567)	(0.411)	(but not now)	(0.441)	(0.639)	(0.468)
Wife: Secondary	-0.205	-0.652	0.319	=1 if says husband does not work	-0.822	1.117	0.273
	(0.237)	(0.535)	(0.369)		(0.632)	(1.070)	(0.850)
Wife: Tertiary	-0.158	-0.759	0.382	=1 if says husband worked	-0.008	0.450	0.717
	(0.297)	(0.642)	(0.431)	in past 12 months (but not now)	(0.729)	(1.171)	(1.321)
Urban	0.228	0.038	-0.600**	Wife empowerment index	0.056	0.059	-0.184
	(0.175)	(0.322)	(0.267)		(0.093)	(0.186)	(0.128)
Wife: Delay	-0.168	0.931**	1.015***	Husband: Delay	-0.413**	-0.006	-0.489
	(0.208)	(0.439)	(0.340)		(0.200)	(0.419)	(0.298)
Wife: No more	-0.523**	0.676	0.149	Husband: No more	-1.039***	-0.653	-0.474
	(0.226)	(0.546)	(0.359)		(0.229)	(0.542)	(0.322)
Wife: Number of children	-0.038	-0.208*	0.088	Retaliation risk index	0.002	-0.001	-0.172
	(0.043)	(0.110)	(0.061)		(0.093)	(0.152)	(0.178)
=1 if recent birth	0.331	-1.630***	0.007	Alternatives	9336		
	(0.231)	(0.613)	(0.352)	Couples	1726		

Note: All estimates in this table and in Table 2 come from a single regression despite being presented separately for readability. Standard errors clustered at the couple's level in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Interestingly, our "retaliation risk index" has no effect on the decision to use contraception or to use a more concealable (i.e., hormonal) method. This index measures the extent to which the wife would hypothetically expect her husband to take actions to punish her for using contraception if she knew he did not want her to, but she used contraception anyway and he found out (divorce her, get another wife, humiliate her, insult her, push/shake her, slap her, twist her arm/pull her hair, punch her/hit her with something). Finding that this retaliation index has no effect on decisions tends to suggest that whatever bargaining process is taking place within the household when it comes to contraceptive decisions, it is generally not an antagonistic one in which the threat of

violence forces wives to accept less preferred outcomes.

4.2 Robustness Checks

Alternative Choice Sets and Priors. Our baseline specification uses the union of the spouses' method awareness sets to form the couple's choice set. When one spouse has heard of a method but the other has not, we do not have data on the beliefs of the second spouse for this method. We set the beliefs of the spouse who does not know the method to zero and control throughout for two indicators, each equal to one if the wife (husband) does not know the method, and zero otherwise. In Column (2) of Table A6, we keep the same approach except that we set the beliefs of the spouse who does not know the method to different priors. Namely, we set the uninformed wife's (husband's) beliefs to 50% for probabilities and to the median belief among wives (husbands) who know of the method for expected monetary costs and waiting times. In Column (3), we instead define the couple's choice set as the intersection of the spouses' awareness sets, and hence do not need to assume any priors. Estimates do not vary much between our baseline specification (column (1)) and either of the alternative approaches in columns (2) and (3), except for the fact that standard errors are larger when we restrict the choice set (and hence the number of observations) to methods known by both spouses.

Imputation of Missing Values. In Table A6 Column (4) we depart from our baseline specification by imputing missing values for couples who have at least two alternatives in their choice set but have at least one missing value for the variables included in the model. Imputation is done by setting the value of the missing variable to zero and including one missing value binary indicator for each variable entering the model. Other than for the smaller standard errors due to using a larger sample, the results are largely unchanged relative to our baseline estimates which only include couples with complete data.

Excluding Polygynous Couples. In the main analysis, we include all couples irrespective of whether the husband has another wife, which is the case of 30% of couples in our main analytical sample. To assess whether we should expect strong strategic interactions between contraceptive decisions of different co-wives (Rossi, 2019), we asked women in polygynous unions to: "Imagine that [her] co-wife had two more children in the next two years, would this change [her] mind about not having another child soon/not having any more children (as applicable)?" Only 3% of women who said they did not want to have any more children said that this would make them want to have another child. Among women who said they wanted to have another child, but wait for at least two years, 6% said that it would make them want to not have children anymore

and 35% said that it would make them want to have another child soon. These responses, while self-reported, suggest that, in our sample, the fertility behavior of co-wives is unlikely to reverse the fertility preferences of women with strong fertility preferences, but that strategic considerations may influence more marginal decisions such as timing. In Table A6 Column (5), we present results excluding polygynous couples and show that our conclusions are not sensitive to the exclusion of these couples.

Dependent Variable Based on Husbands' Survey. The dependent variable in our main estimates is based on the contraceptive use information we obtain from the wife. This is because we assume that she knows best.[23] In Column (6) of Table A6, the dependent variable is based instead on the husbands' reported use. Estimates are broadly consistent with our baseline model, but we obtain a few counterintuitively signed coefficients, as could be expected in the presence of misclassification error. For instance, couples appear significantly more likely to choose methods which the wife expects to be more expensive and that the husband thinks are more likely to affect the libido or sexual pleasure of either spouse.

4.3 Counterfactuals and Policy Implications

To illustrate the magnitude of our estimates and compare the effect of updating the beliefs of wives vs. updating those of husbands across different domains, we report the predicted effect on contraceptive choices in a series of counterfactual scenarios (Figure 10). These counterfactuals are not claimed to be realistic interventions; they simply serve the purpose of illustrating the quantitative importance of different types of barriers and the predicted differences in targeting husbands vs wives. Recall that wives and husbands have similar beliefs (overall, but not within couples). Therefore, our counterfactual experiments "shocking" the beliefs of wives vs. those of husbands lead to effects that are largely proportional to the beliefs weights we report in Table 2—i.e., a larger impact on choices in scenarios where we shock the beliefs of wives (husbands) if we estimate an ω^w above (below) 0.5.[24]

Contraceptive Technology. In the first of these counterfactual scenarios, we remove all potential barriers to contraceptive use that relate to contraceptive technology. Namely, we set the probability of side effects to zero and the probability of interference with libido/sexual pleasure to zero, for all methods. In addition, we set all pregnancy probabilities to the reference rates found in WHO

[23] In 7.8% of couples, the husband says that they are not using a method but the wife says she is. This may reflect covert use or simply a lag in information transmission or limited attention from the husband.

[24] Note also that the choice set varies across couples. Therefore, the predicted effects on the probability of choosing each alternative, conditional on having the alternative in one's choice set, do not add up to 1. All couples have the "No Method" option in their choice set, however, and therefore the predicted effects on non-use apply to the whole sample.

publications. In Panel A1, we do so for wives, and in Panel A2, we do so for husbands. In line with our previous findings, we predict a decrease in the share of couples using no method at all by 11.9 (8.9) percentage points (pp) when recalibrating the beliefs of wives (husbands).

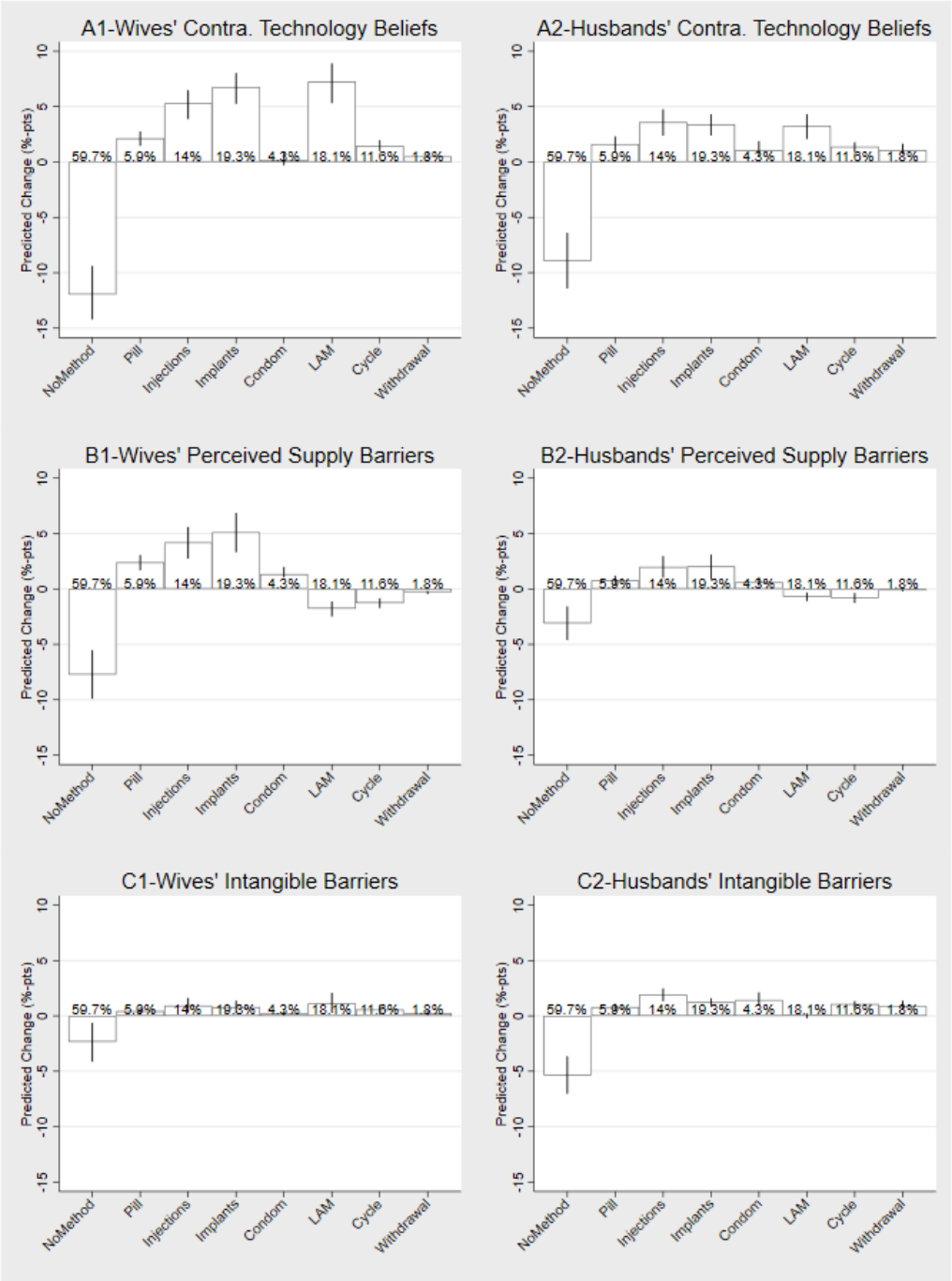
Removing Supply Barriers. In a second experiment (Panels B1 and B2), we remove all supply-side barriers. More specifically, we perform the thought experiment of setting all monetary costs and waiting times to zero, and setting the probability of being able to obtain all modern methods when needed to 100%. It would require both a huge programmatic effort to achieve these supply-side goals and for individuals to fully update their beliefs accordingly. It is therefore not intended as a realistic intervention but rather as an upper bound. In this scenario, our estimates predict a 7.7pp (3.1pp) decrease in non-use when changing the beliefs of wives (husbands) only.

Removing Intangible Barriers. Finally, in the bottom two figures, we estimate the impact of removing intangible barriers. Namely, we set the chance of managing to get pregnant in the future (within 12 months of discontinuation) to the reference WHO rate for probability of pregnancy absent contraception over a period of 12 months (85%) and set the probability of approval by people of the same religion to 100%, for all methods. Again, this hypothetical scenario is not a realistic one, but it serves as an upper bound of what results could be achieved by shifting these barriers. In this scenario, we predict a reduction in non-use by 2.3pp (5.3pp) when we target the beliefs of wives (husbands).

Policy Implications. In the absence of information spillovers from one spouse to the other, the immediate implication of the above counterfactuals is that interventions addressing misconceptions regarding contraceptive efficacy or availability would be best targeted at women, but interventions aiming to relax misconceptions regarding social norms or dispelling myths about long-term fertility may be more effectively targeted at men.

Information Spillovers Between Spouses. Our model is agnostic about how the beliefs of each spouse are formed, and hence we do not model belief formation. If there is asymmetrical pass-through between spouses' beliefs, then information spillovers could either reverse or reinforce our conclusions regarding which spouse to target by domain.

It is possible to test for the sensitivity of counterfactual comparisons to asymmetrical information spillovers, as we now illustrate. In figure A13, we report the predicted effect on non-use of a series of counterfactual exercises in which we consider an information intervention targeting either wives only (dark grey bars) or husbands only (light grey bars), and which fully updates the beliefs of the targeted individuals regarding pregnancy risk absent contraception to match the



Notes: The percentages indicate the predicted probability of use at baseline, for couples who have the method in their choice set. The choice set varies across couples. Therefore, the predicted effects on the probability of choosing each alternative, which apply conditional on having the alternative in one's choice set, do not add up to 1. All couples have the "No Method" option in their choice set, however, and therefore the predicted effects on non-use apply to the whole sample. Confidence intervals based on 1,000 draws of model parameters from a multivariate normal distribution with mean equal to the value of the estimates from our baseline model and variance equal to the variance of these estimates. See Section 4.3 for details of each scenario.

Figure 10: Counterfactual Experiments

WHO reference rate of 85%. In addition, we consider alternative scenarios in which this targeted information intervention *also* partially updates the beliefs of the other spouse to be closer to 85% by either 25%, 50% or 75% of the gap between the other spouse's beliefs and the 85% reference rate. This exercise illustrates that, if the pass-through from wives' information to husbands' beliefs is sufficiently weaker than the reverse, then an intervention aimed at correcting beliefs about pregnancy risk might be more effective if targeted at husbands than wives despite wives' beliefs carrying a larger weight on couples' decisions than the beliefs of the husbands. With no information spillover, the predicted impact of targeting husbands' beliefs is only about two-thirds as large as that of targeting wives' beliefs. If we assume no spillover at all when wives receive the information while assuming a 25% spillover when husbands receive the information, then it would still be relatively more impactful to target wives, but only marginally. But with a much larger difference in spillovers—e.g., 0 when targeting wives and 50% when targeting husbands—it would become more effective to target husbands despite wives' beliefs carrying a higher weight.[25]

But it is hard to think of reasons why asymmetrical spillovers would run contrary to relative beliefs weights. For this to be the case, wives would need to be seen as more persuasive in a certain domain when it comes to making decisions, but much less persuasive when transmitting external information about the same domain. If anything, we would expect any asymmetrical spillovers to go in the same direction as relative beliefs weights, which would reinforce our conclusions regarding optimal targeting based on no spillovers. For instance, assuming zero information spillovers when targeting husbands and 50% when targeting wives, the impact of targeting wives would be twice as large as that of targeting husbands (as can be seen by comparing the second and fifth bars in figure A13).

5 Heterogeneity by Observable Characteristics

We next consider, in turn, whether the model parameters—and hence implied beliefs weights—are heterogeneous alongside splits of the sample that are likely to align with differences in preferences, bargaining power, and/or perceived expertise. We consider heterogeneity by: inter-spouse differences in fertility desires (separately for cases where the husband (wife) has a strictly stronger fertility desire than their spouse); inter-spouse differences in education levels (separately for cases where the husband (wife) has strictly more formal education); whether the wife does not have a son yet; whether the couple is Muslim or not; and whether the wife expects a below- or above-median risk of retaliation in case of contraceptive use against her husband's wishes.

Table A7 (A8) reports estimates obtained when allowing coefficients associated with subjective

[25]Note that a given spillover in the *other* spouse's beliefs has a larger predicted impact on non-use for husbands than wives. This is because the wives' beliefs weight is larger in magnitude than that of husbands for pregnancy risk.

expectations to vary according to whether or not the husband (wife) has *strictly* higher desired fertility (so the difference between the two tables is the way we classify couples where both spouses have the same desired fertility). More specifically, we define husbands as having strictly higher desired fertility than their wife if, when classifying wives and husbands as "wanting no more children", "wanting a(nother) child but after two years" or "neither" based on their individually stated preferences, the husband wants children earlier or wants more children than the wife. Importantly, we elicited the husband's preferences for fertility with the index wife, even when he had another wife. The husband (wife) has strictly higher fertility preferences in 25.6% (17.7%) of couples in the estimation sample. When the husband does not have strictly stronger fertility preferences than his wife, results are in line with the overall sample findings of Section 4.1. For the sample of couples in which husbands have strictly higher fertility preferences than their wives, then results are largely in line with the baseline model except that the relative weight the couple puts on husbands' perceived chances of fecundity after discontinuation is much larger ($0.08/0.007$ in this sub-sample instead of $0.038/0.026$ in the sample of couples in which the husband does not have strictly higher fertility preferences, and $0.043/0.022$ overall).

Table A8 reports estimates obtained when allowing coefficients associated with subjective expectations to vary according to whether or not the *wife* has *strictly* higher desired fertility.[26] In the sub-sample in which wives do not have higher fertility preferences than their husband, results align with what we find for the entire sample (Section 4.1). In the small sub-sample in which wives have higher fertility preferences, estimates are less precise, but overall in line with prior conclusions except that, in this case, the couple no longer puts more weight on the beliefs of the husband regarding future fecundity. E.g., it could be that the husband does not try as hard to make the couple avoid methods which he thinks may affect long-term fecundity.

For the sub-sample in which husbands do not have a strictly higher education level than their wife, our qualitative conclusions are unchanged (Table A9). In the sample in which husbands have a *strictly* higher education level than their wives, our main qualitative conclusions go through except that: (1) the perceived chance of future pregnancy and side effects by either spouse do not influence the choice of alternative anymore and (2) these couples are less likely to use methods which the husband specifically believes are more detrimental to the libido and sexual pleasure of either spouse.

When wives do not have a *strictly* higher education level than their husband, then our conclusions are similar to those in the overall sample (Table A10). In the small sub-sample (10%) in which wives have a strictly higher education level than their husband, however, only coefficients

[26] We define wives as having higher desired fertility than their husband if, when classifying wives and husbands as "wanting no more children", "wanting a(nother) child but after two years" or "neither" based on their individually stated preferences, the wife wants children earlier or wants more children than the husband.

associated with the wives' beliefs are statistically significantly different from zero, including for the probability of co-religionists approval. This suggests that the husband's perceived "expertise" in intangible domains such as religious approval can be reversed when the wife has an educational advantage.

While son preference does not manifest itself as "missing women" at or around birth in Sub-Saharan Africa, having a son has been shown to positively impact women's family structure (e.g., lower divorce rates) and decrease subsequent fertility in patrilineal Sub-Saharan Africa in general (Genicot and Hernandez-de Benito, 2025) and Nigeria in particular (Milazzo, 2014). For the (small) sub-sample of women who do not have a son yet (278, or 16% of the analytical sample), the beliefs of the husband tend to have more weight relative to the wife's than in the rest of the sample (Table A11). This would be consistent with the idea that women whose reproductive "success" is questioned are less likely to assert their knowledge in this area.

Next, we compare beliefs weights between Muslim and non-Muslim couples (Table A12). We have no strong prior about the direction of these differences, but we expect there to be potential differences in preferences, bargaining power or relative spousal expertise both for cultural reasons and due to differences in living standards across predominantly Muslim and predominantly Christian areas. Overall, there are some differences in estimates between Muslim and non-Muslim couples suggesting somewhat less gender-specialized expertise among Muslim couples. For instance, the beliefs of Muslim husbands regarding side effects and the chance of obtaining the method when needed have more relative weight in the couple's decision than in non-Muslim couples, while husband's beliefs still have less weight than wives' for pregnancy risks and expected monetary costs.

Finally, we compare beliefs weights between couples in which the wife has a below-median vs above-median perceived chance of retaliation if she used contraception against her husband's will (Table A13). One may expect that, in couples where the husband is more likely to punish his wife for acting against his will, wives may be more submissive/less assertive and hence their beliefs have less influence on the couple's decisions—which would translate into smaller coefficients on their beliefs relative to those of their husband. Note that this is distinct from the idea that the couple may put more weight on the husband's *utility* in these couples. The latter is also possible but recall that a larger ϕ_j^h would appear in both spouses' beliefs coefficients. Turning to the results in Table A13, we note that, for couples in which the wife has below-median perceived risk of retaliation, the husbands' beliefs carry little weight in the decision overall, and when they do carry significant weight, we conclude, as in the full sample analysis, that wives' beliefs matter more (less) than husbands' when it comes to beliefs about contraception technology and the health system (co-religionists' approval). For couples in which the wife has above-median perceived risk of retaliation, husbands' beliefs matter significantly in most areas, and relative beliefs weights of husbands and wives are also in line with our domain-specific conclusions for the full sample

analysis. One notable qualitative difference in findings between sub-samples is that, for the below-median (above-median) retaliation threat sub-sample, couples are significantly less (*more*) likely to adopt methods which the wife believes may "affect [her] libido/sexual pleasure or that of [her] husband".

6 Conclusion

Many important decisions are taken as a group. Recent progress in the collection and analysis of subjective expectations data has greatly improved our understanding of decision-making under uncertainty, which accounts for much of decision-making.

Very little is known, however, about the extent to which the subjective expectations of joint decision-makers align, and where there are discrepancies in beliefs, about the relative weight the group puts on the beliefs of each group member. Drawing on theoretical insights from Gilboa et al. (2004), we devise a structural test to answer this question within the discipline of a subjective expected utility framework, under the assumption that choices are not necessarily efficient but that, if individuals had the same beliefs, then group choices would be efficient.

We focus on one highly consequential decision taken by couples, namely whether to use contraception or not, and if so, which method to use. Using primary data from five different states in Nigeria covering varied socio-economic and cultural areas, we first document important discrepancies in the subjective expectations of husbands and wives. We then show that the subjective expectations of spouses contribute to explaining actual contraceptive choices. Finally, applying our new approach to estimating each spouse's beliefs weights, we conclude that, in general, couples do not put equal weight on the subjective expectations of husband and wife. Instead, in most sub-samples they appear to put more weight on her beliefs in areas that are often seen as "women's business", namely contraceptive technology and the family planning healthcare system. But for less tangible domains such as religious approval and potential long-term consequences on fecundity, couples generally put more weight on the beliefs of the husband. This suggests that the optimal targeting of information interventions to wives vs. husbands is domain-specific.

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7 Appendix—For Online Publication Only

A-1 Survey Details

A-1.1 Selection of Study Areas and Screening

To cover a diverse population in terms of variables that are likely to matter for contraceptive use decisions, we first selected five states based on their level of unmet need for family planning among married women as of the Nigeria Demographic and Health Survey (DHS) 2018 and population size. Namely, in each DHS unmet need prevalence category from moderate (16-20%) to very high (26-30%), we selected the most populous state and, among the highest prevalence category (31-35%), we selected the two most populous states (see Figure 7.9 in National Population Commission (NPC) [Nigeria] and ICF (2019)). In each of the five selected states (Akwa Ibom, Bauchi, Borno, Kano, and Oyo), 80 enumeration areas (EAs) were randomly selected using probability weights based on their predicted population. The EAs sampling frame and predicted EA population are those used by the National Population Commission, which administered the survey on our behalf, for the 2023 Population and Housing Census of the Federal Republic of Nigeria.

In these 400 enumeration areas, fieldwork found a total of 17,130 households. All consenting households were screened for the presence of cohabiting women aged between 18 and 44 who were either in a monogamous union or had at most one co-wife. A short screening survey was then administered to all consenting women meeting these criteria to ascertain eligibility for the full survey. The screening survey data were then analyzed by the authors to determine eligibility for the full survey we report on in this article.

A-1.2 Eligibility for Expectations Survey

Based on the screening interviews, we retained women at risk of unwanted or mistimed pregnancies by excluding women who, at the time of screening, wanted to have a(nother) pregnancy within two years, women whose partners lived away and did not return at least once a month, and women reporting infecundity. All women meeting these criteria were invited for a full interview during the main survey phase (about 4 months after the screening interviews), and consenting women were interviewed in full provided they were still cohabiting and were not pregnant. In addition, we invited for full interview all women who, at the time of the screening interview, were pregnant and therefore were not asked whether they wanted to get pregnant within the next two years. If they were no longer pregnant when recontacted for the main survey phase and consented to be interviewed, they were also interviewed for the main survey.

The sample of husbands (*de jure* or *de facto*) of female respondents was drawn from hus-

bands whose wife responded "no" when asked, during the screening interview: "In the past twelve months, has your husband/partner been away from home for more than one month at a time?" Namely, a 50% random sample of monogamous husbands and all polygynous husbands were invited for interview and interviewed provided they could be located after three visits, were deemed fit to be interviewed, and gave their informed consent.

A-1.3 Analytical Sample and Full List of Variables

Our final survey sample includes 2,737 matched couples. Among the matched couples, for the present paper we retain those who have at least two choices in their choice set, i.e., "no method" and at least one method known among the options we model, namely: implants, injections, contraceptive pills, male condom, lactational amenorrhea method (LAM), cycle-awareness methods, withdrawal. For LAM, we only include this method in the couple's choice set if the wife has had a baby in the previous 6 months. From these 2,571 couples we further restrict the sample to couples who are using one of the eight alternatives we model, resulting in 2,539 couples.

Our main analytical sample comprises 1,726 couples. This is the sample for which there are no missing answers to any of the variables and any of the alternatives used in the baseline estimation. In Table A2, we report the average share of missing values overall across individuals, for each belief, and for each alternative. The response rate is high. Seventy-eight percent of wives and 85 percent of husbands responded to all the relevant questions. For each belief individually, non-response rates are also reasonably low, as they vary between less than 1% and 7.9% (expected costs, as perceived by wives).

The following set of alternative-invariant variables is included in all regressions: age of the wife, highest education level completed by the wife, urban residence, wife's and husband's desire to delay or limit fertility (i.e., whether to have another child after two years or not, and whether to have another child at all, with the omitted category corresponding overwhelmingly (88% of cases) to wanting to get pregnant again within less than two years), the wife's number of children currently alive, whether Muslim, whether the wife has a co-wife, and whether she is the second wife, wife's work status (no work in the past 12 months and whether she did some work in the past 12 months but has not worked in the last 7 days, with the excluded and most common category being having done some work in the previous 7 days), husband's work status (same categories as for wife's work status), empowerment index (total number of "empowered" answers to questions about: opinion listened to when the household buys an expensive item, not having to ask permission to buy clothing, being allowed to buy things in the market without asking for permission, who usually makes decisions about own health care, and who decides or would decide how to spend cash she earned), an indicator equal to zero if the wife stated she wanted to delay or limit pregnancy

during the household listing (prior to the beliefs survey) and equal to one if she was pregnant at the time of listing and therefore was not asked about her desire to get pregnant, a Principal Component Analysis (PCA) index based on answers to eight questions about the probability that, if the wife used contraception knowing that her husband did not want her to, he would do the following: get an additional wife, divorce her, or do each of 6 different types of psychological or physical intimate partner violence of varying intensities.

The set of alternative-specific variables (two variables per outcome, one for the wife and one for the husband) comprises: probability of pregnancy in the next 12 months under this alternative; probability of managing to get pregnant in the next 12 months *following the discontinuation* of the alternative if both spouses wanted the wife to get pregnant (for the no method alternative, the question is asked about the next 12 months, if using no method at all and if both spouses wanted her to get pregnant); probability of the wife experiencing three types of side effects: nausea/vomiting/headaches, menstrual irregularities, other side effects, each asked about separately and then averaged over any non-missing answer for each of the three types of side-effects; probability that the respondent's libido/sexual pleasure or that of their husband/wife would be affected by the use of each method; probability that people of the same religion would approve of the couple choosing this alternative; probability of being able to obtain the method when needed (set to 100% for traditional methods and "no method"); expected total monthly costs (based on two separate questions, one on expected "health-related expenses" and another one on expected "other expenses" such as transport costs, cost of paying someone to replace you at work, etc.); expected waiting time at the point of service (as an interval in minutes).

A-1.4 Survey Design

Interviews were implemented by experienced interviewers of the same gender as the respondent using Computer-Assisted Personal Interviewing. The main survey instrument asked (in this order) about women's socio-economic and demographic characteristics; knowledge, use of contraception and fertility intentions, subjective beliefs about contraception (on a scale from 0 to 20, as explained in the next subsection); stated preferences between different contraceptive methods under different circumstances; and various contraception-related questions such as direct questions on the respective role of partners in decision making, Likert-scale questions about trust in various possible sources of information about contraception, intensity of desire to avoid a pregnancy (on a scale from 1 to 10, elicited after a series of anchoring vignette questions), time since last sexual intercourse, and subjective beliefs about the risk of her husband acting in undesirable ways if she hypothetically used contraception while knowing that he disapproved (again on a scale from 0 to 20). The husband's survey instrument included an adapted subset of the questions asked in the

women's survey, asking separately about each wife if polygynous.

For most questions other than those about the respondent's subjective beliefs, we used a similar wording to that of the latest Demographic and Health Survey of Nigeria as of the time of data collection. For subjective beliefs questions, we built closely on the survey instrument we had used previously in Mozambique for an earlier paper focusing on modeling demand for contraception in a small sample of women (Miller et al., 2025), and which itself built on validated beliefs elicitation techniques, as described in the next subsection. Small adjustments were made following desk-review by experienced survey experts at the National Population Commission and pre-testing of the questionnaires in the field.

A-1.5 Measurement

Our measurement of probabilistic beliefs follows best practice, including a training module requiring considerable respondent engagement and the use of visual aids (20 dried beans on a 20-cell grid) (Delavande et al., 2011; Delavande and Kohler, 2012).[27] As part of the training module, respondents practiced using the visual aids by answering preliminary questions and getting feedback and a second attempt at answering when providing inconsistent answers. For instance, if they reported beliefs regarding the probability of going to the market in the next two days greater than the probability of going to the market in the next two weeks, the interviewer would read a scripted response explaining why they expected a different answer.

We elicited beliefs about up to eight alternatives, depending on whether the respondent said that they had heard of the method before. Namely, we asked about the most popular modern or "traditional" methods known by respondents (male condoms, implants, injections, contraceptive pills, lactational amenorrhea, cycle-based methods, and withdrawal), as well as for "no method". We elicited women's probabilistic beliefs about key factors suggested by previous literature to matter for contraceptive choice (Gage, 1998; Miller, 2002; Muanda et al., 2017; Saleem and Bobak, 2005; Biddlecom and Fapohunda, 1998; Miller et al., 2025).

We asked about a wide range of subjective expectations. Given our focus on couples in this paper, we restrict the subjective expectations used in our model to those asking husband and wife about the probability of the same outcome. This excludes subjective expectations asked about the chances of the *respondent* experiencing an outcome such as contracting an STI, for instance, since the wife contracting an STI is not the same outcome as the husband contracting an STI.

[27] Based on evidence presented in Delavande et al. (2011), we asked respondents to express their answers out of 20 rather than out of 10 to improve precision.

A-2 Using Stated Preferences Data to Identify Utility Weights

If one has data on individual spouse's stated preferred options, one can estimate the individual utility parameters Δu_j^k for $k = w,h$ from choice models where the dependent variable is the individual spouse's stated preferred option and the model regressors are the spouse's individual beliefs.

For each outcome j, the couple's model produces two estimates (in red in Equation 1), one for each of the spouse's beliefs. This allows us to pin down the beliefs weights ω_j^w and $\omega_j^h = 1 - \omega_j^w$, and one other unknown.

For outcome j, let A_j and B_j denote the joint-model coefficients on the wife's and husband's beliefs, respectively. There are two equations per j but three apparent unknowns, ϕ_j^w, ϕ_j^h, and ω_j^w. Under the additional assumption that the utility weights add up to one ($\phi_j^w + \phi_j^h = 1$), we could write:

$$\left(\phi_j^w \Delta u_j^w + (1-\phi_j^w)\Delta u_j^h\right)\omega_j^w = A_j,$$

so that

$$\boxed{\phi_j^w = \frac{A_j/\omega_j^w - \Delta u_j^h}{\Delta u_j^w - \Delta u_j^h}.}$$

Thus, ϕ_j^w is identified whenever $\omega_j^w \neq 0$ and $\Delta u_j^w \neq \Delta u_j^h$.

However, this ignores three additional unknowns: the scale parameters (equivalently, the standard deviations of the Extreme Value disturbances) in the joint revealed-choice model and the two individual stated-preference models. Because utility is identified only up to scale, coefficients from separately estimated discrete-choice models are generally not directly comparable unless restrictions are imposed on the relative scale parameters across models (Train, 2009, Section 7.2). Without such restrictions, coefficient magnitudes are not comparable across the three models.

In addition, it is not clear whether the utility parameters obtained in the individual models using stated preferred alternatives as dependent variable should have the same structural interpretation as the individual utility primitives (Δu_j^k). Indeed, when asking stated preference questions, it is hard to control exactly the scenario in the mind of the respondent to make it fully comparable to the preferences estimated using actual choice data.

Given the additional assumptions needed to pin down the utility weights, and the above concerns regarding the dissimilarity of preference parameters across models, we abstain from this exercise. For completeness nonetheless, below we report estimates from the individual models using stated preferences as outcome to compare the signs of estimates (since these are scale-free). As can be seen in Table A1, the signs of the estimated coefficients in the individual wives' and individual husbands' models are the same whenever at least one of these coefficients is statistically

significant at 5%, except for one case (waiting time). One plausible explanation is that expected waiting times capture both opportunity cost of the wife's time and some unobserved quality (higher for products that are in higher demand), and that husbands have lower disutility of their wives' time than the wives themselves. Whenever husbands and wives preferences go in the same direction, then with positive beliefs weights and positive utility weights (which we do not need to assume but would be the most plausible), we would also expect the coefficients of the individual and joint models to have the same signs. This is again the case whenever coefficients are significant at 5%.

Table A1: Estimates from Individual Stated Preferences Models

Wives' Stated Preference Model		**Husbands' Stated Preference Model**	
	(1)		(1)
	Chosen Alternative		Chosen Alternative
Wife's P(pregnancy)	-0.031***	Husband's P(pregnancy)	-0.027**
	(0.011)		(0.013)
Wife's P(side effect)	-0.029**	Husband's P(side effect)	-0.041***
	(0.012)		(0.008)
Wife's P(affect libido/pleasure)	0.010	Husband's P(affect libido/pleasure)	-0.017*
	(0.009)		(0.009)
Wife's P(obtain when needed)	0.043***	Husband's P(obtain when needed)	0.002
	(0.012)		(0.011)
Wife's E(total costs)	0.010*	Husband's E(total costs)	0.000
	(0.005)		(0.003)
Wife's E(waiting time)	-0.004**	Husband's E(waiting time)	0.003***
	(0.002)		(0.001)
Wife's P(pregnancy after disc.)	0.012	Husband's P(pregnancy after disc.)	0.032*
	(0.010)		(0.018)
Wife's P(coreligionists approval)	0.027***	Husband's P(coreligionists approval)	0.039***
	(0.008)		(0.009)
Alternatives	6066	Alternatives	7846
Couples	1408	Couples	1743

Note: Dependent variable: stated most preferred alternative when asked "If it was only up to you and no one else had a say or an opinion about what you did, please can you tell me which of the following options would be your preferred one right now?" Method-invariant covariates are the same as in the couple's model, namely: age and education level of the wife, urban residence, number of children, recent birth, whether Muslim, whether polygynous, wife's work in the previous 12 months, husband's work in the past 12 months, wife's stated fertility desires, husband's stated fertility desires, wife's empowerment index, wife's perceived PCA risk of retaliation score if using contraception against husband's will. Samples correspond to wives (column 1) and husbands (column 2) for whom all variables needed for the model are non-missing. Standard errors clustered at the couple's level in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

A-3 Appendix Tables

Table A2: Non-Response Across Wives, Husbands, by Belief, and by Method

Distribution Across Individuals	Wives	Husbands
Average missing	0.031	0.020
0 missing answers	0.78	0.85
$<$5% missing	0.83	0.88
$>$25% missing	0.028	0.012
Share Missing by Belief (Averaged over 8 Alternatives)	Wives Beliefs	Husbands Beliefs
P(Pregnancy w/i 12 months)	0.016	0.007
P(Pregnancy after Disc.)	0.012	0.006
P(Side Effects)	0.027	0.029
P(Altered libido, etc...)	0.031	0.062
P(Relig. Approval)	0.015	0.009
P(Obtaining When Needed)	0.011	0.016
E(Waiting Time)	0.038	0.036
E(Costs)	0.079	0.051
Share Missing by Alternative (Averaged over 16 Beliefs)	Couples Beliefs	
No Method	0.005	
Condoms	0.030	
Implants	0.053	
Injections	0.058	
Pill	0.060	
Cycle-Awareness	0.006	
LAM	0.004	
Withdrawal	0.006	

Source: Survey described in Section 2.2. P() denotes subjective probabilities and E() denotes subjective expected values. Non-response defined as having no answer or an invalid answer conditional on the question being applicable (i.e., the respondent having heard of the method). Statistics for the sample of 2,571 couples with at least two alternatives in their choice set (no method and one contraceptive method out of the seven we model: implants, injections, pill, condoms, cycle awareness, LAM, withdrawal). Individual-level averages are obtained by averaging the share of missing values over the 8 individual beliefs for a given alternative and then taking the average of this average across all the alternatives in the individual's choice set.

Table A3: Comparison of Main Analysis Sample with Excluded Sample

	Excluded			Included			T-test	
	mean	sd	count	mean	sd	count	diff.	p-val
18–24	0.20	0.40	1011	0.14	0.35	1726	0.06	0.00
25–29	0.18	0.38	1011	0.17	0.37	1726	0.01	0.49
30–34	0.18	0.39	1011	0.22	0.42	1726	-0.04	0.02
35–39	0.16	0.37	1011	0.20	0.40	1726	-0.03	0.03
40–45	0.27	0.45	1011	0.27	0.44	1726	0.00	0.81
No schooling	0.47	0.50	1011	0.39	0.49	1726	0.08	0.00
Some primary schooling	0.21	0.41	1011	0.18	0.38	1726	0.03	0.06
Some secondary schooling	0.26	0.44	1011	0.33	0.47	1726	-0.07	0.00
Some tertiary schooling	0.07	0.25	1011	0.11	0.31	1726	-0.04	0.00
Urban	0.36	0.48	1011	0.44	0.50	1726	-0.08	0.00
Pregnant at listing	0.23	0.42	1011	0.17	0.37	1726	0.07	0.00
Wife wants to delay	0.29	0.45	1011	0.29	0.45	1726	-0.00	0.99
Wife wants no more	0.36	0.48	1011	0.36	0.48	1726	0.00	0.95
Number of children alive	4.51	2.75	1011	4.00	2.54	1726	0.51	0.00
Muslim	0.83	0.38	1011	0.65	0.48	1726	0.18	0.00
Polygynous	0.40	0.49	1011	0.30	0.46	1726	0.10	0.00
Second wife	0.12	0.32	1011	0.08	0.28	1726	0.03	0.00
Wife: no work	0.27	0.44	1011	0.24	0.43	1726	0.03	0.07
Wife: some work in past year	0.05	0.21	1011	0.05	0.22	1726	-0.00	0.66
Husband: no work	0.02	0.13	1011	0.04	0.20	1726	-0.02	0.00
Husband: some work in past year	0.01	0.09	1011	0.02	0.12	1726	-0.01	0.17
Empowerment index	3.43	1.17	1011	3.78	1.15	1726	-0.35	0.00
Husband wants to delay	0.45	0.50	1006	0.33	0.47	1726	0.13	0.00
Husband wants no more	0.25	0.43	1006	0.28	0.45	1726	-0.03	0.06
Missing threat index	0.38	0.49	1011	0.00	0.00	1726	0.38	0.00
Threat index	0.06	1.14	622	-0.02	0.94	1726	0.09	0.06
Know no method	0.05	0.22	1011	0.00	0.00	1726	0.05	0.00
Number of methods in choice set	5.14	1.99	1011	4.85	1.76	1726	0.29	0.00
Using contraception	0.33	0.47	1011	0.40	0.49	1726	-0.07	0.00
Wife's perceived pregnancy risk absent contraception	10.81	6.01	1010	11.87	6.01	1726	-1.06	0.00
Sample	2737							

Notes: Variables refer to the wife, unless stated otherwise. Choice set refers to the union of the husband and wife's awareness sets.

Table A4: Wives' Beliefs Summary Statistics

	No method			Pill			Injectables			Implants			Condom			LAM			Cycle Awareness			Withdraw			Total		
	mean	sd	count	mean	sd	count	mean	sd	count	mean	sd	count	mean	sd	count	mean	sd	count	mean	sd	count	mean	sd	count	mean	sd	count
Wife's P(pregnancy)	11.87	6.01	1726	3.88	4.70	771	3.59	4.44	1018	3.59	4.46	822	3.92	4.46	919	4.76	4.38	189	4.96	5.04	503	5.41	4.62	723	6.14	6.05	6671
Wife's P(side effect)	0.00	0.00	1726	7.02	5.40	771	6.72	5.39	1018	6.69	5.52	822	2.33	2.96	919	3.16	3.76	189	2.47	3.83	503	2.44	3.26	723	3.52	4.82	6671
Wife's P(affect libido/pleasure)	0.00	0.00	1726	3.45	4.55	771	3.06	4.09	1018	3.16	4.16	822	6.84	6.35	919	2.69	3.39	189	3.37	4.74	503	5.29	6.15	723	3.10	4.87	6671
Wife's P(obtain when needed)	20.00	0.00	1726	14.70	4.93	771	14.92	4.71	1018	15.19	4.63	822	15.70	4.98	919	20.00	0.00	189	20.00	0.00	503	20.00	0.00	723	17.43	4.27	6671
Wife's E(total costs)	0.00	0.00	1726	7.22	12.51	771	7.59	10.65	1018	9.70	12.86	822	7.23	13.55	919	0.00	0.00	189	0.00	0.00	503	0.00	0.00	723	4.18	9.85	6671
Wife's E(waiting time)	0.00	0.00	1726	45.08	39.42	771	53.09	39.27	1018	58.94	41.86	822	25.12	25.28	919	0.00	0.00	189	0.00	0.00	503	0.00	0.00	723	24.03	36.34	6671
Wife's P(pregnancy after disc.)	13.03	5.65	1726	13.29	5.22	771	13.26	5.37	1018	13.82	5.15	822	13.78	5.70	919	11.54	6.16	189	13.38	5.65	503	12.77	6.00	723	13.25	5.58	6671
Wife's P(coreligionists approval)	7.22	6.21	1726	12.15	5.62	771	12.16	5.71	1018	12.63	5.57	822	12.13	5.87	919	12.35	6.97	189	12.60	6.12	503	10.50	6.11	723	10.79	6.34	6671
N	6671																										

Note: All subjective probabilities are denoted by $P(\cdot)$ and are expressed "out of 20 beans". Subjective expectations regarding average monetary costs and waiting times at the point of service are denoted by $E(\cdot)$. Monetary costs are winsorized at the top 1% and converted from Nigerian Nairas to US dollars using the exchange rate at the start of data collection. The statistics in this table only use data from individuals who say that they have heard of the method (individual awareness sets), and who are included in the baseline sample.

Table A5: Husbands' Beliefs Summary Statistics

	No method			Pill			Injectables			Implants			Condom			LAM			Cycle Awareness			Withdraw			Total		
	mean	sd	count	mean	sd	count	mean	sd	count	mean	sd	count	mean	sd	count	mean	sd	count	mean	sd	count	mean	sd	count	mean	sd	count
Husband's P(pregnancy)	12.73	5.02	1726	4.14	3.63	702	4.19	3.75	882	4.20	3.65	611	5.22	3.47	1350	4.98	3.78	147	5.40	3.73	784	7.07	4.45	1296	6.98	5.28	7498
Husband's P(side effect)	0.00	0.00	1726	9.01	5.49	702	7.95	5.71	882	7.34	5.29	611	2.49	2.51	1350	3.42	3.29	147	2.47	1.92	784	3.88	4.22	1296	3.82	4.81	7498
Husband's P(affect libido/pleasure)	0.00	0.00	1726	3.93	4.03	702	3.53	3.97	882	3.67	4.07	611	5.90	4.69	1350	3.36	3.44	147	4.46	4.40	784	7.51	5.97	1296	3.97	4.86	7498
Husband's P(obtain when needed)	20.00	0.00	1726	12.87	5.22	702	13.11	4.86	882	13.69	4.68	611	13.74	5.98	1350	20.00	0.00	147	20.00	0.00	784	20.00	0.00	1296	16.88	4.94	7498
Husband's E(total costs)	0.00	0.00	1726	23.23	24.32	702	18.02	21.59	882	16.67	20.44	611	10.88	18.03	1350	0.00	0.00	147	0.00	0.00	784	0.00	0.00	1296	7.61	16.65	7498
Husband's E(waiting time)	0.00	0.00	1726	50.02	48.54	702	62.98	48.87	882	83.20	58.08	611	27.99	27.48	1350	0.00	0.00	147	0.00	0.00	784	0.00	0.00	1296	23.91	41.78	7498
Husband's P(pregnancy after disc.)	13.23	5.29	1726	15.22	4.39	702	14.40	4.54	882	14.58	4.27	611	14.04	4.97	1350	16.18	3.93	147	15.19	4.91	784	15.37	5.01	1296	14.44	4.94	7498
Husband's P(coreligionists approval)	9.59	6.33	1726	9.62	6.17	702	10.40	5.93	882	11.02	5.94	611	9.70	6.24	1350	14.67	4.74	147	13.72	5.57	784	9.69	6.88	1296	10.37	6.37	7498
N	7498																										

Note: All subjective probabilities are denoted by $P(\cdot)$ and are expressed "out of 20 beans". Subjective expectations regarding average monetary costs and waiting times at the point of service are denoted by $E(\cdot)$. Monetary costs are winsorized at the top 1% and converted from Nigerian Nairas to US dollars using the exchange rate at the start of data collection. The statistics in this table only use data from individuals who say that they have heard of the method (individual awareness sets), and who are included in the baseline sample.

Table A6: Full Baseline Regression Output and Robustness Tests

	(1) Baseline	(2) 50% Priors	(3) Intersection of Awareness Sets	(4) Imputed Missing Values	(5) Monogamous Only	(6) Husband's Use Data
Method-Specific Variables						
Wife's P(pregnancy)	-0.086***	-0.086***	-0.092***	-0.084***	-0.093***	-0.077***
	(0.013)	(0.013)	(0.016)	(0.011)	(0.016)	(0.011)
Wife's P(side effect)	-0.060***	-0.059***	-0.056***	-0.052***	-0.058***	-0.040***
	(0.015)	(0.015)	(0.018)	(0.012)	(0.017)	(0.015)
Wife's P(affect libido/pleasure)	0.006	0.006	0.021	0.004	0.019	-0.024*
	(0.014)	(0.014)	(0.014)	(0.011)	(0.015)	(0.013)
Wife's P(obtain when needed)	0.134***	0.133***	0.120***	0.106***	0.155***	0.089***
	(0.022)	(0.022)	(0.026)	(0.018)	(0.029)	(0.021)
Wife's E(total costs)	-0.032***	-0.032***	-0.033***	-0.031***	-0.034***	0.019***
	(0.006)	(0.006)	(0.008)	(0.006)	(0.008)	(0.006)
Wife's E(waiting time)	0.004*	0.004*	0.003	0.003*	0.003	0.004
	(0.002)	(0.002)	(0.004)	(0.002)	(0.003)	(0.003)
Wife's P(pregnancy after disc.)	0.022	0.022	0.012	0.027**	0.026	0.004
	(0.014)	(0.014)	(0.017)	(0.012)	(0.018)	(0.013)
Wife's P(co-religionists approval)	0.012	0.012	0.005	0.008	0.012	0.026***
	(0.008)	(0.008)	(0.009)	(0.007)	(0.009)	(0.008)
Husband's P(pregnancy)	-0.065***	-0.064***	-0.069***	-0.051***	-0.073***	-0.030**
	(0.014)	(0.014)	(0.017)	(0.011)	(0.019)	(0.013)
Husband's P(side effect)	-0.046***	-0.048***	-0.055***	-0.044***	-0.047**	0.017
	(0.017)	(0.017)	(0.020)	(0.014)	(0.020)	(0.015)
Husband's P(affect libido/pleasure)	-0.013	-0.013	-0.016	-0.022	-0.022	0.074***
	(0.017)	(0.017)	(0.018)	(0.014)	(0.021)	(0.013)
Husband's P(obtain when needed)	0.042**	0.044***	0.027	0.038**	0.056***	0.078***
	(0.017)	(0.016)	(0.021)	(0.015)	(0.019)	(0.017)
Husband's E(total costs)	-0.006	-0.005	-0.002	-0.001	-0.007	0.005
	(0.005)	(0.005)	(0.005)	(0.004)	(0.006)	(0.005)
Husband's E(waiting time)	-0.001	-0.001	-0.000	0.000	-0.003*	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Husband's P(pregnancy after disc.)	0.043***	0.043***	0.034	0.034***	0.046**	0.099***
	(0.016)	(0.016)	(0.022)	(0.012)	(0.020)	(0.020)
Husband's P(co-religionists approval)	0.043***	0.043***	0.046***	0.028***	0.051***	0.070***
	(0.009)	(0.009)	(0.011)	(0.007)	(0.012)	(0.009)
=1 if not in Husband's set	-0.535	-0.505**		-0.642**	-0.384	-1.351***
	(0.352)	(0.228)		(0.313)	(0.408)	(0.436)
=1 if not in Wife's set	-2.156***	-2.467***		-2.937***	-2.102***	-0.065
	(0.580)	(0.429)		(0.547)	(0.769)	(0.433)
No Method Nest						
Wife: 25-29	-0.488	-0.489	-0.090	-0.308	-0.326	-0.078
	(0.321)	(0.322)	(0.394)	(0.268)	(0.401)	(0.307)
Wife: 30-34	-0.064	-0.062	-0.011	-0.024	0.107	0.099
	(0.315)	(0.315)	(0.397)	(0.271)	(0.401)	(0.317)
Wife: 35-39	-0.276	-0.276	0.105	-0.359	0.039	0.217
	(0.341)	(0.341)	(0.430)	(0.290)	(0.429)	(0.334)
Wife: 40-45	-0.097	-0.095	0.217	-0.283	0.262	0.339
	(0.358)	(0.359)	(0.474)	(0.306)	(0.446)	(0.365)
Wife: Primary	-0.212	-0.211	-0.394	-0.126	-0.436	0.298
	(0.243)	(0.243)	(0.339)	(0.207)	(0.351)	(0.271)
Wife: Secondary	-0.205	-0.199	-0.479	-0.343*	-0.395	-0.117
	(0.237)	(0.236)	(0.304)	(0.205)	(0.323)	(0.236)
Wife: Tertiary	-0.158	-0.149	-0.504	-0.301	-0.254	-0.140
	(0.297)	(0.297)	(0.373)	(0.271)	(0.390)	(0.338)
Urban	0.228	0.231	-0.037	0.140	0.180	-0.360*
	(0.175)	(0.175)	(0.217)	(0.151)	(0.223)	(0.190)
Wife: Delay	-0.168	-0.170	-0.742***	-0.321*	-0.077	-0.509**
	(0.208)	(0.209)	(0.261)	(0.181)	(0.266)	(0.231)
Wife: No more	-0.523**	-0.520**	-1.126***	-0.543***	-0.452	-1.013***
	(0.226)	(0.227)	(0.299)	(0.197)	(0.296)	(0.261)
Wife: Number of children	-0.038	-0.039	-0.007	-0.008	-0.038	0.073
	(0.043)	(0.043)	(0.057)	(0.037)	(0.058)	(0.045)
Muslim	-0.271	-0.272	-0.460**	-0.131	-0.329	-0.875***
	(0.198)	(0.198)	(0.226)	(0.172)	(0.230)	(0.226)
Polygynous	-0.047	-0.049	-0.040	0.116	0.000	-0.184
	(0.210)	(0.210)	(0.270)	(0.176)	(.)	(0.212)
=1 if Second wife	-0.130	-0.130	0.225	-0.376	-1.484*	0.029

Continued on next page

Table A6 – continued from previous page

	(1) Baseline	(2) 50% Priors	(3) Intersection of Awareness Sets	(4) Imputed Missing Values	(5) Monogamous Only	(6) Husband's Use Data
	(0.331)	(0.331)	(0.467)	(0.274)	(0.776)	(0.350)
=1 if no work	0.982***	0.981***	0.942***	0.691***	1.280***	0.925***
	(0.246)	(0.246)	(0.318)	(0.210)	(0.364)	(0.250)
=1 if work in past 12 months	0.204	0.206	0.716	0.346	0.654	-0.034
	(0.441)	(0.442)	(0.461)	(0.357)	(0.533)	(0.445)
=1 if says husband does not work	-0.822	-0.815	-0.780	-0.496	-0.907	0.024
	(0.632)	(0.632)	(0.841)	(0.582)	(1.051)	(0.590)
=1 if says husband worked in past 12 months	-0.008	-0.011	0.758	0.524	0.018	-1.009
	(0.729)	(0.733)	(0.957)	(0.746)	(0.811)	(0.667)
Wife empowerment index	0.056	0.055	0.117	0.007	0.158	0.241**
	(0.093)	(0.093)	(0.120)	(0.075)	(0.126)	(0.102)
=1 if recent birth	0.331	0.332	0.556**	0.467**	0.644**	0.168
	(0.231)	(0.231)	(0.279)	(0.201)	(0.277)	(0.224)
Husband: Delay	-0.413**	-0.409**	-0.420*	-0.269	-0.754***	-0.496**
	(0.200)	(0.200)	(0.241)	(0.172)	(0.262)	(0.204)
Husband: No more	-1.039***	-1.037***	-1.298***	-0.996***	-1.327***	-1.803***
	(0.229)	(0.229)	(0.307)	(0.198)	(0.298)	(0.259)
Retaliation risk index	0.002	0.001	0.023	0.041	-0.109	0.102
	(0.093)	(0.093)	(0.124)	(0.079)	(0.113)	(0.108)
Condoms Nest						
Wife: 25-29	-0.345	-0.345	0.017	-0.318	-1.004	0.545
	(0.653)	(0.653)	(0.744)	(0.518)	(0.667)	(0.616)
Wife: 30-34	0.301	0.300	0.352	0.196	-0.215	0.483
	(0.625)	(0.625)	(0.717)	(0.519)	(0.657)	(0.642)
Wife: 35-39	-0.179	-0.181	0.265	-0.526	-0.745	0.145
	(0.682)	(0.683)	(0.791)	(0.590)	(0.778)	(0.721)
Wife: 40-45	-0.593	-0.595	-0.238	-0.636	-1.276	0.102
	(0.774)	(0.775)	(0.870)	(0.603)	(0.853)	(0.798)
Wife: Primary	-0.166	-0.163	-0.404	-0.141	-0.695	0.143
	(0.567)	(0.567)	(0.681)	(0.469)	(0.667)	(0.509)
Wife: Secondary	-0.651	-0.646	-0.533	-0.121	-0.961	-0.346
	(0.535)	(0.535)	(0.625)	(0.442)	(0.611)	(0.485)
Wife: Tertiary	-0.759	-0.752	-0.723	-0.177	-1.150	-0.227
	(0.642)	(0.642)	(0.734)	(0.547)	(0.708)	(0.557)
Urban	0.037	0.036	-0.237	-0.056	-0.054	-0.558*
	(0.322)	(0.322)	(0.350)	(0.283)	(0.355)	(0.289)
Wife: Delay	0.930**	0.930**	0.070	0.606	0.933**	-0.379
	(0.439)	(0.438)	(0.494)	(0.374)	(0.472)	(0.398)
Wife: No more	0.677	0.679	-0.181	0.136	0.377	-0.252
	(0.546)	(0.547)	(0.587)	(0.431)	(0.558)	(0.400)
Wife: Number of children	-0.208*	-0.208*	-0.156	-0.104	-0.091	-0.018
	(0.109)	(0.110)	(0.127)	(0.102)	(0.121)	(0.083)
Muslim	-1.118***	-1.120***	-0.965**	-0.828***	-1.101***	-1.193***
	(0.348)	(0.348)	(0.379)	(0.306)	(0.399)	(0.330)
Polygynous	-0.229	-0.231	-0.469	0.255	0.000	-0.192
	(0.442)	(0.441)	(0.548)	(0.375)	(.)	(0.421)
=1 if Second wife	0.810	0.808	1.645*	0.232	-14.007***	1.352**
	(0.704)	(0.705)	(0.889)	(0.594)	(1.065)	(0.571)
=1 if no work	0.495	0.501	0.001	0.556	0.978	0.530
	(0.607)	(0.607)	(0.834)	(0.460)	(0.658)	(0.495)
=1 if work in past 12 months	0.600	0.603	1.603***	1.151**	0.725	0.087
	(0.639)	(0.639)	(0.619)	(0.501)	(0.668)	(0.636)
=1 if says husband does not work	1.118	1.130	1.225	0.640	2.130**	0.503
	(1.070)	(1.070)	(1.418)	(1.067)	(1.075)	(0.937)
=1 if says husband worked in past 12 months	0.452	0.453	1.247	0.575	0.501	0.260
	(1.171)	(1.171)	(1.191)	(1.030)	(1.325)	(1.116)
Wife empowerment index	0.059	0.062	0.158	-0.068	0.344	0.142
	(0.186)	(0.186)	(0.205)	(0.152)	(0.249)	(0.172)
=1 if recent birth	-1.630***	-1.634***	-1.907**	-1.900***	-1.437**	-0.772
	(0.613)	(0.614)	(0.768)	(0.619)	(0.628)	(0.525)
Husband: Delay	-0.007	-0.003	0.050	-0.223	-0.304	0.133
	(0.419)	(0.419)	(0.476)	(0.378)	(0.490)	(0.343)
Husband: No more	-0.654	-0.654	-0.861	-0.460	-0.698	-0.829*
	(0.542)	(0.542)	(0.623)	(0.423)	(0.620)	(0.476)
Retaliation risk index	0.002	0.001	0.041	-0.083	-0.242	-0.234
	(0.152)	(0.152)	(0.158)	(0.144)	(0.194)	(0.222)

Continued on next page

Table A6 – continued from previous page

	(1) Baseline	(2) 50% Priors	(3) Intersection of Awareness Sets	(4) Imputed Missing Values	(5) Monogamous Only	(6) Husband's Use Data
Traditional Nest						
Wife: 25-29	-0.695*	-0.699*	-0.580	-0.610*	-0.682	-0.371
	(0.419)	(0.419)	(0.509)	(0.361)	(0.491)	(0.360)
Wife: 30-34	-0.623	-0.620	-0.982*	-0.534	-0.333	-0.371
	(0.418)	(0.418)	(0.505)	(0.372)	(0.492)	(0.370)
Wife: 35-39	-0.569	-0.572	-0.107	-0.623	-0.186	0.050
	(0.453)	(0.452)	(0.549)	(0.392)	(0.536)	(0.395)
Wife: 40-45	0.022	0.025	0.263	-0.059	0.270	-0.017
	(0.480)	(0.479)	(0.586)	(0.420)	(0.571)	(0.424)
Wife: Primary	-0.214	-0.211	-0.701	0.233	-0.028	-0.914***
	(0.411)	(0.410)	(0.510)	(0.352)	(0.559)	(0.341)
Wife: Secondary	0.320	0.334	-0.260	0.349	0.468	-0.766**
	(0.369)	(0.367)	(0.468)	(0.322)	(0.508)	(0.301)
Wife: Tertiary	0.382	0.402	-0.254	0.504	0.449	-0.749*
	(0.431)	(0.428)	(0.539)	(0.381)	(0.585)	(0.387)
Urban	-0.600**	-0.586**	-0.930***	-0.380*	-0.905***	-0.584**
	(0.267)	(0.268)	(0.306)	(0.222)	(0.322)	(0.227)
Wife: Delay	1.016***	1.008***	0.638	0.913***	1.427***	-0.142
	(0.341)	(0.341)	(0.397)	(0.301)	(0.420)	(0.276)
Wife: No more	0.149	0.151	-0.199	0.399	0.534	-0.735**
	(0.359)	(0.359)	(0.453)	(0.305)	(0.452)	(0.302)
Wife: Number of children	0.088	0.087	0.089	0.056	0.002	0.120**
	(0.061)	(0.061)	(0.079)	(0.056)	(0.078)	(0.052)
Muslim	-0.704**	-0.707**	-0.864**	-1.079***	-0.376	-0.990***
	(0.331)	(0.331)	(0.379)	(0.288)	(0.374)	(0.289)
Polygynous	-0.134	-0.135	-0.306	-0.145	0.000	0.118
	(0.359)	(0.359)	(0.416)	(0.294)	(.)	(0.249)
=1 if Second wife	0.157	0.154	0.386	-0.009	-0.563	0.410
	(0.539)	(0.538)	(0.712)	(0.448)	(1.115)	(0.381)
=1 if no work	-0.337	-0.340	-0.372	-0.157	-0.802	-1.014***
	(0.418)	(0.417)	(0.514)	(0.351)	(0.608)	(0.337)
=1 if work in past 12 months	0.544	0.551	1.089**	0.708*	0.895	0.102
	(0.468)	(0.469)	(0.520)	(0.403)	(0.561)	(0.430)
=1 if says husband does not work	0.273	0.273	0.593	0.051	-0.909	-0.125
	(0.849)	(0.851)	(1.048)	(0.807)	(1.392)	(0.795)
=1 if says husband worked in past 12 months	0.717	0.719	0.609	0.850	1.656	0.050
	(1.321)	(1.314)	(1.212)	(0.940)	(1.736)	(0.849)
Wife empowerment index	-0.184	-0.186	-0.179	-0.244**	-0.153	-0.210*
	(0.128)	(0.128)	(0.151)	(0.119)	(0.164)	(0.108)
=1 if recent birth	0.006	0.012	-0.010	0.012	-0.343	0.522*
	(0.352)	(0.351)	(0.459)	(0.308)	(0.449)	(0.268)
Husband: Delay	-0.488	-0.476	-0.721**	-0.408	-0.890**	-0.732***
	(0.298)	(0.298)	(0.364)	(0.258)	(0.355)	(0.256)
Husband: No more	-0.473	-0.471	-0.645	-0.452	-0.925**	-0.716**
	(0.322)	(0.322)	(0.414)	(0.281)	(0.394)	(0.292)
Retaliation risk index	-0.176	-0.181	-0.270	-0.135	-0.469*	-0.376**
	(0.180)	(0.180)	(0.218)	(0.141)	(0.255)	(0.172)
LAM						
	-0.015	-0.034	1.127	0.374	0.420	1.799***
	(0.775)	(0.772)	(0.941)	(0.656)	(0.939)	(0.618)
condom						
	-1.660*	-1.661*	-2.438**	-1.468*	-1.796	-2.233**
	(0.994)	(0.994)	(1.031)	(0.829)	(1.310)	(0.947)
implants						
	-0.390	-0.367	-0.869	-0.628	0.196	-0.863
	(0.644)	(0.648)	(0.779)	(0.547)	(0.860)	(0.637)
injections						
	-0.734	-0.713	-1.192	-0.922*	-0.113	-1.029
	(0.644)	(0.647)	(0.788)	(0.545)	(0.851)	(0.641)
pill						
	-1.219*	-1.195*	-1.556*	-1.419***	-0.629	-1.536**
	(0.650)	(0.652)	(0.800)	(0.549)	(0.859)	(0.653)
rhythm						
	-1.117	-1.122	-0.507	-0.985	-0.927	0.733
	(0.731)	(0.729)	(0.822)	(0.618)	(0.901)	(0.556)
withdrawal						

Continued on next page

Table A6 – continued from previous page

	(1) Baseline	(2) 50% Priors	(3) Intersection of Awareness Sets	(4) Imputed Missing Values	(5) Monogamous Only	(6) Husband's Use Data
	-2.633***	-2.627***	-2.025**	-2.217***	-2.951***	-0.209
	(0.755)	(0.755)	(0.817)	(0.647)	(0.977)	(0.553)
No Method τ	1.000	1.000	1.000	1.000	1.000	1.000
	(46.280)	(22.212)	(87.638)	(3.678)	(1.861)	(4.518)
Condoms τ	1.000	1.000	1.000	1.000	1.000	1.000
	(50.082)	(157.252)	(554.228)	(2.792)	(10.069)	(21.434)
Hormonal τ	0.835***	0.837***	0.611***	0.809***	0.775***	0.872***
	(0.103)	(0.103)	(0.137)	(0.090)	(0.122)	(0.107)
Traditional τ	0.635***	0.633***	0.525***	0.592***	0.669***	0.628***
	(0.132)	(0.133)	(0.137)	(0.099)	(0.146)	(0.090)
Alternatives	9336	9336	4351	14114	6698	9016
Women	1726	1726	1273	2539	1207	1665
P-values of tests of equality of beliefs weights:						
H0:ω domain-invariant	0.018	0.020	0.038	0.034	0.050	0.000
H0:ω spouse-invariant	0.000	0.000	0.000	0.000	0.002	0.000
H0:ω spouse-invariant by domain:						
contraception and health	0.000	0.000	0.001	0.000	0.002	0.000
contraception	0.557	0.552	0.348	0.105	0.395	0.000
health	0.000	0.000	0.002	0.000	0.002	0.077
less tangible	0.020	0.022	0.011	0.100	0.032	0.000

Notes: Although coefficients are not reported in the table, missing variable indicators (one for each variable) are included in the regression reported in Column (4) in which we impute missing values. $1-\tau_n^2$ is the correlation among alternatives in nest n. Standard errors clustered at the couple's level are in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

Table A7: Heterogeneous Model: Husbands with Higher Desired Fertility than their Wife vs. Not

Wives' Beliefs	
	Chosen Alternative
Not × Wife's P(pregnancy)	-0.090***
	(0.015)
Not × Wife's P(pregnancy after disc.)	0.026
	(0.017)
Not × Wife's P(side effect)	-0.059***
	(0.016)
Not × Wife's P(affect libido/pleasure)	0.008
	(0.015)
Not × Wife's P(coreligionists approval)	0.007
	(0.009)
Not × Wife's P(obtain when needed)	0.143***
	(0.026)
Not × Wife's E(total costs)	-0.027***
	(0.006)
Not × Wife's E(waiting time)	0.005**
	(0.003)
Higher × Wife's P(pregnancy)	-0.086***
	(0.025)
Higher × Wife's P(pregnancy after disc.)	0.007
	(0.027)
Higher × Wife's P(side effect)	-0.065**
	(0.033)
Higher × Wife's P(affect libido/pleasure)	-0.013
	(0.031)
Higher × Wife's P(coreligionists approval)	0.023
	(0.018)
Higher × Wife's P(obtain when needed)	0.114***
	(0.039)
Higher × Wife's E(total costs)	-0.046***
	(0.015)
Higher × Wife's E(waiting time)	0.003
	(0.003)
N	9336

Husbands' Beliefs	
	Chosen Alternative
Not × Husband's P(pregnancy)	-0.067***
	(0.017)
Not × Husband's P(pregnancy after disc.)	0.038**
	(0.018)
Not × Husband's P(side effect)	-0.059***
	(0.019)
Not × Husband's P(affect libido/pleasure)	-0.005
	(0.019)
Not × Husband's P(coreligionists approval)	0.039***
	(0.010)
Not × Husband's P(obtain when needed)	0.051**
	(0.020)
Not × Husband's E(total costs)	-0.006
	(0.006)
Not × Husband's E(waiting time)	-0.002
	(0.001)
Higher × Husband's P(pregnancy)	-0.075***
	(0.027)
Higher × Husband's P(pregnancy after disc.)	0.080**
	(0.035)
Higher × Husband's P(side effect)	0.009
	(0.039)
Higher × Husband's P(affect libido/pleasure)	-0.053
	(0.040)
Higher × Husband's P(coreligionists approval)	0.059***
	(0.021)
Higher × Husband's P(obtain when needed)	0.020
	(0.031)
Higher × Husband's E(total costs)	-0.001
	(0.009)
Higher × Husband's E(waiting time)	-0.001
	(0.003)
N	9336

Note: "Higher" indicates that husbands have *strictly* higher desired fertility than their wife. "Not" indicates that Husbands do not have *strictly* higher desired fertility than their wife, i.e., husbands have either equal or lower desired fertility. All estimates in this table come from a single regression despite being presented in separate columns for ease of comparison. The regression also controls for the same method-invariant regressors as in the baseline model (Table 3). Standard errors clustered at the couple's level in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A8: Heterogeneous Model: Wives with Higher Desired Fertility than their Husband vs. Not

Wives' Beliefs	
	Chosen Alternative
Not × Wife's P(pregnancy)	-0.092***
	(0.014)
Not × Wife's P(pregnancy after disc.)	0.034**
	(0.016)
Not × Wife's P(side effect)	-0.062***
	(0.016)
Not × Wife's P(affect libido/pleasure)	0.001
	(0.016)
Not × Wife's P(coreligionists approval)	0.011
	(0.009)
Not × Wife's P(obtain when needed)	0.107***
	(0.023)
Not × Wife's E(total costs)	-0.028***
	(0.007)
Not × Wife's E(waiting time)	0.003
	(0.002)
Higher × Wife's P(pregnancy)	-0.071***
	(0.027)
Higher × Wife's P(pregnancy after disc.)	-0.044
	(0.029)
Higher × Wife's P(side effect)	-0.067
	(0.044)
Higher × Wife's P(affect libido/pleasure)	0.030
	(0.030)
Higher × Wife's P(coreligionists approval)	0.011
	(0.019)
Higher × Wife's P(obtain when needed)	0.284***
	(0.060)
Higher × Wife's E(total costs)	-0.041***
	(0.013)
Higher × Wife's E(waiting time)	0.006
	(0.005)
N	9336

Husbands' Beliefs	
	Chosen Alternative
Not × Husband's P(pregnancy)	-0.072***
	(0.016)
Not × Husband's P(pregnancy after disc.)	0.043**
	(0.018)
Not × Husband's P(side effect)	-0.058***
	(0.020)
Not × Husband's P(affect libido/pleasure)	-0.011
	(0.018)
Not × Husband's P(coreligionists approval)	0.037***
	(0.010)
Not × Husband's P(obtain when needed)	0.030
	(0.018)
Not × Husband's E(total costs)	-0.015**
	(0.006)
Not × Husband's E(waiting time)	-0.001
	(0.001)
Higher × Husband's P(pregnancy)	-0.034
	(0.041)
Higher × Husband's P(pregnancy after disc.)	0.005
	(0.044)
Higher × Husband's P(side effect)	-0.005
	(0.044)
Higher × Husband's P(affect libido/pleasure)	0.021
	(0.056)
Higher × Husband's P(coreligionists approval)	0.089***
	(0.030)
Higher × Husband's P(obtain when needed)	0.123**
	(0.048)
Higher × Husband's E(total costs)	0.026***
	(0.010)
Higher × Husband's E(waiting time)	-0.005
	(0.004)
N	9336

Note: "Higher" indicates that wives have *strictly* higher desired fertility than their husband. "Not" indicates that wives do not have *strictly* higher desired fertility than their husband, i.e., wives have either equal or lower desired fertility. All estimates in this table come from a single regression despite being presented in separate columns for ease of comparison. The regression also controls for the same method-invariant regressors as in the baseline model (Table 3). Standard errors clustered at the couple's level in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A9: Heterogeneous Model: Husbands with Higher Education Level than their Wife vs. Not

Wives' Beliefs	
	Chosen Alternative
Not × Wife's P(pregnancy)	-0.085***
	(0.015)
Not × Wife's P(pregnancy after disc.)	0.041**
	(0.018)
Not × Wife's P(side effect)	-0.070***
	(0.017)
Not × Wife's P(affect libido/pleasure)	-0.011
	(0.016)
Not × Wife's P(coreligionists approval)	0.017*
	(0.009)
Not × Wife's P(obtain when needed)	0.122***
	(0.026)
Not × Wife's E(total costs)	-0.031***
	(0.008)
Not × Wife's E(waiting time)	0.002
	(0.002)
Higher × Wife's P(pregnancy)	-0.091***
	(0.022)
Higher × Wife's P(pregnancy after disc.)	-0.008
	(0.023)
Higher × Wife's P(side effect)	-0.032
	(0.028)
Higher × Wife's P(affect libido/pleasure)	0.037
	(0.027)
Higher × Wife's P(coreligionists approval)	0.001
	(0.014)
Higher × Wife's P(obtain when needed)	0.170***
	(0.042)
Higher × Wife's E(total costs)	-0.033***
	(0.009)
Higher × Wife's E(waiting time)	0.006
	(0.004)
N	9336

Husbands' Beliefs	
	Chosen Alternative
Not × Husband's P(pregnancy)	-0.062***
	(0.016)
Not × Husband's P(pregnancy after disc.)	0.049***
	(0.019)
Not × Husband's P(side effect)	-0.062***
	(0.021)
Not × Husband's P(affect libido/pleasure)	0.006
	(0.019)
Not × Husband's P(coreligionists approval)	0.045***
	(0.011)
Not × Husband's P(obtain when needed)	0.045**
	(0.020)
Not × Husband's E(total costs)	-0.004
	(0.006)
Not × Husband's E(waiting time)	-0.002
	(0.002)
Higher × Husband's P(pregnancy)	-0.077***
	(0.025)
Higher × Husband's P(pregnancy after disc.)	0.029
	(0.032)
Higher × Husband's P(side effect)	-0.012
	(0.028)
Higher × Husband's P(affect libido/pleasure)	-0.058*
	(0.035)
Higher × Husband's P(coreligionists approval)	0.042**
	(0.017)
Higher × Husband's P(obtain when needed)	0.026
	(0.028)
Higher × Husband's E(total costs)	-0.013*
	(0.007)
Higher × Husband's E(waiting time)	0.001
	(0.003)
N	9336

Note: "Higher" indicates that husbands have a *strictly* higher education level than their wife (e.g., some primary education vs. none, some secondary vs none or primary only, etc.). "Not" indicates that husbands do not have *strictly* higher education than their wife, i.e., husbands have either equal or lower education. All estimates in this table come from a single regression despite being presented in separate columns for ease of comparison. The regression also controls for the same method-invariant regressors as in the baseline model (Table 3). Standard errors clustered at the couple's level in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A10: Heterogeneous Model: Wives with Higher Education Level than their Husband vs. Not

Wives' Beliefs	Chosen Alternative
Not × Wife's P(pregnancy)	-0.098***
	(0.014)
Not × Wife's P(pregnancy after disc.)	0.029*
	(0.015)
Not × Wife's P(side effect)	-0.056***
	(0.015)
Not × Wife's P(affect libido/pleasure)	0.008
	(0.014)
Not × Wife's P(coreligionists approval)	0.005
	(0.008)
Not × Wife's P(obtain when needed)	0.129***
	(0.024)
Not × Wife's E(total costs)	-0.034***
	(0.007)
Not × Wife's E(waiting time)	0.002
	(0.002)
Higher × Wife's P(pregnancy)	-0.022
	(0.029)
Higher × Wife's P(pregnancy after disc.)	-0.020
	(0.039)
Higher × Wife's P(side effect)	-0.089**
	(0.044)
Higher × Wife's P(affect libido/pleasure)	-0.026
	(0.051)
Higher × Wife's P(coreligionists approval)	0.061**
	(0.028)
Higher × Wife's P(obtain when needed)	0.192***
	(0.071)
Higher × Wife's E(total costs)	-0.025
	(0.018)
Higher × Wife's E(waiting time)	0.020***
	(0.007)
N	9336

Husbands' Beliefs	Chosen Alternative
Not × Husband's P(pregnancy)	-0.070***
	(0.015)
Not × Husband's P(pregnancy after disc.)	0.050***
	(0.017)
Not × Husband's P(side effect)	-0.051***
	(0.019)
Not × Husband's P(affect libido/pleasure)	-0.016
	(0.018)
Not × Husband's P(coreligionists approval)	0.046***
	(0.010)
Not × Husband's P(obtain when needed)	0.046**
	(0.018)
Not × Husband's E(total costs)	-0.007
	(0.005)
Not × Husband's E(waiting time)	-0.001
	(0.001)
Higher × Husband's P(pregnancy)	-0.056
	(0.035)
Higher × Husband's P(pregnancy after disc.)	0.048
	(0.049)
Higher × Husband's P(side effect)	-0.019
	(0.049)
Higher × Husband's P(affect libido/pleasure)	0.016
	(0.050)
Higher × Husband's P(coreligionists approval)	0.014
	(0.030)
Higher × Husband's P(obtain when needed)	0.037
	(0.041)
Higher × Husband's E(total costs)	0.011
	(0.012)
Higher × Husband's E(waiting time)	-0.004
	(0.004)
N	9336

Note: "Higher" indicates that wives have a *strictly* higher education level than their husband (e.g., some primary education vs. none, some secondary vs none or primary only, etc.). "Not" indicates that wives do not have *strictly* higher education than their husband, i.e., wives have either equal or lower education. All estimates in this table come from a single regression despite being presented in separate columns for ease of comparison. The regression also controls for the same method-invariant regressors as in the baseline model (Table 3). Standard errors clustered at the couple's level in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A11: Heterogeneous Model: Wife Already Has a Son vs. Wife Does Not Have a Son Yet

Wives' Beliefs	
	Chosen Alternative
Son × Wife's P(pregnancy)	-0.091***
	(0.014)
Son × Wife's P(pregnancy after disc.)	0.021
	(0.016)
Son × Wife's P(side effect)	-0.057***
	(0.016)
Son × Wife's P(affect libido/pleasure)	0.003
	(0.015)
Son × Wife's P(coreligionists approval)	0.014*
	(0.008)
Son × Wife's P(obtain when needed)	0.146***
	(0.024)
Son × Wife's E(total costs)	-0.036***
	(0.007)
Son × Wife's E(waiting time)	0.003
	(0.002)
No Son × Wife's P(pregnancy)	-0.048
	(0.035)
No Son × Wife's P(pregnancy after disc.)	0.035
	(0.031)
No Son × Wife's P(side effect)	-0.111***
	(0.042)
No Son × Wife's P(affect libido/pleasure)	0.031
	(0.034)
No Son × Wife's P(coreligionists approval)	-0.016
	(0.024)
No Son × Wife's P(obtain when needed)	0.058
	(0.055)
No Son × Wife's E(total costs)	0.010
	(0.019)
No Son × Wife's E(waiting time)	0.006
	(0.005)
N	9336

Husbands' Beliefs	
	Chosen Alternative
Son × Husband's P(pregnancy)	-0.068***
	(0.015)
Son × Husband's P(pregnancy after disc.)	0.043**
	(0.017)
Son × Husband's P(side effect)	-0.046**
	(0.019)
Son × Husband's P(affect libido/pleasure)	-0.005
	(0.018)
Son × Husband's P(coreligionists approval)	0.041***
	(0.010)
Son × Husband's P(obtain when needed)	0.037**
	(0.018)
Son × Husband's E(total costs)	-0.005
	(0.005)
Son × Husband's E(waiting time)	-0.001
	(0.001)
No Son × Husband's P(pregnancy)	-0.064*
	(0.038)
No Son × Husband's P(pregnancy after disc.)	0.039
	(0.050)
No Son × Husband's P(side effect)	-0.064
	(0.051)
No Son × Husband's P(affect libido/pleasure)	-0.048
	(0.053)
No Son × Husband's P(coreligionists approval)	0.068***
	(0.025)
No Son × Husband's P(obtain when needed)	0.102**
	(0.049)
No Son × Husband's E(total costs)	0.005
	(0.012)
No Son × Husband's E(waiting time)	-0.003
	(0.004)
N	9336

Note: All estimates in this table come from a single regression despite being presented in separate columns for ease of comparison. The regression also controls for the same method-invariant regressors as in the baseline model (Table 3). Standard errors clustered at the couple's level in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A12: Heterogeneous Model: Muslim vs. Other Couples

Wives' Beliefs	
	Chosen Alternative
Other × Wife's P(pregnancy)	-0.097***
	(0.020)
Other × Wife's P(pregnancy after disc.)	0.022
	(0.028)
Other × Wife's P(side effect)	-0.075***
	(0.023)
Other × Wife's P(affect libido/pleasure)	-0.010
	(0.021)
Other × Wife's P(coreligionists approval)	0.030***
	(0.011)
Other × Wife's P(obtain when needed)	0.173***
	(0.047)
Other × Wife's E(total costs)	-0.047***
	(0.014)
Other × Wife's E(waiting time)	0.008**
	(0.003)
Muslim × Wife's P(pregnancy)	-0.075***
	(0.017)
Muslim × Wife's P(pregnancy after disc.)	0.023
	(0.017)
Muslim × Wife's P(side effect)	-0.057***
	(0.020)
Muslim × Wife's P(affect libido/pleasure)	0.013
	(0.019)
Muslim × Wife's P(coreligionists approval)	-0.013
	(0.012)
Muslim × Wife's P(obtain when needed)	0.101***
	(0.026)
Muslim × Wife's E(total costs)	-0.022***
	(0.008)
Muslim × Wife's E(waiting time)	0.002
	(0.003)
N	9336

Husbands' Beliefs	
	Chosen Alternative
Other × Husband's P(pregnancy)	-0.101***
	(0.024)
Other × Husband's P(pregnancy after disc.)	0.066**
	(0.026)
Other × Husband's P(side effect)	-0.024
	(0.030)
Other × Husband's P(affect libido/pleasure)	-0.039
	(0.028)
Other × Husband's P(coreligionists approval)	0.057***
	(0.015)
Other × Husband's P(obtain when needed)	0.010
	(0.023)
Other × Husband's E(total costs)	-0.015
	(0.011)
Other × Husband's E(waiting time)	-0.003*
	(0.002)
Muslim × Husband's P(pregnancy)	-0.047***
	(0.017)
Muslim × Husband's P(pregnancy after disc.)	0.009
	(0.022)
Muslim × Husband's P(side effect)	-0.077***
	(0.023)
Muslim × Husband's P(affect libido/pleasure)	0.001
	(0.022)
Muslim × Husband's P(coreligionists approval)	0.025**
	(0.012)
Muslim × Husband's P(obtain when needed)	0.079***
	(0.024)
Muslim × Husband's E(total costs)	-0.005
	(0.005)
Muslim × Husband's E(waiting time)	0.003
	(0.002)
N	9336

Note: All estimates in this table come from a single regression despite being presented in separate columns for ease of comparison. The regression also controls for the same method-invariant regressors as in the baseline model (Table 3). Standard errors clustered at the couple's level in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A13: Heterogeneous Model: Wives Who Perceive Above-Median vs. Below-Median Chance of Retaliation

Wives' Beliefs		**Husbands' Beliefs**	
	(1) main_user_ methodstring b/se		(1) main_user_ methodstring b/se
Below Med × Wife's P(pregnancy)	-0.055***	Below Med × Husband's P(pregnancy)	-0.032*
	(0.016)		(0.019)
Below Med × Wife's P(pregnancy after disc.)	0.037**	Below Med × Husband's P(pregnancy after disc.)	0.016
	(0.018)		(0.021)
Below Med × Wife's P(side effect)	-0.039**	Below Med × Husband's P(side effect)	0.001
	(0.018)		(0.023)
Below Med × Wife's P(affect libido/pleasure)	-0.049**	Below Med × Husband's P(affect libido/pleasure)	-0.015
	(0.021)		(0.023)
Below Med × Wife's P(coreligionists approval)	-0.002	Below Med × Husband's P(coreligionists approval)	0.024*
	(0.011)		(0.012)
Below Med × Wife's P(obtain when needed)	0.083***	Below Med × Husband's P(obtain when needed)	0.070***
	(0.027)		(0.025)
Below Med × Wife's E(total costs)	-0.019*	Below Med × Husband's E(total costs)	-0.010
	(0.010)		(0.009)
Below Med × Wife's E(waiting time)	0.005*	Below Med × Husband's E(waiting time)	-0.002
	(0.003)		(0.002)
Above Med × Wife's P(pregnancy)	-0.137***	Above Med × Husband's P(pregnancy)	-0.114***
	(0.022)		(0.023)
Above Med × Wife's P(pregnancy after disc.)	-0.006	Above Med × Husband's P(pregnancy after disc.)	0.098***
	(0.023)		(0.027)
Above Med × Wife's P(side effect)	-0.100***	Above Med × Husband's P(side effect)	-0.089***
	(0.025)		(0.027)
Above Med × Wife's P(affect libido/pleasure)	0.093***	Above Med × Husband's P(affect libido/pleasure)	-0.029
	(0.022)		(0.029)
Above Med × Wife's P(coreligionists approval)	0.030***	Above Med × Husband's P(coreligionists approval)	0.057***
	(0.011)		(0.015)
Above Med × Wife's P(obtain when needed)	0.214***	Above Med × Husband's P(obtain when needed)	0.020
	(0.038)		(0.026)
Above Med × Wife's E(total costs)	-0.035***	Above Med × Husband's E(total costs)	-0.011*
	(0.008)		(0.006)
Above Med × Wife's E(waiting time)	0.003	Above Med × Husband's E(waiting time)	0.002
	(0.003)		(0.002)
N	9336	*N*	9336

Note: "Above Med" ("Below Med") indicates that the wife's perceived risk of retaliation PCA index is above (below) median. All estimates in this table come from a single regression despite being presented in separate columns for ease of comparison. The regression also controls for the same method-invariant regressors as in the baseline model (Table 3). Standard errors clustered at the couple's level in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

A-4 Appendix Figures

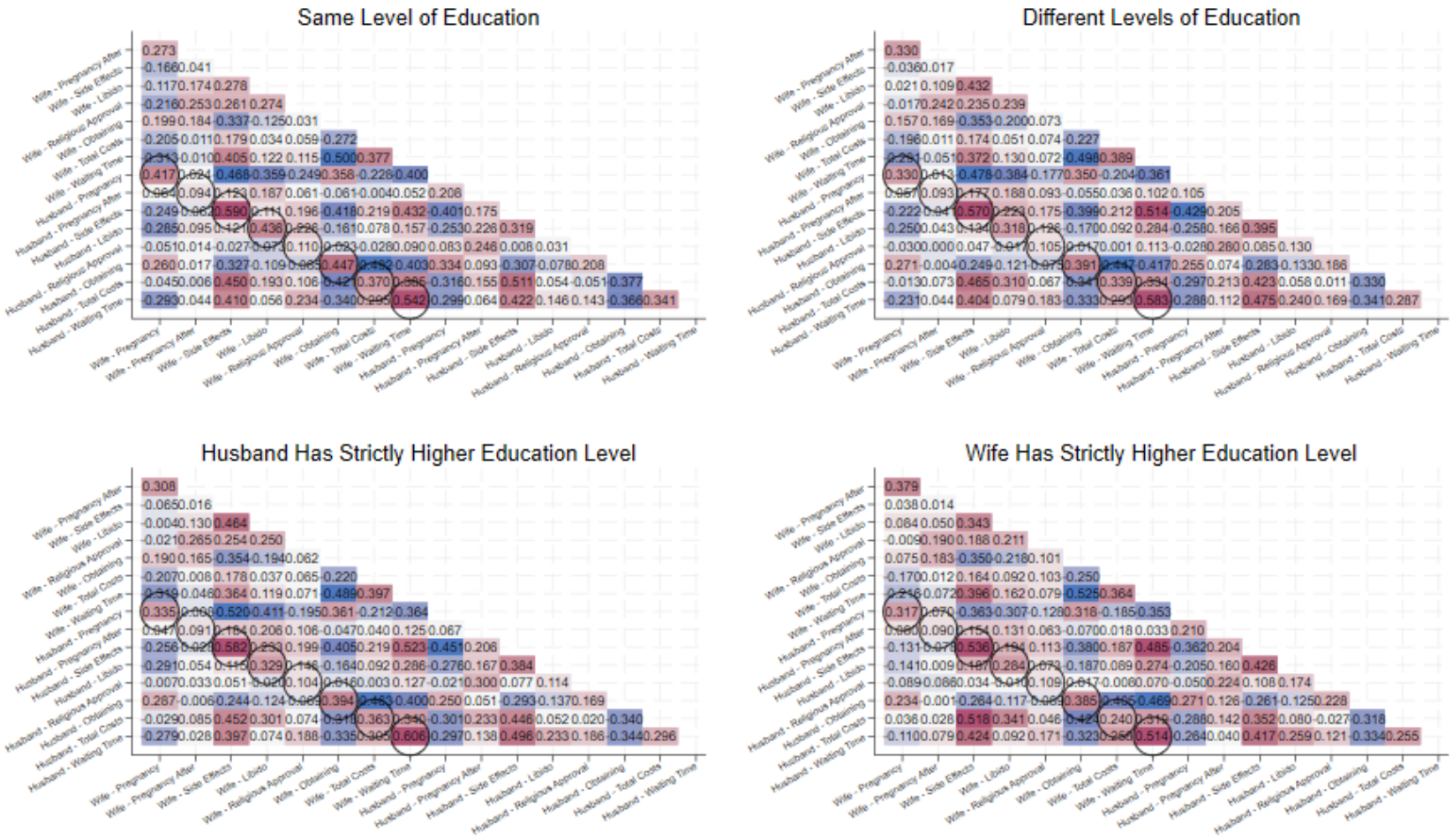

Figure A1: Beliefs Correlation by Educational Assortative Mating

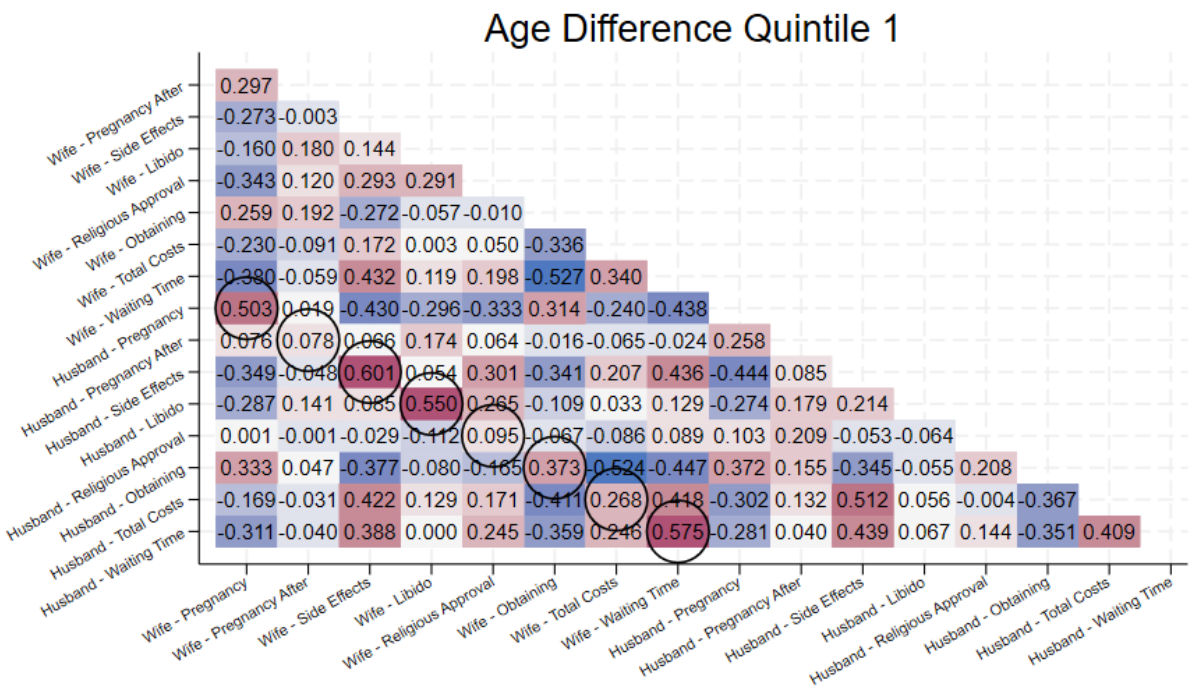

Figure A2: Husband-Wife Pairwise Correlation of Beliefs For Quintile 1 of Spousal Age Difference

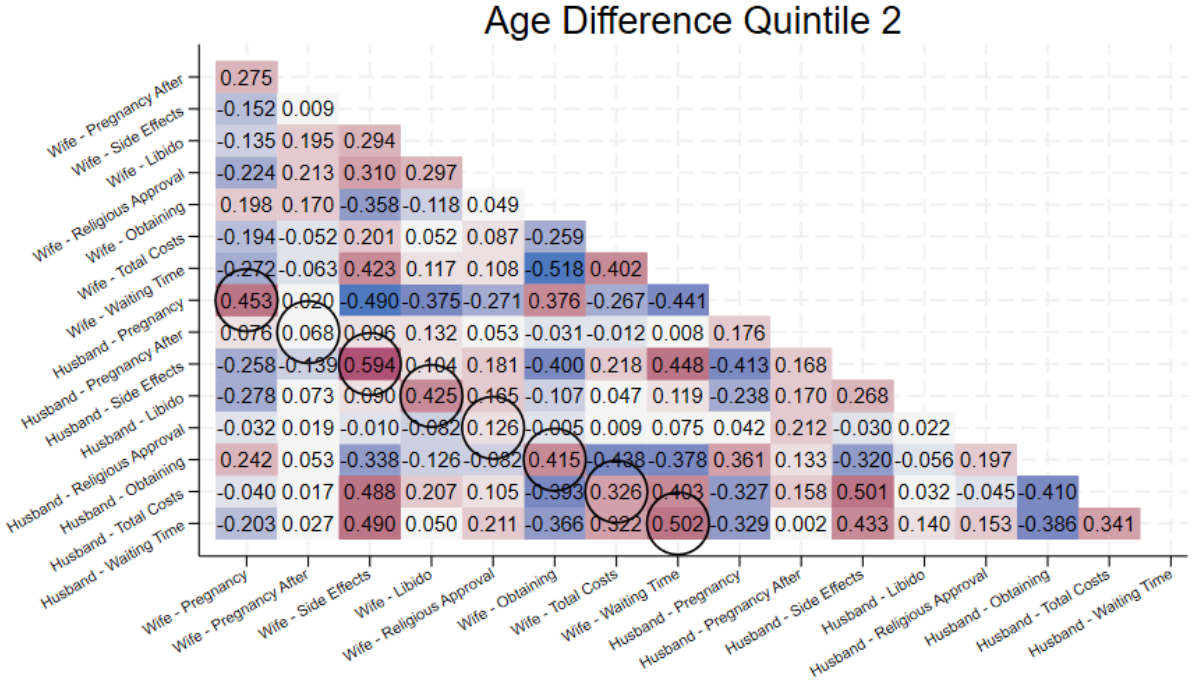

Figure A3: Husband-Wife Pairwise Correlation of Beliefs For Quintile 2 of Spousal Age Difference

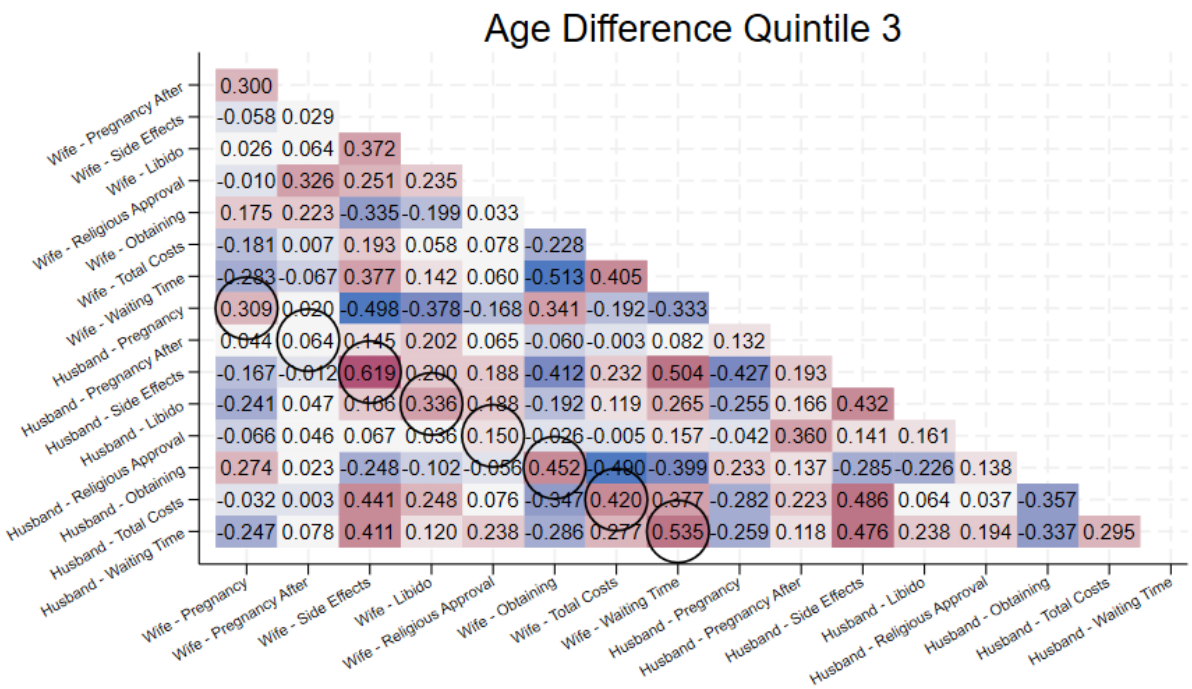

Figure A4: Husband-Wife Pairwise Correlation of Beliefs For Quintile 3 of Spousal Age Difference

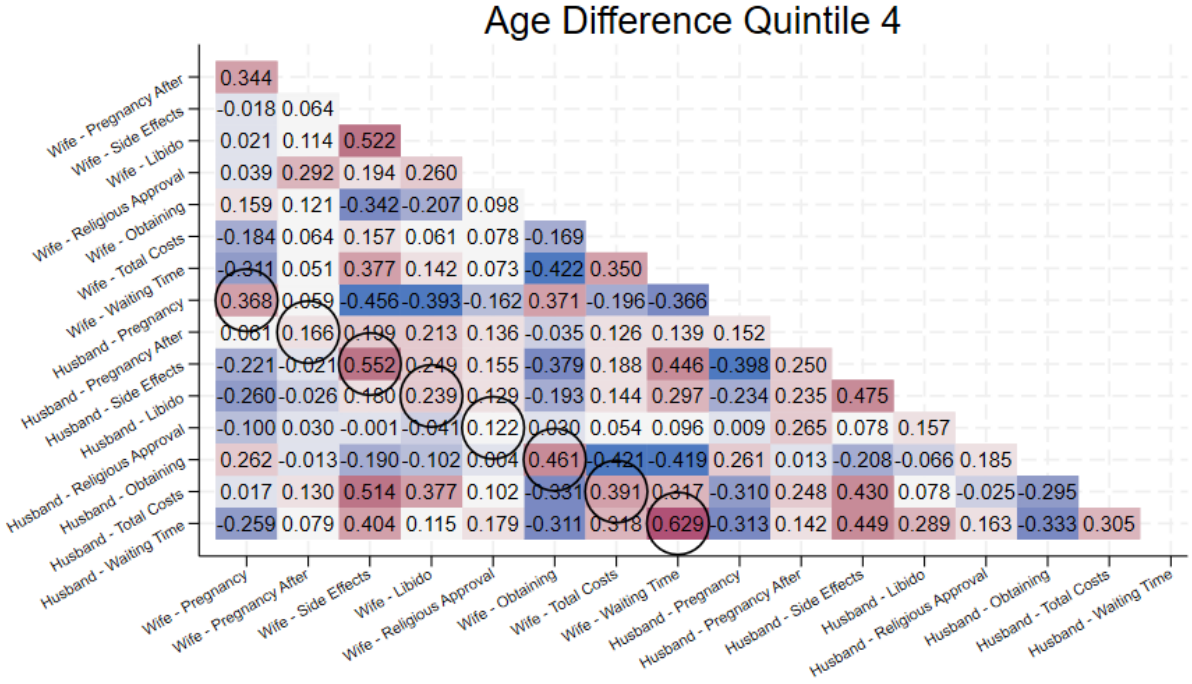

Figure A5: Husband-Wife Pairwise Correlation of Beliefs For Quintile 4 of Spousal Age Difference

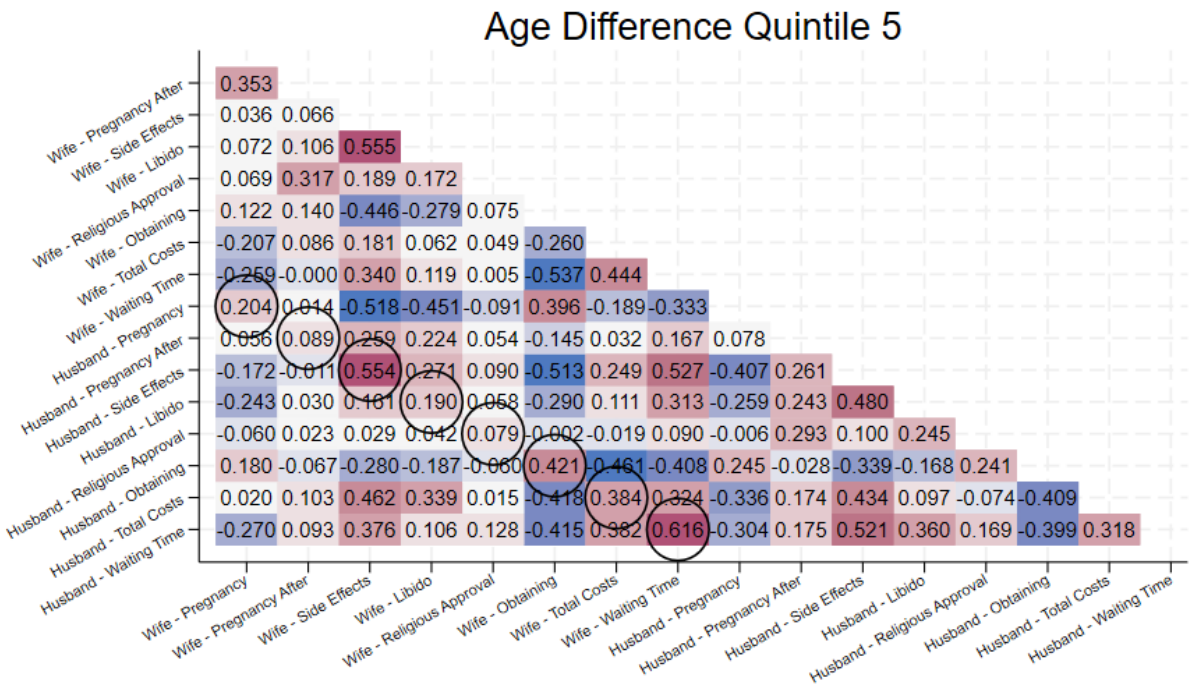

Figure A6: Husband-Wife Pairwise Correlation of Beliefs For Quintile 5 of Spousal Age Difference

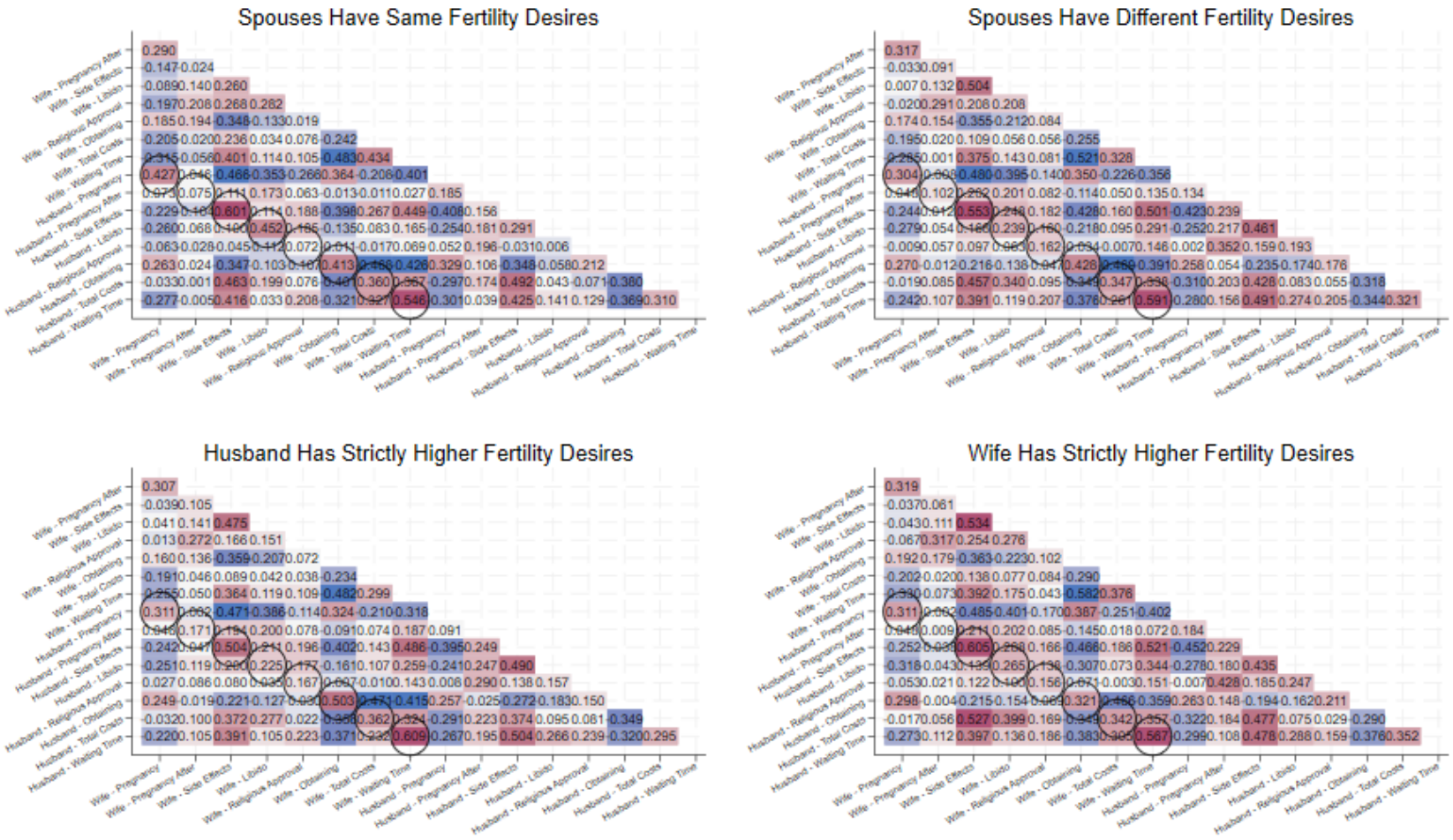

Figure A7: Beliefs Correlation by Fertility Preferences

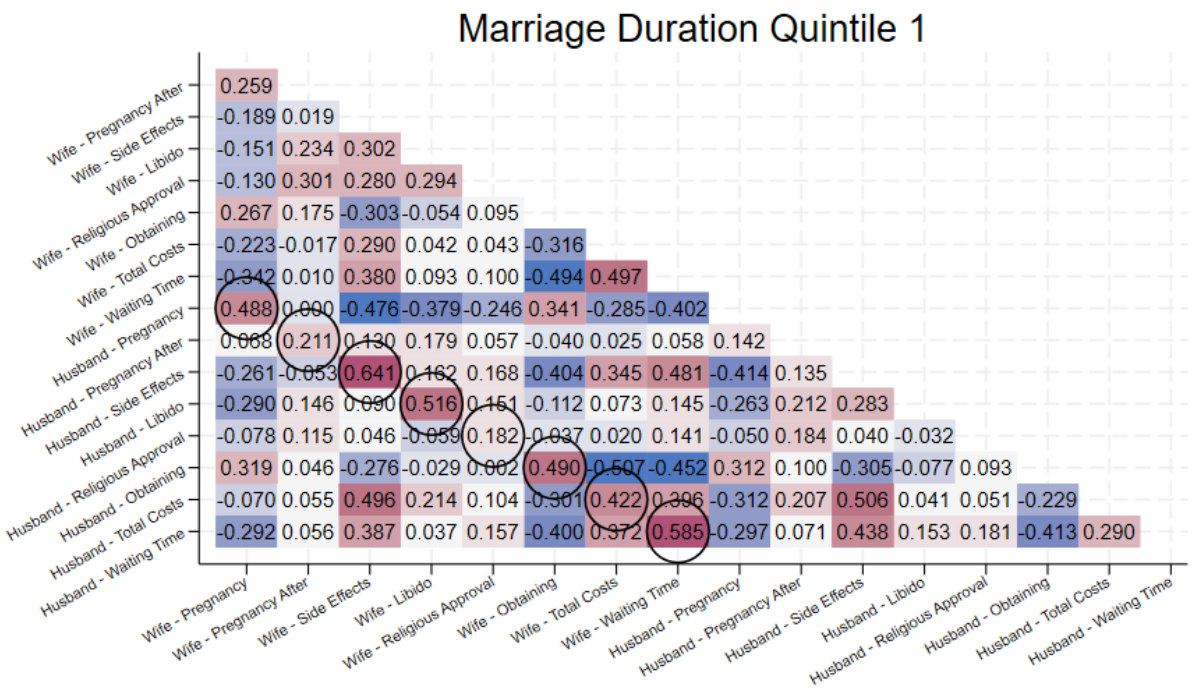

Figure A8: Husband-Wife Pairwise Correlation of Beliefs For Quintile 1 of Marriage Duration

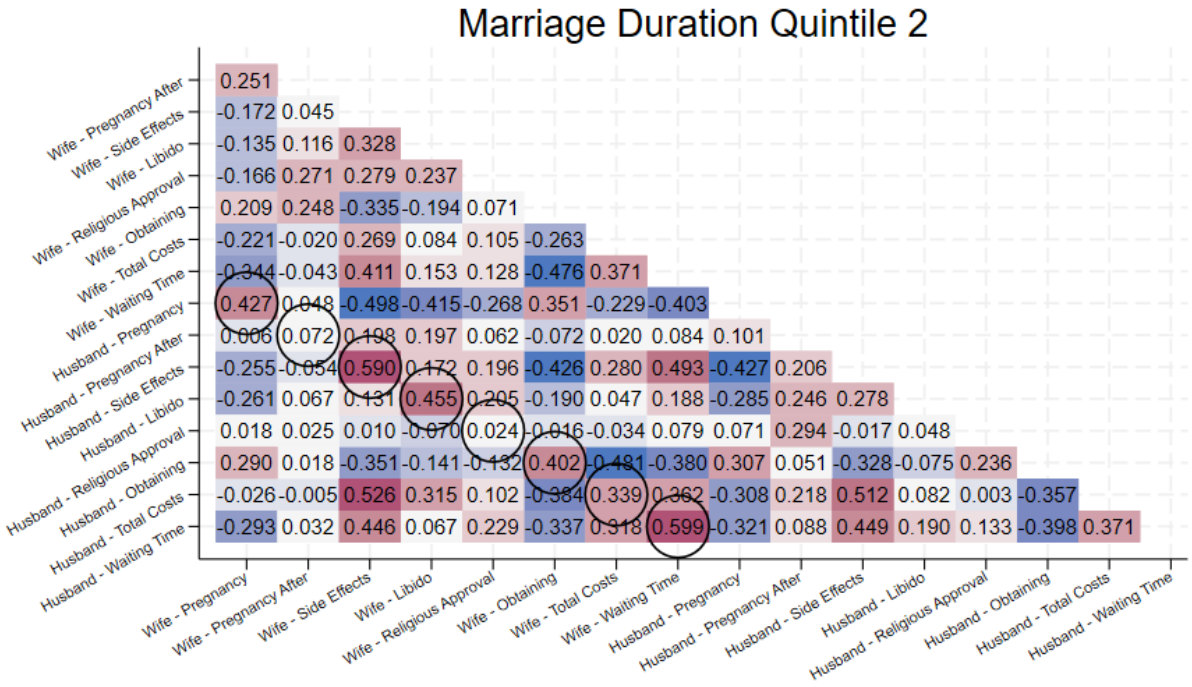

Figure A9: Husband-Wife Pairwise Correlation of Beliefs For Quintile 2 of Marriage Duration

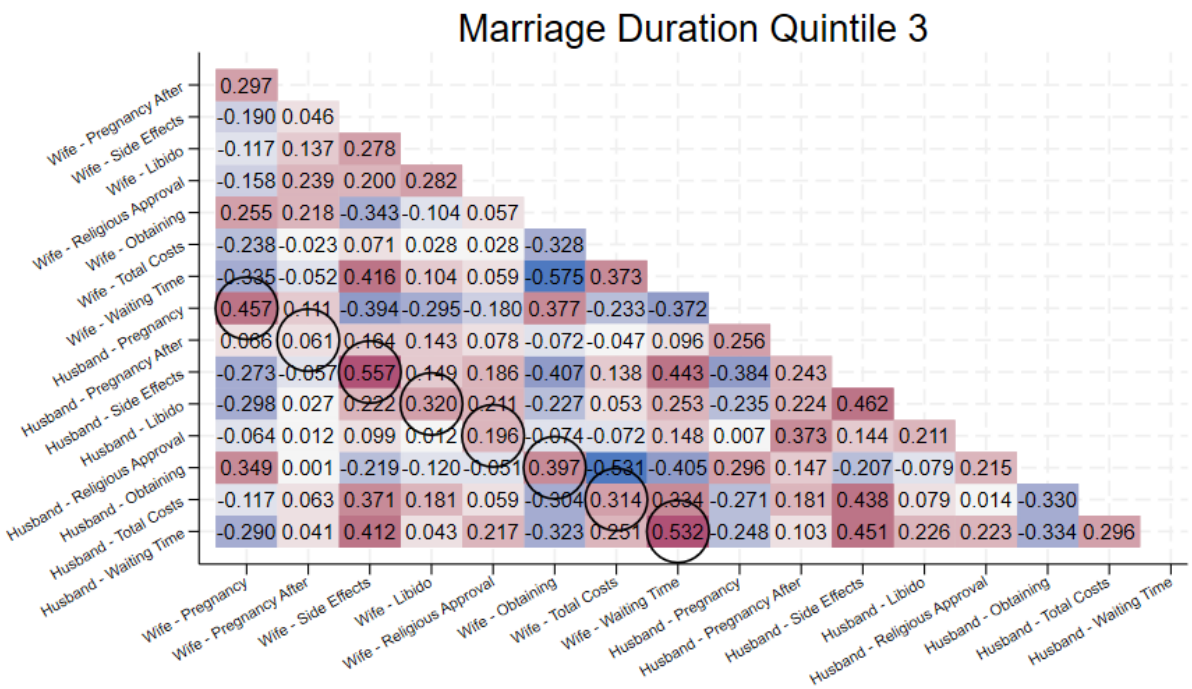

Figure A10: Husband-Wife Pairwise Correlation of Beliefs For Quintile 3 of Marriage Duration

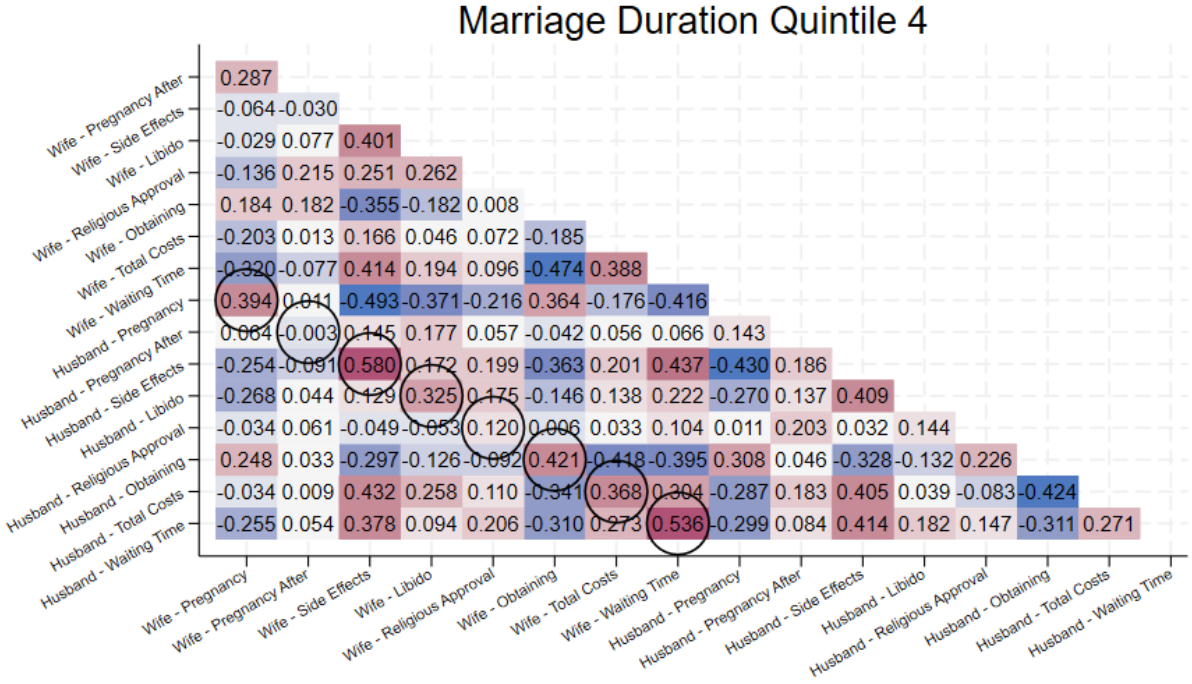

Figure A11: Husband-Wife Pairwise Correlation of Beliefs For Quintile 4 of Marriage Duration

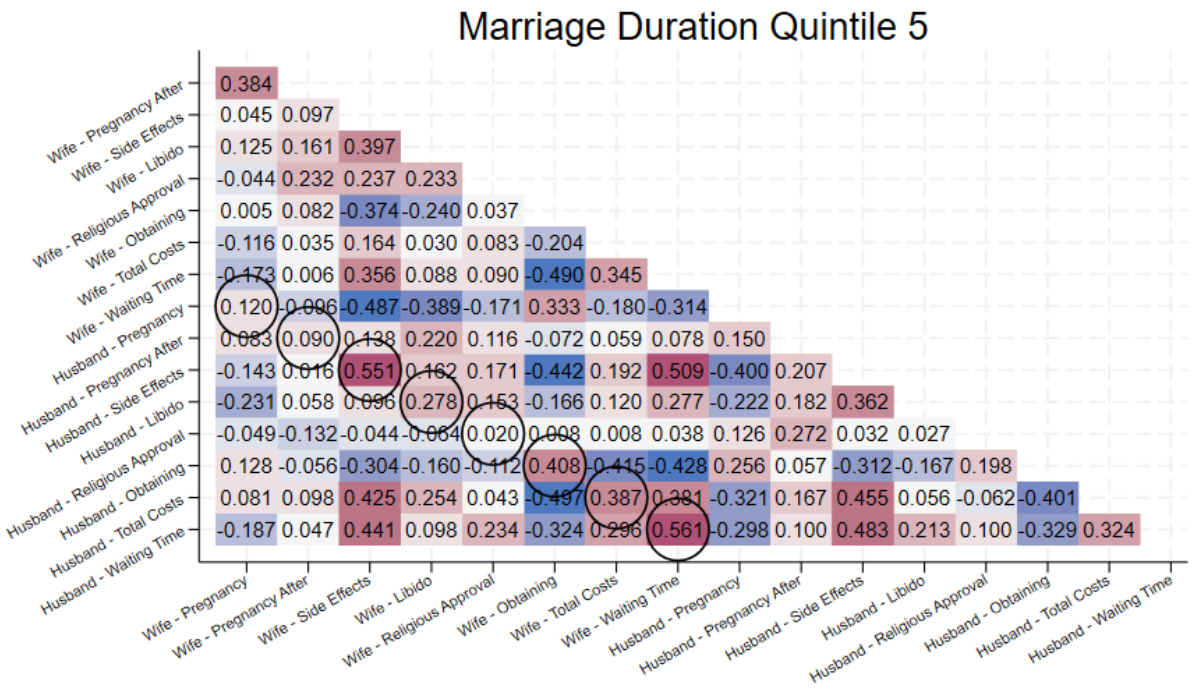

Figure A12: Husband-Wife Pairwise Correlation of Beliefs For Quintile 5 of Marriage Duration

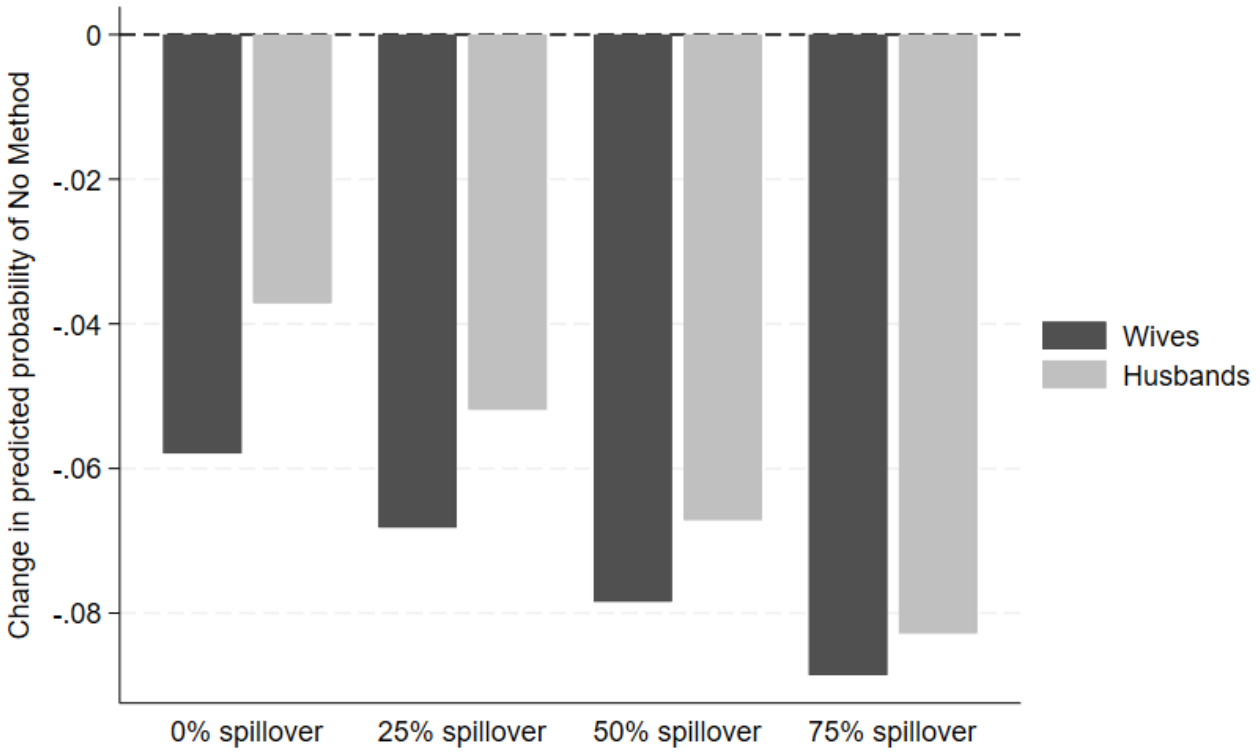

Figure A13: Sensitivity to Information Spillovers Between Spouses:
Illustration from counterfactuals targeting beliefs about pregnancy risk absent contraception

Notes: The first two bars correspond to the predicted change in the share of non-users when setting the perceived risk of pregnancy absent contraception to 85% for either wives (dark grey) or husbands (light grey). The remaining bars correspond to counterfactual experiments in which we additionally assume that the information received by either spouse partially spills over to the other spouse. In the 25% spillover counterfactual for wives, for instance, in addition to setting the perceived risk of pregnancy absent contraception to 85% for wives, we also partially update the husbands' perceived risk of pregnancy absent contraception to be closer to 85% by 25% of the husband's actual belief gap (i.e., the difference between the husband's belief and 85%).