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# Household Bargaining and Excess Fertility: An Experimental Study in Zambia

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## Abstract

We posit that household decision-making over fertility is characterized by moral hazard due to the fact that most contraception can only be perfectly observed by the woman. Using an experiment in Zambia that varied whether women were given access to contraceptives alone or with their husbands, we find that women given access with their husbands were 19% less likely to seek family planning services, 25% less likely to use concealable contraception, and 27% more likely to give birth. However, women given access to contraception alone report a lower subjective well-being, suggesting a psychosocial cost of making contraceptives more concealable.

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# 1 Introduction

The ability to control fertility through modern contraception is one of the most important technological developments of the 20<sup>th</sup> century, with potentially broad social and economic consequences for women and society. Yet despite the fact that modern methods of birth control have been around for almost half a century, many countries still report substantial unmet need for contraceptives and high rates of unwanted births.<sup>1</sup> For instance, the overall rate of unmet need in Sub-Saharan Africa was estimated to be 27% in 2006 (Westoff, 2006). Although unwanted births are often treated as evidence of a supply constraint, the fact that high rates of unwanted births occur in settings in which birth control is readily and cheaply available suggests that household demand for children must be a critical factor underlying low levels of contraceptive adoption (Pritchett, 1994).

In truth, the term “unwanted” is potentially misleading, given that household demand for fertility depends on two partners who may disagree about the optimal number of children. Indeed, data from the Demographic and Health Surveys (DHS) indicate that, in many countries, men on average report larger ideal family sizes than their wives (Westoff, 2010). While differences in preferences between spouses have been documented across many domains, leading to a rejection of unitary models of the household (Thomas, 1990; Lundberg et al., 1997; Lusardi, 2009), under standard bargaining models couples can still achieve efficient outcomes (Rangel, 2006; Manser and Brown, 1980; Browning and Chiappori, 1998). However, these models, with a few exceptions, are generally silent on the implications of asymmetric information and hidden action, which can lead to inefficiency (Bloch and Rao, 2002; Anderson and Genicot, 2012; Ashraf, 2009).

The possibility of hidden action is significant in the fertility domain, where many modern contraceptive technologies are used by the wife and unobservable to the husband. Qualitative studies and survey data from Zambia and elsewhere indicate that women frequently hide contraceptive use from their partners (Biddlecom and Fapohunda, 1998; Castle et al., 1999; McCarraher et al., 2005), and concealability is the most cited reason given for the growth in popularity of injectable contraceptives (Kaler, 2000; Gule, 1994).

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<sup>1</sup> Unmet need is defined by demographers as the difference between the share of women at risk of pregnancy who report wishing to space or discontinue childbearing and the share of women who report currently using a contraceptive method. Unwanted births are defined either, using panel data, as births to women who reported within the past two years that they did not wish to become pregnant within the next two years, or, using cross-section data, as births to women who report ex-post that the birth was undesired.

This paper documents the role of moral hazard in household decision-making over fertility, and presents evidence of inefficiencies in household bargaining around fertility through a field experiment with a large family planning clinic in Lusaka, Zambia. Our experiment provided 749 married women with a voucher guaranteeing free and immediate access to modern contraceptives through a private appointment with a family planning nurse. This included access to the most concealable and highly demanded method, which is often out of stock – injectables. In one condition, the voucher was provided to women alone (“Individual”) and required her signature only; in the other condition it was handed to the husband in the presence of his wife and required both of their signatures (“Couple”). The Individual treatment approximates the many family planning programs that target women directly and privately, providing them the opportunity for greater reproductive control (OlaOlorun and Tsu, 2010). The Couple treatment, by essentially giving husbands veto power over contraceptives provided throughout the study, approximates the spousal consent rules governing many family planning services offered through public and private clinics in much of the developing world (Miller et al., 1998).

We use this experiment to investigate the impact on contraceptive use and fertility of spousal consent which reduces the scope for moral hazard – thereby limiting women’s ability to meet their own fertility objectives, but also potentially curtailing suspicion and mistrust in the household. We first present a conceptual framework, drawing from a benchmark collective model, to derive predictions for both the long run and the experiment. We subsequently introduce a psychosocial cost to the household of moral hazard in intimate settings, a shading by the husband that arises from aggrievement (Hart and Moore, 2008), and show how the incorporation of this psychosocial cost has distinct long-run implications, which can arise even in the absence of assumptions of commitment and efficiency.

The resulting predictions are supported by the empirical findings from our experiment, which provide evidence of a trade-off between privately improving the woman’s set of choices, which may result in contraceptive outcomes that could improve welfare for herself and her child, and lowering the conjugal value of the marriage. In our experiment, women assigned to a treatment group in which their husbands were better able to control wives’ use of family planning services were 10 percentage points (19%) less likely to visit a family planning nurse and 6 percentage points (25%) less likely to use a relatively concealable form of contraception (injectables). The local average treatment effect from instrumental variables (IV) estimation indicates that use of family

planning services during this period was associated with a 27% reduction in births. These effects were concentrated, as predicted by theory, among women who wanted to postpone childbearing and also reported having a husband who desired more additional children than they did. Among this subsample, involving husbands in the family planning visit reduced use of injectables by 40%. There was no measurable treatment effect on the remainder of women. We find evidence suggestive of possible dynamic inefficiency in household bargaining over family planning, even when both spouses wish to postpone childbearing by at least two years. Such features of the bargaining environment could increase the net welfare benefit of placing contraceptives in the hands of women.

Two years after the intervention, we do not find any increase in marital dissolution or domestic violence among responders in the Individual treatment. However, we do find that these individuals experienced a significant reduction in happiness, health and ease of mind compared to those in the Couple treatment. This suggests a longer-term psychosocial cost to concealable contraceptives that can be mitigated by spousal involvement and is often ignored by programs focused on giving women reproductive control. We also find that giving men more control over contraceptives may lessen the marital tension and strife that the moral hazard problem inherent in contraception creates.

Ultimately, then, our results on welfare are inconclusive. Our results provide a cautionary note *both* to family planning programs that target women exclusively and promote more concealable forms of contraceptives, and to male involvement campaigns hoping to change fertility trends and promote family planning. The conclusion discusses other first-best options in light of these trade-offs.

## 2 Context

Our study is set in urban Zambia, where fertility and undesired pregnancy are high. According to the 2007 Zambia Demographic Health Survey (ZDHS), 41% of births in the previous five years were unwanted at the time of conception.<sup>2</sup> However, it is likely that many were unwanted only by the wife. Based on data from a nationally representative 2002 survey of men's family planning attitudes, on average Zambian men want 0.8 more children than their wives (Salem, 2004).

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<sup>2</sup> According to the 2007 ZDHS, the total fertility rate in Lusaka was 4.6 and maternal mortality was estimated to be 1 in 27 nationwide.

As in many countries in which men have relatively high demand for children, there is significant anecdotal evidence that women hide contraceptive use. Female demand is consequently higher for less visible methods such as injectables, which are superior to the pill in terms of both efficacy and concealability.<sup>3</sup> In a study in Swaziland, for example, injectables and IUDs were reported to be the most popular methods because they do not have to be taken every day and are easy to hide (Gule, 1994). Correspondingly, data from our baseline survey in Zambia indicate that a high fraction of women hide contraceptive use from their husbands. Among the 23% of men who claim they are currently “not doing anything to prevent pregnancy,” 59% have wives who separately report using some method of birth control. Furthermore, 77% of women reported preferring “a family planning method that only I know I am using.” Likewise, demand for injectables is high: at baseline, 20% of women were relying on injectables, and 37% said they hoped to use them in the future.

In Lusaka, contraceptives – including pills, condoms and injectables – can be obtained through public clinics, private clinics, or pharmacies; however, the price of access fluctuates widely. Injectables have been available in Zambia for many years, but are often either stocked out or pulled out of the market (USAID, 2005).<sup>4</sup> According to a comprehensive assessment of stockouts conducted by USAID, between October and December 2007, 53% of hospitals and health clinics in Zambia were stocked out of injectables for an average of 54 out of 90 days, and 28% were stocked out of contraceptive pills for an average of 35 out of 90 days (Ali et al., 2008). During the time of our study, there were frequent stockouts and very long waiting times at clinics, leading to high variance in supply. According to personnel at the clinic in which we conducted our study,

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<sup>3</sup> Women report hiding their contraceptives through various creative strategies: obtaining them from clinics close to the market while they do their shopping, or hiding them in bags of maize meal, outside under a stone, in their daughter’s rooms, in the roofs or with a female friend. In a survey of studies across Africa, documented covert use has ranged from 6 percent to 20 percent (Biddlecom and Fapohunda, 1998). According to Kaler (2000), “The desire for women to gain control over the means of regulating their fertility and the need for this seizure of control to be invisible to the eyes of the husband... led to the dominance of the Depo-Provera injection, the most private of all available methods.” Zulu (1998) explains one woman’s predicament in Malawi: “She said she could not go for sterilization since the hospital requires the husband’s approval. She ruled out pills because it would be easy for the husband to catch her since pills are taken every day. She thought the injection was the best option for her since it is administered once in three months, and she could lie to her husband that she went to the hospital for a vaccine.”

<sup>4</sup> Until the mid-1990s, most women in Zambia who used modern family planning methods used either oral contraceptives or the condom. Interventions sought to expand contraceptive choice, in particular working to overcome long-standing biases against injectables, which had essentially been banned in the country since 1982. This led to increased take-up of all methods, and injectables (registered in 2004) were found to be particularly popular (Depo-Provera, 2011).

the year before our study injectables were out of stock more than half of the time.<sup>5</sup> Although patients could purchase injectables outside of the clinic and bring them in to be administered, nurses reported that average wait times for family planning visits were typically more than 2 hours, and often approached 3-4 hours.

Though spousal consent was required by law until 2005, women are no longer officially required to have their husbands' approval in order to obtain contraceptives through public clinics in Zambia. Anecdotally, however, health care providers in rural Zambia, as in other parts of rural Africa, still commonly refuse to give contraceptives to women without the explicit consent of their husbands. For long-term methods such as implants and IUDs, this practice has been reported in urban areas as well (Osei-Hwedie and Osei-Hwedie, 1992). Similar practices have been documented in other African countries (Miller et al., 1998).

Perhaps because of spousal consent practices, men are generally aware of the existence of injectables. In the 2007 ZDHS, 75.1% of men knew about injectables despite the fact that only 18.8% of women had ever used them (Central Statistical Office, 2009). However, since husbands rarely visit the clinic, women likely have more precise information regarding current availability.

There is anecdotal evidence that suspicion over hidden contraception has contributed to increased marital tension in some households (Kaler, 2000). According to Chikovore et al. (2002), couples engage in a process of “hide-and-peek,” where “women acquire and use contraceptives secretly while men search for evidence of use.” In in-depth interviews we conducted with women drawn from the same population as our study sample, women stressed the challenge of husbands generally being suspicious. As one woman described, “women are ever worried, especially those on pills because it’s not easy to hide pills in these small houses of ours. For the injectables, they are less worried because a man cannot easily tell unless ... you are not conceiving.”

### 3 Conceptual Framework

We provide a basic conceptual framework with which to analyze what occurs when women’s decision rights over contraception are curtailed by spousal consent rules (which shut down moral hazard), both in our experiment and in the long run. This distinction is important because, when women were given more autonomy over contraceptive choice in the context of our experiment,

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<sup>5</sup> Interview, Nurse Grace Daka, Chipata Clinic, July 2009.

husbands' beliefs about their wives' ability to access contraception were also potentially altered.<sup>6</sup> We think of the long run as the point at which the supply of injectables has become sufficiently widespread and consistently available that the scope for moral hazard is transparent to all parties. Although testing for long-run predictions is outside of the scope of this paper, it is useful to have a framework for thinking about them in order to interpret our results.

We begin by deriving predictions based on a collective bargaining model (Browning and Chiappori, 1998; Chiappori et al., 2002), with the fundamental assumption that spouses can bargain efficiently. To provide a benchmark, we assume that utility is transferable within the household, and remain agnostic as to which bargaining solution is used.<sup>7</sup> We also assume a fixed distribution of bargaining weights, and predict how moral hazard affects outcomes given this fixed distribution.<sup>8</sup> We make predictions for both the experiment and the long run, using this benchmark model. We then introduce a particular cost to the household of moral hazard in intimate settings, a shading by the husband that arises from aggrievement (Hart and Moore, 2008), and show how the incorporation of this psychosocial cost has different long-run implications. In the Online Technical Appendix, we show mathematically how this can arise even in the absence of commitment and transferable utility via a noncooperative bargaining model with moral hazard where efficient bargaining is not assumed.

### 3.1 Bargaining Efficiently

Although traditionally collective bargaining frameworks have ruled out informational frictions of the kind generated by moral hazard, we can use as a benchmark case what we might expect if spouses were able to redistribute surplus amongst themselves efficiently in the face of a moral hazard constraint. Consider the choice of whether the wife should use contraception. We are interested in the case in which the wife does not want another child and the husband does.

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<sup>6</sup> In particular, husbands in the Individual condition knew about the existence of injectables but did not necessarily know that their wife had free and guaranteed access to them, whereas in the Couple condition the husband and wife had the same beliefs about access. Importantly, our setting is one in which both men and women knew of the existence of injectables prior to our study but the supply was very limited and erratic.

<sup>7</sup> See for instance Manser and Brown (1980) and McElroy and Horney (1981) for models of cooperative bargaining in which explicit bargaining concepts are analysed.

<sup>8</sup> One effect of increasing moral hazard may be to increase the bargaining weight of the wife, although this is not certain. This could lead to a type of dynamic inefficiency, where even if there is agreement on the wife's most preferred option in the first period (here, not having a child), the husband wants to avoid any contraception that introduces moral hazard as it could affect her bargaining power in the second period, and thus the couple may reach an inefficient outcome. We find evidence consistent with this outcome, described in the Results section.



**Case 1: Contraception is Pareto-efficient** Consider first couples for which the Pareto-efficient choice *absent moral hazard* involves using contraception. This happens whenever the wife’s net increase in payoff from not having a child (including the various costs of acquiring and using contraception) is greater than the husband’s net decrease in payoff. The collective paradigm assumes that the couple coordinates on using contraception and the husband receives some form of compensation. Since the couple, *absent moral hazard*, coordinates on the wife’s *most preferred choice* (that is, since there is no tension between the wife’s preferences and what the “marital contract” is designed to have her do), there is no reason to anticipate that, when this decision is not observable, the couple would coordinate on inducing the wife to not use contraception. As there is nothing to prevent the couples in question from taking the efficient action, they will use contraception whether it is observable or not. Importantly, thus, we expect no differences across the Individual and Couple groups in injectables use for these couples.<sup>9</sup>

**Case 2: No use of contraception is Pareto-efficient** Consider now the couples for which the Pareto-efficient choice *absent moral hazard* is not to use contraception; that is, the wife’s net increase in payoff from not having a child is lower than the husband’s net decrease in payoff. While the exact outcome of introducing moral hazard depends on the employed bargaining solution and the spouses’ preferences towards risk, we may nevertheless reach several conjectures.<sup>10</sup>

Note first that the non-observability of contraception use tends to make intra-household bargaining less efficient (simply by reducing the number of contractible contingencies) since these couples are coordinating on the wife taking her *least preferred option*. Given these inefficiencies, it follows that the larger the scope for moral hazard in the long run, the (weakly) lower the surplus created by the couple. Because of this, more of these couples should either start using contraception or revert to their outside options such as the payoffs under divorce or the payoffs accruing in a noncooperative outcome (Lundberg and Pollak, 1993). Said differently, contraception take-up should increase in the long run together with moral hazard, if moral hazard is not so severe that couples start separating.<sup>11</sup>

<sup>9</sup> In the Individual treatment, showing her husband the voucher may lead to a renegotiation in favor of the husband and thus she may prefer to remain silent, use the contraception and make the transfer as agreed upon in the status quo. In the Couple treatment, she may need to provide him more transfers. Her payoffs then would be higher in the Individual condition.

<sup>10</sup> We describe below one reduced-form way of introducing moral hazard, with risk neutrality.

<sup>11</sup> In our case, we do not find evidence of treatment effects on separation or violence.

### 3.2 Costs of moral hazard

One specific way to incorporate moral hazard into a collective model that, although reduced form, yields insight, is through a psychosocial cost that reduces the surplus of the couple. We allow the husband to feel aggrieved and act as a “difficult” husband, depending on his level of suspicion concerning the wife’s use of contraception. Although injectables are virtually undetectable, his suspicion should increase as time goes by without his wife conceiving. The language of aggrievement is taken from [Hart and Moore \(2008\)](#), where becoming a “difficult” husband in our setting is what Hart and Moore model as ex-post uncontractible shading. In our setting, the informal contract makes clear the expectation of childbearing as part of the marital arrangement, a strong cultural norm. The husband can become “aggrieved” when these expectations for children are not met (or not met quickly enough) when there is a possibility for shirking by the wife. Shading thus arises here from the suspicion that the reason for not having a child is shirking, and not bad luck.<sup>12</sup>

The perception that a partner could be keeping something private can create a feeling of distrust and social exclusion, which then translates to worse emotional outcomes for the partner perceived as concealing (for a review see [Williams, 2007](#)). This is supported by qualitative work we conducted with study subjects several years after the experiment in which we asked a representative sample of 30 men how they would interpret a voucher for family planning services being handed to them, showing them a replica of the voucher used in the experiment. They talked of a feeling of being “not excluded from something that belongs to me too” and having “control over her visit to the clinic because if I don’t get involved she might get birth control for 5 years while I still want to have children.” The inclusion of men gives them more control – and hence ability to obstruct women’s choices – but at the same time the psychological benefit to the husband can have positive spillovers on the wife. If the couple had coordinated on not using contraception and having another child, the presence of this effect of moral hazard would lead

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<sup>12</sup>Shading here is thus based on the subjective probability of an unobservable action (that is, contraception), while it comes from an observable price in [Hart and Moore \(2008\)](#). If the husband and wife can transfer utility contingent on the birth of a child, they can write a contract that implements no use of contraception even in the absence of shading. Thus, if the husband’s shading decision is based on his rational belief, he will not shade under such a contract and shading will be irrelevant in equilibrium. There are two potential reasons why this might not be the case: 1) The couple cannot write a child-contingent contract, as in the noncooperative model below, or 2) the husband has an “automatic”/hard-wired response of feeling aggrieved to expectations not being met. This hard-wired response is predictable and based, as we describe below, on his subjective probability that the reason for expectations not being met is contraceptive use (and not bad luck, for example).

the husband to become increasingly aggrieved as his wife does not conceive, suspecting that she is using contraception and shirking their contract – and thus impose a loss on the wife.

Of course, the husband has to feel confident enough that the wife’s shirking/taking contraception is the reason for a delay in conception. That will be the case only when the scope for moral hazard is high enough (say because the supply of contraceptives is known to be high). She might use contraception as long as he does not (sufficiently) suspect. Thus we would observe couples who would not have used contraception absent moral hazard, but who use contraception once the scope for moral hazard increases. However, if suspicion and aggrievement is high enough – for example, if the supply of injectables becomes guaranteed and widespread while men’s expectations of the marital contract (reference point) remain constant – contraceptive use could easily revert back to baseline levels in the long run.

### 3.3 Aggrievement in a non-cooperative model

Interestingly, the model of aggrievement, and its results, do not require assumptions of commitment, transferable utility, or even efficiency. In the Online Technical Appendix, we analyze a model of how aggrievement arises in a non-cooperative game, in which husband and wife cannot reach binding agreements (i.e., each spouse’s action is a best response to the other spouse’s action). Aggrievement is in this case precisely ex-post noncontractible shading. The predictions for the experiment itself are similar to those of the cooperative model above. In the long run we assume, as above, that the husband has the right beliefs concerning the scope for moral hazard.<sup>13</sup> We find a possibility that, among couples with misaligned preferences for fertility, increased supply of concealable contraceptives past a certain threshold could generate a mistrust that leads to welfare losses for *both* husband and wife, akin to [Akerlof \(1970\)](#). This ultimately could lead to less use of injectables overall and lower subjective well-being for both parties in the long run.

### 3.4 Mapping predictions to the experimental setting

In the experiment, the scope for moral hazard was not known to both parties in the Individual treatment: although husbands knew about the existence of injectables, it was only in the Couple treatment that they knew with certainty that the availability of injectables was guaranteed for

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<sup>13</sup>Note that, in all cases, men being aware of the enhanced ability to access injectables actually increases moral hazard, since injectables are practically undetectable.

their wife. Under both a collective and a noncooperative model, because of a simple revealed preference argument (the wife could choose to turn over the voucher to the husband or use it in the Individual condition), and because the husband has decision rights over the use of the voucher in the Couple group, we would predict that contraceptive use and welfare would be higher for women in the Individual treatment than in the Couple treatment. Although we cannot test for the long-run predictions of the framework without a different experiment, we can use follow-up data from our experiment to shed light on what mechanisms might be at play in the long run by testing for psychosocial costs. Our framework predicts greater aggrievement arising from the enhanced scope for moral hazard that increased supply creates among couples with misaligned preference. In the long run, as injectables become widespread, a potential outcome (holding preferences constant) is that the use of injectables would decline and fertility would either remain the same or increase, depending on the extent of the aggrievement from husbands.<sup>14</sup>

## 4 Experimental Design and Data

This section describes the sample for the field experiment, the survey data gathered, and how we implemented the experimental conditions above and measured their impact.<sup>15</sup>

### 4.1 Sample

We recruited subjects from the catchment area of Chipata Clinic, a large government clinic that serves low-income “compound” neighborhoods in Lusaka. Community health workers (CHWs) from the clinic were hired to recruit subjects through home visits. Married women of childbearing age (18-40) were invited to participate in the study if they: (1) currently lived with their husband; (2) had last given birth between January 2004 and December 2006; (3) were not currently pregnant; (4) had neither been sterilized nor had a hysterectomy; (5) were not known to have health conditions for which hormonal contraceptives are contraindicated; and (6) agreed to participate in a survey and information session about family planning together with their hus-

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<sup>14</sup>Of course, it is possible that as countries get richer, both male and female preferences for contraception and fertility will change, which could lessen this effect.

<sup>15</sup>This experiment is part of the larger *Zambian Contraceptive Access Study (ZCAS)*. [Ashraf et al. \(2012\)](#) explore the implications of lowering the price of contraception in the combined treatment group compared to a control group that did not receive the voucher, while this paper focuses on the difference between the Individual and Couple Treatment arms, which were randomized as a second stage of the study.

band.<sup>16</sup> Although the voucher intervention only required the husband’s presence in the Couple condition, criteria (6) was imposed on all subjects in order to prevent higher rates of attrition among those assigned to the Couple condition relative to those in the Individual condition. Recruitment was conducted in two stages using two different sampling frames during July 2006 to April 2007, described in detail in the Online Appendix.

Figure 1 illustrates the stages of our experiment, with relevant sample sizes. The experiment consisted of a baseline survey in the first visit administered solely to the wife, during which an appointment was made for a second visit with both the wife and husband. Treatment (Individual versus Couple) was then randomly assigned.<sup>17</sup> Among the 1031 women eligible for inclusion in the experiment, 749 participated, including 371 assigned to the Couple treatment condition and 378 assigned to the Individual condition. Figure 1 shows the breakdown of reasons for non-participation. Non-participation overwhelmingly reflected resource constraints on the part of the investigators and a strict timeline for completion of the study, both of which caused us to halt recruitment efforts before all households could be reached for a second visit.

Given that recruitment was double-blind, drop-out happened before assignment was revealed to either subjects or enumerators. Hence, it is safe to assume that factors determining non-participation were orthogonal to treatment assignment.<sup>18</sup> Correspondingly, rates of non-participation were almost identical across treatment arms (28.4% in the Couple arm and 26.2% in the Individual arm). Table 1, which reveals that treatment arms in the final sample (excluding non-participants) remained balanced on all observables, provides further evidence that non-participation was independent of treatment assignment.<sup>19</sup>

Approximately two years later, we conducted a follow-up survey in which we re-interviewed 94% of individuals, leaving a final sample of 706. Only 1% of study subjects could not be accounted for (an additional 3% had passed away and 2% refused). There were no significant differences in attrition rates at follow-up across treatment arms.

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<sup>16</sup>Each of these inclusion criteria was screened by the CHW during recruitment visits. In addition, women were thoroughly screened for health conditions for criteria 3 and 5 if and when they visited the family planning nurse at Chipata clinic. Disqualifying health conditions included diabetes, heart disease and high blood pressure.

<sup>17</sup>Our choice to balance treatment assignment on baseline characteristics prevented us from randomizing earlier.

<sup>18</sup>Importantly, no subjects dropped out of the study mid-way through the second visit, which was when treatment assignment was revealed.

<sup>19</sup>Although this non-participation is not a threat to internal validity, it could still affect external validity: some amount of non-participation may reflect subjects’ tacit unwillingness to participate in the study. However, the direction of bias due to this type of sample selection is unclear. See Online Appendix Section on Sampling and Online Appendix Table 2 for discussion.

## 4.2 Baseline Survey

Our baseline survey and voucher intervention for both treatment groups took place between March and June 2007. At the first household visit, a team of one enumerator and one CHW administered the baseline survey to wives only (Figure 1). During this visit, CHWs first re-screened women to ensure that they continued to meet all of the inclusion criteria and still agreed to participate. Eligible women gave consent to participate and were administered a one-hour survey in their homes that collected detailed information about marriage and childbearing, fertility preferences, decision-making in the household, and contraceptive use.

Immediately following the survey, CHWs were responsible for delivering health information about the prevention of sexually transmitted diseases (STDs) and condom use and distributing a three-pack of condoms.<sup>20</sup> In addition, CHWs gave participants information about the benefits of family planning, the range of family planning methods available at Chipata Clinic, specific information about injectable contraceptives and contraceptive implants including contraindications and side effects, and counseling about dual protection. Husbands were not present during either the survey or the information session of the first visit.

## 4.3 Experiment

The key experimental manipulation took place during a second visit in which all households received the voucher described above that guaranteed minimal wait time and access to injectables and implants.<sup>21</sup> Prior to this visit, all women were randomly assigned to either the Couple or Individual condition, which determined whether they were given the voucher alone (Individual) or together with their husband (Couple). Treatment group was assigned dynamically within batches of surveys collected from enumerators approximately daily.<sup>22</sup>

The experimental protocol was as follows: when the field team arrived at the couple's home

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<sup>20</sup>CHWs all had previous experience working with the clinic to implement information campaigns and homecare programs. The script containing the information covered in this visit is provided in the Online Appendix Section 3.

<sup>21</sup>Sufficient condoms, pills, and IUDs were already available at the clinic. To keep waiting lines short we spaced the voucher intervention over 4 months, distributing about 50 vouchers per week. One injection lasted 3-4 months.

<sup>22</sup>Randomization was done using the minmax t statistic method (Bruhn and McKenzie, 2008), with treatment assignment balanced on the following variables collected in the baseline survey: wife's age, wife's education, current number of living children, reported desired number of children, reported differential in fertility desires between the woman and her husband, whether the woman was currently using injectables, and whether the woman was currently using the pill.

for the second visit, the couple was told that the team would be conducting short surveys of each spouse. To ensure confidentiality, they were surveyed separately and in private. The husband’s survey primarily gathered information on fertility preferences and income. The wife’s survey contained only questions about whether she had visited a clinic since the previous visit and whether she had seen or heard about the voucher.<sup>23</sup>

Treatment assignment was revealed to the survey team when they removed the survey instrument from the pre-labeled envelope at the start of the interview. In both cases, first the husband was surveyed alone, then the voucher was given out, then the wife was surveyed alone. The difference is that in the Couple condition, the husband and wife received the voucher together, with the voucher given to the husband, whereas in the Individual condition, the wife was given the voucher in private. In the Couple treatment, the husband’s NRC number was required on the voucher and it was given directly to him. In the Individual treatment, the voucher was given to her, it only required her NRC number on it, and she could simply take it and redeem it.<sup>24</sup> Based on responses to debriefing surveys conducted among 48% of women in our study, we estimate a 1.1% rate of non-compliance with treatment assignment. Throughout the paper we consider only treatment assignment rather than treatment received.

Table 1 presents summary statistics on a wide range of variables available in the baseline broken down by treatment assignment. Panel B describes summary statistics for the variables that were used to balance assignment across the treatment arms, hence, means of these variables are predictably very similar across these two groups. Out of 29 variables not used to balance the sample there are no differences in means that are statistically significant or large in magnitude, indicating that treatment assignment was balanced.

#### 4.4 Clinic Take-up Data

To keep track of visits women made to the family planning clinic to redeem their voucher, the nurse hired for the study kept daily visit logs. To ensure that vouchers were not used by individuals outside of our sample, the wife’s name and national ID numbers were written on

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<sup>23</sup>The main purpose of re-surveying wives in this visit was to have women alone so that those assigned to the Individual condition could be given the information session and voucher privately. Compensation for participation was given to the husband and wife separately.

<sup>24</sup>The protocol is described in depth in the Online Appendix. CHWs and surveyors were responsible for ensuring adherence to the protocol, monitored daily by supervisors.

the voucher by enumerators, and women were instructed to bring their ID cards to the clinic at the time of the visit for the nurse to verify.<sup>25</sup> For each woman who came to the clinic to redeem a voucher, the nurse verified her identity, discussed family planning alternatives, and prescribed her desired method of contraception after screening for contraindications. Detailed logs of each visit recorded the date and time of visit, the name and National Registration Code (NRC) number of the woman, the ID number of the voucher, and the desired, prescribed and received family planning method. Official expiry date of the last voucher was June 23, 2007.

#### 4.5 Follow-up Surveys

To study the impact on fertility of birth control access provided through our study, we conducted a follow-up survey approximately two years after the baseline. The follow-up survey contained detailed questions on reproductive histories over the past two years, as well as questions about respondents' marital status and current health and well-being. In addition, we collected extensive qualitative data at the time of the follow-up survey, in focus groups with subsets of participants (men and women separately) in July 2010, and in an additional round of individual interviews in June 2012 about factors that influenced a respondent's decision to redeem the voucher and, for men, their interpretation of receiving the voucher.

## 5 Results

In the results that follow, we estimate a linear probability model with the following ordinary least squares (OLS) regression:

$$Y_i = a + \beta I_{MH} + \omega v X_i + e \tag{1}$$

where  $Y_i$  is the binary outcome variable of interest;  $I_{MH}$  is an indicator for assignment to the Couple condition; and  $X_i$  is a vector of controls from the baseline survey, including: husband's and wife's age, husband's and wife's education, husband's and wife's income, husband's and

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<sup>25</sup>These data were also cross-checked with two additional sources: 1) all of the vouchers that were redeemed were physically collected from the clinic by the investigators to verify that all women who redeemed a voucher were reported in the nurse's logs; 2) enumerators conducted a short debriefing survey with each woman in the study as she exited the clinic after her family planning visit. We found no vouchers for women who completed debriefing surveys who were not recorded in the nurse's log.



wife’s existing and ideal number of children, whether wife was using contraception at baseline, whether wife was over 40, whether wife was aware of her most fertile period of the month, difference between the husband and wife’s total number of children, difference between husband and wife’s preferences for number of children, months since last birth, and dummy indicators for compound of residence within the catchment area. We show all results with and without a long list of demographic controls detailed in the table notes. Tables 2-5 present experimental results on the impact of assignment to the Couple treatment arm on voucher and injectable take-up, and various indicators of female well-being.

We also refine our empirical predictions to better fit the conceptual framework motivating our analysis by isolating the subsample of couples for whom we should expect the privacy condition to influence contraceptive behavior. In particular, moral hazard only pertains to couples in which incentives to have children are misaligned. That is, based on the conceptual model we expect to see differences in outcomes only among couples that currently disagree over whether or how quickly to have another child such that the man has a lower demand for birth spacing in the immediate future. We classify such women as potential “responders” to Individual treatment if they satisfy the following two criteria: (1) she does not want to get pregnant in the near future,<sup>26</sup> and (2) she believes that her husband desires more *additional* children than she does at the time of the beginning of the study.<sup>27</sup> While there is no reason to anticipate a response to treatment among women who do not meet the criteria for potential responders, it is important to note that there are many potential sources of measurement error in the variables used to classify women as responders. These sources are likely to lead us to underestimate the number of potential responders in the sample. For instance, women’s reported fertility desires may reflect family planning objectives given the availability of contraceptives at baseline rather than under the hypothetical “ideal” circumstances that they were asked about. Also, women may have

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<sup>26</sup>A woman is considered to have unmet need for contraception if she: (1) is married or in a consensual union; (2) is of reproductive age; (3) is capable of becoming pregnant; and (4) wants to have no more children or to postpone childbearing by at least two years. Based on the sampling frame, all women in our study meet the first three criteria. We use two questions from the baseline survey data to identify women who meet the fourth criteria at the time of the study: “If it were completely up to you, would you like to have another child within the next two years, after two years or not at all?” and “If it were completely up to you, how long would you like to wait until the birth of another child?” A respondent is reported as desiring to conceive if she reports wanting to give birth within two years for either of these questions.

<sup>27</sup>Since we are interested in how the wife responds to gaining asymmetric control over guaranteed access to contraceptives, we use her beliefs about her husband’s preferences rather than his stated preferences. We include couples in which the man states a higher preference for either the ideal or maximum desired number of children, so as to capture as many potential conflicts as possible.

substantial uncertainty regarding their husband’s fertility preferences, and thus, for instance, may conceal contraceptive use even when they guess that their husband does not want more children if they assign some probability to his deciding to have another child.

## 5.1 Voucher and Contraceptive Use

### 5.1.1 Voucher Take-up

In total, 48% of women redeemed the voucher for family planning services. While 53% of women in the Individuals treatment redeemed the voucher, the rate was only 43% in the Couple treatment arm, a 19% reduction in use. Table 2 presents corresponding regression estimates of the effect of private information on voucher redemption, which verify that the difference is significant at the 5% level with and without controls (Column 1, Panels A and B).

Among the subset of potential responders, which encompasses a mere 23% of the sample, women are 16 percentage points (25%) less likely to use the voucher in the Couple treatment (significant at the 5 percent level). Meanwhile, the point estimate is half the size and insignificant among the predicted non-responders, although the difference between responders and non-responders is not statistically significant (Columns 5 and 7, Panels A and B).

To gain confidence in our interpretation that this difference in voucher take-up is indeed due to a difference in opportunity for hiding contraceptive use in the Individual treatment, we use in-depth interviews conducted in conjunction with the follow-up survey to learn what women did with the voucher after receiving it, including whether and why or why not they spoke to their husbands about the voucher, why they did or did not use the voucher, and whether their husbands discouraged them from using it.

Using these responses, we identify respondents in the Individual treatment who redeemed the voucher without their husband’s knowledge because they believed he would otherwise not have let them use it. That is, according to our analytical framework, the difference in the rate of voucher redemption between the two treatment arms is equal to the number of Individually-treated women who used the voucher but whose husbands would not have let them go had they been made aware of the opportunity. We hand-coded each observation, making use of all responses to questions in this section, and classify respondents’ motives conservatively such that we only report a woman as hiding from her husband when she makes explicit reference to

hiding.<sup>28</sup>

Identifying these respondents allows us to directly estimate the fraction of the treatment effect on voucher redemption that can be accounted for by greater reported ability to conceal. In total, among women in the Individual condition who used the voucher, 11% admit that they did so behind their husband’s back because he would not have let them redeem it, and another 5% appear to have misrepresented the voucher offer in order to convince their husbands to let them use it. The first category alone implies a 6 percentage point difference in voucher redemption across treatment arms. If we also include cases of misrepresentation, this accounts for an 8.5 percentage point difference in voucher use. These numbers imply that hiding vouchers from disapproving husbands alone explains 60-85% of our estimated treatment effect. Among the responder subsample, women in the Individual treatment who admit in qualitative interviews to redeeming the voucher without their husband’s knowledge explain 61% of the estimated treatment effect.

### 5.1.2 Injectable Take-up

We next turn to the effect of male involvement on take-up of injectable contraceptives.<sup>29</sup> Given that injectables are considered more concealable than other methods of contraception, husband involvement should have an especially large negative effect on their use. The estimates in Column 2 (Panels A and B) of Table 2 reveal that take-up of injectable contraceptives is 25% (6.0 percentage points) lower among women in the Couple condition and that the difference is statistically significant at the 5% level.<sup>30</sup>

These numbers imply that the rate of injectable take-up is disproportionately high among voucher users, which we can infer from the fact that 46% of Individual voucher users received injectables compared to only 43% of those in the Couple treatment. Using women in the Couple treatment’s rate of take-up of injectables as the counterfactual, this implies that, among the

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<sup>28</sup>For example, the following woman who was in the Individual treatment was coded as hiding: “I put [the voucher] in the bag for my children’s clothes to hide it from my husband. I did not show him the voucher because he does not know that I am using contraceptives.” In contrast, although ambiguous, the following Individually-treated woman who used the voucher but did not tell her husband was not considered to be hiding. According to this woman, “I kept the voucher in my handbag. I did not talk about the voucher with my husband.”

<sup>29</sup>Based on values recorded in the nurse’s logs, we construct an indicator variable equal to one if the woman received injectable contraceptives at the time of her family planning visit.

<sup>30</sup>The results are robust to expanding the definition of relatively concealable methods to include contraceptive implants and IUDs, both of which are used very rarely by women in our sample. Only 23 women chose to take up implants through the voucher, compared to the 160 that took up injectables.

19.1% of women who were encouraged by the privacy condition to redeem their voucher, the rate of concealables is 59%.<sup>31</sup>

Among the responder subsample the difference is even starker: Women are 47.9% (13.6 percentage points) less likely to take up a concealable form of contraception when it is observable to the husband, indicating that 85.3% of women who are encouraged to use family planning services by the privacy condition demand injectables, compared to only 31.3% of responders in the Couple condition (Table 2, Columns 5 and 6, Panels A and B). That is, virtually all women in the responder subsample that use the voucher only when it is offered in privacy go home with injectables, or 2.7 times as many as would otherwise.<sup>32</sup> With respect to take-up of injectables, there is no difference according to treatment condition among women identified as non-responders, and the difference in treatment effect estimates between responders and non-responders is statistically significant.

### 5.1.3 Inefficient Outcomes?

What is perhaps most interesting about fertility preferences among our potential responders is that, while by definition they disagree on the ideal number of children, the majority agree that they would not like to have a child in the near future. In particular, 63% of couples who *disagree* about how many additional kids to have at baseline *agree* that it would be preferable to wait at least two years to have their next child. This makes the experimental results somewhat puzzling since it indicates that wives often have greater demand for long-acting contraception even when their husbands would also prefer to avoid pregnancy. To investigate the patterns in more detail, we run the experimental analysis on this subsample of “short-run concordant” couples. The subsample, which encompasses 419 of the 749 households in our sample, is balanced on observable characteristics across Couple and Individual arms, as shown in Online Appendix Table A.4. In

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<sup>31</sup>In total, 18.3% of women in the Couple treatment received injectables. Since 42.8% of women in the Couple treatment redeemed their vouchers, this is an average injectable take-up among voucher users of 42.8%. The rate of 59% injectable usage among marginal voucher users comes from decomposing the average rate of injectable take-up among the Individual voucher users (45.9%) into a weighted sum of the take-up rate among the 80.9% of “unconditional” voucher users plus the 19.1% of “marginal” voucher users implied by the difference in rates of voucher use between treatment arms. In particular:  $0.809(0.428) + 0.191(0.590) = 0.459$

<sup>32</sup>Among this subsample, 14.8% of women in the Couple treatment received injectables. Since 47.3% of women in the Couple treatment redeemed their vouchers, this is an average injectable take-up among voucher users of 31.3%. The rate of 85.3% injectable usage among marginal voucher users comes from decomposing the average rate of injectable take-up among the Individual voucher users (44.9%) into a weighted sum of the take-up rate among the 74.8% of “unconditional” voucher users plus the 25.2% of “marginal” voucher users implied by the difference in rates of voucher use between treatment arms. In particular:  $0.748(0.313) + 0.252(0.853) = 0.449$

terms of characteristics of couples that fall into this category, couples that agree on spacing in the short-run look qualitatively similar to couples that do not, except that on average they have more existing children, and are more likely to have recently given birth, suggesting that this sub-sample reflects particular life stages of a couple rather than a different type of couple.<sup>33</sup>

As predicted, the results of the subgroup analysis presented in Table 3 reveal that take-up of family planning services and use of injectables are significantly higher when women are assigned to the Individual condition, even among couples for whom short-term fertility goals are aligned. That is, even when neither partner wishes to have a child in the near future, men discourage their wives from using injectables. Once again, the effects are driven entirely by households in which the husband desires more children than his wife (although he still prefers to space them, by virtue of the fact that he claims to not want children within the next two years).<sup>34</sup>

Strikingly, among couples that agree in the short run but disagree in the long run, women are twice as likely to redeem the voucher and three times as likely to choose long-acting hormonal methods when they are assigned to the Individual treatment, despite the fact that neither spouse wants to become pregnant. The magnitude of the estimate among this subset of responders implies that *most* of the increase in contraceptive use occurs among households in which both spouses wish to avoid pregnancy in the short run. As before, when spouses agree on the number of children to bear, there is no effect on take-up of hormonal methods (Table 3, Columns 5 and 6).

This suggests that discordance in spousal preferences over number of children discourages men from using the most effective form of contraceptive method even when they would ideally rather postpone child-bearing, and thereby increases the rate of births that are unwanted (at least in terms of timing) by *both* the husband and wife. However, the fact that couples do not make use of injectables despite reporting that they would ideally like their next child not to be born in the next two years can be rationalized in several ways, only some of which are consistent with inefficient outcomes in the household. We present four possible phenomena, the last three

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<sup>33</sup>In particular, regressing an indicator of whether the couple agrees on delaying childbirth by at least two years on a host of observable characteristics of the couple reveals that they differ with respect to 4 characteristics: they married at a younger age, have given birth more recently, are less sexually active, and have higher parity. Other than the wife's age at birth (which is only marginally significant as a predictor of falling into this category), all other characteristics are presumably indicators of the couple's eagerness to have another child, which varies over the life cycle of a couple.(results available on request).

<sup>34</sup>Note that this subset corresponds to a subset of our responder sample.

being closely related to the problem of moral hazard surrounding the wife's use of contraception, this paper's central theme.

First, because there is a stochastic component to conception and birth, attitudes towards risk may play a role in explaining differences between husbands' and wives' desire to contracept even when neither wants children right away. In particular, if the husband feels very strongly about eventually attaining a sufficiently high number of children, or attaining a child within a certain time period (beyond 2 years), he may be willing to start trying to conceive now even though he risks having a child very soon. In this case, although he reports that he would ideally like his next child to be born in two years, he prefers to begin trying to conceive immediately to reduce the risk of failing to produce sufficiently many children over his lifetime.<sup>35</sup> We present a simple intra-household model with risk preferences over births in the Online Appendix to illustrate this.

Second, this difference may be exacerbated by inaccurate beliefs that husbands may hold regarding the average necessary length of time for wives to conceive. Such differences in beliefs can arise naturally in a world in which women utilize birth control covertly more often than their husbands estimate. Indeed, in the post-experiment survey we ran among husbands we find that men overestimate the length of time to conception, compared to the average time it takes for women of this age group to conceive naturally. In particular, on average men in our sample report that they would only become suspicious that their wife was using contraception covertly if she did not become pregnant after 26 months of sexual intercourse. Meanwhile, the estimated time to conception for the average woman in her late twenties is significantly shorter, even when lactational amenorrhea from exclusive breastfeeding is taken into account.<sup>36</sup> Husbands' beliefs about the hazard of conception may be systematically lower than their wives' particularly among couples in which women are more likely to have been hiding contraception in the past. If this is the case, husbands' perception of risk increases and they will on average desire a longer period over which the couple attempts to conceive in an effort to achieve their desired number of kids relative to their wives who are better informed about actual time to conception.

Third, a husband who does not wish to conceive immediately, but does want more kids than his wife does, may be unwilling to let his wife use contraception in that he may believe that

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<sup>35</sup>The survey measure should thus be seen as eliciting the spouses' preferences over spacing in a world in which they could perfectly control birth events.

<sup>36</sup>See for instance, Wang et al. (2003) for an estimate from a population-based sample in China in which over 90% of women in their mid-twenties conceive after 6 menstrual cycles of engaging in intercourse without contraceptives.

doing so would exacerbate moral hazard in the future through, for instance, his wife learning how to better hide or obtain injectables.<sup>37</sup> The husband would thus be willing to have a child in the near future, although reporting that ideally he would rather not, in order not to decrease his bargaining strength, or specifically his ability to monitor her action, in the future.

Finally, moral hazard could also be relevant through a more elaborate channel. As we discussed above, the fact that the use of injectables is almost unobservable to the husband (coupled with the fact that in this subsample husbands want more children than their wives) should lead their wives to enjoy a larger share of the surplus created by the couple. Indeed, economic theory tells us that, as long as bargaining does not collapse altogether, the party taking the unobservable action may enjoy rents. However, we also know that the wife's bargaining strength is decreasing in her outside option (her payoff outside the union), and in turn that the outside option is decreasing in the number of children. If contracting is not perfectly efficient, in that spouses cannot commit fully to a future plan of actions and transfers, the husband may be tempted to induce his wife into having children - even if he would ideally rather wait - as it would increase his bargaining strength immediately (in the spirit of a hold-up problem).

## 5.2 Fertility

We next quantify the effect of reducing the scope for moral hazard on fertility. Since husband involvement lowered take-up of long-term contraceptive methods in the short run, but we do not have reliable data on continuation rates (which were reportedly low), we concentrate on birth rates 9-13 months after a respondent received a voucher. The largest difference in birth control patterns between treatment arms is use of injectables, so this time period reflects the period over which most women were protected by the birth control received from the treatment. As long as there was little substitution towards contraceptives outside of the clinic, the difference in the likelihood of giving birth 9 to 13 months after receiving a voucher measures the increased efficacy of concealable methods relative to birth control methods marginal users would otherwise have relied on.

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<sup>37</sup>We find some evidence of this in qualitative follow up surveys we did with a convenience sample of 60 husbands, in November 2102, which suggest that husbands worry significantly about what happens at the Clinics and with respect to contraceptive use. Men share among themselves what they believe are the most common side effects of particularly concealable contraceptives, but there is also concern that women learn how to hide these side effects and that women are learning more quickly than men based on women's private interaction with the nurse and family planning clinic.

In total, 29% of women gave birth in the two years following our experiment, and 6.8% of women gave birth 9-13 months after they received a voucher. If we define a birth as unwanted if at baseline a woman stated that she did not want to have another child for at least two years (consistent with the standard definition of unmet need for contraception), a remarkable 65% of births in this interval were unwanted.<sup>38</sup>

Fertility patterns over the entire 24 months following the intervention are presented in Figure 2. Here we see a divergence in birth rates between the two treatment arms beginning at month 8 (the first possible month that births could be influenced by the treatment), that lasts for about 5 months. Between months 14 and 18, the pattern switches, and births in the Couple treatment arm are significantly lower. This pattern indicates that our intervention essentially postponed births in the Individual arm by 3-5 months (or on average slightly more than the duration of one shot of injectable contraceptives). Even this small degree of postponement offers a potentially significant welfare benefit for some women and children in a setting in which the average pregnancy interval is 26 months and an estimated 20% of birth intervals are under 15 months. In terms of child health, a number of studies document that neonatal and infant mortality as well as chronic and general undernutrition are decreasing functions of birth interval until 36 months (Rutstein, 2005; Conde-Agudelo et al., 2006).

We next use treatment assignment as an instrument for voucher redemption, and estimate the causal effect of access to contraception provided through our study on births in the subsequent year (9-13 months after the voucher was initially made available). The IV is valid as long as receiving the Couple as opposed to the Individual treatment had no influence on fertility other than through its effect on use of family planning services provided through our study, which we think is reasonable.<sup>39</sup> Coefficient and standard error estimates from the first and second equation of this bivariate probit estimation are presented in Columns 3 and 4 of Table 2.<sup>40</sup> The total vector

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<sup>38</sup>While this is higher than the DHS estimate (52%) of excess fertility in Zambia, the discrepancy is consistent with the fact that, due to ex-post rationalization, ex-post measures of birth “wantedness” are generally much higher than ex-ante measures.

<sup>39</sup>The two relevant proximate determinants of fertility to consider in assessing this are frequency of intercourse and use of contraception. Arguably, the only scope for Individual treatment to increase use of birth control is through changes in access provided through the voucher. Meanwhile, there is no reason to anticipate frequency of intercourse to increase among couples unless failure to get pregnant reduces frequency of intercourse, which is unlikely to be the case.

<sup>40</sup>Because a linear IV model provides a biased, while consistent, estimate of the average effect of treatment and its small sample performance may be inferior to a correctly specified maximum likelihood model, we use the simplest approach of a maximum-likelihood bivariate probit or biprobit (Heckman, 1978).



of control variables described above was included in the IV estimation. Using this estimation to generate predicted values of births based on using the voucher, we calculate the Average Treatment Effect (ATE) and the Average Treatment Effect on the Treated (ATT).<sup>41</sup> Family planning services offered through our study have an average treatment effect of -0.268, reducing the likelihood of births in the next year by 27%. The ATE with controls (Table 2, Columns 3 and 4, Panel B) is -0.325. The coefficients for the bivariate probit model are statistically significant at the 5% level in both stages, which indicates that the estimated ATE is statistically significant (Greene, 2010). The ATT estimates are nearly twice as large (between -0.47 and -0.58).

The fact that birth rates are substantially different between treatment groups also confirms that substitution among the Couple group towards other, equally effective sources of birth control offered outside of the clinic was limited. Hence, the short-term fertility results validate our previous findings on take-up of contraception since they measure the effect of contraceptives obtained from all possible sources.

### 5.3 Well-Being

Using data from the follow-up survey two years after the experiment, we look at the effects of assignment to the Couple treatment on separation, domestic violence, condom use and subjective well-being (Table 4 and Table 5). Recall that the model of aggreivment predicts that such indicators of marital strife could increase, particularly in the long run when husbands become aware of the scope for concealment. We find little evidence that these outcomes are affected by treatment assignment: in the sample of all women, point estimates on an indicator for assignment to the Couple arm are small and statistically insignificant in all specifications (Columns 1, 2 and 3). The same is true for the subsample of potential respondents.

For predicted non-responders, we find that assignment to the Couple arm is associated with a significant decrease in rates of condom use relative to the Individual arm (Column 9), although the estimate loses significance when controls are added. One interpretation is that, when men feel less suspicious that wives are using family planning, they are less concerned about extra-marital affairs. However, it is unclear why this result would only show up for couples in which there is no current disagreement over fertility.

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<sup>41</sup>Using Stata's binormal command to calculate predicted linear indices provides the same estimates.

We also asked women directly several questions about their subjective well-being.<sup>42</sup> We use three main subjective well-being measures to evaluate life satisfaction, happiness and peace of mind, and health, described in detail in Table 5. Using the same categorization of responders as described above, we find that those women in the Couple treatment report being significantly happier and healthier than those in the Individual treatment group. Specifically, 50% of potential responders in the Individual treatment report their overall health as being “good” or “excellent” compared to women in their community of the same age, while 73% of potential responders in the Couple treatment group report this high level of health, a difference that is significant at the 1% level. 69% of women who are predicted responders in the Couple treatment group report feeling “Happy and Content” or “Very Happy and Content” compared to women in their community of the same age, compared to 54% of potential responders in the Individual treatment group, a difference that is marginally significant with a p-value of 0.057. We see no significant differences in these outcomes associated with assignment to the Couple or Individual treatment, however, in the full sample of women in our study.

## 6 Discussion

Our findings that in the Couple treatment there was significantly less take-up of the voucher, less take-up of injectables, and subsequently more births (less spacing) than in the Individual treatment, are consistent with the predictions for the experiment in both the collective and noncooperative models we describe. Although these results demonstrate that women in couples with misaligned preferences are willing to hide when given the opportunity, this is not necessarily evidence of inefficiency, given that husbands were not aware of the change in scope for moral hazard. However, even when *both* spouses do not want to have children in the next two years but do have misaligned preferences over number of children, the fact that the privacy condition increases take-up of the cheaper contraceptive option suggests that couples may have difficulty coming to an efficient bargaining outcome.<sup>43</sup>

An important limit to extrapolating from our results is that injectables were freely available

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<sup>42</sup>Subjective well-being measures of self-reported happiness and satisfaction in life have been shown to be significantly correlated with physical measures of happiness in the body and brain (Diener, 1984), as well as evaluations by friends, sleep quality and changes in life circumstances (Diener et al., 2006; Kahneman and Krueger, 2006).

<sup>43</sup>As we mention in the Conceptual Framework, this could be suggestive of dynamic inefficiency, even if there is static efficiency.

to women in our study, which is not the case in much of Sub-Saharan Africa, particularly in rural areas. Furthermore, our asymmetry of decision rights over contraceptive access was accompanied by informational asymmetries within couples regarding the ease of accessing concealable contraceptives. Although our experiment does not allow us to evaluate what would happen when both parties are fully aware of the scope of moral hazard, our follow-up survey results provide some evidence that rising tension and strife within the marriage is likely to undo at least some of the short-run effects we find. That is, while we do not find evidence of increased separation, divorce or violence, as described in the Conceptual Framework, breakdown of cooperative bargaining may well take the form of staying together but with less happiness. Our results on subjective well-being point in that direction. Extensive qualitative work we conducted with subjects after the study reaffirm that the channel could well be one of more (or less, in the case of the Couple treatment) mistrust and sense of exclusion. Of course, as we point out above, this is only one possible way of incorporating this implication of moral hazard in intimate settings into a framework of decision-making over fertility, and depends critically on maintaining the difference in fertility demand between husbands and wives.

## 7 Conclusions

This paper uses a novel experimental design to understand the nature of household bargaining over fertility in a world of hormonal contraceptive technology that is only perfectly observable to the wife. Our experimental manipulation changed the degree of concealability of contraceptive use by varying whether a woman received access to injectable contraception alone or in the presence of her spouse. The opportunity to conceal led to a dramatic increase in use of injectables and reduction in births. Furthermore, the pattern of results indicates that giving women greater opportunity to conceal birth control brought not only women but also a non-trivial fraction of men closer to their short-term fertility goals by increasing the rate of effective contraception among couples who both wished to avoid pregnancy in the near future but who differed in terms of long-run fertility goals.

In this manner, the paper documents the role of moral hazard in household decision-making over fertility, and presents evidence of inefficiencies in household bargaining around fertility that have not been considered in the existing literature. Our findings also provide suggestive

evidence of a trade-off between privately improving a woman's set of choices, which may result in contraceptive use outcomes that could improve welfare for herself and her child, and lowering the conjugal value of the marriage. In particular, survey data on subjective well-being collected more than two years after the experiment indicate lower health and happiness among women given the opportunity to conceal relative to those whose husbands were given some degree of veto power over injectables. This result points in the direction of longer-run implications of the conceptual framework we present, whereby husbands feel aggrieved as the scope for moral hazard increases in the home and the subsequent shading and mistrust can lead, under certain conditions, to lower welfare for all.

The finding of a potential negative effect of male involvement among couples with conflicting fertility preferences helps explain why results from previous studies on male involvement in family planning have been mixed, and why concealable contraceptives such as injectables have proven to be so popular in cultural contexts in which men dominate family planning decisions.<sup>44</sup> In reality, the path of giving women access to injectables privately, while improving their set of choices, also may have detrimental consequences for the conjugal value of their marriage. Hence, it is important for practitioners to ask whether policies that further reduce the marriage surplus for women are the best option, even if they improve certain individual outcomes.

Given that household frictions may result from the interaction of misaligned preferences with unobservable contraceptive choice, changing either of these features could improve the bargaining environment. Understanding why male and female preferences are so misaligned, and involving men in a way that influences their preferences on number of children or helps them to better internalize the costs to women of childbearing and child-raising may be promising areas for future research and policy development.

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<sup>44</sup>Over the past 40 years, only three randomized studies – Fisek and Sumbuloglu (1978), Terefe and Larson (1983), and Wang et al. (1998) – have found any evidence that providing education about family planning to husbands raised adoption of contraception, and one very large study Freedman and Takeshira (1969) found no effect.

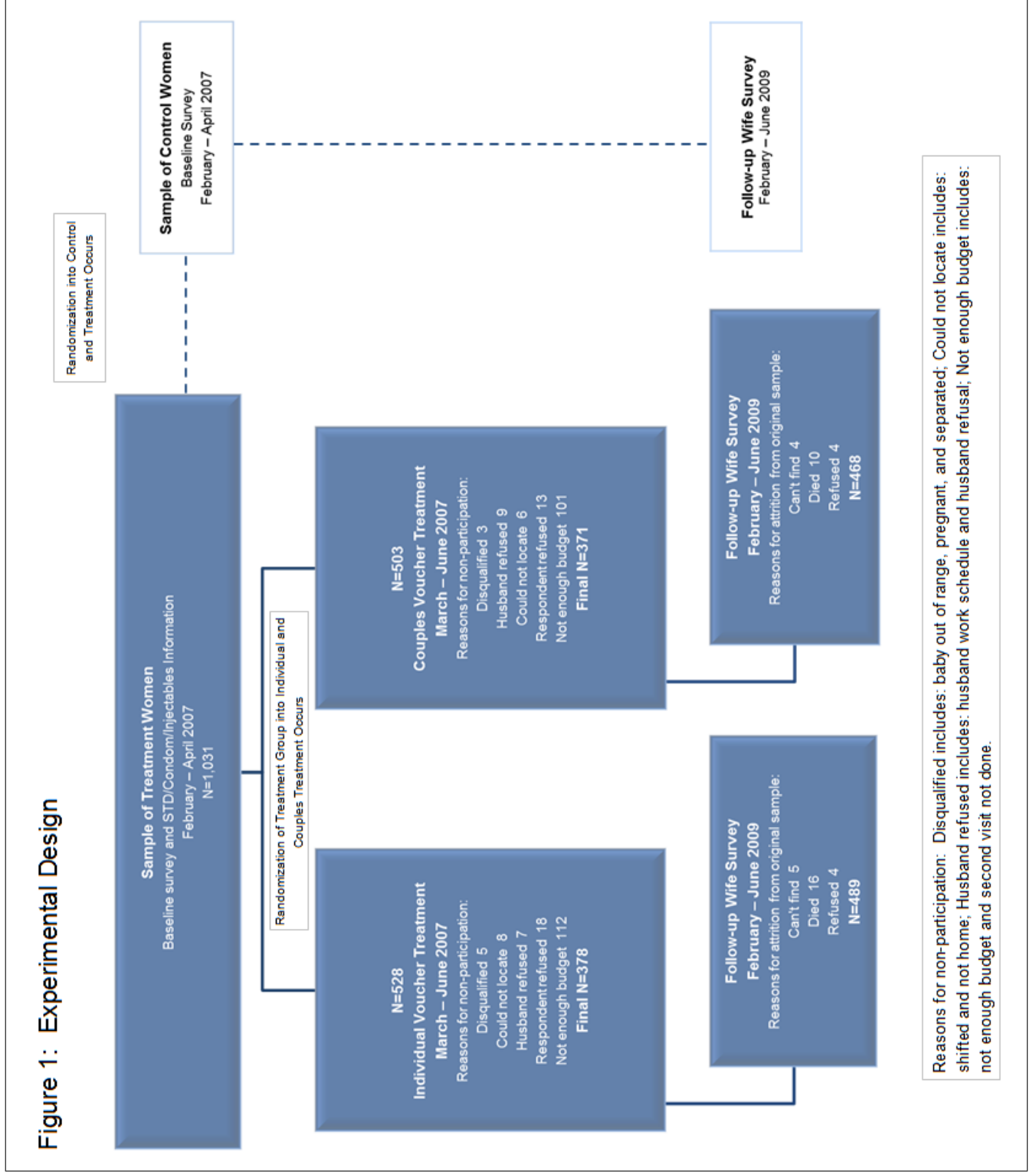
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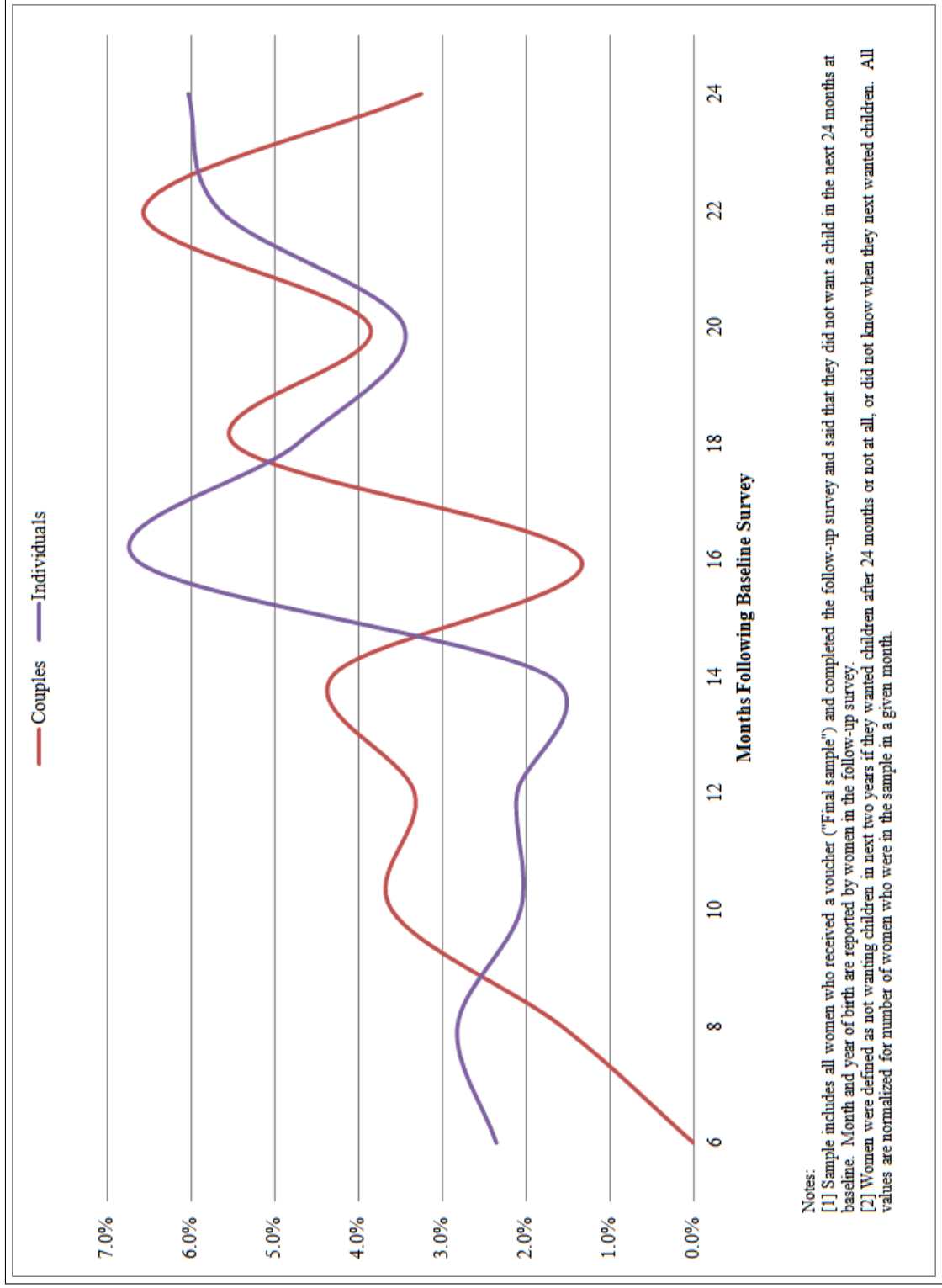
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Figure 1: Timeline of Randomization





**Figure 2:** Frequency of Births by Month and Treatment Arm Following Baseline Survey Women Who Did Not Want a Child in 2 Years Following Baseline



Notes:  
 [1] Sample includes all women who received a voucher ("Final sample") and completed the follow-up survey and said that they did not want a child in the next 24 months at baseline. Month and year of birth are reported by women in the follow-up survey.  
 [2] Women were defined as not wanting children in next two years if they wanted children after 24 months or not at all, or did not know when they next wanted children. All values are normalized for number of women who were in the sample in a given month.

**Table 1: Summary Statistics for Final Sample**

	Individual Treatment			Couple Treatment			P-Value
	Mean	SE	N	Mean	SE	N	
<b>Panel A</b>							
Highest schooling attained	6.673	0.225	339	6.487	0.159	339	0.409
Husband's highest schooling attained (reported by wife)	9.536	0.205	343	9.377	0.145	337	0.436
Ideal number of children	3.915	0.115	378	3.997	0.0817	371	0.476
Age	27.58	0.456	378	27.65	0.324	368	0.873
Husband's age (reported by wife)	34.50	0.547	339	34.46	0.390	327	0.938
Husband's ideal number of children (reported by wife)	4.184	0.142	359	4.286	0.101	346	0.471
Has ever used a modern contraceptive method	0.889	0.0237	378	0.873	0.0168	371	0.511
Wife has monthly income	0.347	0.0353	378	0.396	0.0251	371	0.160
Wife knows when she is most fertile	0.142	0.0251	346	0.103	0.0178	339	0.126
Wife wants to become pregnant in following 2 years	0.262	0.0324	378	0.275	0.0230	371	0.688
Age wife married	19.39	0.304	373	19.03	0.216	366	0.238
Catholic	0.217	0.0304	378	0.226	0.0216	371	0.755
Comparison of happiness with other women in region (1=very unhappy, 5=very happy)	3.579	0.0654	378	3.563	0.0464	371	0.806
Comparison of health with other women in region (1=very poor, 5=excellent)	3.619	0.0562	378	3.657	0.0400	370	0.502
Number of years respondent lived in Lusaka	18.33	0.788	378	17.88	0.561	369	0.562
Couple has electricity	0.410	0.0359	378	0.391	0.0255	371	0.592
Formally married	0.886	0.0236	378	0.879	0.0167	371	0.749
Number of days in past 7 days couple has sex	2.067	0.121	373	2.068	0.0858	369	0.995
Number of days in past month couple has sex	7.920	0.395	374	8.180	0.280	367	0.510
Number of children husband has with other women	0.289	0.0335	367	0.283	0.0237	364	0.861
Frequency at which couple has talked about contraception in last year	1.775	0.0768	378	1.701	0.0546	371	0.334
Couple has ever disagreed on number of children	0.138	0.0248	378	0.127	0.0176	371	0.661
Couple has ever disagreed on contraception use	0.106	0.0230	378	0.116	0.0163	371	0.661
Have used contraceptive method without husband's knowledge	0.138	0.0253	377	0.138	0.0179	370	0.997
Husband drinks at least 2 to 3 times a week	0.410	0.0360	378	0.418	0.0256	371	0.830
Husband has ever threatened physical violence	0.516	0.0364	378	0.566	0.0259	371	0.169
Wife ever pressured to have sex	0.500	0.0366	378	0.518	0.0260	371	0.632
Husband does budgeting	0.143	0.0261	378	0.157	0.0186	370	0.595
Husband decides major purchases	0.655	0.0349	377	0.647	0.0248	371	0.813
Joint F Statistic							12.86
P-value							0.996
<b>Panel B</b>							
Using any method at baseline	0.841	0.0259	377	0.869	0.0184	366	0.280
Number of living children	2.950	0.132	377	2.986	0.0941	366	0.781
Using injectable at baseline	0.202	0.0300	377	0.221	0.0214	366	0.511
Using pill at baseline	0.297	0.0337	377	0.306	0.0240	366	0.791
Using a hormonal contraceptive at baseline	0.501	0.0367	377	0.536	0.0261	366	0.352
Has ever used an injectable contraceptive method	0.405	0.0359	378	0.407	0.0255	371	0.950
Months sine last birth (at recruitment)	15.57	0.445	377	15.30	0.317	366	0.536
Husband's age (reported by husband)	33.80	0.563	376	34.24	0.400	371	0.438
Husband's highest schooling attained (reported by husband)	8.831	0.213	378	8.682	0.151	371	0.485
Husband's ideal number of children (reported by husband)	4.168	0.148	374	4.435	0.105	368	0.0721
Husband's average monthly income (1,000 USD) (reported by husband)	0.131	0.0160	378	0.153	0.0114	371	0.162
Wife earned money in previous month	0.403	0.0363	375	0.450	0.0257	369	0.194
Husband works 40+ hours	0.575	0.0374	360	0.546	0.0267	346	0.442
Wife ever pressured violently to have sex	0.128	0.0253	375	0.149	0.0180	370	0.415
Husband decides savings	0.614	0.0356	378	0.622	0.0254	368	0.811
Husband holds the money	0.164	0.0275	372	0.171	0.0195	368	0.793

**Table 2: Effect of Private Information Treatment on Households**

	All Women							
	All Women				Responders		Non-Responder	
	Voucher Redeemed	Received Injectable	Birth in Next Year	Used Voucher	Voucher Redeemed	Received Injectable	Voucher Redeemed	Received Injectable
Assigned to	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	IV - 2nd Stage							
	IV - 1st Stage							
Couple Treatment	-0.101*** (0.036)	-0.060** (0.030)		-0.269*** (0.096)	-0.159** (0.076)	-0.136** (0.064)	-0.070 (0.043)	-0.029 (0.035)
Used Voucher			-1.369** (0.614)					
Ave. Treatment Effect (ATE)								
Ave. Treatment on the Treated (ATT)								
<b>Panel B: With Controls</b>								
Assigned to								
Couple Treatment	-0.098*** (0.037)	-0.058* (0.030)		-0.244** (0.106)	-0.182** (0.083)	-0.108 (0.068)	-0.072 (0.044)	-0.046 (0.035)
Used Voucher			-1.656** (0.681)					
Ave. Treatment Effect (ATE)								
Ave. Treatment on the Treated (ATT)								
N	749	749	706	706	169	169	536	536
Mean of Outcome Variable								
among Individual Treatment	0.529	0.243	0.054	0.541	0.632	0.284	0.496	0.223
Estimator	OLS	OLS	Probit	Probit	OLS	OLS	OLS	OLS

\* p<.1, \*\* p<.05, \*\*\* p<.01

[1] A responder is defined as a woman who doesn't want a child in the next two years who believes her husband wants to have more children than they currently have and who also believes her husband wants more children than she does. Non-responders didn't satisfy these requirements and didn't have missing information on the relevant variables.

[2] Controls include: age, husband's age, education, husband's education, number of children, wife's ideal # of children, husband's ideal # of children, using injectables at baseline, using pill at baseline, using any hormonal contraceptive at baseline, wife's monthly income, husband's monthly income, difference in desired fertility of couple, wife knows when she is most fertile, woman's age > 40, time since last birth, difference between husband's and wife's total number of children, and compound indicators.

[3] Missing values for controls were replaced with a zero and dummy variables for missing values were included in the regression.

[4] A voucher was "redeemed" if there is a record of a voucher use by a woman in the study at the Chiapata Clinic.

[5] Bootstrapped biprobit estimation was used to determine Birth in Next Year, with assignment to treatment as an IV for take-up of family planning services. The ATE and ATT were determined using Stata's binormal command to calculate predicted linear indices.

**Table 3: Effect of Private Information Treatment on Households in Which Both Husband and Wife Do Not Want a Child in Next 2 Years**

	<b>Panel A: Without Controls</b>					
	All Women		Responders		Non-Responder	
	Voucher Redeemed	Received Injectable	Voucher Redeemed	Received Injectable	Voucher Redeemed	Received Injectable
[1]	[2]	[3]	[4]	[5]	[6]	
Assigned to						
Couple Treatment	-0.103** (0.049)	-0.065 (0.040)	-0.259*** (0.095)	-0.213*** (0.077)	-0.041 (0.059)	-0.014 (0.048)
<b>Panel B: With Controls</b>						
Assigned to						
Couple Treatment	-0.097* (0.051)	-0.061 (0.041)	-0.274** (0.120)	-0.253*** (0.094)	-0.051 (0.063)	-0.020 (0.049)
N	419	419	106	106	290	290
Mean of Outcome Variable among Individual Treatment	0.531	0.244	0.650	0.300	0.483	0.214

\* p<.1, \*\* p<.05, \*\*\* p<.01

[1] A responder is defined as a woman who doesn't want a child in the next two years who believes her husband wants to have more children than they currently have and who also believes her husband wants more children than she does. Non-responders didn't satisfy these requirements and didn't have missing information on the relevant variables.

[2] Controls include: age, husband's age, education, husband's education, number of children, wife's ideal # of children, husband's ideal # of children, using injectables at baseline, using pill at baseline, using any hormonal contraceptive at baseline, wife's monthly income, husband's monthly income, difference in desired fertility of couple, wife knows when she is most fertile, woman's age > 40, time since last birth, difference between husband's and wife's total number of children, and compound indicators.

[3] Missing values for controls were replaced with a zero and dummy variables for missing values were included in the regression.

[4] A voucher was "redeemed" if there is a record of a voucher use by a woman in the study at the Chipata Clinic.

**Table 4: Effect of Private Information Treatment on Households - Potential Adverse Effects of Intervention**

<b>Panel A: Without Controls</b>									
	All Women			Responders			Non-Responder		
	Separated	Domestic Violence	Using Condom	Separated	Domestic Violence	Using Condom	Separated	Domestic Violence	Using Condom
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Assigned to Couple Treatment	-0.028 (0.018)	0.001 (0.033)	-0.034 (0.023)	-0.050 (0.038)	0.012 (0.073)	0.067 (0.051)	-0.016 (0.021)	-0.010 (0.039)	-0.054** (0.027)
<b>Panel B: With Controls</b>									
Assigned to Couple Treatment	-0.028 (0.019)	0.016 (0.034)	-0.024 (0.024)	-0.048 (0.042)	0.018 (0.075)	0.074 (0.055)	-0.021 (0.022)	-0.006 (0.040)	-0.039 (0.028)
N	706	704	705	156	154	155	509	509	509
Mean of Outcome Variable among Individual Treatment	0.076	0.268	0.122	0.080	0.267	0.080	0.069	0.268	0.134

\* p<.1, \*\* p<.05, \*\*\* p<.01

[1] A responder is defined as a women who doesn't want a child in the next two years who believes her husband wants to have more children than they currently have and who also believes her husband wants more children than she does. Non-responders didn't satisfy these requirements and didn't have missing information on the relevant variables.

[2] Controls are same as Table 3.

[3] Domestic violence at follow-up is measured using the following question: Has your husband ever been physically violent toward you?

**Table 5: Effect of Private Information Treatment on Households - Measures of Well Being**

<b>Panel A: Without Controls</b>									
	All Women			Responders			Non-Responder		
	Satisfaction	Health	Happiness	Satisfaction	Health	Happiness	Satisfaction	Health	Happiness
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Assigned to Couple Treatment	0.041 (0.037)	0.038 (0.037)	0.049 (0.037)	0.053 (0.078)	0.230** (0.077)	0.151* (0.079)	0.070 (0.044)	0.008 (0.044)	0.050 (0.043)
<b>Panel B: With Controls</b>									
Assigned to Couple Treatment	0.030 (0.036)	0.028 (0.038)	0.048 (0.037)	0.065 (0.078)	0.273*** (0.085)	0.142* (0.083)	0.059 (0.044)	-0.028 (0.045)	0.053 (0.044)
N	705	705	705	155	155	155	509	509	509
Mean of Outcome Variable among Individual Treatment	0.588	0.568	0.574	0.609	0.506	0.540	0.557	0.589	0.573

\* p<.1, \*\* p<.05, \*\*\* p<.01

[1] A responder is defined as a women who doesn't want a child in the next two years who believes her husband wants to have more children than they currently have and who also believes her husband wants more children than she does. Non-responders didn't satisfy these requirements and didn't have missing information on the relevant variables.

[2] Controls are same as Table 3.

[3] Satisfaction is measured using the following question: All things considered, how satisfied are you with your life as a whole these days?

Please tell me which number on this scale more adequately represents your level of satisfaction with your life as a whole: 1 means you are ?

"Completely Dissatisfied" and 5 means you are "Completely Satisfied".

[4] Health is measured using the following question: Compared to women in your community of the same age, how would you describe your overall health?

[5] Happiness is measured using the following question: Compared to women in your community of the same age, how would you describe your overall level of happiness and peace of mind? "Very Unhappy or Discontent" is coded as 1 and "Very Happy and Content" is coded as 5.

[6] An individual was considered satisfied, healthy or happy if they responded with a value great than or equal to 4 for the above questions.