

Education and Contraception Choice among Women in Vietnam*

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Abstract

The costs of fertility regulation may encompass not only losses related to money, time, and inconvenience, but also psychic costs, such as those related to intrahousehold negotiation of sexual and fertility choices, especially in more traditional societies where women may have relatively little bargaining power. We investigate the possible role that educational attainment has on the choice of contraception method used among a nationally-representative sample of over 17,000 women from the Vietnam National Health Survey (2001-2002). Education is hypothesized to reduce women's convenience costs associated with fertility regulation by increasing their bargaining position relative to men's; women who are more effective in the negotiation process may be more likely to enforce the use of contraceptive methods that impose a higher relative inconvenience cost on her male partner, such as condoms or abstinence. We restrict our sample to the subset of women who are aged 25 and older who presumably have finished their educational career and who do not intend to become pregnant in the following year, as well as control for past unwanted pregnancies and abortions. To the extent that we are able to address endogeneity and other omitted factors, the findings lend support to our hypothesis that highly educated women have more intrahousehold bargaining power in terms of choosing contraception methods compared to less educated women.

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1. Introduction

While family planning programs have long been viewed as an integral part of economic development by reducing fertility and slowing population growth, their utility remains contested. Evaluations of programs, such as those implemented in Indonesia and Colombia, have generally showed a significant effect of these programs on delaying childbirth, and subsequently improved women's socioeconomic status (Gerlter and Molyneaux, 2000; Miller, 2005). Some argue, however, that development reduces the demand for children independently of contraceptive availability (Pritchett, 1994). This contrasts with more neoclassical economic approaches where demand for children, as determined by income, prices, and tastes, are the primary determinants of fertility constrained by income and the cost of fertility regulation (Becker, 1992; Easterlin, 1975). Under this framework, fertility regulation costs not only encompass losses related to money, time, and inconvenience, but also psychic costs (such as dislike for the idea of birth control, and reconciliation with religious beliefs). Furthermore, in more traditional societies, these costs may also include the costs related to intrahousehold negotiation of sexual and fertility choices where women may have relatively little bargaining power (e.g. Thomas, 1990). Therefore, indicators of social development, such as women's education and status, may be important factors for determining overall fertility rates.

In this paper, we investigate the possible role that intrahousehold power dynamics has in determining contraceptive use in a developing country context. Characteristics of women's social status, primarily educational attainment, is used an indicator for her position within the household. Education is hypothesized to reduce the costs associated with fertility regulation by increasing the women's bargaining position; women who are more effective in the negotiation process may be more likely to enforce the use of contraceptive methods that impose a higher

relative cost on her male partner, such as condoms or withdrawal. We employ information from 17,340 women collected in the Vietnam National Health Survey in 2001-2002 (VNHS), the first nation-wide household survey specializing in the health sector. We limit our sample to women who report that they do not intend to become pregnant in the upcoming year and further restrict it to those aged 25 and older who have presumably finished their educational career to address possible endogeneity from contraception use to educational attainment. Furthermore, we are able to control for a number of potential confounding factors, such as preferences toward modern versus for traditional medicines, the number of desired children, past unwanted pregnancies, among others. Multinomial logit is used to model the choice of contraceptive use among six alternatives: (1) contraceptive pill, (2) intra-uterine device (IUD), (3) female sterilization, (4) condom, (5) abstinence from sex, and (6) withdrawal. We find that higher educational attainment in women significantly increases the likelihood of using two methods that require more responsibility from male partners: condoms and periodic abstinence. To the extent that we are able to address endogeneity, the findings lend support to our hypothesis that more educated women have more intrahousehold bargaining power compared to less educated women. We further test these results against a variety of sensitivity checks.

Vietnam

Family planning efforts in Vietnam began as early as 1963 through active promotion of a two or three child norm, increasing thereafter with promotion of birth control, late marriage, and increased birth spacing, and leading to adopting a one- or two-child policy in 1988 (Haughton, 1997). Over the past three decades, Vietnam's total fertility rate (TFR) has fallen considerably. In comparison to other Asian countries in the region, the total fertility rate in Vietnam is now on

par with that of China, which has had arguably the most stringent population controls. Figure 1 shows that the TFR has fallen dramatically from about 6.0 in 1970 to just under replacement rate at 1.9 in 2002. Along with declining mortality rates,¹ this trend suggests that Vietnam's demographic transition is well underway.

2. Literature review

The existing literature generally accords with the hypothesis that women with more advantageous positions in terms of income, education, and social status, may be more willing to incur the costs of fertility regulation, including intrahousehold bargaining. For example, evidence from Cote d'Ivoire suggests that better educated and unmarried women are significantly more likely to utilize use some sort of contraceptive method than nothing at all (Guillaume and Desgrees du Lou, 2002). These findings are echoed among women surveyed in Southern Ethiopia where socioeconomic status (SES), literacy, religion, and family size were all significantly related to contraception utilization (Hogan et al., 1999). In fact, female schooling has a positive relationship with contraceptive use across 14 sub-Saharan Africa (Ainsworth et al., 1996). In Bangladesh, participation in the Grameen Bank credit program was found to be positively associated with women's level of empowerment and with contraceptive use through random sampling (Schuler and Hashemi, 1994). Steele et al. (1999) attempt to address selection by controlling for distance to a pharmacy in their assessment of family planning service provision in Morocco. However, we do not know of any studies that have addressed possible endogeneity between educational attainment and contraceptive use. Lower fertility or more optimal birth timing may expand a household's feasible production set, improving overall socioeconomic outcomes.

¹ Under-5 mortality declined from 87 per 1,000 in 1970 to 30 per 1,000 in 2000 (World Bank, 2007).

To our knowledge, the research literature to date has not explicitly addressed the link between education level and the choice of contraception methods that take gender dynamics into account. More specifically, women who are more educated may be more effective in the negotiation process and may be more likely to enforce the effective use of contraceptive methods that impose a higher relative cost on her male partner, such as condoms, in contrast to other methods that impose a higher relative cost on women, such as female sterilization. We develop this hypothesis within a theoretical framework that focuses on partner negotiation as an added cost to fertility regulation.

3. Modeling contraceptive choice

There are three main types of costs involved in adopting and using contraception: (1) a social cost or the perceived risk of incurring social, familial, or spousal wrath for violating behavioral norms; (2) a psychic cost, or the personal fears, anxieties and risks about health; (3) economic cost or time and money costs required to obtain the services (Robinson, 1997). The first type can be thought of as a societal constraint on making certain choices, while the second is the socio-psychological cost of various methods open to the individual.² Thus, characteristics that enhance a woman's bargaining position may reduce these costs. Educational attainment can be viewed as measure of status that affects the relative bargaining position of women within a given relationship. Furthermore, women with better bargaining positions may be better able to impose the use of a birth control method that relies more heavily on responsible use by her male partner. For example, more empowered women may be better able to insist on condom use by her male partner, even if the use of the method implies more inconvenience to the man; less

² While education may have a direct effect on the specific method of contraception chosen in terms of learning and adoption of different technologies, it may also have an indirect effect through more effective bargaining over contraceptive methods with a sexual partner.

empowered women may need to rely on methods more within her control (e.g. pill, IUD) if her partner is less responsible.

The decision to use a particular contraception method can be considered to be the product of cost-benefit analysis from the woman's standpoint. For any individual i , a contraceptive method will be used ($m_{ij}=1$) for method $j=1\dots J$ if the utility from using the method, $U(m_{ij})$, exceeds the costs associated with using the method (C). In other words,

$$p(m_{ij}=1|X_i) = \sum_{j=1}^J \Phi(U(m_{ij}) - C(e_i) > 0 | X_i) \quad (1)$$

where X_i denotes a vector of control variables (e.g. age, household expenditures), Φ is an indicator function, and e represents educational attainment that affects the relative bargaining position of the woman and consequently, costs.

Another way to look at the woman's decision-making process is to consider that she has already the calculated costs associated with each method and include these calculations in her utility function, which can now be regarded as a form of disutility. For example, the disutility of violating certain family norms will be implicitly taken into account, and our expectation is that with more education, the disutility for certain methods will be reduced. This allows us to use the logic of a random utility process in order to apply multinomial logit specification.

We assuming the data is generated according to linear additive random net benefit utility process:

$$U_{ij} = x'_{ij} \beta + \varepsilon_{ij}, \text{ where } j=1, 2, \dots, 6 \quad (2)$$

where $x'_{ij} \beta$ is the deterministic components of utility and ε_{ij} is its random part, assuming

$\varepsilon_{ij} \sim$ i.i.d. across i observations and j choices with type I extreme distribution, and with regressors that do not vary over choices. Therefore, increases in educational attainment of women will decrease their negotiating costs for the family planning methods preferred by them, and thus, increase net benefits of using those methods. Moreover, we expect net benefits of different contraceptive method choices conditional on education to group into two types that reflect the degree of responsibility for use from the male partner. This demarcation is illustrated in Figure 2 where the methods involving condoms, abstinence, and withdrawal place a higher responsibility on the male partner; the methods involving the birth control pill, intrauterine device, and female sterilization, on the other hand, impose more inconvenience and hence higher non-monetary cost on the female partner. Therefore, we expect the decrease in non-monetary costs associated with more education to lead to greater use of the methods in the former group among more educated women.

Following Cameron and Trivedi (2005), then, the probability that person i will choose contraception j can be expressed as:

$$\Pr(y_i = j | \mathbf{x}_i) = \frac{\exp(\mathbf{x}_i' \beta_j)}{\sum_{j=0}^J \exp(\mathbf{x}_i' \beta_j)}, \text{ where } i = 1, \dots, N, j = 0, \dots, 6 \quad (3)$$

so that the goal is to maximize the following log-likelihood function by the choice of parameters

β_j :

$$L(\beta_0, \dots, \beta_J) = \ln \prod_{i=1}^N \left(\prod_{j=0}^J \Pr(y_i = j | \mathbf{x}_i)^{1\{y_i=j\}} \right) = \sum_{i=1}^N \sum_{j=0}^J 1\{y_i = j\} \Pr(y_i = j | \mathbf{x}_i) \quad (4)$$

where $i = 1, \dots, N, j = 0, \dots, 6$

With the structure of our individual probabilities, expression (3) can be re-written as

$$\sum_{i=1}^N \sum_{j=0}^J 1_{\{y_i = j\}} \frac{\exp(\mathbf{x}_i' \beta_j)}{\sum_{l=0}^J \exp(\mathbf{x}_i' \beta_l)} \quad (\beta_0 = 0) \quad (5)$$

This approach allows estimating the β 's using multinomial logit. It requires an assumption that there is no correlation between the error terms in the random utility model (1), in other words that indeed $\varepsilon_{ij} \sim \text{iid}$ (this is also called independence of irrelevant alternatives assumption, or IIA). We adopt this approach and test for violation of IIA using Hausman-McFadden test.³

4. Data and Estimation Strategy

Data source

This study utilizes information collected in the Vietnam National Health Survey (VNHS) in 2001-2002 (VNHS), the first nation-wide household survey specializing in the health sector. The survey collected information on health status, health care utilization, access to health care facilities, and household consumption and expenditures. Approximately 36,000 households were surveyed, covering nearly 160,000 individuals. Of this, 25,357 women within these households were separately administered a survey regarding reproductive characteristics. This section of the questionnaire included a variety of questions related to contraception, including use, type, source, reason for non-use (if relevant), use in the past 5 years, unwanted pregnancy, abortion, gynecological checkups, and previous births. We restrict our sample to married women of childbearing age (15-49) who do not intend to have a child in the next year (excludes 5,041

³ If the assumption of IIA is violated, using multinomial logit models may produce erroneous estimates. In such case, an alternative nested logit estimator can be utilized to model the structure described in Figure A.1. However, this procedure is computationally intensive and it is recommended that IIA test be performed prior to a nested logit estimation.

individuals) and used some method of birth control at the time of the survey (excludes 3,617 individuals), leaving 17,340 observations. In addition, we further restrict our sample to those women ages 25 or older that have presumably completed their education (excludes 9,000 individuals).

There are six methods of contraceptives that survey respondents can choose from as the primary method used: (1) contraceptive pill, (2) intra-uterine device (IUD), (3) female sterilization, (4) condoms, (5) periodic abstinence from sex, and (6) withdrawal. The last two methods are usually called “natural, or traditional methods” in the family planning literature. Among the six methods, we consider the first three to bear a relatively disproportionate higher cost on the woman in terms of responsibility for applying it. The remaining three methods are considered to have a higher relative cost for males for appropriate use. This classification is based on how the responsibility for effective contraception is divided amongst the partners. We group abstinence into the male group because of the fact that abstaining from sex requires agreement on the part of both individuals. Thus, the male partner must be not only be willing, but also be a responsible participant in the effective use of this method of contraception.

Table 1 provides summary statistics for the sample of women included in this analysis. The average woman is aged 37 with approximately 3 children. The median level of per capita household expenditures is about 3.166 million Vietnamese Dong (VND) per year, but ranges from nearly 200 thousand VND to 390 million VND, indicating that some households are extremely wealthy in this survey; however, 95% of households spend less than 8.5 million VND. While only about 20% have completed high school or the equivalent, over 50% of the women have had at least some post-primary schooling. Nearly 95% were currently employed at the time of the survey and 12% reported that they were the household head. Over two-thirds of the

sampled women are from rural areas. By far, the most common contraceptive method was IUDs with 44% of women using this method, followed by 16% practicing periodic abstinence, roughly 10%-11% each using the withdrawal method, condoms, and female sterilization, and only 8% were using the contraceptive pill.

The main explanatory variable of interest in our model is educational attainment. As the level of education increases, the opportunity cost of time also increases, reducing the demand for children while also decreasing the cost of fertility regulation. While education may be endogenous with the decision to use contraceptives (since this choice may simultaneously be made with the decision to otherwise invest in educational attainment), this is less likely to be the case here. We restrict our sample to the set of women who indicate that they are not planning to have children in the next year so that these women presumably have already made their fertility choice, at least for the near future. In addition, our focus here is not whether contraceptives are used or not, but rather on which method is chosen given the woman's characteristics. Another possible confounding factor is that omitted preferences for new contraceptive technology may be systematically correlated with educational attainment. For example, the unobserved preference for "natural" methods may arise as new technology is introduced into more traditional cultures. As shown, two of the six methods can be considered "natural" and may be chosen precisely for that reason. We proxy for this tendency with a variable from the survey indicating whether or not the household prefers traditional medicine to Western medicine. To address the fact that certain religions discourage the use of some methods, we also include religion in the regression in our specification checks. Similar concerns are addressed in the robustness check to be presented.

It is also possible that the characteristics of male partners will have an influence as to which contraceptive method is used. The characteristics of male partners may be systematically

correlated with female characteristics, as the assortative mating mechanisms work in the marriage market (Becker et al. 1977). It is possible to obtain the information on a woman's partner for a subset of households in the VNHS, where the woman is either the household head or wife of the head. We will investigate the effect of characteristics of the male partner on contraceptive method choice in future work. While the investigation into these confounding factors is limited by the data, we posit that such selection factors affecting the choice of partners is also a result of the woman's characteristics and her educational attainment level, in particular. Consequently, the fact the more educated women also choose more educate men who may be more effective at using various contraceptive methods reflects the underlying "ability" of the woman to make decisions that maximize her utility.

5. Main results

Testing the IIA assumption

We start out with a Hausman-McFadden test for IIA on a subset of alternatives to assess the validity of our multinomial logit specification. We first run a simple multinomial logit model for the choice of contraceptives normalized to the choice of IUDs, conditional on education, household head status, household expenditures, and an urban indicator. Then we run a model on a subset of data, omitting the female sterilization category. Coefficient estimates of the two models are reported in annex Tables A1 and A2. The chi-squared test of no systematic difference between the two set of coefficients yields a p-value of 0.827. We take this result to indicate that the IIA assumption holds for the problem at hand. For the rest of the analysis, we will report the results of multinomial logit estimate of contraceptive choice.

Results of main regressions predicting the likelihood of using each contraception method

Table 2 reports results of our main model, controlling for fixed differences between regions of residence. Relative risk ratio (of reported contraception choice compared to the omitted IUD category) is reported. All coefficients are significant at the 95% confidence level. At each level of education, women are most likely to use condoms, followed by periodic abstinence and the withdrawal method over the remaining choices. Among those choosing condoms and periodic abstinence, higher levels of education are significantly related to increasing likelihoods of use. For example, compared to those women with minimum education (illiterate), the most highly educated women (with some college schooling or more) were 6.597 ($p < 0.001$) times more likely to use condoms and about 2.618 ($p < 0.001$) times more likely to rely on periodic abstinence relative to using an IUD. This education gradient is reversed for those choosing the withdrawal method; however, only estimates for women with education through primary education are significant suggesting that the least educated are significantly more likely to use withdrawal compared to all others and the illiterate. For female sterilization, higher levels of education (secondary school and above) are significantly and progressively related to lower likelihoods of use. Among women using the birth control pill, no significant relationship to educational attainment is observed.

The ordering of the relative risks for the six contraception method choices over education levels is also observed for urban areas; condom use ($rrr = 2.003$, $p < 0.001$) and periodic abstinence ($rrr = 1.512$, $p < 0.001$) are significantly more likely to be used than all other methods (Table 2). No observed differential choice of contraception method is observed among women who are household heads. However, estimates of the effect of the linear age term indicates that older women are most likely to choose female sterilization ($rrr = 1.713$, $p < 0.001$), followed by

condoms ($rrr=1.118$, $p<0.050$), IUDs, and withdrawal, and periodic abstinence ($rrr=0.907$, $p<0.050$). Although the quadratic age term is significant for all methods, it does not alter the point estimate of the linear age term appreciably. No differential effect of per capita expenditures is observed with the estimated effect size, although it is significant for female sterilization.

Are more educated women having more unwanted pregnancies?

These results suggest that the education level of women may have some important effect within the contraceptive method decision process. In particular, women with increasing levels of educational attainment appear to increasingly choose condom use and periodic abstinence in favor of other alternatives. However, it is generally acknowledged that these two methods have lower efficacy than other methods, such as the pill (about 95% effective), female sterilization (99% effective), and IUDs (99%) (Trussell, 2007). If this is the case, we would expect that women who use methods with lower efficacy will have higher numbers of pregnancies, and possibly number of children if pregnancies are not aborted. In this survey, it is observed, however, that women with the highest levels of education have nearly two fewer children than illiterate mothers on average: 2.08 for those with college degrees compared with 3.82 for the illiterate (Table 1).

To address this possible confounding factor, we include the number of children in the household at the time of survey as an additional control; results are reported in Table 3. We find that the education gradient with respect to choice of contraception method remains. Coefficients (and subsequently relative risk ratios) on educational attainment variables do not change appreciably and previously significant estimates remain so. Women with the same number of children are most likely to choose female sterilization ($rrr=1.272$, $p<0.001$) followed by the birth

control pill ($rrr=1.09$, $p<0.050$) as compared to IUDs; they are least likely to choose periodic abstinence ($rrr=0.941$, $p<0.050$).

We next include a variable for the number of unwanted pregnancies in the past five years in the regression and find that estimated coefficients and significance levels for education variables again change very little (Table 4). Women who reported having had an unwanted pregnancy within the previous five years were most likely to choose condoms ($rrr=1.995$, $p<0.001$) and withdrawal ($rrr=1.980$, $p<0.001$), followed by the pill ($rrr=1.774$, $p<0.001$) and periodic abstinence ($rrr=1.756$, $p<0.001$) as compared to female sterilization and IUDs. While causality between unwanted pregnancies and type of current contraception use is impossible to establish, we focus on the stability of the estimated coefficients on the education variables. This suggests that when controlling for age and having had an unwanted pregnancy in the recent past, more highly educated women are still more likely to choose condoms and periodic abstinence over other methods all-the-while having fewer children on average. The choice of generally less efficacious methods by more educated women suggests that education may play an additional role in adherence to the method chosen. We posit that these women may be better able to enforce the use of contraception within their negotiations with their sexual partner.

Robustness checks: how does contraceptive use differ by minority status, religion, and preferences for western medicine, and access to health facilities?

The choice of a particular contraception method may also be determined by other characteristics of the woman. In particular, we investigate whether differences in use may change depending on minority status, religious beliefs, preferences for Western medicine, and access to health facilities. We subsequently introduce each new variable into the previous estimated

regressions to assess robustness. These results are reported in annex Tables A.3-A.6. In all instances, the education gradient observed in the main specification is preserved, although the significance levels of a few coefficients disappear in some specifications as more controls are added. Here, we report the results of our most stringent model that includes all the aforementioned additional controls (Table A.6). Women who belong to ethnic minorities are significantly less likely to choose withdrawal ($rrr=0.479$, $p<0.001$), followed by condoms ($rrr=0.531$, $p<0.001$), periodic abstinence ($rrr=0.547$, $p<0.001$), and female sterilization ($rrr=0.723$, $p<0.050$) than the pill or IUDs. By religious beliefs, those who adhered to Buddhism were significantly more likely to choose periodic abstinence ($rrr=2.054$, $p<0.001$) than all other methods; no significant differences in likelihoods of use were found among Catholics. Women who indicated that they had a preference for Western medicine were significantly less likely to choose female sterilization ($rrr=0.753$, $p<0.001$) and periodic abstinence ($rrr=0.833$, $p<0.050$) than all other methods. Finally, we find that the number of health facilities does not alter the likelihood of a woman choosing any one method over another.

Investigating the role of male partners

While these analyses capture the essence of the effect of women's education on their choice of contraceptive method under a variety of controls, the negotiation process may also depend on the characteristics of her male partner. For example, more highly educated women may be more likely to marry higher-educated men resulting from assortative mating in the marriage market. We exploit additional information about male partners on a subset of women where their partners can be matched.

Results forthcoming.

6. Conclusion

We find that more educated women are more likely to use condoms and periodic abstinence compared to other methods while they have fewer children on average as well as fewer unwanted pregnancies. Moreover, these results are robust to the inclusion of a variety of covariates that may also affect the choice of contraceptive methods. While we have sought to exclude the possibility of endogeneity by restricting this analysis to the set of women who are aged 25 and older and who do not have plans to have a child in the coming year (thus restrict to those who arguably have similar fertility preferences), we cannot wholly rule out the possibility of reverse causality. The findings regarding condoms and periodic abstinence use generally accord with our hypothesis that better educated woman may be able to negotiate better compliance with more inconvenient contraception methods for male partners. However, results pertaining to the withdrawal method suggest that the pattern observed do not fit the hypothesized relationship with education and bargaining position. While further research is needed to investigate this equivocal finding, we speculate that more educated women are also generally more knowledgeable about *effectiveness* of contraceptive technologies. Given unreliability of withdrawal as a method of birth control, the direct effect from this knowledge accorded with more education may outweigh the indirect effect observed through the bargaining process whose goal is to place more responsibility on the man. This requires corroborative evidence from actual observations of intrahousehold bargaining and the negotiations between sexual partners and more detailed information about individual knowledge of contraceptive use. Therefore, we take the results of this analysis to be suggestive, providing a foundation for further research.

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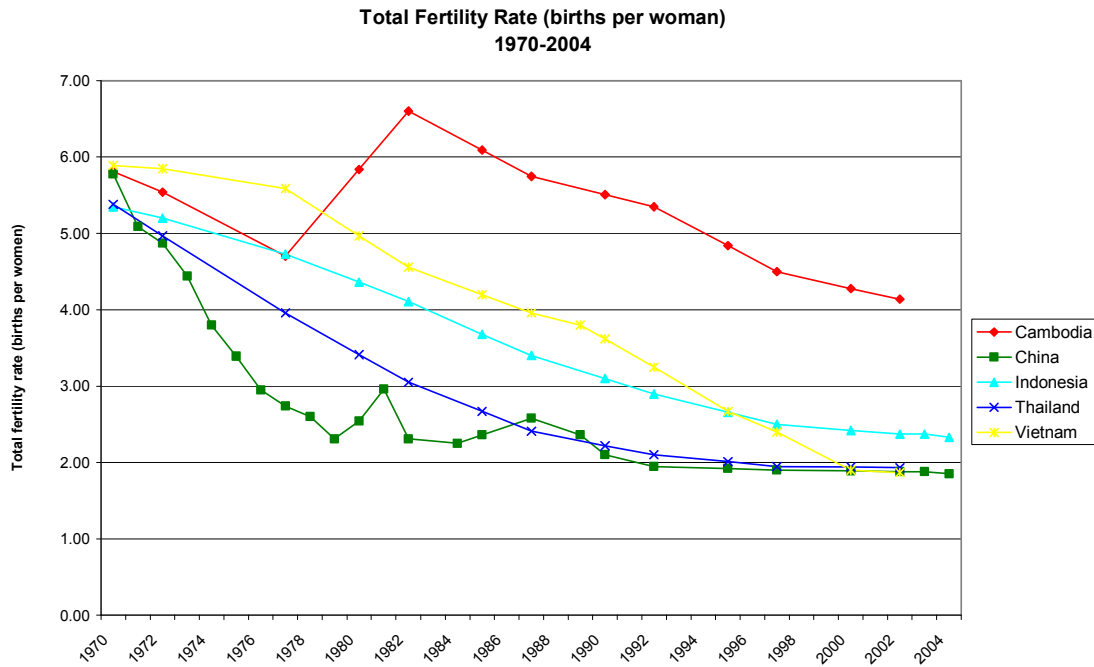
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Figure 1. Total Fertility Rates in Select Asian Countries, 1970-2004.



Source: Health, Nutrition, and Population Statistics Database, World Bank 2007

Figure 2. Contraceptive methods nests.

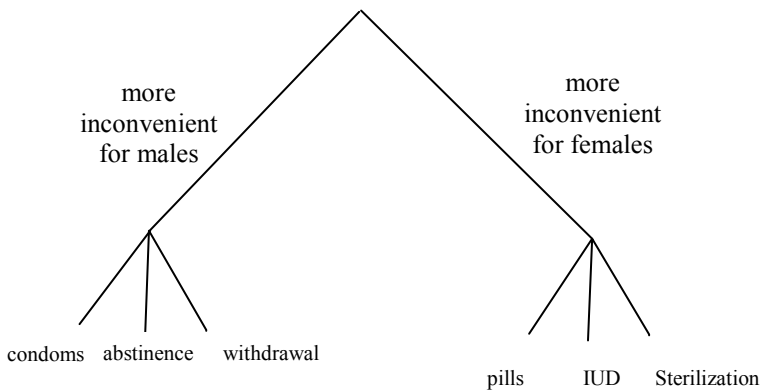


Table 1. Summary Statistics

Variable	<u>N</u>	<u>Mean</u>	<u>Standard deviation</u>	<u>Min</u>	<u>Max</u>
Age	17340	37.33	6.46	15.00	49.00
Age ²	17340	1,434.90	472.96	225.00	2401.00
Number of children	17340	2.91	1.31	0.00	14.00
By education level:					
Illiterate	1206	3.82	1.72	1.00	14.00
Below primary school	2734	3.55	1.56	1.00	11.00
Completed primary school	4386	3.02	1.32	0.00	11.00
Secondary/primary technical training	5586	2.72	1.04	1.00	9.00
High school/secondary technical training	2811	2.29	0.79	1.00	7.00
College or more	617	2.08	0.61	1.00	6.00
Number of health facilities in the commune	17317	6.44	8.17	0.00	88.00
Number of pharmacies in the commune	17284	5.92	6.22	0.00	55.00
	<u>N</u>	<u>Median</u>	<u>Standard deviation</u>	<u>Min</u>	<u>Max</u>
Per capita household expenditures (in thousand VND)	17340	3,165.66	4444.98	199.35	389,506.50
	<u>N</u>	<u>Percent</u>			
Contraceptive method	17036				
Contraceptive pill		8.45			
Intrauterine device (IUD)		44.22			
Condom		10.42			
Female sterilization		10.56			
Periodic abstinence		16.22			
Withdrawal		10.13			
Urban	17340	32.59			
Education	17340				
Illiterate		6.96			
Below primary school		15.77			
Completed primary school		25.29			
Secondary/primary technical training		32.21			
High school/secondary technical training		16.21			
College or more		3.56			
Ethnic minority	17340	14.83			
Currently employed	17340	94.77			
Household head	17340	12.16			
Has insurance	17173	14.55			
Had child in last 5 years	17340	27.02			
Unwanted pregnancies in last 5 years	17340				
0		85.06			
1		11.45			
2		2.61			
3+		0.88			
Religion					
Buddhism	17340	5.45			
Catholicism	17340	6.11			
No Religion	17340	85.41			
Other	17340	3.03			

Table 2. Likelihood of contraceptive use with regional fixed effects

Education	Contraceptive choice relative risk ratio (t-statistic)				
	Pill	Female sterilization	Condom	Periodic abstinence	Withdrawal
Illiterate (comparison group)					
Below primary school	1.067 (0.45)	1.072 (0.47)	2.015 (3.15)	1.686 (3.730)	1.543 (2.90)
Completed primary school	0.933 (-0.51)	0.890 (-0.74)	2.797 (4.86)	1.822 (4.25)	1.359 (2.11)
Secondary/primary technical training	0.853 (-1.09)	0.68 (-2.40)	2.921 (4.94)	1.913 (4.41)	1.265 (1.51)
High school/secondary technical training	0.772 (-1.53)	0.538 (-3.44)	4.522 (6.72)	2.212 (5.06)	1.262 (1.39)
College or more	1.014 (0.05)	0.573 (-2.00)	6.597 (7.13)	2.618 (4.93)	1.12 (0.46)
Urban	1.146 (1.55)	1.005 (0.05)	2.003 (8.89)	1.512 (6.02)	1.001 (0.01)
Per capita expenditures	1.000 (-0.09)	1.000 (-3.37)	1.000 (1.39)	1.000 (1.33)	1.000 (0.860)
Household head	1.062 (0.52)	0.967 (-0.31)	1.159 (1.63)	0.935 (-0.85)	1.12 (1.16)
Age	1.12 (1.90)	1.713 (7.93)	1.118 (2.05)	0.907 (-2.22)	0.934 (-1.35)
Age squared	0.998 (-2.58)	0.994 (-6.31)	0.998 (-2.04)	1.002 (3.27)	1.002 (2.31)
Regional fixed effects	YES				
Pseudo R square	0.0501				
Wald chi square p value	0.000				
N	116,568				

The comparison group is use of intrauterine devices.

A Hubert-White correction is applied to standard errors, which are clustered at the commune level.

Table 3. Likelihood of contraceptive use, controlling for the number of children

Education	Contraceptive choice relative risk ratio (t-statistic)				
	Pill	Female sterilization	Condom	Periodic abstinence	Withdrawal
Illiterate (comparison group)					
Below primary school	1.104 (0.69)	1.163 (0.98)	2.003 (3.12)	1.654 (3.59)	1.534 (2.87)
Completed primary school	0.987 (-0.100)	1.046 (0.28)	2.759 (4.74)	1.746 (3.94)	1.343 (2.04)
Secondary/primary technical training	0.920 (-0.560)	0.870 (-0.85)	2.864 (4.79)	1.778 (3.93)	1.24 (1.39)
High school/secondary technical training	0.865 (-0.84)	0.746 (-1.61)	4.415 (6.48)	2.027 (4.52)	1.225 (1.21)
College or more	1.016 (0.06)	0.805 (-0.78)	6.497 (6.97)	2.349 (4.37)	1.089 (0.35)
Urban	1.173 (1.8)	1.106 (1.18)	1.982 (8.88)	1.463 (5.45)	0.987 (-0.13)
Per capita expenditures	1.000 (-0.09)	1.000 (-2.62)	1.000 (1.31)	1.000 (1.23)	1.000 (0.8)
Household head	1.1 (0.82)	1.055 (0.48)	1.156 (1.58)	0.929 (-0.94)	1.113 (1.1)
Age	1.118 (1.86)	1.665 (7.46)	1.125 (2.15)	0.932 (-1.6)	0.942 (-1.18)
Age squared	0.998 (-2.69)	0.994 (-6.28)	0.998 (-2.11)	1.002 (2.81)	1.001 (2.2)
Number of children	1.091 (2.86)	1.272 (8.95)	0.982 (-0.54)	0.941 (-2.23)	0.976 (-0.78)
Regional fixed effects	YES				
Pseudo R square	0.0524				
Wald chi square p value	0.000				
N	116,250				

The comparison group is use of intrauterine devices.

A Hubert-White correction is applied to standard errors, which are clustered at the commune level.

Table 4. Likelihood of contraceptive use, controlling for the number of unwanted pregnancies in the last 5 years

	Contraceptive choice relative risk ratio (t-statistic)				
	Pill	Female sterilization	Condom	Periodic abstinence	Withdrawal
Education					
Illiterate (comparison group)					
Below primary school	1.078 (0.51)	1.158 (0.96)	1.915 (2.91)	1.621 (3.49)	1.477 (2.64)
Completed primary school	0.964 (-0.26)	1.041 (0.25)	2.663 (4.58)	1.716 (3.86)	1.298 (1.82)
Secondary/primary technical training	0.904 (-0.68)	0.869 (-0.86)	2.797 (4.68)	1.754 (3.88)	1.206 (1.22)
High school/secondary technical training	0.83 (-1.07)	0.739 (-1.65)	4.2 (6.25)	1.962 (4.37)	1.165 (0.92)
College or more	0.976 (-0.09)	0.8 (-0.8)	6.161 (6.73)	2.272 (4.22)	1.036 (0.14)
Urban	1.154 (1.61)	1.101 (1.13)	1.939 (8.52)	1.443 (5.23)	0.971 (-0.31)
Per capita expenditures	1.000 (-0.01)	1.000 (-2.63)	1.000 (1.36)	1.000 (1.28)	1.000 (0.9)
Household head	1.069 (0.58)	1.04 (0.36)	1.117 (1.22)	0.903 (-1.31)	1.077 (0.76)
Age	1.094 (1.48)	1.655 (7.36)	1.09 (1.55)	0.913 (-2.06)	0.914 (-1.77)
Age squared	0.998 (-2.19)	0.994 (-6.15)	0.999 (-1.34)	1.002 (3.44)	1.002 (2.97)
Number of children	1.063 (1.98)	1.263 (8.69)	0.953 (-1.46)	0.921 (-3.000)	0.95 (-1.66)
Number of unwanted pregnancies in last 5 years	1.774 (9.64)	1.127 (1.45)	1.995 (12.76)	1.756 (10.98)	1.98 (12.55)
Regional fixed effects	YES				
Pseudo R square	0.0602				
Wald chi square p value	0.000				
N	116,094				

The comparison group is use of intrauterine devices.

A Hubert-White correction is applied to standard errors, which are clustered at the commune level.

Annex**Table A1. Multinomial logit estimate with full set of choices**

	Coefficients (standard error)				
	Pill	Female sterilization	Condom	Periodic abstinence	Withdrawal
Education	-.197 (.009)	-.236 (.009)	.267 (.009)	.076 (.008)	-.062 (.008)
Urban	.156 (.024)	.049 (.025)	.676 (.022)	.420 (.020)	.050 (.024)
Per capita expenditures	.000 (.000)	.000 (.000)	.000 (.000)	.000 (.000)	.000 (.000)
Household head	-.667 (.036)	.229 (.034)	.148 (.029)	.114 (.025)	.202 (.031)
Wald chi2	6629.16				
Pseudo R2	0.192				

Baseline category is IUD

Table A2. Multinomial logit estimate with a subset of choices (female sterilization omitted)

	Pill	Condom	Periodic abstinence	Withdrawal
	Education	-.197 (.009)	.265 (.009)	.073 (.008)
Urban	.156 (.024)	.673 (.022)	.418 (.020)	.049 (.024)
Per capita expenditures	.000 (.000)	.000 (.000)	.000 (.000)	.000 (.000)
Household head	-.064 (.036)	.150 (.029)	.115 (.025)	.202 (.031)
Wald chi2	5496.33			
Pseudo R2	0.0197			

Baseline category is IUD

Table A3. Likelihood of contraceptive use, including ethnic minority status

	Contraceptive choice relative risk ratio (t-statistic)				
	Pill	Female sterilization	Condom	Periodic abstinence	Withdrawal
Education					
Illiterate (comparison group)					
Below primary school	1.056 (0.37)	1.066 (0.4)	1.615 (2.11)	1.381 (2.36)	1.477 (2.64)
Completed primary school	0.941 (-0.43)	0.945 (-0.34)	2.189 (3.56)	1.426 (2.57)	1.298 (1.82)
Secondary/primary technical training	0.876 (-0.9)	0.769 (-1.5)	2.22 (3.50)	1.400 (2.36)	1.206 (1.22)
High school/secondary technical training	0.805 (-1.26)	0.656 (-2.2)	3.347 (5.12)	1.574 (2.96)	1.165 (0.92)
College or more	0.949 (-0.2)	0.713 (-1.19)	4.94 (5.80)	1.835 (3.14)	1.036 (0.14)
Urban	1.149 (1.55)	1.089 (1.000)	1.907 (8.31)	1.415 (4.98)	0.971 (-0.31)
Per capita expenditures	1.000 (-0.03)	1.000 (-2.68)	1.000 (1.32)	1.00 (1.23)	1.000 (0.900)
Household head	1.066 (0.56)	1.035 (0.31)	1.107 (1.12)	0.893 (-1.45)	1.077 (0.76)
Age	1.095 (1.5)	1.659 (7.37)	1.095 (1.63)	0.917 (-1.96)	0.914 (-1.77)
Age squared	0.998 (-2.21)	0.994 (-6.17)	0.999 (-1.43)	1.002 (3.31)	1.002 (2.97)
Number of children	1.063 (1.98)	1.267 (8.83)	0.958 (-1.30)	0.927 (-2.78)	0.95 (-1.66)
Number of unwanted pregnancies in last 5 years	1.768 (9.62)	1.120 (1.37)	1.984 (12.72)	1.745 (10.85)	1.98 (12.55)
Ethnic minority	0.927 (-0.57)	0.728 (-2.03)	0.525 (-4.29)	0.528 (-5.71)	0.966 (-0.23)
Regional fixed effects	YES				
Pseudo R square	0.0618				
Wald chi square p value	0.000				
N	116,094				

The comparison group is use of intrauterine devices.

A Hubert-White correction is applied to standard errors, which are clustered at the commune level.

Table A4. Likelihood of contraceptive use, including religion

	Contraceptive choice relative risk ratio (t-statistic)				
	Pill	Female sterilization	Condom	Periodic abstinence	Withdrawal
Education					
Illiterate (comparison group)					
Below primary school	1.063 (0.42)	1.069 (0.42)	1.577 (2.000)	1.333 (2.11)	1.221 (1.33)
Completed primary school	0.957 (-0.32)	0.961 (-0.24)	2.144 (3.47)	1.369 (2.30)	1.056 (0.38)
Secondary/primary technical training	0.903 (-0.7)	0.779 (-1.43)	2.221 (3.51)	1.397 (2.35)	0.948 (-0.35)
High school/secondary technical training	0.823 (-1.14)	0.662 (-2.16)	3.386 (5.17)	1.599 (3.07)	0.92 (-0.47)
College or more	0.981 (-0.07)	0.72 (-1.15)	5.074 (5.9)	1.918 (3.37)	0.839 (-0.72)
Urban	1.157 (1.63)	1.108 (1.21)	1.873 (8.08)	1.383 (4.75)	0.95 (-0.53)
Per capita expenditures	1.000 (0.16)	1.000 (-2.51)	1.000 (1.28)	1.000 (1.2)	1.000 (0.82)
Household head	1.068 (0.57)	1.032 (0.28)	1.106 (1.11)	0.888 (-1.5)	1.068 (0.67)
Age	1.097 (1.54)	1.665 (7.41)	1.096 (1.65)	0.918 (-1.92)	0.919 (-1.65)
Age squared	0.998 (-2.24)	0.994 (-6.23)	0.999 (-1.43)	1.002 (3.33)	1.002 (2.82)
Number of children	1.06 (1.88)	1.274 (8.87)	0.944 (-1.72)	0.902 (-3.91)	0.958 (-1.38)
Number of unwanted pregnancies in last 5 years	1.774 (9.68)	1.126 (1.45)	1.988 (12.76)	1.755 (10.92)	1.966 (12.49)
Ethnic minority	0.93 (-0.53)	0.723 (-2.06)	0.53 (-4.2)	0.544 (-5.43)	0.479 (-4.36)
Religion					
No religion (comparison group)					
Buddhism	1.162 (0.74)	1.035 (0.18)	1.369 (1.74)	2.074 (4.45)	0.955 (-0.23)
Catholicism	0.946 (-0.38)	1.079 (0.52)	0.821 (-1.3)	0.85 (-1.33)	0.866 (-0.95)
Other	1.654 (2.54)	1.731 (2.57)	0.803 (-0.92)	0.838 (-0.93)	1.144 (0.6)
Regional fixed effects	YES				
Pseudo R square	0.0646				
Wald chi square p value	0.000				
N	115,956				

The comparison group is use of intrauterine devices.

A Hubert-White correction is applied to standard errors, which are clustered at the commune level.

Table A5. Likelihood of contraceptive use, including preference for western medication

	Contraceptive choice relative risk ratio (t-statistic)				
	Pill	Female sterilization	Condom	Periodic abstinence	Withdrawal
Education					
Illiterate (comparison group)					
Below primary school	1.063 (0.42)	1.06 (0.37)	1.57 (1.98)	1.324 (2.06)	1.217 (1.31)
Completed primary school	0.956 (-0.33)	0.954 (-0.28)	2.134 (3.45)	1.359 (2.25)	1.052 (0.36)
Secondary/primary technical training	0.904 (-0.7)	0.762 (-1.55)	2.202 (3.46)	1.378 (2.26)	0.942 (-0.39)
High school/secondary technical training	0.825 (-1.13)	0.639 (-2.33)	3.338 (5.1)	1.564 (2.93)	0.916 (-0.53)
College or more	0.983 (-0.06)	0.689 (-1.31)	4.983 (5.82)	1.865 (3.22)	0.828 (-0.77)
Urban	1.156 (1.62)	1.118 (1.31)	1.88 (8.12)	1.391 (4.84)	0.952 (-0.51)
Per capita expenditures	1.000 (0.16)	1.000 (-2.5)	1.000 (1.27)	1.000 (1.19)	1.000 (0.82)
Household head	1.068 (0.57)	1.024 (0.21)	1.103 (1.08)	0.884 (-1.57)	1.066 (0.66)
Age	1.097 (1.54)	1.667 (7.43)	1.097 (1.66)	0.919 (-1.9)	0.92 (-1.64)
Age squared	0.998 (-2.25)	0.994 (-6.25)	0.999 (-1.45)	1.002 (3.3)	1.002 (2.81)
Number of children	1.06 (1.9)	1.275 (8.88)	0.945 (-1.7)	0.903 (-3.88)	0.958 (-1.38)
Number of unwanted pregnancies in last 5 years	1.774 (9.7)	1.123 (1.42)	1.985 (12.7)	1.75 (10.82)	1.963 (12.46)
Ethnic minority	0.928 (-0.55)	0.727 (-2.04)	0.531 (-4.19)	0.547 (-5.41)	0.48 (-4.34)
Religion					
No religion (comparison group)					
Buddhism	1.162 (0.74)	1.026 (0.13)	1.362 (1.71)	2.061 (4.4)	0.952 (-0.25)
Catholicism	0.947 (-0.37)	1.063 (0.42)	0.815 (-1.35)	0.841 (-1.41)	0.861 (-0.990)
Other	1.657 (2.55)	1.731 (2.57)	0.799 (-0.95)	0.833 (-0.96)	1.14 (0.58)
Western medicine preference	1.038 (0.45)	0.753 (-3.77)	0.885 (-1.67)	0.829 (-3.01)	0.926 (-1.000)
Regional fixed effects	YES				
Pseudo R square	0.0651				
Wald chi square p value	0.000				
N	115,944				

The comparison group is use of intrauterine devices.

A Hubert-White correction is applied to standard errors, which are clustered at the commune level.

Table A6. Likelihood of contraceptive use, including the number of health facilities in the commune

	Contraceptive choice relative risk ratio (t-statistic)				
	Pill	Female sterilization	Condom	Periodic abstinence	Withdrawal
Education					
Illiterate (comparison group)					
Below primary school	1.06 (0.4)	1.059 (0.36)	1.565 (1.97)	1.32 (2.05)	1.212 (1.28)
Completed primary school	0.957 (-0.32)	0.948 (-0.32)	2.136 (3.45)	1.36 (2.25)	1.049 (0.33)
Secondary/primary technical training	0.907 (-0.68)	0.757 (-1.6)	2.209 (3.48)	1.382 (2.28)	0.945 (-0.37)
High school/secondary technical training	0.828 (-1.11)	0.636 (-2.36)	3.325 (5.08)	1.561 (2.91)	0.921 (-0.5)
College or more	0.987 (-0.05)	0.683 (-1.34)	4.985 (5.82)	1.867 (3.23)	0.83 (-0.76)
Urban	1.13 (1.3)	1.154 (1.55)	1.895 (7.5)	1.391 (4.47)	0.967 (-0.32)
Per capita expenditures	1.000 (0.12)	1.000 (-2.44)	1.000 (1.27)	1.000 (1.19)	1.000 (0.85)
Household head	1.069 (0.59)	1.023 (0.21)	1.104 (1.09)	0.885 (-1.56)	1.067 (0.66)
Age	1.097 (1.53)	1.666 (7.41)	1.097 (1.67)	0.918 (-1.93)	0.921 (-1.6)
Age squared	0.998 (-2.23)	0.994 (-6.24)	0.999 (-1.45)	1.002 (3.32)	1.002 (2.77)
Number of children	1.06 (1.88)	1.273 (8.83)	0.945 (-1.71)	0.904 (-3.85)	0.96 (-1.31)
Number of unwanted pregnancies in last 5 years	1.775 (9.7)	1.12 (1.38)	1.988 (12.73)	1.752 (10.83)	1.965 (12.47)
Ethnic minority	0.935 (-0.49)	0.723 (-2.08)	0.531 (-4.19)	0.547 (-5.39)	0.479 (-4.34)
Religion					
No religion (comparison group)					
Buddhism	1.159 (0.73)	1.023 (0.12)	1.367 (1.72)	2.054 (4.38)	0.948 (-0.27)
Catholicism	0.945 (-0.39)	1.057 (0.38)	0.818 (-1.32)	0.838 (-1.44)	0.856 (-1.03)
Other	1.639 (2.48)	1.745 (2.6)	0.803 (-0.92)	0.83 (-0.97)	1.142 (0.59)
Western medicine preference	1.047 (0.55)	0.753 (-3.77)	0.893 (-1.54)	0.833 (-2.94)	0.93 (-0.94)
Number of health facilities in the commune	1.003 (0.61)	0.996 (-0.82)	0.999 (-0.19)	1.000 (0.08)	0.998 (-0.29)
Regional fixed effects	YES				
Pseudo R square	0.0652				
Wald chi square p value	0.000				
N	115,758				

The comparison group is use of intrauterine devices.

A Hubert-White correction is applied to standard errors, which are clustered at the commune level.

