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The Choice of Contraceptive Method: Estimation of the Economic Model

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ABSTRACT

In recent years, researchers have emphasized prices and accessibility as important explanatory factors in contraceptive use and choice of contraceptive method. Unfortunately, no one has estimated a basic economic demand model for contraceptives, mainly because the data has not been available. The purpose of this research is to fill this void using data from The Republic of the Philippines Fertility Survey (RPFS) that was collected in 1978. We are able to estimate a model that includes normal types of socioeconomic variables that have been used in contraception usage estimation as well as variables for the prices perceived by households for alternative contraception methods. Since the RPFS respondents were asked the price they would have to pay (and the time they would have to spend to reach the source) for all alternatives with which they were familiar the data can be used for estimation of a correctly specified system of demand equations.

Actual estimation is in two stages:

1. Estimation of the probability that the household will use contraceptives at all.
2. Estimation of the probabilities of usage of each method for those who do contracept.

The results are both interesting and in some ways counter to the basic economic model. Time costs do seem to play a part in the choice of methods in the normally hypothesized manner, but money prices appear to be responded to in an almost perverse manner. The Filipino sample appears to be attracted to a method when its price is increased relative to other methods rather than when it is decreased. These positive price effects do

not appear to be an artifact of some data problems, nor do they seem to be sensitive to the sub-sample of the total population used for estimation or to use of a one-equation as opposed to two-equation estimation (and specification). These positive price effects, if proven by later research to be widespread would have immense policy implications. It may actually be counterproductive to lower the price of contraceptives (often to zero) if widespread usage is desired. If, as these results suggest, positive prices increase usage, positive prices would not only not reduce the effectiveness of population control initiatives but could also help to provide the funds for financing the programs.

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INTRODUCTION

In many of the poorer countries of the world, population programs are of utmost importance. Methods of contraception must not only be made available but made available in a manner which leads to high levels of usage. To date much of the funding of population programs has come from international donor sources. The fear that such funds will eventually (and perhaps soon) cease to be widely available has given impetus to design of ways of funding population programs internally. One possible approach would be to change higher prices (often in practice this would mean higher than zero) for the contraceptives, and in so doing to raise added revenues to fund the population program.

The important questions to be answered before pricing policies are determined in poor countries are:

1. Will higher prices lead to reduced usage of methods?
2. For which methods will reductions in usage occur?
3. Among which population groups (especially groups classified by income) will reductions be expected to occur?
4. Based on the answers to 1-3, for which methods can prices be raised and by how much, without significant usage reduction?

In order to answer all of these questions scientific analysis of responsiveness of contraceptive users to changes in prices of the various methods is necessary. In this paper we carry out just such an analysis for the Philippines. To our knowledge this is the first research effort to specify and estimate an economic model in which the prices of all available methods are controlled, the important non-price factors affecting choice of method are controlled, and responsiveness to price changes by each method are estimated with the appropriate econometric technique. We believe the

results of this analysis to be of extreme importance for population policy makers in Third World countries.

In order to determine the responsiveness of users to changes in prices of the various available methods we specify and estimate a complete economic demand system model for contraceptives. The work will be presented in two stages. Because our objective is to determine the changes in usage patterns that would result from price changes for any (or all) method(s) we first must choose a sample only of women who desire to use some method of contraception. We, however, do not wish to limit our sample to those who purchase some contraceptive method; one of the possible rational choices by a poor woman who wishes to space* her next birth but cannot afford to purchase contraceptives is to attempt this spacing by use of less effective methods such as rhythm, abstention or withdrawal. Our sample, is, therefore, made up of women who indicate that they use any of the purchased or non-purchased methods of contraception.[1]

After limiting our sample to women who potentially will purchase the priced contraceptives, we undertake the estimation of the total demand system for the various types. A unique feature of our empirical work is that our data set allows us to incorporate into the model as explanatory factors accessibility and prices of the various methods, in addition to the

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*We realize that those who desire to space for some finite period will possibly behave differently than those who wish never to have another child. Behavior with respect to the choice of sterilization will most certainly be different. We control for this behavioral difference by adding an explanatory variable which takes a value of one for women who wish to have no more children (and is zero otherwise). Because all of our sample by design desire to space for some period, the addition of this variable allows us effectively to differentiate the behavior of "spacers" and "stoppers".

standard explanatory factors that have been used in the past.

Our data set is the Republic of the Philippines Fertility Survey (RPFS) that was done as part of the World Fertility Survey (WFS) effort in 1978. Because the survey included the family planning module developed by the WFS it provides the best data set yet collected for analysis of the economic demand model with respect to contraceptive behavior. There is information on the household's perceived price of pills, condoms, IUD's, and sterilization as well as on the distance to outlets from which the various contraceptives would be obtained if selected. To estimate correctly a demand system, it is of absolute necessity to include all alternative types of the goods in question and the prices of each. The reasoning is that the consumer examines the products available (given all aspects of each product including its perceived "quality") and the price of each, and chooses the one that is viewed as providing the best value relative to its price. What it means to choose one method at a stated price can only be understood in the context of knowing what else was available at what price and was not chosen.

This paper is organized as follows. In the next section the theoretical model is developed. As will be seen below, the demand for contraceptives is viewed as correctly being part of a larger model which takes into account couples' desires to space children. In the third section empirical results are presented, and conclusions follow in the fourth section.

THEORETICAL MODEL

The basic economic model suggests that purchase of any item for consumption should be related to its price, the price of all other goods and services

available for purchase (i.e., relative prices of all goods and services and their characteristics determines demand), the household's income (or ability to purchase) and the household's tastes and preferences with respect to different goods and services (including contraceptives). In practical attempts to estimate such relationships various control variables, such as age, education, region of residence, and occupation are used as proxies for tastes and preferences for the good being analyzed. As stated above, when analyzing contraceptive use it is necessary to include in the sample only women who are effectively in that market. Only women who have some desire to space their next birth will be potential purchasers of contraception. We limit our sample to this group by including only women who make some attempt (including withdrawal, rhythm or abstinence) to space. We then further control for the possibility of differences in behavior on those who wish to have no more children (the ultimate spacing interval) by including a variable that differentiates such women. In order to estimate such a demand model for contraceptive methods it is necessary to estimate separate equations for each method type, because each has a whole set of related characteristics such as cost of usage and perceived effectiveness therefore is a different good to be used for the overall objective of spacing. By estimating separate equations in which the prices and time costs of both the method in question and alternative methods are included as explanatory variables one can determine how relative prices and time costs affect the choice of the various methods.[2]

Before estimating the price and time cost relationships to usage of each method, with both tastes and preferences and income[3] controlled it is necessary to determine which households (mothers) have any probability of

purchasing a contraceptive method at all. Only these households are potential participants in the market for purchased contraceptives. There are therefore essentially two decisions that must be examined in the total contraception demand estimation. First is the decision on whether or not to attempt to contracept. Second is the decision, for those who contracept, of the type of contraceptive method to use. The model is estimated sequentially by first using the logit technique to estimate the effect of various individual, household, and community level variables on the decision to contracept, and then using a multinomial logit to determine exactly which method is used by those who contracept. The end result is the ability to predict unconditional probabilities that any particular form of contraceptive is used.

This contraception choice model must be considered as one part of a larger birth spacing model. The model is conceptualized as one in which households attempt to maximize utility. It is posited that both number of children and intervals between these children enter into the utility function of the household decisionmakers (parents). (See Newman (1983) for a concise review of the economics literature on spacing of births.) For our purposes children will be viewed as consumption goods desired by parents for their own value, rather than as investment goods desired because they will later earn income for the family. Child spacing enters into the utility function because previous research has shown (and we assume parents perceive) that longer spaced children tend both to be healthier and higher achievers, and that longer spacing serves the convenience of the household (Wishik and Van der Vynck, 1975; Russell, 1976).

The motivation of parents toward shorter intervals, which in a tradeoff with the perceived added quality due to longer intervals leads to the selected optional spacing desire for any set of parents, is due to at least four factors:

1. The woman foregoes earnings during prime earnings years, and the amount foregone is obviously increased as the total childbearing period is lengthened. [This is the assumption made in Razin (1980)].
2. There are economies of scale to raising a given number of children in a shorter period. That is to say, for both money and psychological reasons, total "costs" (to parents) will tend to be less if the childrearing period is shortened. [Newman (1981) suggests that this is the main factor leading to shorter intervals].
3. Added children are perceived as added consumption, (i.e., in economic terms, children are goods). [See Bulatao (1981) for refinements of this line of reasoning.]
4. For sociocultural reasons, couples may be unwilling to contracept or may resort to less effective methods such as rhythm.

The basic model underlying the analysis is therefore:

$$DS = f(X_1, X_2, X_3, X_4, T)$$

where: DS = desired spacing pattern for children,

X_1 = parents' perception of child quality causal factors,

X_2 = desired total number of children,

X_3 = mother's opportunity wage,

X_4 = parents' perception of economies of scale realized by raising the total number of children desired over a shorter period of time, and

T = a set of factors related to tastes, income, residence, education, religion, ethnic status and other family specific control factors. Several of these factors affecting individual behavior are community characteristics. Among other things, these variables control for specific religious and cultural norms and values.

It will be noted that the dependent variable is the optimal desired spacing pattern of the parents, and that it is implicit in this model that biological factors do not enter into the equation explaining desires (except as they may affect the decision indirectly through desired total number of children).

If desired child spacing could be observed it would be feasible to take the model as described above and estimate coefficients explaining the effects of the causal variables on spacing decisions. Unfortunately this is not the case. Even if desired spacing could be observed, it would be difficult to precisely translate desired spacing into actual spacing, as Bongaarts and Potter (1983) have recently shown. On the other hand, it is fortunate that because contraceptive use, breast-feeding and actual spacing can be observed, it is possible to go far toward determining the effects of causal factors on spacing decisions.

A model for estimating the spacing relationships is developed as follows. Begin with a simple system of six equations:

(1) $DS = f(X_1, X_2, X_3, X_4, T)$

(2) C = f(DS, T)

(3) CM = f(T)

(4) BF = f(DS, T)

(5) OF = f(T)

(6) AS = f(C, CM, Bf, (BF x OF), P (biological factors), T)

where the new variables are:

C = the decision to contracept,

CM = the choice of contracepting methods for those who contracept,

BF = the decision to breast-feed,

OF = the decision to feed other foods (breast milk substitutes, supplemental foods),

AS = the actual spacing pattern as observed, and

P = other biological factors which affect fecundability.

This model suggests that the desired spacing decision is as already described [equation (1)], and that the parents can possibly take two types of actions in an attempt to achieve the desired pattern, they can breast-feed or use contraceptives. It is the C and CM equations from this fuller model that we estimate in this paper. It is obvious from examination of the full model that use of contraceptives [equation (2)] must be estimated for the whole sample of women in the age groups that are appropriate because desired spacing decisions, from equation (1), vary from zero to infinite length for any given birth interval. All women must either desire to contracept or desire not to contracept; no one of an age to become pregnant is not a prospective contraceptor. It is also clear that choice of method [equation (3)] must logically be estimated for a sample including

only those who choose to contracept, and therefore will be making a choice of method to be analyzed. It is for those who wish to contracept by some costly or free method that the choice among the various types of contraceptive methods becomes a decision relationship which can be sensitive to prices, time costs[4], and other causal factors.

RESULTS OF ESTIMATION

Contracept/Do Not Contracept Equation:

The results for our logit estimation of the use or contraceptive method equation [equation (2)] are presented in table 1, and the variables are defined in table 2. In general the results are strong and interesting. It appears that the model is reasonably successful in explaining the contracept/do not contracept decision with the specification and variables included. Of the 26 explanatory variables included, 16 are statistically significant at the .05 level, as indicated by the asymptotic "t" values. The specific results are discussed in the following paragraphs.

Tables 1 and 2 about here

"Desires no more children" is a control variable with extreme conceptual importance for the estimation. Its inclusion in effect allows the estimation of equation (2) without the necessity of equation (1), for which the necessary data simply do not (and probably cannot) exist, being estimated. It is to be expected that those who want no more children (one of the most extreme possible desired spacing patterns) will behave differently than will those who do want more children. For those people a "mistake" is obviously considered very costly.

Even though the theoretical case for inclusion of "desires no more

children" is strong, it can be noted that in practice for this data set the variable does not have a statistically significant impact on the decision to use some contraceptive method. For the KPFS sample, when controls for other important characteristics are included, the results show that those who do and those who do not desire more children behave no differently with respect to the decision to use some method of contraception. Other variables such as education, husband's education, and number of living children perhaps are closely enough related to the desire to have no more children that they almost fully explain differences in the choice to contracept. It is possible that if the desired spacing variable most obviously suggested by the theoretical model - "desires to increase the length of time before birth of the next child" - were available, it would have a significant impact on behavior. Given the results for this variable, which serves as a proxy for having a strong desire for spacing, however, we are not at all confident that such would be the case. This result is obviously counterintuitive and more analysis of the sample of those who answer that no more children are desired is called for. Such analysis is beyond the scope of this paper.

The age and education variables are included in the model to control for both biological characteristics of the mother (older women may believe themselves less likely to become pregnant) and taste and preferences of the household (education of each spouse indicates both social status and knowledge about contraception). The mother's age variable is not a significant explainer, a not unreasonable result given that all of our samples' women are both attempting to space the next birth and are age 16 to 44 and, therefore, in the prime childbearing years. While it might be

plausible to expect older women to reduce contraceptive usage as they near the end of the fecund period, such behavior is not observed in our sample. Increases in either respondent's or husband's education leads to increased probability that contraception will be practiced, a result in line with expectations that educated people more often plan their children's spacing.

Neither the "works" nor "works at home" variable has a statistically significant impact on the choice to contracept, a result that is somewhat surprising. The tested hypothesis had been that both working women and women who worked away from home would tend to desire fewer children, or to delay them until they stopped working, and, therefore, be more likely to use contraceptives. Such does not appear to be the case in the Philippines.

We include a set of variables to control for present makeup of the family in terms of previous children. The results on the two "number of children" variables suggest that for a woman whose other characteristics (including those of her household) are controlled, having either more children or more male children increases the likelihood of contraceptive use. The total number result suggests that the women have a completed family size objective and the male result suggests a degree of male preference exists.

The inclusion of "past stillbirths or abortions" was considered important because such experiences could either reduce the desires to lengthen the birth interval, if some completed size goal is strong, or increase the desire to space (perhaps infinitely) if such experiences were traumatic and reduced the desire to attempt childbirth again. The statistical results are consistent with an assumption that past stillbirths

and abortions have no effect on present spacing decisions, or, alternatively, with the hypothesis that the positive and negative effects cancel out for our Philippine sample. Future empirical work will be necessary to test these alternative hypotheses.

There are a set of "place of residence", "ethnic group", and "religious preference" variables designed to control for differences in tastes for children and spacing by area, ethnic group, or religious affiliation. The results suggest that contraceptives are more likely to be used by urban residents, Tagalogs, Cebuanos, and those who regularly attend religious services. Less likely to use contraceptives are Manila residents (NOTE: "t" value of -1.507 indicates significance only at the 13% level), Catholics, Moslems, and followers of the Iglesia ni Kristo religion. All of these residential, ethnic and religious results appear to be reasonable, but it is beyond the scope of this work to suggest why the differences (other than some of the obvious ones for religious groups) due to these control factors exist.

The "presently breast-feeding" and "presently amenorrheic" variables are included because they describe important situations in which natural contraception may occur. Both being amenorrheic and practicing breast-feeding have well documented effects of lengthening birth intervals. It is reasonable to suggest that mothers might believe contraception to be less needed if they are either in the amenorrhea period or they are breast-feeding. It is also a reasonable hypothesis that having an absent mate will reduce the need for artificial contraceptive methods.

The results of these "natural contracepting" type variables are much as expected. Women who breast-feed or experience absences of their mate

are less likely to use contraceptive methods. It does not appear to be true for this sample, however, that amenorrhea reduces the tendency to use some type of contraceptive method.

The last set of variables included in the estimations are 6 variables to describe the occupations of both the respondent and her mate. These variables are intended to control both for income level of the household and for tastes and preferences related to social status. We find that if either the husband or woman is in a mixed occupation--that is sales, skilled or unskilled occupations for the woman and sales, household or services for the spouse--the likelihood of contraceptive use increases significantly. The only other occupation variable that has a coefficient which is statistically significant at any reasonable level is "respondent in modern occupation". The modern occupation women have a greater tendency to use contraceptives.

Because the method of estimation is logit it is difficult to interpret from table 1 exactly what is signified by the magnitudes of the coefficents. For that reason table 3 presents the probabilities of using some contraceptive method related to given levels of various variables of interest.[5] For the purposes of this table all variables are set at their mean values except the one being considered. The first few lines of table 3 are to be interpreted as follows: A woman with average values for all variables has a .511 probability of using some contraception method. For a woman who desires more children [or who has zero value for "desires no more children"] (desires more children is true for .438 of the sample, because the mean value for the "no more" variable is .562), and has the average value for every other variable in the model, the probability of using some

contraceptive method is .34. For a woman exactly similar with respect to all other variables, but who desires no more children, or has a value of one for "desires no more children", (.562 of sample), the probability of using some method is .644. The woman whose age is 40.58 (rather than the mean value of 32.94) will have a probability of usage of .395 (as opposed to .511 for the woman of mean age). Raising education from 7.56 years to 11.83 years will increase the probability of contracepting from .511 to .585 when all other variables are controlled (held at their mean values). The rest of the table is similarly interpreted. It should be noted that for continuous variables the changes shown in table 3 are one standard deviation in magnitude, while for the non-continuous variables we present the probabilities related to various patterns of 0 and 1 values, for comparison to mean behavior. For the occupation variables we present probabilities for which all three occupational variables for each spouse take zero values and for which the occupation is mixed. From the results we can detect that changing from having a mean value for each occupational variable (a physical impossibility, but a useful figure for comparison) to having a mixed occupation leads to relatively small probability changes for each mate (to .558 for the respondent and to .538 for the husband).

Table 3 about here

From table 3 we can determine that, for the variables presented, the largest positive and negative changes in probabilities due to a one category change in a variable is for "desires no more children". It should be noted that this result is based on the use of a not statistically significant coefficient, which is nevertheless the best point estimate of

the effect. The continuous variable having the largest magnitude of effect when its value is changed one standard deviation is "respondent's age". The 7.09 years increase leads to a reduction in probability of use of contraception from .511 to .395.

Choice of Contraceptive Method (Demand) Equations

For the couples in our sample that choose to use some contraceptive method, our next task is to determine which of the free or purchased methods is chosen. We consider six choices: pill, condom, IUD, rhythm and withdrawal, abstinence, and sterilization. We have both time and money costs associated with each method except those which have no prices, rhythm and withdrawal and abstinence.

The method of estimation we use is the multiple logit model (see Schmidt and Strauss, 1975). This method assumes that the choices are mutually exclusive--an individual cannot choose more than one method at a particular time. While this restriction is not necessarily valid theoretically, it is both reasonable and certainly valid for our data set in which respondents can only pick one of the six methods. Our multiple logit model estimates five equations of the following form:

$$\log \left(\frac{P_{jt}}{P_{1t}}\right) = X_t \beta_j \qquad j = 2, \ldots, 6$$

The dependent variable is the logarithm of the ratio of the probability that individual t will choose method j relative to method 1 (putting method 1 in the denominator is arbitrary and does not affect the results). The five equations enumerated above and the fact that the sum of the six probabilities must be one allows us to solve for the probabilities and then set up the likelihood function. After the β_j's have been estimated, any

ratio of probabilities can be examined by simple subtraction. Thus in the results presented in Appendix A, we give all possible comparisons.

In table 4 we present the list of variables used in this phase of the analysis. The actual coefficient estimates are presented in Appendix A. Because the results are necessarily estimated in terms of ratios of pairs of probabilities interpretation of the raw results is even more difficult than for the simple logit analysis. The results are more easily understood in the context of table 5, EXPECTED PROBABILITIES. The probabilities in table 5 are obtained by estimating the result of changes in variables on all pairings of contraceptive choice variables simultaneously. The first line of the table indicates the probability of using each method, when each explanatory variable is set at its mean value. It will be noted that these probabilities sum to one, a necessary outcome since all individuals in the sample use contraception and every method is included. These results suggest that a contracepting woman who had average values for all variables (including prices and time costs faced) would have a .565 probability of using rhythm or withdrawal and only a .042 probability of using abstinence. The probabilities of usage for the other methods vary across the levels between these two extremes. One should note that if a woman desires more children (i.e., her value on the "desires no more children" variable changes from .695 to 0) her probability of using rhythm and withdrawal increases relative to the probability she had with all variables at mean values, and her probabilities of using each other method decreases. These results are very consistent with the underlying conceptual model. The woman who desires more children will not be as worried about longer spacing intervals spacing and will become more likely to use rhythm and withdrawal,

methods which are only moderately effective but both easy to use and free.

Tables 4 and 5 about here

It should also be noted that when the mother moves to the other categorical value for the "desires no more children" variable and does not want more children her probability of using the pill, the IUD, condoms, abstinence and sterilization increases, while the probability of using the somewhat less effec-tive methods, rhythm and withdrawal decreases to a large extent (from .565 to .476).

The variables of most interest are the price and time cost variables. It is the inclusion of these basic economic demand variables that most differentiates this work from past analyses of contraceptive choice, and given the policy related rationale for the research, it is the question of how prices and other costs affect contraceptive method choices for which an answer is most strongly desired. The most interesting general statement to be made, based on the RPFS data, is that, at least for this one country, once mothers decide to use contraceptives, the money prices appear to affect the decision of type in a manner almost diametrically opposed to that posited by economic theory. Filipinos appear to be more likely to choose a given method the higher is its price relative to other available methods. A reasonable interpretation of these finds would be that for a given method quality is judged by price. If condoms are a relatively expensive method given the prices at available sources customers are more likely to choose condoms than if condoms cost less relative to other methods. Examination of each coefficient will allow some few exceptions to this statement of an inverse relationship between price and likelihood of

choice to be noted, but such exceptions are truly the exceptions not the rule. The results for the time cost variables, however, are more in line with expectations based on the economic model. In many cases a choice that is less accessible will be less likely to be chosen. In the following paragraphs we will discuss the probability results for the price and time variables.[6]

Using our estimated coefficients as the best point estimates of the effects being assessed, we determine the changes in probability of the use of each method as prices and time costs change. Raising the price of condoms by its standard deviation tends to cause an increase in the probability that both condoms and pills will be chosen and a reduction in the probability of using the other four methods. Increases in the prices of either IUD's, pills or sterilization all lead to increased probability of usage of that method. In the Philippines it appears that individuals prefer to buy contraceptives that are expensive relative to the other methods available. While it might be placing too much faith on the estimation results to suggest that raising its price would increase the usage of the method the results certainly suggest that prices within the ranges observed in the data are not important deterrents to usage of these methods.[7]

The time cost results are slightly more in line with basic economic theory. For both condoms and pills increasing the time required for procurement tends to decrease the probability of use. For the IUD and sterilization the time cost results suggest that added travel time adds to usage, but these results are not surprising given the nature of these two methods. We would not expect time cost for getting to a sterilization

clinic once in a lifetime or to an IUD distribution center once every three years to serve as much of a deterrent to usage. That women travel farther for these methods may in fact indicate that travel time is important. When you live far from a source of contraception you may choose one that only has to be obtained once a lifetime or once every three years.

Several other probability results from the model are of some interest. Older women tend to move toward rhythm and withdrawal at the expense of all other methods, while more educated women tend to shift away from pills, condoms, abstinence and sterilization toward the other three methods.

More educated husbands tend to lead a couple to more likelihood of usage of sterilization, condoms, and pills and to less use of the IUD, rhythm and withdrawal and abstinence.

Other probability results of note include:

1. High probability of rhythm and withdrawal usage by rural residents, and (as expected) low favor for these methods by non-Catholics.
2. High probability of pill usage where either the husband is highly educated, the price of the pill is high, or the household is non-Catholic.
3. Very low probabilities of IUD usage for rural residents.
4. High likelihood of condom use for educated husbands.
5. Relatively low probability of the use of abstinence for almost everyone.

Table 6 about here

To aid in interpreting table 5, table 6 presents the means and

standard deviations of variables. The note at the bottom of table 6 is provided to give indication of the magnitude of the prices for Filipinos at the time of the survey. As the note suggests, the prices observed in the data are not inconsequential.

Tests of Robustness of Price Results

Several attempts were made to determine whether obvious data problems cause the own price coefficients to be positive. Because of the possibility that individuals might only have reliable perceptions of price for methods actually used average prices of each method for all respondents in each of our 335 LWT sampling areas were determined and used as alternative price variables. We attributed each of these average area price variables to each household in that one and ran regressions for which price was not the price perceived by the given individual but rather the average for all individuals in the area. The price results were basically unchanged; the signs on own price terms were still negative. An alternative estimation was done dropping from the sample all who used abstention and sterilization - very different methods in that one is permanent and one entails foregoing sexual intercourse - and essentially identical price results were again obtained.

A set of cross tabulations of method actually used and price reported for each method were run and examined closely. As the multivariate results would suggest, users of each method did tend to report higher prices for that method, but they did not report prices for other methods that were unlike the prices reported by other respondents. These results are certainly consistent with an assumption that prices were reported reasonably accurately.

As has already been mentioned in footnote 7 the distribution of prices reported by users and non-users of each method was also examined. The patterns were interesting. Zero prices were generally reported no more often by non-users of methods than by users. This pattern alleviated the fear that non-users of methods might have misunderstood the question and reported that the price of methods they did not use was zero, when in fact they meant that they paid no price because they did not use the method. This did not seem to be the case. Non-users of methods reported non-zero prices essentially as often as users; users simply tended to report higher positive prices for the methods they chose.

CONCLUSION

While better future data sets will allow researchers either to reinforce the findings of positive price effects or to provide evidence that they are an aberration, our best estimate, based on much painstaking analysis of these Philippine data, is that there are positive price effects for this sample. It appears that non-price type considerations overwhelm price in affecting the decision on contraceptive type for those who contracept. That the price variables are consistently positive and statistically significant, even after a great number of control variables are included; that these significant and positive results hold for selected subsamples (positive price reporters only and those who do not abstain or obtain sterilization), and for different formulations of the model (a reduced form one equation model with "use efficient method" as the dependent variable was also tested with similar coefficient results); and that the data do not have obvious unrealistic patterns (such as non-users reporting zero prices

or users reporting few zero prices) constitute a strong set of evidence for the positive price hypothesis. A conservative interpretation of these findings would be that the evidence strongly supports the hypothesis that higher prices, within the range observed in the Philippine WFS data, for a given contraceptive method, do not appear to reduce the likelihood that that contraceptive method will be used.

If these results are correct, then the policy implications are large. Not only may a positive price for contraceptives not significantly deter usage, but a low or zero price may in fact push households away from the use of a method. Whether the willingness to buy higher priced products is a result of judging quality by price or of a demand based on "snob appeal", is of little practical import. The importance of the finding is more likely that "for those who desire to purchase the contraceptive method, for whatever reason, prices within the ranges observed do not appear to be a constraint."

FOOTNOTES

1. We realize that some women faced with high prices may opt not to use any method at all, not even one of the less effective methods. Our data does not allow us to identify the desire to space for such women. For our research we assume that women who make absolutely no attempt to space are not potential purchasers of contraceptives.

2. It has been suggested by a reviewer of this work that quality of methods must be controlled. This is only true to the extent that quality across units of the same method differs. That the quality of different goods differs is hardly startling; each method of contraception is a different good and the differences in methods are what the consumers purchase. The product being purchased is a years' worth of pills, or condoms or IUD protection; the purchaser has a conception of what, for example, a years' worth of condoms consists of and the perception of what is being purchased includes quality components such as effectiveness and case of usage. The demand system shows whether changing the price of condoms relative to other methods will affect how many people choose condoms. That people perceive condoms as different in "quality" from pills or other methods is of no consequence. People desire the good for various reasons, what is to be determined is whether their desires for the different methods are strongly affected by price differences or changes across the methods. The demand system formulation (and our available data) does make it necessary to assume that a condom is a condom and a pill a pill. To the extent that there are large quality differences across the same method the price data will be less than perfect. As an indirect

attempt to test for a problem due to quality differences within method an alternative price variable was used for estimation. The average price of each method within the geographic region of the country was assigned to each woman as the price she faced. The assumption was that if there were higher and lower quality versions of methods being sold at different prices such an averaging would tend to provide an average price for the average quality. Coefficients for these aggregated price variables were essentially identical to those obtained from the estimation with individually reported prices.

3. Unfortunately, in actual estimation we use education and occupation as proxies for income because the RPFS data contains neither income nor asset information.

4. Even though our model does not suggest that the decision to contracept at all will be sensitive to prices and time costs, for comparison purposes, we did test a model in which we related choice of using effective contraceptives as opposed to using ineffective or no contraceptives. This model was specified with both socioeconomic and taste factors and prices and distance costs as explanatory variables [i.e., in essence, we combined the explanatory variables from equations (2) and (3) into one equation to explain a yes/no type decision for using effective methods]. Of the price and cost variables included only "time cost of condom use" had an estimated coefficient that was both statistically significant and of the conceptually correct sign for a demand relationship. For that reason we chose not to present the detailed results of that estimation. They are available from the authors.

5. It should be noted that we present results for some variables whose coefficients were not statistically significant at a high level. In these cases the assumption is that the estimated coefficient is in fact the best available point estimate even though we are not extremely confident of its value.

6. It is worth elaborating a bit on the basic logit results. Fifteen logs of probability ratio equations are estimated and each has four money price and four time (distance) cost variables. Of the 60 coefficients on price variables 26 are statistically significant, and of the 60 on time varibles 22 are statistically significant. In some sense, however, only the two price and two time variables related to the pair being analyzed in a given equation will have expected signs on the basis of the theory. Also because the dependent variables include abstinence and rhythm and withdrawal, for which there are no price or cost variables, even fewer than four variables for each of the fifteen equations have sign expectations based on the theory. There are in fact 17 money price and 17 time cost variables for which the theory provides sign expectations. Of these 17 total coefficients on money prices, 10 have statistically significant coefficients, and all 10 are of exactly the opposite sign to that expected. For the time variables, of the 17 coefficients, nine are statistically significant and five of these nine do have the sign predicted by economic theory. It therefore appears that behavior with respect to time costs is more as the basic economic model would predict than is that with respect to money prices.

7. It was suspected that many respondents might have reported a zero perceived price for methods they did not use. This turned out not to be the case. The data show zero price reports to be almost randomly scattered across all methods for individuals, irrespective of which method they actually used. The data were also checked to determine whether zero prices at clinics, etc., were causing the price results; perhaps because places with zero prices tend to be unpleasant or to have stigma attached to visits. Estimations omitting all zero price reports, were run and the results were not significantly changed. For only those who report positive prices for methods, the tendency is still one of being more likely to choose the method as its relative price increases.

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Table 1. Logit Results - Dependent Variable, Log (probability of using some contraceptive method/ probability of using no method)

Independent Variable	Coefficient Estimate	Asymptotic "t" value
Constant	0.264	1.377
Desires no more children	1.254	0.187
Respondent's age	-0.061	-0.118
Respondent's years of education	0.070	6.492
Husband's years of education	0.041	4.092
Respondent currently works	-0.044	-0.577
Respondent works at home	0.076	0.935
Past stillbirths or abortions	-0.038	-0.977
Number of living children	0.090	4.293
Number of living sons	0.061	2.258
Urban residence	0.144	2.031
Manila residence	-0.133	-1.507
Tagala	0.209	2.754
Cebuano	0.203	3.122
Catholic	-0.269	-2.665
Kristo	-0.370	-1.792
Islam	-1.321	-5.115

Table 1 (Cont'd)

Independent Variable	Coefficient Estimate	Asymptotic "t" value
Religious attendance	0.175	2.756
Presently breast-feeding	-0.189	-2.449
Presently amenorrheic	-1.319	-0.148
Mate absent during interval	-0.073	-6.233
Respondent in modern occupation	0.208	1.621
Respondent in transitional occupation	0.120	0.976
Respondent in mixed occupation	0.291	3.635
Husband in modern occupation	0.057	0.483
Husband in transitional occupation	0.038	0.384
Husband in mixed occupation	0.173	2.236

Table 2. Description of Variables

Variable	Description
Constant	All values are equal to one.
Desires no more children	Respondent desires no more children
Respondent's age	In years
Respondent's years of education	
Husband's years of education	
Respondent currently works	(1 = yes; 0 = no)
Respondent works at home	(1 = yes; 0 = no)
Past stillbirths or abortions	Number of past stillbirths and spontaneous abortions - measures whether or not respondent is biologically able to have children.
Number of living children	
Number of living sons	
Urban residence	(1 = urban; 0 = rural)
Manila residence	(1 = Manila resident; 0 = not a Manila resident)
Tagala	(1 = yes; 0 = no) Ethnic group is Tagala).
Cebuano	(1 = yes; 0 = no) Ethnic group is Cebuano
Catholic	(1 = yes; 0 = no) Religion is Catholic

Table 2 (Cont'd)

Variable	Description
Kristo	(1 = yes; 0 = no) Religion is Iglesiya Ni Kristo
Islam	(1 = yes; 0 = no) Religion is Islam
Religious attendance	(1 = yes; 0 = no) Attends often to religious services
Presently breast-feeding	(1 = yes; 0 = no)
Presently amenorrheic	(1 = yes; 0 = no)
Mate absent during interval	(1 = yes; 0 = no)
Respondent in modern occupation	(1 = yes; 0 = no) Respondent classifies occupation as professional or clerical
Respondent in transitional occupation	(1 = yes; 0 = no) Respondent classifies occupation as services or household
Respondent in mixed occupation	(1 = yes; 0 = no) Respondent classifies occupation as sales, skilled or unskilled
Husband in modern occupation	(1 = yes; 0 = no) husband classifies occupation as professional or clerical
Husband in transitional occupation	(1 = yes; 0 = no) husband classifies occupation as sales, household or services
Husband in mixed occupation	(1 = yes; 0 = no) husband classifies occupation as skilled or unskilled

Table 3. Expected Probability of Contracepting with Changes in Independent Variable Values

Variable	Mean Value	Value	Probability of Contracepting
All variables set at mean values	---	---	0.511
Desires no more children	.562	0	0.340
Desires no more children	---	1	0.644
Respondent's age	32.935	40.577	0.395
Respondent's years of education	7.556	11.827	0.585
Husband's years of education	7.900	12.325	0.557
Number of living children	4.006	6.523	0.567
Number of living sons	2.051	3.673	0.536
Urban residence	0.510	0	0.493
Urban residence	---	1	0.528
Catholic	0.864	0	0.569
Catholic	---	1	0.502
Respondent's occupation:			
modern	0.114	0	
transitional	0.057	0	
mixed	0.249	0	0.485
Respondent's occupation:			
modern	---	0	
transitional	---	0	
mixed	---	1	0.558

Table 3 (Cont'd)

Variable	Mean Value	Value	Probability of Contracepting
All variables set at mean values	---	---	0.511
Husband's occupation:			
modern	0.140	0	
transitional	0.152	0	
mixed	0.305	0	0.494
Husband's occupation:			
modern	---	0	
transitional	---	0	
mixed	---	1	0.538

Table 4. Variable Definitions

Dependent Variables:

P1 = Probability of using pill
P2 = Probability of using IUD
P3 = Probability of using condom
P4 = Probability of using rhythm or withdrawal
P5 = Probability of using abstinence
P6 = Probability of using sterilization

Independent Variables:

EXPNOMO:	1 = Desires no more children; 0 = desires more children
MAGE:	Respondent's age in years
EDUCMOTH:	Respondent's years of education
EDUCFATH:	Husband's years of education
URBAN:	1 = urban residence; 0 = non-urban residence
MANILA:	1 = Manila residence; 0 = non-Manila residence
CATHOLIC:	1 = yes; 0 = no
RELIGION (Religious attendance):	1 = often attends services; 0 = otherwise
MOTHMODN:	1 = respondent in modern occupation; 0 = otherwise
HUSMODN:	1 = husband in modern occupation; 0 = otherwise
COSCON:	money cost of year's supply of condoms (determined by frequency of intercourse per week, times 52, times price per condom).
COSIUD:	money cost of year's use of IUD (assume IUD lasts 3 years)
COSPILL:	money cost of year's supply of pills (determined by cost per cycle, times 12).
COSSTER:	money cost of a year of sterilization (assume time horizon of three years [therefore = $\frac{\text{cost}}{3}$])

Table 4 cont:

TIMECON:	time to reach place where condoms obtained 5 times per year
TIMEIUD:	time to reace place where IUD obtained, divided by 3.
TIMEPILL:	time to reach place where pills obtained, 2 times per year
TIMESTER:	time to reach place where sterilization performed, divided by 3

Table 5. Expected Probabilities for Six Methods of Contraception

	Pill	IUD	CONDOM	Rhythm and WITHDRAWAL	ABSTINENCE	STERILIZATION
All variables at mean values	.123	.067	.073	.565	.042	.130
Desires more children (Desires no more children = 0)	.091	.050	.061	.724	.033	.041
Desires no more children (Desires no more children = 1)	.132	.072	.074	.476	.044	.202
Respondent's age increased 7 years	.095	.056	.060	.647	.040	.103
Respondent's education increased 4.2 years	.120	.072	.061	.594	.029	.123
Husband's education increased 4.3 years	.143	.055	.088	.532	.033	.149
Rural resident (Urban = 0)	.110	.049	.068	.622	.040	.110
Urban resident (Urban = 1)	.131	.082	.075	.524	.043	.143
Non-Catholic (Catholic = 0)	.139	.085	.071	.426	.051	.228
Catholic (Catholic = 1)	.120	.064	.072	.584	.041	.119

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Table 5 cont'd

	Pill	IUD	CONDOM	Rhythm and WITHDRAWAL	ABSTINENCE	STERILIZATION
Price of condoms increased 22 pesos per year	.131	.063	.083	.559	.041	.122
Price of IUD's increased 2.5 pesos per year	.092	.086	.078	.562	.053	.129
Price of pill increased 11.6 pesos per year	.174	.050	.070	.525	.042	.138
Price of sterilization increased 7.8 pesos per year	.117	.065	.073	.565	.039	.141
Time cost of condoms increased 139.1 minutes per year	.117	.041	.028	.685	.044	.084
Time cost of IUD increased 10.6 minutes per year	.132	.081	.081	.546	.041	.119
Time cost of pill increased 57.2 minutes per year	.120	.071	.068	.572	.042	.128
Time cost of sterilization increased 14.0 minutes per year	.125	.060	.079	.548	.036	.151

Table 6. Means and Standard Deviations

Variable	Mean Value	Standard Deviation
Desires no more children	0.695	0.461
Respondent's age	33.251	7.098
Respondent's years of education	8.567	4.265
Husband's years of education	8.941	4.301
Urban	0.595	0.491
Price of condoms (pesos per year)	7.101	22.387
Price of IUD (per year)	0.884	2.519
Price of pills (per year)	4.075	11.623
Price of sterilization (per year)	4.583	7.834
Time cost of condoms (minutes per year)	110.999	139.123
Time cost of IUD (per year)	9.398	10.586

Table 6 cont'd:

Variable	Mean Value	Standard Deviation
Time cost of pill (per year)	45.604	57.255
Time cost of sterilization (per year)	17.267	13.998

NOTE: The World Bank's per capita GNP estimate for 1979 was $600 which, at an exchange rate of 7 pesos per U.S. dollar, would be 4,200 pesos. A 22 peso change in the cost of condoms could, therefore, be a change in the magnitude of approximately one-half of one percent of per capita income.

Appendix A

Multiple Logit Estimates of Coefficients for Six Contraception Methods; Republic of the Philippines Fertility Survey, 1978

Dependent Variable
(Asymptotic "t" in parenthesis)

INDEPENDENT VARIABLE	* Log $\frac{P_2}{P_1}$	Log $\frac{P_3}{P_1}$	Log $\frac{P_4}{P_1}$	Log $\frac{P_5}{P_1}$	Log $\frac{P_6}{P_1}$	Log $\frac{P_3}{P_2}$	Log $\frac{P_4}{P_2}$	Log $\frac{P_5}{P_2}$	Log $\frac{P_6}{P_2}$	Log $\frac{P_4}{P_3}$	Log $\frac{P_5}{P_3}$	Log $\frac{P_6}{P_3}$	Log $\frac{P_5}{P_4}$	Log $\frac{P_6}{P_4}$	Log $\frac{P_6}{P_5}$
Constant	-0.06 (-0.11)	-0.01 (-0.02)	0.31 (0.80)	-0.05 (-0.08)	-0.3 (-0.7)	0.05 (0.08)	0.37 (0.78)	0.01 (0.01)	-0.25 (-0.46)	-0.25 (-0.46)	0.32 (0.69)	-0.04 (-0.06)	-0.30 (-0.57)	-0.36 (-0.63)	-0.52 (-1.69)	-0.26 (-0.40)
EXPNOMD	-0.01 (-0.03)	-0.18 (-0.90)	-0.78 (-5.44)	-0.07 (-0.29)	1.24 (6.17)	-0.17 (-0.76)	-0.78 (-4.28)	-0.07 (-0.24)	1.24 (5.41)	1.24 (5.41)	-0.60 (-3.64)	0.11 (0.39)	1.42 (6.53)	0.71 (3.09)	2.02 (0.12)	1.31 (4.82)
MAGE	0.01 (0.72)	0.01 (0.64)	0.05 (5.87)	0.03 (1.77)	0.00 (0.40)	0.00 (-0.11)	0.05 (3.92)	0.02 (1.06)	0.00 (-0.43)	0.00 (-0.43)	0.05 (4.29)	0.02 (1.17)	0.00 (-0.32)	-0.03 (-1.97)	-0.05 (-5.96)	-0.02 (-1.55)
EDUCMOTH	0.02 (0.79)	-0.04 (-1.34)	0.02 (0.86)	-0.08 (-2.3)	-0.01 (-0.29)	-0.06 (-1.92)	-0.01 (-0.23)	-0.11 (-2.70)	-0.03 (-1.08)	-0.03 (-1.08)	0.05 (2.35)	-0.05 (-1.19)	0.03 (1.16)	-0.10 (-3.04)	-0.02 (-1.31)	0.08 (2.15)
EDUCFATH	-0.08 (-2.59)	0.01 (0.29)	-0.05 (-2.27)	-0.09 (-2.55)	0.00 (-0.07)	0.09 (2.69)	0.03 (1.22)	-0.01 (-0.32)	0.08 (2.66)	0.08 (2.66)	-0.06 (-2.33)	-0.10 (-2.64)	-0.01 (-0.37)	-0.04 (-1.37)	0.05 (2.37)	0.09 (2.57)
URBAN	0.33 (1.49)	-0.09 (-0.43)	-0.35 (-2.37)	-0.12 (-0.47)	0.08 (0.43)	-0.42 (-1.80)	-0.69 (-3.65)	-0.45 (-1.66)	-0.25 (-1.20)	-0.25 (-1.20)	-0.26 (-1.58)	-0.03 (-0.11)	0.17 (0.85)	0.24 (1.1)	0.43 (3.14)	0.19 (0.81)
MANILA	0.04 (0.17)	-0.17 (-0.81)	-0.13 (-0.85)	-0.02 (0.07)	0.25 (1.41)	-0.21 (-0.89)	-0.17 (-0.90)	-0.06 (-0.20)	0.21 (1.02)	0.21 (1.02)	0.04 (0.23)	0.15 (0.50)	0.42 (2.08)	0.11 (0.41)	0.38 (2.69)	0.27 (0.97)
CATHOLIC	-0.13 (-0.48)	0.16 (0.59)	0.46 (2.36)	-0.07 (-0.23)	-0.50 (-2.36)	0.30 (0.96)	0.59 (2.52)	0.06 (0.19)	-0.37 (-1.49)	-0.37 (-1.49)	0.29 (1.20)	-0.23 (-0.69)	-0.67 (2.59)	-0.53 (-1.97)	-0.97 (-5.82)	-0.43 (-1.52)
RELIGION	0.01 (0.06)	0.21 (1.1)	0.02 (0.13)	-0.03 (-0.15)	-0.08 (-0.50)	0.20 (0.96)	0.01 (0.03)	-0.05 (-0.19)	-0.09 (-0.47)	-0.09 (-0.48)	-0.19 (-1.25)	-0.25 (-1.03)	-0.29 (-1.62)	-0.05 (-0.26)	-0.10 (-0.76)	-0.04 (-0.19)

Appendix A (cont'd)

INDEPENDENT VARIABLE	Log $\frac{P_2}{P_1}$	Log $\frac{P_3}{P_1}$	Log $\frac{P_4}{P_1}$	Log $\frac{P_5}{P_1}$	Log $\frac{P_6}{P_1}$	Log $\frac{P_1}{P_2}$	Log $\frac{P_4}{P_2}$	Log $\frac{P_5}{P_2}$	Log $\frac{P_6}{P_2}$	Log $\frac{P_6}{P_2}$	Log $\frac{P_4}{P_3}$	Log $\frac{P_5}{P_3}$	Log $\frac{P_6}{P_3}$	Log $\frac{P_5}{P_4}$	Log $\frac{P_6}{P_4}$	Log $\frac{P_6}{P_5}$
HUSHOON	-0.06 (-0.25)	-0.01 (-0.03)	0.00 (0.01)	-0.03 (-0.09)	0.26 (1.34)	0.06 (0.21)	0.07 (0.30)	0.03 (0.09)	0.33 (1.35)	0.33 (1.35)	0.01 (0.05)	-0.02 (-0.07)	0.27 (1.22)	-0.03 (-0.10)	0.26 (1.67)	0.29 (0.86)
COSCON	-0.01 (-1.4)	0.00 (1.07)	0.00 (-1.49)	0.00 (-0.82)	-0.01 (-1.88)	0.01 (2.13)	0.00 (0.61)	0.00 (0.29)	0.00 (0.05)	0.00 (0.05)	-0.01 (-2.55)	-0.01 (-1.38)	-0.01 (-2.75)	0.00 (-0.13)	0.00 (-0.78)	0.00 (-0.28)
COSIUD	0.21 (5.42)	0.14 (3.47)	0.11 (3.11)	0.20 (4.86)	0.11 (2.99)	-0.07 (-2.50)	-0.10 (-4.37)	-0.01 (-0.23)	-0.10 (-3.76)	-0.10 (-3.76)	-0.03 (-1.07)	0.06 (1.95)	-0.03 (-0.91)	0.09 (3.34)	0.00 (0.08)	-0.09 (-2.95)
COSPILL	-0.05 (-5.44)	-0.03 (-4.98)	-0.04 (-8.74)	-0.03 (-3.12)	-0.02 (-5.12)	0.02 (1.93)	0.02 (1.84)	0.02 (1.92)	0.03 (2.91)	0.03 (2.91)	0.00 (-0.47)	0.00 (0.30)	0.01 (1.17)	0.01 (0.68)	0.01 (2.29)	0.00 (0.52)
COSSTER	0.00 (0.17)	0.01 (0.57)	0.01 (0.70)	0.00 (-0.29)	0.02 (1.85)	0.00 (0.35)	0.00 (0.39)	-0.01 (-0.41)	0.01 (1.44)	0.01 (1.44)	0.00 (-0.03)	-0.01 (-0.70)	0.01 (1.16)	-0.01 (0.76)	0.01 (1.77)	0.02 (1.52)
TIMECON	0.00 (-2.24)	-0.01 (-3.90)	0.00 (2.00)	0.00 (0.44)	0.00 (-2.29)	0.00 (-1.74)	0.00 (3.92)	0.00 (2.22)	0.00 (0.30)	0.00 (0.30)	0.01 (5.38)	0.01 (3.66)	0.00 (2.17)	0.00 (-0.83)	0.00 (-4.36)	0.00 (-2.15)
TIMEIUD	0.01 (0.91)	0.00 (0.38)	-0.01 (-1.11)	-0.01 (-0.55)	-0.01 (-1.38)	-0.01 (-0.54)	-0.02 (-2.05)	-0.02 (-1.19)	-0.02 (-2.18)	-0.02 (-2.18)	-0.01 (-1.48)	-0.01 (-0.70)	-0.02 (-1.69)	0.00 (0.08)	0.00 (-0.58)	-0.01 (-0.39)
TIMEPILL	0.00 (0.42)	0.00 (-0.26)	0.00 (0.29)	0.00 (0.06)	0.00 (0.08)	0.00 (-0.60)	0.00 (-0.25)	0.00 (-0.27)	0.00 (-0.37)	0.00 (-0.37)	0.00 (0.52)	0.00 (0.26)	0.00 (0.30)	0.00 (-0.12)	0.00 (-0.21)	0.00 (-0.02)
TIMESTER	-0.01 (-1.34)	0.00 (0.80)	0.00 (-0.71)	-0.01 (-1.35)	0.01 (1.80)	0.01 (1.96)	0.01 (0.99)	0.00 (-0.22)	0.02 (2.87)	0.02 (2.87)	-0.01 (-1.53)	-0.02 (-1.89)	0.00 (0.82)	-0.01 (-1.07)	0.01 (3.19)	0.02 (2.60)

*where:

P_1 = probability of using pill

P_2 = probability of using IUD

P_3 = probability of using condom

P_4 = probability of using rhythm or withdrawal

P_5 = probability of using abstinence

P_6 = probability of using sterilization.