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Knowledge and Use of Modern Contraceptives in a Developing Country: Are the Effects of Women's Schooling Often Misunderstood?

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High population growth rates are thought to be a problem for many developing countries. There are perceived to be private and social costs to excess or unwanted fertility, with a trade off between the attainment of growth and distribution goals on one hand and population growth on the other.[1] Many have argued strongly that substantial resources should be devoted to family planning programs and to increasing modern contraceptive use in developing countries to lessen this problem. Most of the resources of AID that are devoted to demographic questions, for example, are devoted to family planning programs.

These concerns, of course, raise the basic question: what are the determinants of fertility in developing countries? Numerous studies have been undertaken to illuminate the answer to this question, with perhaps the most robust result being an inverse association between fertility and women's schooling.[2]

But there are important questions pertaining to intervining related variables which are relative unexplored. What determines use of modern contraceptives in developing countries? How important are: Human capital investments in schooling? Family background? Household income? Biological exposure to conception possibilities? Exposure to changing norms through other choices? The general environment? Are there systematic differences across regions characterized by the degree of urbanization? Are there systematic differences across cohorts? What does schooling represent in such estimates?

And of course use of modern contraceptives presupposes knowledge of their existence. What determines this knowledge? How important are the various factors mentioned above in determining whether or not a couple (or a woman)

has such knowledge? Do they differ across regions? Across cohorts?

In the present paper we explore such questions pertaining to modern contraceptive knowledge and use in the Central American developing country of Nicaragua. We use data on an area-stratified national random sample of 3215 currently or previously-accompanied women of childbearing ages which we collected in 1977-78 as part of a larger project on the socioeconomic roles of women in developing economies.[3] These data are subdivided into three geographical regions characterized by the degree of urbanization: 1408 women from the central metropolis with about half a million inhabitants (almost a quarter of the country's population), 1060 from other urban areas with 500 to 76,000 inhabitants, and 747 from rural areas. This data set (like others) does not have all the data which we ideally would like for the present study (eg., data on fecundity, frequency of intercourse, and family planning programs are not directly observed). But it does include a rich characterization of such women and the environment in which they live, which permits exploration of some important dimensions of the questions raised above.

Since knowledge of modern contraceptives logically preceeds use, Section 1 considers the determinants of such knowledge. Section 2 then turns to contraceptive use. Section 3 gives conclusions.

Section 1. Knowledge of Modern Contraceptives

We characterize knowledge of modern contraceptives by a dichotomous variable which indicates whether or not the respondent knows of at least one of the following: pills, I.U.D.'s, diaphrams, condoms and shots. For the overall sample 88% have such knowledge. But there are variations across subsamples that are positively associated with the degree of urbanization and

negatively associated with age. For example 81% of rural respondents 35 and older claim knowledge in contrast to 93% of central metropolitan residents under 35 years old (see row for mean dependent variable at bottom of Table 1).

We posit that the probability of a woman knowing about modern contraceptives is a function of her capacity of obtaining, understanding and ingesting such knowledge in the environment in which she is. Her capacity is hypothesized to depend upon her human capital stock and her family background. The availability of knowledge in the environment which she has experienced also depends on her family background, cohort, exposure to different communities due to her particular experience in matters like labor force participation, and the nature of the general environment of the community in which she resides.

Because knoweldge of modern contraceptives is a dichotomous variable, we use logit estimates to explore the importance of various proxies for the woman's capacity and her environment in determining the probability that she knows about modern contraceptives.[4] Because the environment may differ among regions and across cohorts, we consider subsamples divided by region and by age (under 35 versus 35 and older) in addition to the overall sample. Table 1 gives 12 such logit estimates (national and three regional ones for those under 35, 35 and over, and combined across ages). Before we discuss the significant variables in these estimates, we summarize the overall goodness of fit and overall differences among regions and across cohorts.

Overall significance and overall differences among regions and across cohorts: Chi-squared tests indicate that the overall relations generally are significant at stringent levels. All but one of the significance levels are below 1%, and half are below 0.1% (see bottom of Table 1). The exception is

for women 35 or older in the central metropolis, in which case the significance level is 8.8%. Thus generally the logits capture significant factors associated with the probability that women know about modern contraceptives.

Statistical tests also indicate that on an overall level the relations differ among regions and across cohorts.[5] This is consistent with individuals being exposed to different "knowledge environments" depending on their residence and their cohort. In what follows, therefore, we focus on the estimates for the regional-cohort subsamples.

Human capital: Schooling is the most emphasized form of human capital investment.[6] Schooling has significant coefficient estimates in 7 of the logits in Table 1, including ones that are significantly nonzero at the 5% level for all three of the national estimates (ie., under 35, 35 and over, and combined). The significant estimates for schooling imply an increase in the probability of knowing about modern contraceptives of .01 to .04 for each additional year of schooling (at the points of sample means[7]), with slight evidence of a quadratic effect in some cases.

However the national estimates may overstate the role of schooling because there may be a spurious correlation due to a sharp urban-rural dichotomy in the schooling distributions[9] and probably in the unobservable "knowledge environments". Therefore the subsample estimates may be more relevant. The more disaggregate estimates suggest that schooling has a significantly positive impact on contraceptive knowledge in rural areas (particularly for women under 35) and (at the 20% level) for women under 35 in other urban areas and for women over 35 in the central metropolis. Thus schooling does seem to be an important determinant of contraceptive knowledge among some groups -- particularly in rural areas, for which the estimated

effect of an additional year of schooling on the probability of having such knowledge is as high as .04. But schooling probably is much less important overall than the national estimates suggest because of the above-mentioned spurious correlation.

As an additional human capital measure, we include a woman's predicted earnings per fortnight in labor market activity at age 29 based on her human capital stock (ie., schooling, nutrition, health and migratory status[10]). This is a more comprehensive composite human capital measure than is schooling alone. The coefficient estimate of this measure is significantly nonzero at the 5% level in the central metropolis, but not elsewhere.[11] For the central metropolis this estimate implies an increase in the probability of knowing about modern contraceptives of 0.04 for an one standard deviation increase in a woman's predicted earnings at the point of sample means. Thus there is evidence of a somewhat stronger human captial effect than the schooling estimates alone imply.

We also note that human capital may underlie some of the other variables discussed below in regard to family background and exposure due to individual choice.

Family background and age: Family background is represented by whether or not the father was present during the woman's childhood, the presence and socioeconomic (SES) status of her mother, and whether or not her childhood was in an urban region. A priori we expect a "better" family background (ie., both parents present, higher SES for mother, urban background) to increase the probability of modern contraceptive knowledge through more human capital (either through genetics or through environment) and greater probability of exposure to contraceptive knowledge through the family.

The estimates provide some support for such effects. The father being present is significantly associated (at least at the 20% level) with an increase of .02 to .05 in the probability of a woman knowing about modern contraceptives in the central metropolis and national sample for women under 35 and in other urban areas for older women. A one point increase in the mother's SES is associated with a significant .01 increase in the probability of contraceptive knowledge for older women in rural areas which carries over to the national older subsample and (at the 20% level) to the national rural subsample.[12] Since the standard deviation of this varaible is over 11 in the older women rural subsample, this effect can be fairly large within the historically-observed variation. Urban residence during childhood is related to a significant .10 increase in the probability of women under 35 now resident in rural areas knowing about modern contraceptives, again with carry-over to the national under 35 and (at the 20% level) combined-age rural subsamples.[13] Thus there is some evidence, though it is not overwhelming, of a direct impact of family background on contraceptive knowledge. In addition, of course, family background may be operating through schooling and other variables.[14]

Age might be representing cohort effects that are not captured by breaking the sample between those under 35 and those 35 and older. Age also might represent the fact that the probability of obtaining contraceptive knowledge in a given environment for a women with given characteristics increases with the time spent in that environment -- and thus with age. Because of such a combination of effects, we include age in a quadratic form.

The significant coefficient estimates suggest an interesting pattern. For those under 35 the effect is positive, implying the dominance of the

length-of-exposure phenomenon. In contrast for older women in urban areas, the effects are negative, which may be due to a cohort effect among older women.

Exposure from individual experience: The nature of one's particular experience in a number of important dimensions might alter the probability of exposure to knowledge about modern contraceptives. Of course some elements of whether or not an individual has these experiences reflects individual choices conditioned by human capital and family background. Nevertheless such choices would seem to be recursive from the point of view of the probability of acquiring contraceptive knowledge, and we assume they are prior recursive.[15]

Those who have never migrated might seem to be self-selected in a way which lessens their exposure to various communities and to contraceptive knowledge.[16] This would imply negative coefficients. However we do not find any significant negative estimates even at the 20% level. To the contrary we obtain a significant increase in the probability of contraceptive knowledge of 0.09 for "never migrated" for older women in other urban areas (which carries over at the 10% level to the estimate for this region with all ages). This prima facie puzzling result may reflect multicollinearity with urban childhood (obviously those who never migrated from other urban areas have an urban childhood), but this is not a fully satisfactory explanation.[17]

Those who have participated in the work force would seem to have been exposed to a wider environment with more probability of acquiring contraceptive knowledge than those who have not. Our estimates tend to provide some support for this hypothesis. The strongest effect is an increase of 0.09 in the probability of contraceptive knowledge for older women in other urban areas who have ever worked, which carries over in somewhat weaker form to the

combined age-group estimates for this region. At the 20% level there also are positive effects for the rural younger women and the national younger women and overall sample -- but also a negative one for older women in the central metropolis.

Having had formal medical care reflects choice under constraints related to income, price and the supply of such options -- given the perception that such care is desirable (see 37). Whatever the determinants and whatever the value of the perceived needs, such exposure a priori would seem to increase the probability of modern contraceptive knowledge given the frequent provision of such knowledge by the providers of formal medical care. Our estimates suggest that this indeed may be an important channel for knowledge, with significant increases in the probabilities of knowing about modern contraceptives of 0.02 to 0.08 in over half of the logits. On the disaggregate level, this effect is significant for all women in the central metropolis and for older women in rural areas with a carryover to the national younger women and all-age group estimates.

The intensity of religious observances would seem to reflect choices to spend time in communities in which contraceptive knowledge is less widespread in this predominantly Catholic country.[18] We find weak evidence of such an effect with significantly negative coefficients (but only at the 10% or, for the central metropolis, 20% level) for younger women in rural areas, the central metropolis and the national aggregate and for the rural sample combined across age cohorts.

Other household income (ie., other than from the woman's earnings) reflects a number of choices (ie., labor force participation, interhousehold transfers) under constraints (ie., labor market options, marriage options,

market returns to human capital). We posit that the experience of obtaining greater income and the exposure associated with spending greater income are likely to be associated with higher probabilities of knowing about modern contraceptives. For over half of the logits there is significant evidence at least at the 20% level for such effects. It is strongest for other urban areas (especially for younger women) and on the national level for older men.

Some particular forms of consumption of income might seem a priori to be important in increasing knowledge since they facilitate communication. We have considered medical care above. Another interesting possibility is ownership of a radio, particularly because radio broadcasts had been used for a number of information campaigns, including some related to health and family planning. 78% of sample households have radios, with a positive association with the degree of urbanization. However we find no evidence of a significant relation (even at the 20% level) with radio ownership and contraceptive knowledge.

Finally, some households choose (under various constraints, including labor market options and their access to various types of assets) to obtain their income primarily from own-agricultural production. A priori such an orientation would seem to be associated with relative isolation and thus smaller probability of knowing about modern contraception. Our estimates suggest that older women in primarily-agricultural households have a -.11 smaller probability of knowing about modern contraceptives than do other older women in rural areas, with a carryover of effects to all aggregates which include this group.[19]

Thus there seems to be evidence consistent with a number of plausible effects of exposure through specific individual experiences altering the

probabilities of knowing about modern contraceptives.

General environment: The subdivision of our sample into three regions provides some control for different general environments. However there may be heterogenieties within these regions which we can approximate by some macro demographic characteristics of the department of residence.[20]

A priori we expect that departmental population would be positively associated with contraceptive knowledge. Our estimates imply a significant positive effect at the highest level of aggregation and one at the 20% level for younger women at the national level, but negative ones for younger women in other urban areas and (at the 20% level) for all women in other urban areas. Such a pattern is not necessarily internally inconsistent if most of the positive effect of population size is captured by our subdivision into three regions. But the estimate for younger women in other urban areas still is surprising.

A priori population density would seem to increase knowledge by facilitating communication. On the other hand population density may be a proxy for poorer neighborhoods, the residents of which are likely to have less human capital and to be less well-informed. The significant negative estimates for younger women in the central metropolis and (at the 10% level) for older women in rural areas are consistent with the dominance of the latter effect, but that for the combined cohort other urban subsample is consistent at the 20% level with the former.

Our prior belief is that the proportion of women aged 20-39 who participate in the labor force would be positively associated with communication, modernity, and therefore the probability of modern contraceptive knowledge. For older women in other urban areas there is weak (at the 20%) support for

this hypothesis. However for the combined-cohort rural and national estimates - and (at the 10% level) the younger rural one, the signs are negative! Careful examination of these data suggest that for the rural areas this proportion probably is a proxy for inequality of distribution and therefore a relatively large proportion of poorer households. That is, where distribution of assets (especially land) is quite unequal, a higher proportion of females participate in the labor force (due to the relative lesser option of own-farm work), and more households are relatively poor. Thus these results for the rural area probably are consistent with those noted above for population density in the central metropolis in implying that knowledge is less likely for members of communities with a relatively high proportion of poorer households.

Thus, our exploration of these aggregate demographic general environmental conditions has raised as many questions as it has answered -- perhaps in part because of the crude and partial nature of the available proxies. In any case it is not clear that it has added much beyond the simple subdivision of our sample into three regions.

Section 3. Use of Modern Contraceptives

Of the 2839 women who know about modern contraceptives, 53% have used them. The proportion of knowers who use is associated with the degree of urbanization (68% in the central metropolis, 52% in other urban areas, 24% in rural areas) and negatively associated with age cohort (44% of those 35 and over, 57% of those under 35).

The use of modern contraceptives is one possible strategy for those who would like to reduce their number of children below what it otherwise would be. Or, in the terms of Easterlin, Pollak and Wachter (EPW, 1980), for

couples whose "natural fertility" (i.e., the level of fertility that would prevail if the household made no deliberate effort to influence its level[21]) exceeds their "optimal fertility" (i.e., the level which is the outcome of the household's maximizing decisions given its resources, norms and the constraints which it perceives that it faces).[22] Natural fertility depends on biological factors, norms relating to intensity of exposure to conception (e.g., frequency and timing of intercourse), and (perhaps unperceived) effects of decisions regarding health and nutrition and other forms consumption and labor force participation and other activities. Optimal fertility depends on the households' resources, norms (i.e., regarding family size, consumption, frequency of intercourse, contraceptive use, infantcide, abortion, intrahousehold decision making, etc.), perception of the constraints that it faces (i.e., various functions for household production, etc., market prices and options), and the procedure for combining individual preferences into a household utility function.

This is a complicated process indeed! To further illustrate the complexities, consider the possible roles of women's schooling -- the most emphasized policy-related variable in the literature on fertility and contraceptive use determinants. Variations in schooling across women in our sample may imply differing probabilities of contraceptive use due to differing: genetics that also are related to biological determinants of natural fertility and to skills and abilities in household and market production; norms relating to exposure to conception, contraceptive use, alternatives to contraception such as infantcide and abortion, labor force participation, etc.; skills and abilities learned in school or through skills (e.g., literacy) acquired in school pertaining to health and nutrition, understanding contraceptive options and

use, other dimensions of household production, and market productivity; cohort and regional differnces in the supply of schooling for females, labor market options for women, and the general health environment; family background that is related to skills and abilities in household and in market production; power relations among the woman and her companion and other household members; expectations regarding options for children; etc.

With such complexities, abstract formal modeling does not lead to clear-cut predictions.[24] Of course one can simplify by assumption and assert, for example, that women's schooling primarily represents opportunity costs in the labor force.[25] The essence of effective modeling is in making critical simplifying assumptions that do not do violence to reality. However we expect that this particular (and common and generally unqualified) assumption does do violence to reality in exploring fertility and contraceptive questions for developing countries, though available data permit out limited exploration of the issue.[26] If so, the opportunity cost interpretation may be misleading in terms of understanding and in terms of policy formulation.

Because casual empiricsm and observations of others (eg., EPW) leads us to believe that such complexities are important, we do not lay out a formal mathematical model of contraceptive use here since such an exercise would not lead to testable hypotheses given available data. Instead we attempt to represent empirically features of the type of model implied by the general verbal description of the previous paragraph and conjecture what might be the underying channels of influence or association. Because of the possible complexities and ambiguities, such conjectures must be qualified. We herewith issue a blanket qualification to avoid tedious repetition.

Since the decision to use or not to use modern contraceptives is a dicho-

tomous one, we again use logit estimators. Because of differences in social factors that affect norms and the supplies of schooling, of contraceptive options and of work opportunities, we again subdivide our sample by regions and by age cohorts. An additional reason for dividing the sample at age 35 is that for the older groups fertility is likely often to be completed, but for the younger women it often is incomplete. This means that younger women who have never used modern contraceptives may be more likely to do so in the future because their lack of use to date may only reflect that they have not yet reached their "optimal" (in the EPW sense) family size. Table 2 gives the estimates.

Overall significance and overall differences among regions and between cohorts: Chi-squared tests indicate that all of the relations are significant at the 1% level and all but one (i.e., for older women in the central metropolis again) at the 0.1% level. Thus the logits capture general associations that are quite consistent with the decision whether or not to use modern contraceptives for women who know of such options.

Statistical tests also indicate that on an overall level the relations differ among regions and across cohorts.[27] Thus the reasons for so subdividing the sample given above are supported (though it is difficult to sort out the relative importance of various reasons). Therefore we generally focus on the disaggregate point estimates below.

Human capital: The woman's predicted earnings per fortnight are included as our best representation of opportunity costs to childbearing and raising children in terms of labor force participation. The point estimates indicate that predicted earnings are a significant factor in the rural region (particularly for older women), with a magnitude that indicates that a one standard

deviation increment in predicted earnings increases the probability of modern contraceptive use by 0.06. Thus schooling and other human capital investments that increase opportunity costs in terms of expected labor market earnings have a strong impact in the rural region. But perhaps more striking is the lack of support for any significant effect (even at the 20% level) of the labor force opportunity cost effect in urban areas of any size.

After controlling for her opportunity cost in temrs of market earnings, the woman's schooling still has widespread significant effects (at the 5% level in half the estimates and at the 20% level in two thirds of them). This generally is a positive linear effect, though for older women the estimates imply a quadratic with a maximum at about 6 grades of schooling. For the overall sample the estimates imply an increase in the probability of using modern contraceptives of 0.04 for a marginal year of schooling. On the most disaggregate level, these effects are most important for women of all ages in the rural region and for older women in other urban areas. What is striking is that the strong and fairly widespread impact of female schooling is beyond the usually-emphasized effect of increasing opportunity costs of children due to market productivity. This has important implications which we discuss in Section 3.

The logits also include the schooling of the woman's companion (if any) since this too might affect the contraceptive use decision through various channels (eg., 23). The point estimates are significantly positive for this variable in half of the logits (though only at the 20% level for the national older women sample).[28] They imply that another year of shcooling of the companion increases the probability of using modern contraceptives by about 0.01 (but about twice that amount for older women in the central

metropolis). On the disaggregate level this effect is particularly strong in the central metropolis and stronger there (though not elsewhere) than the effect of woman's schooling. Because of the limited role of men in household production the possible channels through which schooling for men may be having an effect are not so complicated as for schooling for women. Given that men's earnings are controlled for by other household income (discussed below), among the most likely channels would seem to be taste changes regarding the consumption of numbers of children versus other goods and services, the disutility of contraceptives verus other means of limiting family size, and the weight given to the woman's preferences in intrahousehold decisions.

Family background: We include some measures of family background[29] to represent their possible direct effects (beyond those through other intervining variables like schooling) on human capital and on norms. The point estimates suggest some limited such effects.

The father being present during the woman's childhood has a significantly positive coefficient estimate for younger women in other areas (which implies a 0.09 higher probability of using modern contraceptives) but (at the 20% level) a negative one for the rural area (implying a -0.05 drop). A somewhat ad hoc reconciliation is that the former reflects the dominance of human capital factors, but the latter reflects family wealth and expectations regarding martial stability.

The number of siblings is included to represent their possible role in setting norms for family size. However this variable has a significant coefficient only for older women in other urban areas, in which case it is positive. Such a sign is not consistent with the hypothesized effect on norms. To the contrary it might reflect that older women who suffered relative

deprivation from being in larger childhood families are more likely to try to preclude by contraceptive use repetition of that experience for their children.

Urban residence as a child is included to represent the effect of the childhood environment on norms and abilities (e.g., through the quality of schools). It has significant positive coefficients for the national younger and combined-age samples and (at the 20% level) for the central metropolis older and combined-age samples. These suggest that such women have a 0.08 to 0.13 higher probability of using modern contraceptives than women with rural childhood.

Household income. Income other than from the woman's earnings (which is excluded because of possible simultaneity and because of the inclusion of her predicted earnings) represents an income or wealth effect. But it also may be related to endogenous taste formation depending on income- related exposure, which may shift tastes away from numbers of children -- perhaps because of lessen old-age or social security motives with more own income. The estimates indicate significant positive effects (at least at the 20% level) for half of the logits. The strongest are for other urban areas, in which case a one standard deviation increase in other income is associated with a rise of 0.09 in the probability of suing modern contraceptives.

Exposure to conception possibilities. Natural fertility presumably depends on frequency of intercourse and on fecundity. Direct observations of these factors are not available, but we include some proxies.

Women who are currently accompanied by a male and who have not had conception exposure interrupted by periods between accompaniments probably have been more exposed to conception possibilities and thus have more

incentive for using contraceptives. Our estimates suggest that those who currently are accompanied are more likely to report using modern contraceptives (with the estimates significant at least at the 10% level for all of the subsamples except for older women in the central metropolis). The point estimates imply an increase of from 0.10 to 0.27 in the probabilities, which is fairly considerable. Of course there is some possibility of an upward bias since among ever users of contraceptives, currently-accompanied women may be more likely to acknowledge use.

On the other hand we find no significantly negative coefficients for previous cohabitations. In fact we find one significantly positive coefficient at the 20% level (for younger women in other urban areas). The lack of general negative significance (and possibly some positive effect) may reflect that any interruption in exposure to conception has been offset by more negative expectations regarding future marital stability (and associated permanent income expectations).

To represent fecundity, we include a dichotomous variable for whether or not women have ever given birth. Of course there is possible reverse causality: women who always have used modern contraceptives are less likely to have ever had a birth. But this simultaneity means that our estimates almost certainly are biased downwards as a measure of the effect of perceived fecundity on contraceptive use. That makes all the more impressive the strong estimated positive impact of our fecundity variable[30] -- significant at the 5% level in all but the two less urban subsamples for older women, and in those two cases the lack of significance probably only reflects that over 98% of the women have had children so there is too little sample variance.[31] These estimates suggest a substantial effect. On the national level they imply that

a women who knows about modern contraceptives but has never given birth is 0.67 less likely to have ever used modern contraceptives.[32]

Thus, particularly given the limitations of our proxies, our estimates seem to provide definitive support for the emphasis of EPW and others on "biological" or "supply" factors in contraceptive and fertility outcomes.

Individual choice and exposure: In Section 1 we argue that certain individual choices (given relevant resources and constraints) affect the probability of being exposed to contraceptive knowledge, though these choices probably are made independent of this possible effect. Here we maintain that such choices also may affect exposure to social factors that condition individual norms relating to contraceptive use. Admittedly, there may be more possibility of reverse causality for contraceptive usage than for contraceptive knowledge with some of these variables, but the estimates suggest very limited associations (none at the 5% level) for the first two of these variables for which this would seem most likely to be a problem.

Those who have never migrated would seem less likely to be exposed to changing, more modern social norms that probably are pro-contraceptive.[33] The negative estimate in the national subsample for younger women provides weak (since it is significant only at the 20% level) support for such an effect, with the implication that such women have a probability -0.04 less of using modern contraceptives. But this slender evidence is brought into great doubt by the significant positive coefficient (at the 10% level) for older women in rural areas.

Similarly, those who have worked in the paid labor force would seem to be more likely to have been influenced by modern "pro-contraceptive" norms. But again the statistical support is very limited: only one significantly posi-

tive coefficient even at the 20% level (i.e., for younger rural women).

Likewise the support is nil or quite sparse for two other such variables. There are no significant coefficient estimates even at the 20% level for religious intensity, though it is plausible that more frequent attendance at religious services would be associated with reinforcement of anticontraceptive norms. There is but one significant positive coefficient at the same level for a pro-contraceptive effect of having a radio.

In contrast, for the other two variables in this category, the estimates imply strong and widespread effects. Women who have received formal medical care have a probability about 0.16 higher on the overall level of using modern contraceptives than do women who have not, with the coefficient estimates significant at the 5% level in all but the older other urban subsample. This probably reflects a combination of factors: norms more conducive to use of formal medicine and of contraceptives, greater availability (i.e., lower time and income cost) of medical services in general and of contraceptives in particular, and possibly some wealth effect since the demand for formal medical care probably is income-elastic (though presumably other household income is a better proxy).

Women who reside in the primarily-agricultural households have a -0.25 less probability of using modern contraceptives in the overall sample (with all but one of the relevant coefficient estimates significant at the 5% level). This is plausible due to a combination of less exposure to "modern" pro-contraceptive norms, lesser total costs for children because of their contribution in farm work, and higher economic (i.e., nominal and time) contraceptive costs.

General demographic environment: The (constrained) choice of type of

urban environment may affect contraceptive use within regions in addition to those effects which cause the estimates to differ among regions. A priori, larger population centers and more densely settled areas would seem to have more pro-contraceptive social norms and less costly (both nominally and in terms of time) contraceptive options. The coefficient estimates, particularly for population density, are consistent with a pervasive impact of such factors in the urban areas.[34]

Section 3. Concluding Remarks

Our empirical investigation leads to identification of some important factors associated with the probabilities of knowing about modern contraceptives and of using them. Noteworthy are the significant roles in both cases of regional and cohort differentials, human capital variables, constrained choices regarding medical care and own-agricultural production, and, to a lesser extent, of houehold income and family background variables. Also noteworthy is the lack of much apparent importance of some plausible variables, such as religious intensity, having a radio, and never migrating. We have attempted to provide interpretations above of why the various variables with significant coefficient estimates affect the probabilities of knowing and of using modern contraceptives.

But our most striking result concerns the role of women's schooling on the probabilities of knowing and using modern contraceptives. The predominant interpretation in the large literature on fertility determinants is that the robust inverse association of women's schooling with fertility reflects price or opportunity cost effects in the form of market participation as an alternative to raising children. We find significance evidence of such an effect

operating through expected labor market returns in the rural region.

However we do not find evidence of such a significant effect in urban areas, in which live the majority of the population in most Latin American countries. Moreover, after controlling for the impact of labor market options, we still find a fairly widespread effect of women's (and men's) schooling on contraceptive use. As we discuss, these may reflect a wide range of factors, including efficiency in household production and in using information, but also regarding the determination of norms and the nature of intra-household decision-making. Though we can not be absolutely sure, because of the importance of schooling for men (who are not very involved in household production) and other evidence that is consistent with exposure to different social norms being relevant, we believe that schooling is representing more than just efficiency.

What difference does it make? It makes a considerable difference both in regard to policy formulation and the welfare interpretation of changing fertility.

For example, if female schooling is primarily reflecting labor market opportunity costs, one important fertility reduction policy might be to eliminate any sexual discrimination in labor markets (which also would have added efficiency benefits and, given our values, probably positive distributional effects). If social returns to reduced fertility are higher than are private returns (e.g., due to social costs of schooling, etc.), then it also may be sensible to subsidize female employment. If female schooling basically is representing labor market opportunity costs, moreover, the private gross welfare effects of reducing fertility through more public female schooling are unambiguously positive (abstracting from the question of how such schooling is

However if female schooling primarily is working through other channels, then the situation is much different. It still probably is desirable to eliminate any sexual discrimination in labor markets on efficiency and (probably on equity) grounds, but a fertility reduction is not a likely return. Likewise regarding subsidies for female employment. Moreover, if the inverse association between female schooling and fertility reflects in substantial part the impact of education on norms, the private gross welfare effects may be ambiguous because of the induced taste changes. Care must be taken not to attempt to compare private preference functions conditional on different norms (also see EPW).

Our results do not suggest that there are not positive effects of schooling on information and through labor-market alternatives to child raising. In fact they provide some support for the significance of these effects. But they also suggest that female schooling is representing other important factors in contraceptive use-fertility analysis. And these factors may be much more important than the usually-emphasized information and labor market efficiency effects. If so, appropriate interpretations of fertility behavior and policy recommendations may be much different than those commonly given.

Table 1. Logit Estimates for Knowledge of Modern Contraceptives[a]

Right-Hand Side Variables	Under 35 years old				35 Years old and Older				All Ages			
	Nation	Central Metropolis	Other Urban	Rural	Nation	Central Metropolis	Other Urban	Rural	Nation	Central Metropolis	Other Urban	Rural
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Human Capital												
Schooling (grades)	.19[c]	.13	.14[e]	.29[c]	.20[c]	.18[e]	.07	.23	.11[c]	.10	.06	.26[c]
	[.01]	[.01]	[.01]	[.04]	[.02]	[.02]	[.01]	[.02]	[.01]	[.01]	[.01]	[.04]
Schooling^2 (grades^2)	-.008	-.007	.001	-.023[e]	-.020[d]	-.025[e]	.005	.05	-.00	-.01	.01	-.021[e]
	[-.00]	[-.00]	[.00]	[-.00]	[-.00]	[-.00]	[.00]	[.00]	[-.00]	[-.00]	[.00]	[-.00]
Predicted Earnings (1000 cordobas/fortnight)	.9	2.7[e]	-1.4	3.4	2.2[e]	2.9[e]	.3	3.6	.4	2.7[c]	-1.4	4.4
	[.1]	[.1]	[-.1]	[.4]	[.2]	[.3]	[.0]	[.3]	[.0]	[.2]	[-.1]	[.6]
Family Background & Age												
Father Present[b]	.22[e]	.48[d]	.04	.10	.00	-.37	.54[e]	-.51	.06	.09	.27	-.12
	[.02]	[.02]	[.00]	[.01]	[.00]	[-.04]	[.05]	[-.05]	[.01]	[.01]	[.02]	[-.02]
Mother Present[b]	-.03	.25	-.94	.54	-1.5[c]	-.08	-.97	-4.3[c]	-.71[d]	.23	-.97[e]	-1.7[c]
	[-.00]	[.01]	[-.06]	[.07]	[-.17]	[-.01]	[-.09]	[-.41]	[-.07]	[.02]	[-.08]	[-.23]
Mother's SES (0-100)	-.01	-.02	.02	-.02	.06[c]	.03	.03	.14[c]	.01	-.00	.02	.04[e]
	[-.00]	[-.00]	[.00]	[-.00]	[.01]	[.01]	[.00]	[.01]	[.00]	[-.00]	[.00]	[.01]
Urban Residence in Childhood[b]	.42[c]	-.36	.17	.80[c]	-.29	-.09	-.72[e]	-.19	.11	-.31	-.15	.32[e]
	[.03]	[-.02]	[.01]	[.10]	[-.03]	[-.01]	[-.07]	[-.02]	[0.1]	[-.02]	[-.01]	[.04]
Age (years)	.08[c]	-.00	-.04	.00	-.06[c]	-.05[d]	-.31[e]	.03	.00	-.04[c]	-.05[c]	.04
	[.01]	[-.00]	[-.00]	[.00]	[-.01]	[-.01]	[.03]	[.00]	[.00]	[-.00]	[-.00]	[.01]
Age^2 (years^2)	f	.001[c]	.0024[c]	.0016[c]	.0001	.0001	.0016	.0004	-.0004[c]	.0005[e]	.0005[e]	-.0005
		[.00]	[.00]	[.00]	[.00]	[.00]	[.00]	[.00]	[-.00]	[.00]	[.00]	[-.00]
Exposure from Individual Experience												
Never Migrated[b]	.02	.31	-.07	.08	.23	-.11	1.0[c]	-.27	.06	.10	.38[d]	.01
	[.00]	[.02]	[-.00]	[.01]	[.03]	[-.01]	[.09]	[-.03]	[.01]	[.01]	[.03]	[.00]
Ever Work[b]	.26[e]	.18	.35	.45[e]	.16	-.86[e]	.93[c]	.06	.19[e]	-.10	.62[c]	.31
	[.02]	[.01]	[.02]	[.06]	[.02]	[-.09]	[.09]	[.01]	[.02]	[.01]	[.05]	[.04]
Medical Care[b]	.32[c]	1.01[c]	.01	-.04	.47[c]	.77[c]	.14	.84[c]	.32[c]	.83[c]	.03	.21
	[.02]	[.05]	[.00]	[-.00]	[.05]	[.08]	[.01]	[.08]	[.03]	[.06]	[.00]	[.03]
Religious Frequency (Services/month)	-.05[d]	-.07[e]	.00	-.11[d]	.03	.05	.07	-.01	-.02	-.01	.01	-.08[d]
	[-.00]	[-.00]	[.00]	[-.01]	[.00]	[.01]	[.01]	[-.00]	[-.00]	[-.00]	[.00]	[-.01]
Other Household Income (1000 cordobas/fortnight)	.14	.09	.67[c]	-.04	.37[c]	.62[d]	.15	.40[e]	.18[d]	.27[e]	.52[c]	.04
	[.01]	[.00]	[.04]	[-.01]	[.04]	[.06]	[.01]	[0.4]	[.02]	[.02]	[.04]	[.00]
Radio[b]	.08	-.05	-.10	.25	.16	.45	.22	.06	-.01	.06	-.02	.08
	[.01]	[-.00]	[-.01]	[.03]	[.02]	[.04]	[.02]	[.01]	[-.00]	[.00]	[.00]	[.01]
Primarily Agriculture[b]	.38[e]	g	g	.39	-.73[c]	g	g	-1.2[c]	-.31[e]	g	g	-.34[e]
	[.03]			[.05]	[-.08]			[-.11]	[-.03]			[-.05]

Table 1 continued

General Environment												
Population	.9[e]	g	-10.7[c]	1.5	-1.0	g	-6.0	3.0	1.2[c]	g	-8.6[e]	1.2
(100,000's)	[.1]		[-.7]	[.2]	[-.1]		[-.5]	[.3]	[.1]		[-.7]	[.2]
Population Density	-.00	-.007[c]	.01	-.01	.00	.00	.01	-.05[d]	-.00	-.003[e]	.01[e]	-.01
(people/km^2)	[-.00]	[-.00]	[.00]	[-.00]	[.00]	[.00]	[.00]	[-.01]	[-.00]	[-.00]	[.00]	[-.00]
Proportion Female of	-.73	g	1.0	-2.7[d]	.42	g	4.7[e]	-2.8	-2.9[c]	g	1.3	-3.4[c]
Labor Force	[-.05]		[.07]	[-.35]	[.05]		[.43]	[-.27]	[-.27]		[.11]	[-.47]
Constant	-1.0[d]	.61	1.17[d]	-.24	2.8[d]	2.1[e]	9.1[e]	.79	2.2[c]	2.0[c]	2.3[c]	.99
Log Likelihood Functions	683	237	213	212	382	141	111	103	1106	394	342	335
Chi-Square Test Significance	.00%	.05%	.7%	.9%	.01%	8.8%	.3%	.4%	.00%	.00%	.02%	.9%
Number of Observations	2267	1028	745	494	948	380	315	253	3215	1408	1060	747
Mean Dependent Variable	.90	.93	.91	.82	.84	.86	.86	.81	.88	.91	.89	.82

Notes to Table 1

The asympototic significance levels according to t tests are indicated by otes c, d, and e. Beneath the point estimates in brackets are the partial erivatives at the point of sample means.

Dichotomous variable with value of one in indicated state, zero otherwise.

Asymptotic t-test indicates significantly nonzero at 5% level.

Asymptotic t-test indicates significantly nonzero at 10% level.

Asymptotic t-test indicates significantly nonzero at 20% level.

Excluded becuase multicollinearity is so great that algorithm does not work.

Excluded because no variance within this subsample.

Table 2. Logit Estimates for Use of Modern Contraceptives Among Women Who Know about such Options[a]

Right-Hand-Side Variables	Under 35 years old (1) Nation	(2) Central Metropolis	(3) Other Urban	(4) Rural	35 Years Old and Older (5) Nation	(6) Central Metropolis	(7) Other Urban	(8) Rural	All Ages (9) Nation	(10) Central Metropolis	(11) Other Urban	(12) Rural
Human Capital												
Schooling (grades)	.12[c]	.09	-.00	.24[c]	.24[c]	.07	.25[c]	.46[d]	.15[c]	.09[e]	.07	.28[c]
	[.03]	[.02]	[-.00]	[.04]	[.06]	[.02]	[.06]	[.04]	[.04]	[.02]	[.02]	[.04]
Schooling^2 (grades^2)	-.003	-.003	.007	-.008	-.021[c]	-.011	-.023[d]	-.017	-.006[d]	-.004	.001	-.014
	[-.00]	[-.00]	[.00]	[-.00]	[-.005]	[-.003]	[-.005]	[-.002]	[-.001]	[-.00]	[.00]	[-.00]
Predicted Earnings	.24	.35	.01	7.8[e]	1.0	.78	1.97	14.6[c]	.33	.30	.36	.92[c]
(1000 cordobas/fortnight)	[.1]	[.1]	[.0]	[1.3]	[.3]	[.2]	[.5]	[1.4]	[.1]	[.1]	[.1]	[1.4]
Companion's Schooling	.04[c]	.06[c]	.00	.03	.05[e]	.10[c]	-.02	-.35[d]	.04[c]	.07[c]	.01	-.00
(grades)	[.01]	[.01]	[.00]	[.00]	[.01]	[.02]	[-.00]	[-.03]	[.01]	[.01]	[.00]	[-.00]
Family Background												
Father Present[b]	.03	-.17	.38[c]	-.21	-.12	.15	-.24	-.55	-.01	-.07	.17	-.32[e]
	[.01]	[-.03]	[.09]	[-.03]	[-.03]	[.03]	[-.06]	[-.05]	[-.02]	[.02]	[.04]	[-.05]
Urban Residence as	.46[c]	.28	.10	.33	.00	.53[e]	.01	-.49	.31[c]	.32[e]	.05	.06
Child[b]	[.11]	[.06]	[.03]	[.05]	[.00]	[.13]	[.00]	[-.05]	[.08]	[.07]	[.01]	[0.1]
Number of Siblings	.00	.01	-.02	.04	.02	-.03	.10[c]	-.06	.01	.01	.01	.03
	[.00]	[.00]	[-.01]	[.01]	[.01]	[-.01]	[.02]	[-.05]	[.00]	[.00]	[.00]	[.00]
Household Income												
Other Income (1000	.09[e]	.05	.52[c]	-.10	.08	.04	.40[d]	.04[e]	.06[e]	-.02	.42[c]	.01
cordobas/fortnight)	[.02]	[.01]	[.13]	[-.02]	[.02]	[.01]	[.09]	[.004]	[.02]	[-.00]	[.11]	[.00]
Exposure to Contraception Possibilities												
Companion Present[b]	.76[c]	.49[d]	1.1[c]	1.1[d]	.72[c]	.39	1.2[c]	1.3[d]	.73[c]	.45[c]	1.1[c]	1.1[c]
	[.19]	[.10]	[.27]	[.18]	[.18]	[.09]	[.28]	[.13]	[.18]	[.10]	[.27]	[.16]
Previous Cohabitation[b]	.12	-.02	.33[e]	.26	.01	.25	-.04	.08	.06	.03	.19	.09
	[.03]	[-.00]	[.08]	[.04]	[.00]	[.06]	[-.01]	[.01]	[.01]	[.01]	[.05]	[.01]
Fecund (Ever birth[b])	2.8[c]	2.6[c]	3.7[c]	3.0[e]	2.2[c]	1.8[c]	20.5	17.0	2.7[c]	2.4[c]	3.5[c]	2.9[c]
	[.69]	[.52]	[.91]	[.49]	[.53]	[.44]	[4.8]	[1.6]	[.67]	[.51]	[.87]	[.44]
Individual Choice & Exposure												
Never Migrated[b]	-.15[e]	-.06	-.04	-.10	.06	-.06	-.20	.96[d]	-.08	-.03	-.08	.19
	[-.04]	[-.01]	[-.01]	[.02]	[.01]	[-.01]	[-.05]	[.09]	[-.02]	[-.01]	[-.02]	[.03]
Ever Work[b]	.15	.11	.04	.50[e]	.21	.40	-.09	-.23	.13	.16	-.02	.36
	[.04]	[.02]	[.01]	[.08]	[.05]	[.10]	[-.02]	[-.02]	[.03]	[.03]	[-.00]	[.06]
Medical Care[b]	.63[c]	.51[c]	.65[c]	.71[c]	.59[c]	.63[c]	.11	1.4[c]	.66[c]	.66[c]	.50[c]	.84[c]
	[.15]	[.10]	[.16]	[.12]	[.14]	[.15]	[.03]	[.14]	[.16]	[.14]	[.12]	[.13]
Religious Frequency	.00	.01	.00	-.03	.01	.03	-.03	-.14	-.01	.01	-.02	.07
(Services/month)	[.00]	[.00]	[.00]	[-.00]	[.00]	[.01]	[-.01]	[-.01]	[-.00]	[.00]	[-.00]	[-.01]
Radio[b]	.14	-.06	.08	.42[e]	.06	.08	-.05	.04	.10	-.03	.04	.29
	[.03]	[-.01]	[.02]	[.07]	[.02]	[.02]	[-.01]	[.00]	[.03]	[-.01]	[.01]	[.05]
Primarily Agriculture[b]	-1.0[c]	g	g	-.96[c]	-1.0[c]	g	g	-.61	-1.0[c]	g	g	-.92[c]
	[-.25]			[-.16]	[-.26]			[.06]	[-.25]			[-.14]

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Table 2 continued

General Environment												
Population (100,000's)	1.0[c]	g	-1.8	-6.1	.56	g	4.1	3.9	.95[c]	g	-.30	-2.2
	[.3]		[-.5]	[-1.0]	[.1]		[.9]	[.4]	[.2]		[-.1]	[-0.3]
Population Density	.005[c]	.003[e]	.009[c]	-.029	.008[c]	.007[c]	.014[c]	-.038	.005[c]	.004[c]	.010[c]	-.034[d]
(people/km^2)	[.001]	[.001]	[.002]	[-.003]	[.002]	[.002]	[.003]	[-.003]	[.001]	[.001]	[.003]	[-.005]
Constant	-5.2[c]	-3.5[c]	-.58[c]	-7.0[c]	-4.7[c]	-4.3[c]	-22.9	-21.5	-5.1[c]	-3.7[c]	-5.6[c]	-6.9[c]
Log Likelihood Function	1107	509	380	192	469	203	162	81	1590	720	553	285
Chi-Squared Test Significance	.00%	.00%	.00%	.00%	.00%	.6%	.05%	.04%	.00%	.00%	.00%	.00%
Number of Observations	2038	957	675	406	801	327	269	205	2839	1284	944	611
Mean Dependent Variable	.57	.71	.56	.27	.44	.59	.44	.20	.53	.68	.52	.24

[1] See notes to Table 1.

NOTES

1 Enke (20) provides an illustrative formal statement of the possible population-economic growth trade off. For a much different view see Simon (28).

2 The World Bank (42) summarizes recent studies. Williams (30) provides an earlier but more extensive review. We have investigated various dimensions of fertility determination for the sample used in this study in (3,4,6,10,33).

3 The total sample exceeds 4000 in number. For the present study we exclude never-accompanied women and those for whom critical data are not available. Under the assumption that never-accompanied women are a random subsample (which is assured by the sample design) and that missing information is random (which we have no way of testing adequately), the sample we use here is an area stratified random sample. For some experiments which support dropping observations for which random bits of information are missing, see (41). For further description of the data see (14,37,38,39). For other studies completed or in process based on this data see (2-10,29,31-43).

4 See Maddala (22) for a discussion of the shortcomings of ordinary least squares with limited dependent variables such as this and of the major alternatives.

5 The Chi-squared test statistic is 35 (with a critical value of about 15 at the 1% level of significance) for combining across regions, 41 (7.6) for combining across cohorts, and 89 (15+) for both.

6 Of course for some purposes (e.g., labor market activities) other forms of human capital related to health and nutrition also frequently are emphasized (e.g., 4-5,11-13,21). But such factors a priori seem less likely to be relevant for contraceptive knowledge and we have a binding constraint on how many variables we can include in our logit, so we have not explored such possiblities here.

7 Because of the nonlinearities of the logit functions, the marginal impact of a change depends upon all of the right-hand-side variables in a given logit. We value all of the partial derivatives at the points of sample means throughout this paper, but will not repeat this qualification ad nausem.

8 Unless otherwise qualifid, we follow the standard procedure of characterizing point estimates to be significant if a t test at the 5% level indicates that they are.

9 Mean grades of schooling completed are 5.1 (with a standard deviation of 3.4) in the central metropolis, 4.9 (3.6) in other urban areas, and 1.5 (2.1) in rural areas.

[10] The estimates are based on a double-selectivity (i.e., for participation and for reporting earning) extended-human-capital model in (12, 15, 29). We standardize at age 29 to abstract from the effects of differential work experience due to age differences.

[11] The three cases in which the estimates are significantly nonzero at the 20% level apparently reflect this effect in the central metropolis and suggest that there is no significant difference across age cohorts in the central metropolis.

[12] The significant negative coefficient estimates for mother present in 5 logits apparently are due to interaction with this variable. Multicollinearity may be a problem in that the correlation between the two is over 0.9. Moreover, there is an interaction between the two variables since actual mother's SES is not observed in cases in which mothers were not present, so the coefficient estimates for mother present may just reflect an adjustment to the implicitly assumed values of this SES in such cases. For these technical reasons we are doubtful about the interpretation that mother's presence causes lower probability of contraceptive knowledge.

[13] However the coefficient estimate for older women in other urban areas is negative, though only at the 20% level. See the discussion below of "never migrated" in note 17.

[14] Some studies suggest that such effects may be quite strong in developed economies (eq. 2). Little evidence is available for developing countries but we have several related studies underway (7, 33-34).

[15] That is, it does not seem to be plausible that a conscious decision is made simultaneously about whether or not to acquire (at that point of time, unknown) contraceptive knowledge and whether or not to migrate, go to religious services, etc. However whether or not one migrates, etc. may affect the probability that one learns about modern contraceptives in a recursive fashion. We focus on such possibilities. But also there is some chance of the reverse direction of recursive casuality in that acquiring contraceptive knowledge might affect the probability of having some of these experiences (particularly if the knowledge is put to use).

[16] With the exception, perhaps, of those in the central metropolis with relatively rich human capital stocks, for whom the expected returns to migration elsewhere may be negative. For evidence consistent with such a possibility in regard to expected earnings, see (12). We currently are investigating the micro determinants of female migration in (11).

[17] The only bivariate correlation of any magnitude of "never migrated" with any of our other variables in this subsample is with "urban childhood residence" and the negative coefficient of the latter (see note 13 above) also might reflect a multicollinearity problem. But questions remain as to why "never migrated" represents "urban childhood" better

than does "urban childhood" in this subsample, and why does it not do so in the others?

[18] However, though contraceptive use may be less among more devout Catholics, contraceptive knowledge might be greater if the local church explicitly admonishes against use.

[19] At the 20% level of significance there also is a smaller positive effect on younger women at the national level. However this seems spurious in that it is not supported at lesser or higher levels of aggregation.

[20] A census and political unit akin to a county.

[21] Natural fertility is not the biological maximum level of fertility because social taboos, deficient health and nutrition, and practices like lactation reduce natural fertility below biological possibilities.

[22] "Optimal fertility" generally exceeds the "desired fertility" that would prevail in a "perfect contraceptive society" in which contraceptive use has neither economic nor disutility costs.

[23] EPW emphasize the possibility of such "unperceived jointness" (e.g., health and nutrition affecting fecundity without the effect being perceived, so it is not incorporated into decisions relating to allocation of resources to health and nutrition). One can also conceive of perceived links that do not actually exist (e.g., eating certain foods alters fecundity). Pure neoclassical economists tend to dismiss such possibilities because of the learning about actual relations that will occur when outcomes differ from those expected. But in a stochastic world with complex interactions and long gestation periods, such learning may be slow indeed.

[24] Sanderson (25) criticizes the EPW model on these grounds. But the criticism is applicable to much simplier models. For example, see Rosenzweig and Wolpin (24).

[25] For another example, Michael and Willis (23) present an interesting attempt to explore contraceptive use decisions by marrying the economic maximizing model with the demographic "renewal" model. But in their more rigorous formulation they make strong assumptions to make the analysis tractable (i.e., they assume that a pure contraceptive strategy (i.e., only using one contraceptive or none at all) is adopted over the child-bearing decades (independently of stochastic outcomes) and they effectively divorce the fertility-contraception decision from others by assuming that exposure to conception, biological fertility supply, and post-partum sterility are fixed independently by other activities) and in their empirical analysis they characterize women's schooling as relating only to efficiency in contraceptive use.

[26] The results presented in Tables 1 and 2 give some insight into this question since a separate representation of labor market opportunity

costs is included in addition to schooling. Also see (4,6,10,33).

[27] The Chi-squared test statistic is 32 (with a critical value of about 15 at the 1% of significance) for combining across regions, 14 (7.6) for combining across cohorts, and 63 (15+) for both.

[28] There also is a negative coefficient at the 10% level for the schooling of the companion of older rural women. This may reflect that in the more traditional areas and cohort more schooling for the companion, ceteris paribus, increases the power of "macho" males to impose their preferences on the females in intrahousehold decisions.

[29] Though fewer than in Section 1 because of the binding constraint on the total number of variables given our logit program and priors that other variables are more important to include.

[30] However there may be a positive bias since some of those who have never given birth are not subfecund, but merely women who have not been exposed very much to conception possibilities (e.g., women who have not been accompanied by a male for very long). Since most such women are relatively young and the results seem robust for the overall sample, such an effect does not seem to be overriding the fecundity factor.

[31] Or, equivalently, multicollinearity with the constant estimates -- which are not significantly nonzero in these two cases (and only in these two cases).

[32] Because of the possible upward bias particularly for younger women discussed above in note 28, perhaps the -0.53 estimate from the older women national subsample should be emphasized. In either case, the effect is substantial.

[33] But see note 16 above regarding the central metropolis.

[34] Of course there remains some possibility of reverse causality in that couples with norms for more children may choose to live in less densely settled areas, but we doubt that this is dominating.

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