PN-ACB-945 COIE
96399

Effect of Childbearing on Filipino Women's Labor Force Participation and Earnings*

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October 7, 1997.

It is generally assumed by those who promote family planning that having fewer children improves child health and survival, and also contributes in positive ways to the quality of women's lives. While the former assumption is well founded and documented in an extensive literature, there remain questions about how family planning influences various aspects of women's lives.[1] There are significant health costs for women in developing countries of high levels of reproductive stress, particularly when coupled with chronic under nutrition and physically demanding work. Repeated cycles of pregnancy and lactation can deplete maternal energy and nutrient stores.[2,3] There are also hypothesized effects of childbearing on economic and social-psychological well-being and overall quality of life.

Women in developing countries are faced with competing demands of reproductive and productive roles. It has been argued that by limiting family size, constraints to productive economic activities are reduced.[4] With fewer children, women can theoretically earn more income and thereby improve their own well-being as well as that of other family members. While this hypothesis is appealing, there is a lack of empirical evidence from developing countries supporting a strong effect of childbearing on women's earnings.

Researchers uniformly acknowledge that the relationship of work and childbearing is very complex. Since decisions about childbearing and work are likely to be made jointly, it is challenging to disentangle cause and effect. Working women may choose to limit childbearing so they can continue to work

and earn income. Alternately, childbearing may decrease women's opportunities for work or affect type of work, place of work, or hours. Either sequence would result in a negative association of work and childbearing. In contrast, increased economic demands of larger family size may push women into the labor force, resulting in a positive association of work and childbearing. In either case, the nature of the work-childbearing relationship may depend on the type of work women do.

Much of the work done by women in developing countries is carried out in the informal sector, that is, under conditions lacking routine government regulation, formal contractual arrangements or benefits such as health insurance.[5] Informal sector work often involves market sales, food production, and piece work.[6,7] Self-employed workers in the informal sector often own their own means of production. Compared to work in the formal sector, informal sector work offers women flexibility in hours, but less security, status, and non-wage benefits such as social security, health insurance, or paid sick leave. Given its greater flexibility, women may regard informal sector work as more compatible with childbearing. In contrast, work in the formal sector offers greater stability, some non-wage benefits, and greater structure, but generally longer hours and a work site typically away from home.[8]

Becker (1981) offers an explanation for a negative association of fertility and work based on opportunity costs, but conditioned on work sector.[9] He hypothesizes that formal sector work away from home presents higher opportunity

costs, and thus acts as a greater deterrent to childbearing. Under this premise, limiting family size should promote participation in the formal work sector, but have relatively little impact on the informal work sector where opportunity costs are lower and incompatibility of productive and reproductive roles is assumed to be lower.

The type of work selected by women is affected by a wide range of factors including education and training, prior work experience, earning potential, compatibility with other roles (childbearing, elder care, other household responsibilities etc.), household characteristics including income, partner's education, and presence of childcare substitutes, and community level characteristics such as infrastructure, labor opportunities and wage structure. For many women in the Philippines, work is regarded solely as an economic necessity. For some, work is a choice that carries other benefits, including status and a sense of personal achievement. Thus, the choice to work or not, and the type of work selected may differ at opposite ends of the SES spectrum. Women from higher SES households may elect not to work unless they are also highly educated while women from poor households may be driven to work by economic necessity.

To understand the effect of childbearing on women's earnings, it is important to consider not only the type of work women do but also the hours they work. Women may increase earnings by working more hours, but this may create more competition between their productive and reproductive roles, and thus result

in no net gain in other quality of life outcomes. One strategy to overcome the time demand dilemma is to select jobs with more flexible hours but lower pay. It is therefore important to explore the effects of childbearing on earnings both as a function of hours and of earnings per unit of time worked.

Childbearing is likely to affect women's earnings in 2 major ways. One is through influencing whether or not women work for pay at various points in their reproductive years and the second is through the specific effects of having small children on the earnings of women who are working. These effects will be mediated by the type of work women do and by the availability of childcare substitutes. Becker (1981) argues that working women with children may seek less effort-intensive jobs because of the time demands of child-care, but these jobs will most likely pay less well.[9]

Mothers working in the formal wage sector where opportunity costs are high and flexibility for childbearing is more limited, may withdraw from the labor force for a period of time or may shift to a lower-paying but more flexible job. Women from lower income households may be less able to withdraw from the labor force and may continue working at the same or reduced hours. For women who shift to a lower-paying job without increasing hours, childbearing would result in reduced income. Self-employed women with work that is relatively compatible with child care may be able to continue their work and may see little decrease in income. In their study of piece workers in Mexico City, Beneria and Roldan (1987) found that compatibility with childcare is a reason often given by

women for why they are involved in piece work.[10] Women engaged in piece work or whose self-employed work is fairly demanding may work similar hours, but find that they are less productive because of the demands of child-care. These women may earn less income, may increase their work hours to maintain their profits, or may switch to work that is less demanding and usually less profitable.

Finally, the effects of childbearing are likely to depend on its different phases. Late in pregnancy, women may find it difficult to continue working because of physical constraints. Mothers of infants and young children face the time demands of more intensive childcare and breast-feeding. As children get older, these demands may decline or child care may be more easily assumed by alternate care givers. In studies of US women showing a relationship of childbearing and earnings, the age of the youngest child at the time of measurement is a stronger predictor of wages than the total number of children.[11] In a summary of several studies that used mainly US data, Korenman and Neumark (1992) concluded that "children appear to reduce wages primarily 'indirectly' by reducing labor force participation and accumulation of human capital rather then 'directly' by lowering the productivity of otherwise similar work."[12] In their own study, Korenman and Neumark control for the endogeneity of children through the use longitudinal data and a fixed effects estimator.[13] After this endogeneity is controlled, the effect of children on wages is found to be insignificant.[12]

Given the vast differences in labor markets in developed versus developing countries, it may not be possible to generalize results from the US. Further research in developing countries is needed to explore the effects of number and ages of children on women's earnings. Such research requires detailed longitudinal data on women at different stages of their reproductive lives. Of particular importance is the ability to document the sequence of work and childbearing events.

The Cebu Longitudinal Health and Nutrition Survey (CLHNS) is particularly well suited to this purpose, since data are available on work patterns, earnings, and reproductive events in a large cohort of women over an 8 year period. Prospective data allow us to examine changes in women's labor force participation and earnings subsequent to a well documented pregnancy, but also conditioned on prior reproductive experiences and a wide range of other maternal characteristics. Detailed data on type of work allow differentiation by wage, self-employment, and piece work sectors. This provides the opportunity to explore work sector effects on women's earnings while adjusting for hours of work.

Data

Data were collected for the CLHNS from 1983 to 1991. Cebu, the second largest city in the Philippines, is a major shipping center undergoing rapid urban development and population growth. Like the rest of the Philippines, the Central Visayas region where Cebu is located, has a moderately high fertility rate. In

1993, the total fertility rate (TFR) for this region was 4.38, compared to 4.09 for the entire country. These levels represent only modest declines from the previous decade, when TFR was 4.7 for the entire country (DHS 1993).[13]

The study area encompasses the densely populated urban areas of Cebu City and other contiguous smaller cities, peri-urban areas around these cities, and more isolated rural areas in the mountains and on smaller islands. The CLHNS is a community based study of a cohort of childbearing women, ages 14 to 47 at entry into the study. Following a census of all urban and rural barangays (administrative units) of the Metro Cebu area, 33 barangays were randomly selected for the study. All pregnant women in these barangays who subsequently had a birth or pregnancy termination in a one year period from 1983 to 1984 were recruited into the study (n=3,327). The study sample is representative of childbearing women in communities of Metro Cebu, with a preponderance of low income families, a wide range of variability in income, education, and level of modernization.

Highly trained interviewers from the Office of Population Studies at the University of San Carlos visited each household to collect sociodemographic, environment, health, nutrition, and reproductive history data. Data collection took place during the 6th to 7th month of pregnancy, then at bimonthly intervals for 2 years. A follow-up survey was conducted in 1991, and 2,395 women (72% of the baseline sample) were located and re-interviewed. We focus this analysis on the women present at the 1991 follow-up.

In the majority of cases, loss to follow-up occurred because families moved away from the Metro Cebu area. Most migration took place during the first several years of the study. Relatively little migration occurred from 1986 to 1991 resulting in low rates of loss to follow-up during this period. Women lost to follow-up were younger, more educated, came from smaller households, were more likely to be urban residents, and less likely to have been working for pay at entry into the study compared to those who remained in the study area (see Table 1). Despite measurable differences in characteristics of migrants, in previous studies of health-related outcomes, we found no significant biases in multivariate results attributable to loss to follow-up.[14]

Definition of Study Variables

1. *Labor force participation* was defined for purposes of this study as "working for pay". During the baseline survey, women were asked if they were currently doing any work for pay, or whether they had worked in the previous 4 months. We define as working, those women with affirmative answers to either question, since women may have recently stopped working because of advancing pregnancy. Excluded from this classification of work are those women who are unpaid workers in a family business or farm. This type of work was excluded because we wanted to focus on women's cash earnings. The same criteria were used to identify work status of women in 1991.

Work done by Cebu women was categorized into 3 work sectors based on the mode of pay. Data were not collected on contractual arrangements, so we do

not use the standard formal-informal sector dichotomy. *Wage* workers are paid on a time basis (most often daily or hourly), and may or may not have formal contracts and benefits. Most wage workers are in service-related jobs (clerical, domestic help, etc.). *Piece* workers are paid by the amount of goods they produce. Most piece work in Cebu involves manufacture of shell, wood or fabric handicrafts. *Self-employed* women run their own small businesses. Many of these are small "sari-sari" stores which have a limited inventory of sundries and food items, and are typically located in the woman's own home or a neighboring building. Other small businesses may involve selling prepared foods. One aspect of job stability, as well as opportunity costs of work was captured by variables representing whether the woman worked in the same sector at the time of the baseline survey and at follow-up. These variables estimate stability with some error, since transitions within the 8 year period are not considered.

The concept of labor force attachment, which may partially control for a set of underlying characteristics of "workers" in general, is represented by a dichotomous variable indicating whether the woman worked before marriage.[15]

2. *Income* was determined for each individual in the household based on a series of questions about earnings in primary and secondary jobs, and in family businesses (including raising of livestock, sale of produce). For analyses of the effects of household income on women's labor force participation, we computed income of all family members *exclusive of the index woman.* Income was measured during the baseline survey, at 12 and 24 months postpartum, and in

1991 using the same set of questions to insure comparability across the surveys. Using Philippines consumer price indices, income values were deflated to a common time point in 1983 so that real changes in income could be determined.

We also conducted 3 focus group discussions with women similar to CLHNS participants. Based on information gathered during these focus groups, we hypothesized non-linear effects of women's education and household socioeconomic status. Women expressed an ideal of not having to work if family income was high enough. Therefore in assessing the likelihood of working, we modeled the effects of high and low income of others in the household by comparing the top and bottom quartiles to the middle 2 quartiles.

Change in women's total weekly cash earnings and change in earnings per hour in the interval from the baseline survey to 1991 are the main dependent variables in our analysis. We restrict our analysis to cash income, since women are more likely to have control over their own cash earnings, and tend to spend their earnings to benefit their children and themselves.[16-18] There are additional rationales for defining women's income as cash income only. One aspect relates to measurement. The noncash component of income is a measure of household activity and since many household members may work on these activities in this population, imputation of any in-kind income to the women could add error to the estimate of women's income. Another relates to behavior. Often economists do not attribute in-kind household production to one individual since many members work on these activities and the family is felt to place a lower value on

participation in home production activities. That is, it is felt that cash income may be more strongly associated with decision making power and autonomy in spending income.[19]

3. *Hours* worked. Women were asked to report the usual number of hours per day, and the number of days per week they worked in the past 4 months. Hours were summed for main and secondary jobs.

4. *Childbearing patterns* were determined from detailed reproductive histories. We examine the effects of parity (number of live births) and age of children at the time of the baseline survey, with a focus on children less than 2 years of age. At baseline, 23% of sample women were pregnant for the first time, and 36% had a child less than 2 years of age. For 1983 to 1991, continuous variables represented the number of surviving children born during the interval, and age of the youngest child in 1991.

5. *Other covariates*. Mother's age, education, place of residence (urban or rural community), and family structure (extended or nuclear family, presence of spouse, presence of individuals who may serve as alternate care givers, including grandmothers, and other adult females) were also entered into analysis. Finally, we have community level information about the prices of major commodities such as corn, fuel oil, and the price of infant formula that may have indirect effects on the outcome variables.

Methods

In the present analysis, we were interested in how childbearing affects women's weekly and hourly earnings. To control for the endogeneity of childbearing we make use of the longitudinal data to specify change in earnings between 1983 and 1991 as the dependent variable. Clearly, changes in earnings can only be studied in the sub-sample of women earning cash income at both points in time. Since this is a highly selected group of women, we must examine characteristics of labor force participants and non-participants in 1983-84 and 1991, and factors that affected changes in participation. The sample consists of women who were not earning cash incomes at either point in time (17.9% of the sample of 2,395 women present in 1991), women who were working in 1983 but not in 1991 (11.2%), women who were not working in 1983 but were working in 1991 (35.5%), and those who worked at both time periods (35.4%). The methods that we use to control for selectivity into this final group are discussed below.

For the group working at both points in time, we modeled change in earnings using linear regression with corrections for selectivity. In the analysis, we ignore the timing of transitions, and focus on net change in income over the 8 year period, since during this longer period of time, we expected substantial variation in patterns of childbearing. Survey data suggest most of the income changes occurred between 1986 and 1991, rather than 1983-86. This is consistent with the overall rate of economic growth that characterized the Metro Cebu area in the later time period.

A critical methodological consideration concerns sources of potential bias. First, unobserved characteristics of women are likely to affect both their work and childbearing decisions. If this is the case, we will obtain biased estimates of the effects of childbearing on work. Second, women are likely to make simultaneous decisions about work and having children. They may choose not to work while children are young, or they may choose specific jobs that offer greater flexibility to care for young children, but shorter hours or lower pay. A woman with a secure, well paying job may elect to delay childbearing to maintain her work status. Thus it may be virtually impossible to identify the effect of childbearing on work with cross sectional data. One possible approach involves the use of instrumental variables for childbearing. However, this presupposes that instruments can be identified. Given the joint nature of work and childbearing decisions, it is nearly impossible to find exogenous variables that affect one decision but not the other. The difficulty of this problem has led several groups of researcher to make the simplifying assumption of treating the number and age of children as exogenous variables in models of labor force participation or earnings.[11, 20-23]

In a preliminary analysis that makes use of our longitudinal data, we examined the effects of endogeneity in our estimates of the effects of childbearing on weekly income and hourly earnings by comparing results of random versus fixed effects models and using Hausman test procedures. Ignoring selectivity problems that are addressed below, the fixed effects estimator is consistent under

both the null hypothesis of no endogeneity bias and the alternate hypothesis while the random effects estimator is consistent and asymptotically efficient only under the null hypothesis of no simultaneity bias. Data for the two cross sectional time points, baseline 1983 and 1991, were stacked, and level of weekly income or earnings per hour were the dependent variables. Independent variables included those representing parity, household composition, income of others, mother's age, and several community level exogenous price variables. A test of the hypothesis that the difference in coefficients estimated in random and fixed effects model is not systematic yielded a highly significant Chi-square (P<.00001). Random effects models produced substantively different estimates of coefficients on childbearing, work sector and household composition variables, confirming a high level of endogeneity of childbearing variables in income and hourly earnings models.

The statistical specification of our complete estimation strategy that deals with both the endogeneity of childbearing decisions and selectivity into the group of women that were working at both points in time is as follows. Consider the following earnings equation:

$$E_{ti}=X_{ti}\beta+Z_i\alpha+CB_{ti}\gamma+\mu_i+\varepsilon_{ti} \qquad (1)$$

where E_{ti} represents the earnings of woman i (i=1,2,...,N) at time t (t=1,2), the X's represent time varying characteristics of the woman and household, the Z's represent fixed characteristics and CB represents a set of child bearing

characteristics. The error term has two components. The μ represents unobserved fixed characteristics of the woman that affect her earning ability while the ϵ's represent time-varying unobservables. We further assume that any correlation between the right-hand-side observed variables (the child bearing variables are of particular interest but other variables such as income of other household members and household structure could also be correlated with the fixed error term), and the unobserved variables is through the fixed unobservables represented by the μ's.

If there is correlation between the fixed unobservables and the observed variables, standard methods will result in biased and inconsistent estimates of the regression coefficients. One solution to this problem is to difference the data:

$$\Delta E_i = \Delta X_i \beta + \Delta CB_i \gamma + \rho \nu_i + \Delta \varepsilon_i^* \qquad \textbf{(2)}$$

where we have separated $\Delta\epsilon_i$ into two components. The ν represents unobservables that may be correlated with selection into the group of woman that are working at both points in time and the $\Delta\epsilon^*$ represents purely random error. If $\rho = 0$, equation (2) can be estimated by standard methods since selectivity into the sample of women who are working at both points in time also is only a function of unobserved fixed characteristics of the woman, the μ's, which means that the differenced model also controls for this source of bias. If $\rho \neq 0$, then estimating equation (2) by standard methods will result in inconsistent parameter estimates.

We test for this source of selectivity by jointly estimating equation (2) with equations that explain labor force participation at EACH point in time:

$$\ln[\frac{P(LFP_{ti}=1)}{P(LFP_{ti}=0)}]=W_{ti}\Psi_t+\delta_t\nu_i \qquad (3)$$

where the dependent variable is the log odds that woman i at time t participated in the formal labor force. The W's represent a set of characteristics of the woman, her household, and community that affect the participation decision and we allow for correlation between this set of equations and equation (2) through the common unobservables represented by ν.

Our estimation strategy is joint estimation of the three equations [equation (2) and the two participation equations specified in equation (3)] by maximum likelihood methods using a discrete factor approximation to the distribution of the unobservables along the lines of Heckman and Singer (1984).[24] In the empirical implementation of the estimation method, we decomposed ν into a community level error since our sample is clustered by community (barangays) and an individual level error. The discrete factor method was used to approximate the distribution functions of both error components where the number of points of support for each was determined empirically by adding additional points of support until there was no further improvement in the likelihood function. For additional details on the method, see Mroz and Guilkey (1997).[25]

Results

Results presented here are for the 2,393 women who were participants in the 1991 follow-up survey, and who had complete data on the variables of interest. As discussed below, two formulations of the dependent variable were used: change in the woman's weekly income and change in her hourly earnings. For each formulation of the dependent variable, equation (2) was estimated jointly with the two equations specified in equation (3) for time periods 1993 and 1991. The labor force participation equations are not subject to either simultaneity bias or sample selectivity bias and can be estimated separately by simple logit. As expected, the results for the two sets of estimations for these two equations are very stable and very similar to results for simple logit applied to each equation individually.

Before turning to a discussion of the substantive results, we first discuss estimates of the heterogeneity parameters. In the change in income model, two mass points were optimal for the individual level heterogeneity. Since the discrete factor method imposes the normalization that the first mass is 0 and the last is 1, this means no points of support needed to be estimated. The estimated probability weights for 0 and 1 were .171 and .827 respectively. The community level heterogeneity had three mass points with the middle point estimated to be .541 with probability weights .189, .486, and .323 respectively. The bottom of Table 3 presents the estimated factor loadings for the unobserved heterogeneity at both the community (RHOci) and individual level (RHOi) for the labor force participation equations. It is clear that these parameters are highly significant in

both 1983 and 1991. The bottom of Table 5 presents the estimated factor loadings in the change in weekly income equation labeled in the same manner. In this case, the estimated parameter for individual level heterogeneity is significant at standard levels but the community level parameter drops below standard significance levels. We conclude that there is evidence of significant sample selectivity in this case and simply differencing the data is not sufficient to eliminate the problem.

For the change in wage equation, a discrete factor approximation with three points of support was optimal. Attempts to add individual level heterogeneity to the equation resulted in unstable parameter estimates and so we did not include it in the model. The middle point was estimated to be .531 and the probabilities associated with the mass points were .201, .456, and .343 respectively. The estimated RHOci's in the labor force participation equations had t statistics of 5.5 and 5.6 respectively. Since these two equations are simply re-estimated with the alternative version of the ultimate dependent variable and since the estimated coefficients for the observed variables were virtually the same as those reported for the two equations when they were estimated jointly with the change in weekly income variable, we do not report the rest of the results. Table 6 reports the estimated RHOci for the change in wage equation and we see that its t statistic falls below standard levels of significance indicating that sample selectivity is less of a problem for this specification.

We now present the substantive results. We first discuss the results for the two selectivity equations, that is, factors related to whether women were working in 1983 and 1991. As stated above, we did pairwise estimation of equations (2) and (3) with change in weekly income and change in hourly earnings, so two sets of results are available for the set of selectivity equations. The results for the effects of the observed explanatory variables were quite stable and we present and discuss only the ones estimated jointly with the change in income equation.

1. *Women's likelihood of working for pay.*

The Cebu study began with a cohort of pregnant women. To what extent has pregnancy or childbearing history already affected labor force participation in the sample? At the time of the baseline survey, 46.6% of the sample women reported working for pay, either currently (86%) or in the past 4 months (14%). Of those not working (n=1,278), 31.6% had never worked, 49.8% worked before but not after marriage, 16% worked before and after marriage, and 2.6% began working after marriage. Thus, the group whose current work status is most likely to have been affected by recent childbearing history or the current pregnancy consists of the 205 women who worked for pay before and after marriage, but who were not working at the time of the baseline survey.

Characteristics of women in each of these categories are presented in Table 2, and a comparison is made with current workers. Women who never worked for pay, or worked only before marriage stand out as being more likely to be pregnant for the first time compared to either of the groups who worked after marriage.

Those who never worked for pay are more likely to live in rural areas. Women who worked only before marriage had the lowest mean education level of any of the groups, and were more likely to have less than a primary school education. The exclusion of women with a history of work but who are not currently working is a potential source of bias. On the one hand, they may be women for whom childbearing has the strongest effect on paid work, particularly since the women in this category are disproportionately multiparous. One might also suspect that these women are from higher income households and perhaps do not need to work. However, this is not supported by the household income data presented in Table 2.

Table 3 presents characteristics of working and non-working women at baseline and in 1991. There was a dramatic increase in the percentage of women working, from 46.6% at baseline to 73.9% in 1991. At baseline, working women were more likely to have at least a high school education, to be from households with lower total income (exclusive of women's earnings), to have worked before marriage, to have higher parity, but less likely to have a child less than 2 year of age. In 1991, working women were significantly older than non-working women. As at baseline, working women were more likely to have worked before marriage, to come from lower income households, and were less likely to have a child less than 2 years of age. Total number of children was not different between working and non-working women.

Women working at baseline worked an average 41.6 hours per week. One third worked less than 30 hours per week. These part time workers had less education and were of higher parity than women working more than 30 hours per week. The majority of part-time workers were self-employed.

Among all workers, 31% worked in the wage sector, 21% did piece work (mostly handicrafts of shell and wood, or embroidery), 42% were self employed (mostly in sales at small stores, or as street vendors), and the remaining 7% worked in a family business, earning income by activities such as farming or raising livestock (Table 4). A comparison of characteristics of women working in the different sectors shows that piece workers come from the poorest households, as evidenced by family income and assets. Piece workers are less educated and have lower earnings. In contrast, the most educated workers are in the wage sector. The highest parity women tended to be self employed. Women in the self employment sector had the highest mean earnings, while wage workers had the longest hours.

In 1991, one third of working women worked less than 30 hours per week. The percentage of women doing piece work declined to 15%, while the percentage of self employed women rose to 44%. Earnings remained higher for self-employed and wage workers compared to piece workers.

Results of the logistic regression models of the likelihood of working for pay at baseline and in 1991 estimated jointly with the change in weekly income model are presented in Table 4. At baseline, the strongest determinant of working

for pay was work before marriage. While still a significant determinant of working in 1991, this effects of this measure of labor force attachment were attenuated compared to baseline. A non linear effect of maternal education was found, with higher levels of education increasing likelihood of working for pay. Older maternal age increased the likelihood of working at baseline, but not in 1991. Spouse characteristics had no effect on work at baseline, but were significant determinants of working in 1991.

2. *Changes in women's earnings.*

We calculated the change in each woman's total earnings, and change in earnings per hour from the baseline survey in 1983 to the 1991 follow-up. There is a very wide range of variability in these outcomes, and each has a skewed distribution. Seven women were dropped from the analyses when it was found (by calculating residuals of predicted values) that their inclusion in regression models exerted undue influence on the results[26], and 4 women had missing values on one or more of the independent variables in the model. The final analysis sample included 837 women working for pay in 1983 and 1991, and with complete data for all independent variables in the regression model. Mean change in earnings among these women was 46.6 pesos/week, but the median change was 29.6 pesos/wk. The 25th percentile of change represented a decline of 12 or more pesos/wk from 1983 to 1991. The mean change of nearly 47 pesos/wk represents a 49% increase over women's mean earnings of 94 pesos per week in 1983-84. The mean change in earnings for women with no subsequent surviving child in

the 8.5 year period was 2.3 times higher than that of women with at least one additional child (69.7 vs. 26.4 pesos/wk).

The overall change in income is in part, a reflection of an increase in the number of hours worked per week from 41.6 in 1983 to 46.1 in 1991. In turn, this reflects a tendency for women to move from part-time to full time work. Changes in income varied substantially across sector of employment at baseline, with piece workers having the lowest mean gains (18.6 pesos/wk) and wage workers having the highest gain (62.9 pesos/wk). For the sample of women working at both points in time, their earnings represented 34.9% and 36.7% of total household earnings in 1983-84 and 1991, respectively.

We explored a number of different specifications for the change in weekly income and hourly earnings models. In the final models, we dropped all independent variables with a t-statistic less than 1 when those variables did not appreciably change the coefficient on another variable, or were not needed to interpret another variable. Dropping these variables had no effect on the explanatory power of the model as indicated by the r-squared values. Maternal education, work before marriage and urban residence had no significant effects, and were therefore not included in final models.

The final models included dummy variables representing the number of live births in the interval from 1983 to 1991 (1, 2, 3, 4+), change in the number of children less than 2 years of age, presence of spouse and other adult females in the household, change in hours, change in household income exclusive of the

mother's income, remaining in the wage or self employment sectors, and maternal age. We also tested but found no significant effect of interactions of sector of employment with childbearing variables, suggesting that in this population, there is no substantial difference in the effects of childbearing for women who remained either in the wage or self employed sectors compared to other possible categories or transitions. However, additional clarification of this effect is needed, since women may change sector as a function of childbearing.

Table 5 presents results from the selectivity corrected change in weekly income regression, and table 6 presents results from the change in hourly earnings regression. Children born during the 8 year interval significantly decreased total and hourly earnings. The effect of children was non-linear. Compared to having no additional children in the interval, a condition true for about 29% of sample women, having only 1 additional child decreased weekly earnings by about 11 pesos, and hourly earnings by about 0.28 pesos. Having 4 or more additional children (true for only 6% of sample women) decreased weekly earnings by over 56 pesos, and hourly earnings by about 1.2 pesos. The change in the number of children less than 2 years of age had no significant effect on weekly or hourly earnings.

Change in hours worked was directly related to total earnings, but inversely related to earnings per hour. Sample women worked an average of 5 hours more per week in 1991 than in 1983. Each additional hour worked increased weekly earnings by just over 1 peso (less than half of the 1983 mean earning of 2.35

pesos/hr, and about 1/3 of the 1991 values of 3.1 pesos/hr). In similar models (not shown) we found that birth of additional children reduced the number of hours women worked, with the strongest effects associated with children under 2 years of age. Since the effects of childbearing on weekly income are significant after controlling for change in hours worked, and since there are negative effects of childbearing on earnings per hour, we conclude that the negative effect of additional children on women's earnings represents both a reduction in work hours and a shift to lower paying jobs.

Maternal age is inversely related to total earnings and earnings per hour. Continued presence of spouse significantly increased hourly earnings, but only marginally affected weekly income. Increases in earnings of others in the household were positively related to weekly and hourly earnings. A strong effect on change in earnings was seen with job stability: those women who remained in the wage sector earned 54 pesos more per week, and 1 peso more per hour than did women who did piece work or who changed sector of employment.

Results from the selectivity-corrected change in hourly earnings model did not differ from those of a first differences model without selectivity correction, suggesting that the first differences approach does indeed account for potential bias. Results from the total weekly income model were substantively similar. Uncorrected estimated of the effects of most variables were slightly larger, but of the same sign and significance level. The one exception is the effect of adult females in the household, which had a substantially larger and marginally

significant effect in the uncorrected model, but a negligible non-significant effect in the selectivity corrected model. Its effect is clearly estimated imprecisely by both methods.

Discussion

Using prospective data on a large cohort of women from Cebu, Philippines, this study demonstrated a significant negative effect of childbearing on a woman's likelihood of participating in the labor force, and once in the labor force, on her change in earnings over an 8 year time period. The overall time trend in this sample, which began with a representative cohort of childbearing women in urban and rural communities of Cebu, is toward increasing labor force participation, increased work hours and increased earnings. However, a wide range of variability exists, such that improvements in earnings were typical of only 65% of women working in 1983 and 1991. Results of the analyses confirm the notion of a "child tax" that is, a cost associated with each additional birth, such that childbearing acts as a barrier to improvements in earnings. This result differs from what was reported for the U.S. by Korenmen and Neumark (1992).[12] They found that once endogeneity was controlled in a longitudinal fixed effects model, the effects of childbearing on women's earnings were not significant. In our work, we found that the effect of number of additional live births was greater than the effect of having a child less than 2. However, the form of the childbearing variable may have influenced this result, since the mean age of the youngest child,

and mean birth intervals decrease with number of children born in the interval. Mean age of the youngest child born to women with 4 or more births in the study interval was about 1 year, and about 90% of the children in this category were less than 2 years of age. It is important to note that all children born in the interval were less than 8 years of age in 1991.

The effect of childbearing on earnings operates partly through hours worked, with young children reducing the average number of hours worked. However, a significant effect of childbearing remains even after controlling for hours, suggesting that earnings per unit of work time also decline with childbearing. This would support the notion that women shift to lower paying jobs that are more compatible with their reproductive roles.

Furthermore, the pathway to increased earnings differs by sector of employment. For women remaining in the wage sector, advances in earnings tended to be made by an improvement in hourly wages, while for self-employed women, improved earnings came about more as a function of increased hours.

We were unable to clearly demonstrate a differential effect of childbearing related to sector of employment: none of the sector by childbearing interactions terms were statistically significant. However, we found strong positive effects of remaining in the wage or self employment sector on earnings, suggesting that job stability is an important factor in improving earnings over time. Another consideration is that women remaining in the same sector at both points in time

may be those most "resistant" to the effects of childbearing, based on a set of characteristics that we did not account for in the model.

Our methods clearly demonstrated a high level of endogeneity in models of the effects of childbearing on women's earnings. However, use of the first differences model accounts for unobserved factors that may simultaneously affect earnings and childbearing. Moreover, accounting for selectivity into the earnings models did not appreciably influence estimates of the effects of childbearing.

In another set of studies, we show that childbearing affects other aspects of women's lives.[27] After controlling for changes in income, we show that an increased number of births in the 1983-91 study interval was associated with declines in material well-being measured by the value of household assets, ownership of labor-saving devices such as refrigerators, maternal health, and well being of the index child. By reducing the number of children through use of family planning methods, our models predict that women's earnings would increase. However, it appears that women increase their earnings largely as a function of increasing hours at work. The increase in work hours may exacerbate the conflict between women's productive and reproductive roles. Work hours increased to more than 46 hours/week in 1991. Given that women also report, on average, more than 23 hours per week doing household chores and related activities, one might question the extent to which improvements in income can be translated into improvements in non-material aspects of their lives. In conclusion, these results show strong negative effects of additional live births on

women's total and hourly earnings, suggesting a strong potential for family planning, if it limits births, to affect women's economic well-being.

Notes

* The authors wish to thank Family Health International and the U.S. Agency for International Development (USAID) for their generous support. This publication was funded by USAID under Cooperative Agreement USAID/CCP-3060-A-00-3021-00 to Family Health International (FHI). The conclusions expressed in this report do not necessarily reflect the policies of FHI or USAID.

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26. These were women who had very atypical combinations of characteristics, e.g., very low income but high education.

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Table 1. Baseline characteristics of continuing participants and women lost to follow-up: CLHNS 1983 to 1991

	In '91 Survey N=2395		Lost to follow-up N=932	
	Mean	S.D.	Mean	S.D.
Mother's age	26.3	6.1	25.4	5.7
Years of education	6.9	3.3	7.6	3.3
Parity	2.4	2.3	1.8	1.9
Household size	5.7	2.8	5.3	2.8
Distance to nearest road (m)	323	975	198	700
	Percentage		Percentage	
Working for pay	46.6		41.3	
Household has piped water	6.2		10.9	
Worked before marriage	74.8		71.5	
Extended family	37.4		43.0	
Urban	73.7		84.5	

Comparison of means by t-test indicates that all differences are significant at $p<.01$

Comparison of categorical variables by Chi-square indicates that all differences are significant at $P<.01$, except for worked before marriage, where $p=.054$.

Table 2. Baseline characteristics of women working in 1983, compared to non-workers with different work histories.

	Never worked N=404	Worked before but not after marriage N=636	Worked before and after marriage N=205	Started working after marriage N=33	Currently working N=1117
Age (yr)	25.5±6.4	25.4±5.5	27.2±5.6	27.8±6.3	26.8±6.2
Education (yr)	7.2±3.3	6.7±2.9	7.2±3.1	8.3±3.8	6.9±3.5
<6 yrs (%)	50.0	59.4	54.6	39.4	59.2
>12 yrs (%)	12.1	8.6	11.2	18.2	12.7
Parity	2.4±2.4	2.0± 2.4	2.5±2.0	3.4±5.6	2.5±2.4
Primiparous (%)	23.5	24.5	8.7	6.1	20.7
HH income (pesos/week)[1]	248±376	258±464	237±257	261±348	209±407
Urban (%)	66	78	81	85	72
Extended family (%)	39	42	32	36	35
Worked before marriage (%)	0	100	100	0	85
Years worked after marriage	0	0	1.7±2.1	1.4±1.5	3.5±4.1

Values represent mean and standard deviation; [1]Household income exclusive of mother's earnings.

Table 3. Characteristics of women working for pay vs. Not working at baseline and in 1991.

	Baseline		1991	
	Not working	Working	Not working	Working
N	1278	1117	625	1770
Mother's age at baseline (yr)	25.8	26.8**	25.5	26.6**
Completed high school (%)	10.4	12.7*	10.2	11.9
Education < 6th grade (%)	55.2	59.1*	54.1	58.1*
HH income exclusive of mother (pesos/wk)	242	209**	363	284**
Worked before marriage (%)	65.8	85.1**	71.0	76.1**
Spouse present (%)	95.0	95.5	93.4	91.7
Parity	2.3	2.5**	5.1	5.0
Child <2 yrs old	39.9	34.1**	43.3	29.1**
Urban	75.1	72.2	75.7	73.2
Extended family	39.4	35.1**	14.1	15.0
Spouse age	28.7	29.2*	28.2	29.2**
Spouse education (highest grade)	7.3	6.9**	7.4	7.0**

*p<.10, **p<.05, working women different from non-working women based on Chi Square for categorical variables, one way ANOVA for continuous variables.

Table 4. Logistic regression estimates of the likelihood of working for pay at baseline and in 1991.[1]

Variable	Baseline			1991		
	Coef.[2]	S.E.	T	Coef.	S.E.	T
Mother's age	.320	.124	2.582	.167	.148	1.130
Mother's grade	-.140	.058	-2.422	-.211	.091	-2.319
Grade^2	1.17	.357	3.298	1.769	.644	2.743
Worked before marriage	1.27	.122	10.460	.430	.164	2.626
Urban	-.485	.171	-2.825	-.408	.224	-1.817
Spouse's age	-.055	.111	-.498	.298	.117	2.552
Spouse's grade	-.034	.018	-1.864	-.055	.023	-2.421
Spouse present	.413	.390	1.061	-.713	.277	-2.571
Formula price	.016	.070	.233	-.026	.065	-.400
Rho_{ci}	1.092	.194	5.633	1.285	.324	3.968
Rho_i	1.171	.366	3.202	3.865	.977	4.079

[1]Logistic regression model estimated jointly with the change in weekly income model

[2]Log odds of working compared to not working

Table 5. Results from selectivity corrected linear regression models of change in weekly income (mean change in income = 46.56 pesos/week)

Variable	Mean	Coefficient	S.D.	T-value
1 child in interval	0.29	-10.88	10.70	-1.017
2 children in interval	0.21	-24.83	11.58	-2.144
3 children in interval	0.15	-32.84	12.71	-2.58
4 children in interval	0.06	-56.28	19.13	-2.94
Change in number of children <2 yrs	-0.04	-2.58	6.11	-0.42
Spouse present	0.89	17.02	12.12	1.41
Change in income of others in HH	69.46	0.029	0.01	2.98
Change in mother's hours worked	5.07	1.11	0.12	9.26
Remained in the wage sector	0.07	53.91	10.35	5.21
Remained self-employed	0.10	21.87	9.18	2.38
Adult female (other than mom) present	0.25	2.44	9.01	0.27
Mother's age (baseline)	27.25	-2.42	6.68	-3.63
RHO_{ci}		0.029	0.124	0.237
RHO_i		-4.31	0.365	-11.77
Constant		5.098	0.478	10.66

Table 6. Results from selectivity corrected linear regression models of change in hourly earnings (Mean change in hourly earnings = 0.71 pesos/hr)

Variable	Coefficient	S.D.	T-value
1 child in interval	-0.279	.386	-0.72
2 children in interval	-0.801	.431	-1.86
3 children in interval	-1.707	.495	-3.45
4 children in interval	-1.188	.698	-1.70
Change in number of children <2 yrs	-0.102	0.236	-0.42
Spouse present	0.924	0.466	1.98
Change in income of others in HH	0.0013	0.0004	3.47
Change in mother's hours worked	-0.025	.004	-5.64
Remained in the wage sector	1.004	.383	2.62
Remained self-employed	0.092	.33	.277
Adult female (other than mom) present	0.268	.346	.775
Mother's age (baseline)	-0.046	.0251	-1.839
RHO_{ci}	0.0605	0.0486	1.25
RHO_i			
Constant	-.1094	.0996	1.10