THE ROLE OF HUSBAND'S AND WIFE'S ECONOMIC ACTIVITY STATUS IN THE DEMAND FOR CHILDREN

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Abstract

The existing literature on household demand for children in developing countries focuses on women's choice of different types of market activity. Many types of work in the informal sector are considered to be more compatible with child care because they put less demands on women's time. The presence of such compatibility effects is used to explain why women's wage rates or labor force participation rates are not always negatively related to the fertility rates. However, households in the informal sector may own a family business, which can lead them to have a greater demand for children because child labor can be more productively employed in the family enterprise. Consequently, not only is wife's choice of market activity type important in determining fertility demand, but so is husband's choice. The new emphasis is on men's role. Micro data from the urban sector of Hong Kong are used to test for the presence of both the compatibility and child labor effects on fertility demand with positive results. Our study shows that incorporating husband's choice of market activity type can be important in the analysis of fertility demand in developing countries.

1. Introduction

Recent comparative studies in developing countries have shown that the often postulated negative relationship between women's employment and completed fertility to be weak and often non-existent (see United Nations, 1985). The most common explanation for this phenomenon is that the characteristics of certain types of women's market activity in developing countries are compatible with childcare activities. Since women have to allocate significant amounts of their time to childcare services, these types of market activity can become extremely valuable to them. It is not unlikely that the major effect of an improvement in women's market opportunities in developing countries is to encourage them to participate in such activities. As a consequence, the negative substitution effect of a change in wife's wage rate on her fertility may be weaker in developing than in developed areas. Indeed the observed relationship may be positive because of the failure to hold constant other factors like income effects.

Since the degree of work and childcare compatibility is difficult to observe directly, proxies have to be used. The common practice in many studies is to identify those market activities with a high degree of compatibility to be in the informal sector, and vice versa, on the basis of work characteristics. The early study by Jaffe and Azumi (1960) defined the informal sector in Japan to include the self-employed and family workers. Subsequent work on Japan by Hill (1983) continued to use this definition. McCabe and Rosenzweig (1976), Blau (1984), and others defined formal and informal sector work by occupation and industry classifications. Smith (1981) used a much greater variety of definitions, including part-time work and work at home (also known as outwork). The various definitions used in different studies demonstrates the rich variety of market activity types that exist in developing areas. These different definitions overlap each other to some degree. For example, cottage industries are sometimes found mainly in certain occupations and industries, and they may be reported as part-time work or work at home. The extent of overlap may vary from one place to another.

The issue we wish to address is that because of the way in which the informal sector is sometimes defined, there may be another interpretation as to why the negative relationship between women's market activity and fertility in developed areas is not always observed in developing areas. Self-employed workers and family workers are often partners who work together in a small family business. Jaffe and Azumi (1960) emphasized that the proximity of home and workshop in such small family businesses increases the compatibility of work and childcare activities for the wife. While this interpretation is plausible, the contribution of children to family income may be an additional reason why fertility is higher in households who operate a family business. A similar argument has been used by Rosenzweig (1977) to explain the higher fertility rate among farm households.

The idea here is that if the contribution of children to a family business exceeds that obtained in alternative employment opportunities, then the real cost of children to the household is reduced and total household income is increased. Both effects would tend to encourage the demand for children. To the extent that there are no perfect substitutes for own children in the family business and part of the human capital embodied in children are specific to the family business, then own children will be more productive working in the family business than elsewhere. In many countries, there is legislation restricting the employment of young children.

Child labor laws are at best imperfectly enforced and the use of child labor inputs in the family business is often difficult to substantiate in court. Therefore, children in entrepreneurial households are more likely to work for the family business than as hired labor elsewhere. The existence of specific human capital investments is also evident from the casual observation that children often continue in their fathers' trade and eventually take over the family business, a practice which is quite common in developing areas.

Note that the issue here is not whether the setting is urban or rural as such, but whether household members own a family business or work as wage employees. An interesting result found by Gardner (1973), is that the size of North Carolina rural families were found to be larger among farmers than nonfarmers after controlling for various socio-economic characteristics. Unlike the Jaffe and Azumi (1960) analysis, the child labor interpretation given here is not restricted to households who operate only small businesses. The size of the business is not essential as long as own children are more productive in the family business than elsewhere. The existing literature on fertility demand in developing areas have largely focused on wife's market activity status. Our analysis brings in husband's market activity status as a separate factor determining fertility demand.

In order to distinguish between the childcare compatibility and child labor contribution interpretations, we take advantage of the richness of the various forms of market activity that exist in the urban sector of Hong Kong to examine how the demand for children is affected by the economic returns to different types of market activity. Section 2 describes in some detail the various types of market activity in Hong Kong chosen by husbands and wives, and summarizes how fertility rates vary with their choices. Section 3 develops a household production framework that models salient aspects of the compatibility and child labor contribution features relevant to the demand for children. Section 4 defines the empirical variables and outlines a strategy for estimating the demand for children. Section 5 terprets the empirical results. The final section concludes with a brief summary of the major findings.

2. Data Description

Data from Hong Kong are used to examine the theme outlined in the previous section. The specific data set used is a one percent sample of the 1976 Hong Kong By-Census of Population. 1976 was World Fertility Survey year and there is considerable information on maternity history of women under age 50. For our analysis only women under 50 who are currently married and living with their husbands are included in the sample. The households are restricted to land based and nonfarm families with husbands who are economically active. There are a total of 4,128 families in the sample. In 3,768 families the wife had experienced at least one child birth.

Economic activity status is classified into four major categories. All those who worked for less than 15 hours during census week are classified as not working. By definition there are no such men in the sample since only those who are economically active are selected. Another form of market activity is work for a family business. Individuals who reported themselves as employers, self-employed, or family workers fall under this category. Although some employers may employ large numbers of workers, the overwhelming proportion of these enterprises in Hong Kong is exceedingly small. The average number of persons engaged in all the registered private

enterprises in Hong Kong is 12.7, however, 77 percent of the firms engage less than 10 persons with an average employment of 3.3 persons per firm. Family enterprises are interesting for two reasons. First, they permit women to engage in a type of market activity which is compatible with childcare. Second, they also employ own child labor and enhance the economic contribution of children. This second result occurs regardless of whether the wife works for a family business or not.

The wage employee is the most common type of market activity. These workers perform their jobs at the firm site. However, in Hong Kong a large fraction of the women in the labor force do not work at the firm site. They can take their work wherever they choose and are treated as a distinct category known as outworkers. The kind of work they perform is quite diversified, but many are sewers, embroiderers, plastic product assemblers, and the like. As they usually work at home it is also appropriate to call them home workers. In our sample no men reported themselves as home workers, although there were small numbers of them in the population. This may reflect primarily our decision to include only prime age married men in the sample. For women, the major difference between working at home and working away from home is their compatibility with childcare activities, for example, working at home economizes on fixed commuting costs. Families with women home workers differ from those who operate a family business in that the latter may in addition also utilize child labor. It may be argued that women home workers may also utilize child labor to help perform some of other market tasks at home, in which case, families with women who work at home may not be very different from those with women who work for a family business. To the extent that women home workers perform unskilled market tasks with little need or opportunity to accumulate specific human capital, but women and children who work in a family business can and does accumulate firm specific human capital, the difference between the two types of activities remains. The issue is to some extent empirical. An indirect test to see whether home workers and family business workers are identical is performed in section 4 with negative results.

In Table 1 we have cross tabulated husband's current economic activity status against that of his wife's. The average actual and standardized number of children in each family are also given. The standardization is for husband's schooling, wife's schooling, and wife's age. One can see a rich

Y-c. Wong, Husband's and wife's economic activity, fertility demand

TABLE 1

Number of children by husband's and wife's economic activity status.[a]

Wife's activity status		Husband's activity status: Family business	Husband's activity status: Wage employee	Total
Not working	Cases	559	2073	2632
	N	3.5564	3.0796	3.1809
	Standard *N*	3.2995	3.0565	3.1081
Family business	Cases	158	49	207
	N	4.2152	4.1429	4.1973
	Standard *N*	3.3657	3.5405	3.4071
Home worker	Cases	39	270	309
	N	3.6410	3.5741	3.5825
	Standard *N*	3.3143	3.2611	3.2678
Wage employee	Cases	123	857	980
	N	3.2358	2.3384	2.4510
	Standard *N*	3.0796	2.6135	2.6720
Total	Cases	879	3249	4128
	N	3.6337	2.9412	3.0887
	Standard *N*	3.2813	2.9639	3.0315

[a] *N* is the number of children. Standard *N* means that *N* is controlled for wife's age, wife's schooling, and husband's schooling. *N* was first regressed against linear, quadratic, and interaction terms of the above variables, and seven dummy variables defining husband-wife activity status group. The estimated coefficients were used to predict the mean value of *N* in each husband-wife activity status group based on the mean values in the sample for wife's age, wife's schooling, and husband's schooling.

pattern of interaction between the economic activity status of husband and wife. Among family business men, 64 percent of their wives are not working, 18 percent are in the family business, 4 percent are home workers, and 14 percent are wage employees. Among husbands who are wage employees, 64 percent of their wives are not working, 2 percent are in a family business, 8 percent are home workers, and 26 percent are wage employees. The figures indicate that if a husband works in a family business, his wife is more likely to be similarly employed, but is less likely to be a wage employee working away from home, and is even less likely to be a home worker. Note, however, that a significant number of women who work in a family business have husbands working in wage employment, and the converse is also true.

The figures on the standardized number of children by parents' activity status are most revealing. Men who are wage employees have fewer children, 2.96, than family business men, 3.28. Given wife's choice of economic activity status, the average standardized number of children per family is higher when the husband works for a family business. The only exception occurs when the wife works for a family business, however, it may be a spurious result given the relatively small sample size. Nonworking women have 3.11 children, which is not higher than the corresponding figures for family business women and home workers. Of even greater interest is that the number of children is greater among family business women, 3.41, than among home workers, 3.27. All these figures are significantly higher than that of wage employees, who have 2.67 children. This is consistent with the idea that unlike wage employment, family business and home work are relatively compatible with child care.

Since, both types of economic activity are compatible with childcare, it appears that child labor considerations in the family business may have an independent effect on the demand for children. The results are unchanged even after controlling for husband's economic activity status. The summary evidence in Table 1 suggests that the number of children varies quite systematically with husband's and wife's economic activity status, and that the distinctions which we have made between work and childcare compatibility, on the one hand, and between family business activity and wage employment, on the other hand, are meaningful ones. Since the cross tabulations are of current economic activity status, they do not reveal how family members allocate their time among different activities over their life time. At any moment in time an individual may appear to be specialized in a particular economic activity status. But over the life cycle an individual may devote certain fractions of his total time to different activities, and life time specialization may be less pervasive. For example, setting up a family business requires financial outlays which can be borrowed or saved only after one has accumulated work experience in the labor market, unless, of course, one inherits a business. Similarly, home work is valuable to women who have a high value of home time, say during the childbearing and childrearing years, and who have low market productivity. These intertemporal aspects are clearly important, however, in the absence of relevant data on economic activity history for the individual, we can only focus our analysis on outcomes at a moment in time.

3. Theoretical Framework

In this section a simple one period model of household production and fertility demand is outlined. The more important implications are developed. It is assumed that all decisions are made jointly by the parents, who obtain utility from two commodities described by the utility function

$$U=U(N, S), \tag{1}$$

where N is the flow of child services and S is the stream of services of the alternative commodity. Children who work in the family business generate productive services exceeding that in alternative market employment. This may be due to the fact that perfect substitutes do not exist for own children or because specific human capital is embodied in children. To simplify the exposition we shall model only the net productive services contributed by children who work in the family business. The family business profit function is given by expression (2), where $f(\cdot)$ is a twice differentiable decreasing returns to scale production function and P is the price per unit of output, T_{fb} and T_{mb} are time spent by wife and husband, respectively, in the family business, b_f and b_m are efficiency coefficients, $\hat{W}_f$ and $\hat{W}_m$ are, respectively, the shadow price of time of wife and husband, K is hired physical or human capital services, and r is the rental price of capital services.

$$\pi = Pf(N, b_f T_{fb}, b_m T_{mb}, K) - rK - W_f T_{fb} - W_m T_{mb} \tag{2}$$

The production functions for commodities N and S are linear homogeneous

$$N = G_n(X_n, T_{fn}, T_{mn}), \tag{3}$$

$$S = G_s(X_s, T_{fs}, T_{ms}), \tag{4}$$

Whose inputs are purchased goods X_i and time inputs of parents T_{fi} and T_{mi}. To focus on the crucial features of the model we assume that the husband does not work in the household, but allocates his time between the family business, T_{mb}, and wage employment, T_{me}. Under this assumption his marginal value product in the family business, Pf_{T_m}, equals his wage rate, W_m, in alternative employment. His time constraint is

$$T_m = T_{mb} - T_{me} \tag{5}$$

In addition to household production, the wife also works in the family business, T_{fb}, and in wage employment, T_{fe}. This implies that her marginal value product in the family business, Pf_{Tf}, equals her wage rate, W_f, in alternative employment, which also determines her value of time. Her time constraint is

$$T_r = T_{fn} - T_{fs} - T_{fb} - T_{fe} \tag{6}$$

The family's goods constraint is given by the nonlinear expression (7), where V is non-earnings income, P_n and P_s are price indices of the composite goods used in the household production of N and S, and X_n and X_s are the marginal (=average) composite goods coefficients of N and S.

$$V - W_f T_{fe} + W_m T_{me} + \pi = p_n x_n N + p_s x_s S \tag{7}$$

Constraints (5), (6), and (7) can be combined under the assumption that parent's value of time are W_f and W_m to yield

$$1 = V + W_f T_f + W_m T_m - \pi = \pi_n^c N + \pi_s^c S, \tag{8}$$

Where $\pi_n^c = p_n x_n + W_n t_n$, and $\pi_s^c = p_s x_s + W_s t_s$. t_n and t_s are the marginal (=average) time coefficients of N and S. π_n^c and π_s^c are the constant marginal shadow cost of N and S services. However, as shown below, π_n^c is not the true shadow price of child services in consumption or production within the household. In order to distinguish these latter two concepts from π_n^c we have deliberately chosen to refer to it as the constant marginal shadow cost of child services rather than as the shadow price. As we shall see, both the price of children in consumption and production are not constant.

The optimal consumption of N and S and the optimal utilization of husband's and wife's time and of capital services are obtained by maximizing (1) subject to (8). Assuming that an interior solution exists, the first-order conditions for an optimum are

$$U_n - (Pf_n - \pi_n^c) = 0, \tag{9}$$
$$U_s - i\pi_s^c = 0 \tag{10}$$
$$Pf_r - W_r = 0 \tag{11}$$
$$Pf_r - W_m = 0, \tag{12}$$
$$Pf_k - r = 0, \tag{13}$$

where i is the marginal utility of full income. The second-order conditions are given in Appendix A.

Equations (11) - (13) are the first-order profit maximizing conditions. Husband's and wife's time and capital services are employed such that the contribution to income of the last unit of each equals the market price. An increase in W_m (W_f) will encourage the husband (wife) to allocate more time to wage employment, ceteris paribus. On the other hand, an increase in the efficiency of time in family business production will, ceteris paribus, induce husband or wife to allocate more time to the family business. It is possible that equations (11) and (12) may not hold under some

circumstances. A high value of W_m (W_f) relative to productivity at home or in the family business can lead the husband (wife) to specialize in wage employment, and the converse can lead the husband (wife) to withdraw from wage employment completely. At any moment in time, such situations are not atypical of households in Hong Kong. The majority of the men specialize in wage employment and a smaller fraction in the family business. The majority of the women do not work, and for those who do, they usually specialize either in wage employment or in the family business. There are numerous ways in which husband's pattern of time allocation can be paired with that of his wife. It is sometimes useful to recognize the possibility of specialization in time use when we ascertain the response of the stock of children demanded to changes in the parameters of the model.

The most important feature of the model is that children enter both the utility and profit functions. Consequently, the desired number of children exceeds the amount that would be demanded had children provided only production or consumption services. Rewriting expression (9) yields (14), which indicates that the optimum number of children is obtained when child marginal revenue is less than child cost, by the value of the marginal utility of the stock of children. The true shadow price of children in consumption, $\pi_n^*(=U_n/i)$, contains a child productivity component, which equals the marginal value product of children in the family business.

$$\pi_n^* = U_n/i = \pi_n^c - Pf_n \tag{14}$$

One may think of the productivity component as subsidizing the consumption component, and vice versa. The dual role of children in the family business households implies that more will be demanded children even after market wage rates of household members and other household production characteristics have been held constant. Another consequence is that even when marginal shadow costs of children are constant, the shadow prices of children in consumption π_n^* and in production Pf_n are endogenous and are dependent upon the number of children demanded, since Pf_n and U_n/i will decline as N increases, ceteris paribus.

A further complication emerges when the wife does not engage in wage employment. Her time will now be allocated between home production and the family business, and her value of time, $\hat{W}_f$, becomes endogenous. The marginal shadow cost of children π_n^c is also endogenously determined. The implications of this will be briefly explored later on.

(1) Income effects. - Since the full income budget constraint is nonlinear in N when husband, wife, or both work in the family business, the effect of an increase in non-earnings income V on the demand for children has both a substitution and a pure income component [see Edlefsen (1981)]. Suppose children are normal commodities. An exogenous increase in non-earnings income, holding constant husband's and wife's value of time, will raise the optimal number of children. If husband's and wife's supply of work effort to the family business is not much altered then the productivity component of the price of children is lowered and the price of children in consumption will rise creating a substitution effect away from children. Thus the observed income elasticity of children will be less than the true income elasticity η. When neither

husband nor wife works in the family business, the observed income elasticity equals the true income elasticity η and the elasticity effect of the demand for children is $(V/I)\eta$.

(2) Husband's wage rate. There are three possible situations. When the husband does not work in the family business, the effect of an increase in his wage rate on the demand for children is similar to that of an increase in non-earnings income and the elasticity effect is $(\hat{W}_m T_m / I)\eta$. When the husband works solely in the family business, an increase in his wage rate has no effect on the demand for children unless he shifts some time into wage employment as a consequence. His value of time equals the marginal value product of his time in the family business and is greater than his wage rate $(\hat{W}_m = Pf_{T_m} > W_m)$.

When the husband spends time in both wage employment and the family business, an increase in his wage rate shifts his time away from the family business. By assumption husband's time is not an input in the production of children. However, the price of children is still affected by changes in his wage rate because of linkages through the family business production function. The uncompensated elasticity of demand for children with respect to his wage rate is

$$E_{n.w_m} = \phi_{n.w_m} - (W_m T_m / I)\eta.$$

the sign of which is unknown and depends on the sign and magnitude of the substitution elasticity in the family business production function between husband's and children's time, $\phi_{n \cdot w_m n}$. If they are substitutes $(\phi_{n.w_m} > 0)$ and children are normal commodities $(\eta > 0)$, then $E_{n.w_m}$ is positive; otherwise it is ambiguous.

(3) Wife's wage effect. When the wife does not engage in wage employment, an increase in her wage rate will have no effect on fertility provided that she does not shift time into wage employment as a result. If the wife spends some time initially in both wage employment and the family business, then the uncompensated elasticity of demand for children with respect to wife's wage rate is

$$E_{m \cdot w_1} = E_{n \cdot \pi_n^*}(a_n - a_s) + \phi_{n \cdot w_1} + (W_f T_f / I)\eta.$$

where E is the own compensated price elasticity of children.

$$a_n = (W_f t_n)/\pi_n^*, \qquad a_s = (W_f t_s)/\pi_s^c.$$

In general, if children are time value intensive ($a_n > a_s$) then we would expect that a compensated increase in wife's price of time will reduce the demand for children, because $E_{n.\pi_n^*} < 0$ by the second-order condition. Here, however, it will also depend on the magnitude and sign of the

substitution elasticity in family business production between wife's and children's time, $\phi_{n.w_f}$. Furthermore, even if the cost time intensities of children are equal,

$$(W_f t_n)/\pi_n^c = (W_f t_s)/\pi_s^c,$$

an increase in W_f might still reduce the desired number of children since $a_n > a_s$ as $\pi_n^c > \pi_n^*$. Thus, even when $\phi_{n.w_f}$ is assumed to be insignificant, the compensated female wage effect on fertility will differ as a result of children's labor contributions.

(4) Rental price of capital services. Changes in the prices of other inputs into the family business will influence the shadow price of children by altering child productivity and so affect fertility decisions. A change in policies towards capital markets affecting small businesses can be represented by variations in r. The uncompensated elasticity of demand for children with respect to the rental price of capital services is

$$E_{n\cdot r} = \phi_{n\cdot r} - (rK/I)\eta.$$

If children and capital services are complementary then the effect is unambiguously negative (assuming $\eta > 0$). Otherwise it is uncertain and will depend on the relative magnitudes of the income and substitution effects.

(5) Wife does not engage in wage employment. When a woman spends all her time at home or in the family business, her value of time $\hat{W}_f$ is endogenously determined. There are two important consequences. First, the effect of an increase in non-earnings income *V* is ambiguous because the value of wife's time in household production also rises. This gives rise to both a negative substitution and an income effect. Second, if children may substitute for the wife in the family business, thus allowing her to spend additional time in household production, then it may be possible for the desired number of children to rise even when her value of time $\hat{W}_f$ increases. If it is assumed that the family business production function is separable in the child labor input then this effect will not occur.

(6) Family business productivity effects. An increase in b_m or b_f, raises the efficiency of husband's or wife's time in the family business. This would in general encourage the parent to spend more time in the family business. If children's time and parent's time are complementary in the family business, then the increase in the scale of the family business would also raise the optimal number of children demanded by the household. Note also that if the parent withdraws completely from wage employment as a result of increases in family business productivity, then full income will be raised because parent's value of time is no longer determined by the market wage rate. This would be an additional factor increasing the demand for children.

The above household production model implies a demand for children function for each combination of husband's and wife's choice of economic activity status. For example, if both husband and wife engage in wage employment and in a family business then we have the following demand equation:

$$N = N(W_m, W_f, b_m, b_f, V, \pi). \tag{15}$$

If husband, wife, or both do not engage in wage employment then w_m, W_f, or both will not enter as arguments in equation (15). Similarly, if husband, wife, or both do not work in a family business then b_m, b_f, or both will not enter as arguments in equation (15), assuming that a parent's productivity in the family business is contingent on having spent time working in it. On the assumption that the wife always spends some time in household production, then a total of 12 possible such demand functions for children can be specified depending upon parents' pattern of activity status choice. In the previous section we also indicated that business women and home workers may be considered as distinct categories on empirical grounds, thus making the total number of possible choice combinations to be 24.

4. Empirical Methodology and Specification of Variables

Our purpose here is to develop a feasible strategy for estimating the change in the desired stock of children as a function of various explanatory variables of the model. In principle, we have to specify an estimation equation conditional on each choice of parental activity status. Since the theoretical setup uses a static one period model, it is necessary to have information on how parents utilize their total endowment of lifetime hours. In addition, we must also obtain lifetime measures of the variables used in the analysis. However, such a strategy cannot be feasible when only cross section data are available. Instead we adopt the simplifying assumption that both parents spend some time in each activity status. The appropriate estimation equation for all households would then be equation (15). In section 2 above we indicated that although, at any given moment, an individual may appear to be specialized in a particular economic activity status, however, he or she may in fact engage in various other types of activity over the life cycle. As a consequence, lifetime specialization in any particular activity status may be much less pervasive than is apparent in cross section data. But in the absence of adequate data to verify the appropriateness of this assumption, caution should be exercised in the interpretation of our empirical results.

To estimate a lifetime model of demand for children, we need measures of completed fertility of women, and of husband's and wife's lifetime productivity in household production, wage employment, home work, and a family business. Most of these variables are not available directly and have to be constructed.

(1) Number of children. Current fertility of young women can often differ significantly from their completed levels. Restricting the sample to women over 35 years of age results in a significant reduction of sample size, especially in the loss of women home workers. We decide to adopt the procedure used by Anderson (1983), which is based on the duration ratio developed by Boulier and Rosenzweig (1978). The duration ratio is the ratio of the number of children ever born to the number of children a woman could have if she reproduced according to a natural fertility

schedule. This amounts to standardizing for cumulative fertility by age. A plot of cumulative fertility against women's age in Hong Kong reveals a S-shaped pattern of growth. The procedure used here is to estimate the demand for children constrained by a nonlinear biological supply function, with fertility beginning at the age of menarche. The estimated function is

$$N^* = N\{1 - \exp[-d_1(AGE - d_0)]\}^3,$$

where N^* is the current number of births, N is the cumulative supply of births at the end of childbearing, AGE is the current age of the wife, $d_0 = 15$ is assumed to be the age of menarche, and d_1 is a parameter to be estimated. Rewriting in logarithms yields

$$\text{In } N^* = \text{In } N + 3\{1 - \exp[-d_1(AGE - d_0)]\}$$

ln N depends on a vector of explanatory variables. The above function can be estimated using nonlinear least squares. Since the age adjustment factor is basically linear except at the extremities, a convenient alternative way of specifying the model is to use a linear AGE-15 term in the child regression equation.

(*2) Market productivity*. The construction of variables for measuring market productivity in wage employment (W_m, W_f), and in a family business or home work (b_m, b_f) is somewhat more complex. Data are available only for the current market activity status of husband and wife. There is no information on how they will allocate their time among different uses over their lifetime. Because of this, current market productivity is observed only for individuals conditional on their choice of market activity status. Hence, we lack measures of potential market productivity under alternative choice of market activity status. Heckman (1979) has shown that estimates of market productivity functions based only on those who have chosen a particular market activity status may be biased as a result of self-selection. To obtain consistent estimates he proposed a two-stage method. We first estimate separate reduced-form choice models for husband's and wife's probability of selecting a particular activity status, and then estimate the coefficients of the market productivity functions conditional on the probability of selecting a particular activity status.[1] In the actual estimation we use a dichotomous logit model to describe men's choice, and a polychotomous logit model to describe women's choice. The properties of logit models are contained in McFadden (1982). Both models specify husband's and wife's choice of activity status as functions of the same explanatory variables.

[1] We recognize that husband's choice of an activity status may not be independent of wife's choice, and vice versa. Therefore, the above specification may be inappropriate, however, given that husbands have two choices and wives have four choices, the total number of observable combinations will be eight, with each cell in table 1 representing a single outcome. Unfortunately this results in very small cell sizes for certain outcomes, so that it may be difficult to obtain reliable estimates of the joint probabilities. The large number of choice categories is also a troublesome feature when specifying an appropriate model for estimation purposes. The flexible multinomial probit model will be computationally far too cumbersome, but the simpler multinomial logit model contains the independence from irrelevant alternatives property, which is unlikely to be correct in this instance. Experiments with nested logit models had problems of coverging. In view of the difficulties in getting correct estimates of the joint probabilities of husband's and wife's choice of activity status, we decided on the approach described in the text.

In order to test whether home work and family business work are identical alternatives for women, we estimate both a three-way choice model in which these two choices are combined into a single category, and a four-way choice model where they are treated as separate categories. The likelihood ratio test of the hypothesis that the two parameter vectors for entry into home work and into family business work are equal shows that we should reject the null hypothesis at any conventional level of significance.[2] The four-way choice model is adopted for the rest of the analysis. The maximum likelihood estimates of the reduced-form multinomial logit models for husband's and wife's choice of activity status are given in Appendix 2, along with some brief interpretive notes.

From these reduced-form logit estimates we can construct a selectivity bias correction variable, lambda, and use it as an additional regressor in the estimation of market productivity functions on samples of individuals belonging to a particular market activity status. This variable is defined in Lee (1983), and is appropriate for use in polychotomous choice models. The dependent variables used in the estimation of the market productivity functions are the log value of monthly earnings. The preferred hourly wage rate variable was not reported for all individuals. Monthly earnings are less desirable estimates of market productivity because they include variations in hours worked, and as a result are jointly determined with the number of children. The estimates of the log earnings functions for each activity status of husband and wife using least squares methods are given in Appendix 3. Based on these estimates (and omitting the coefficient of the lambda variable) we can obtain consistent imputed values of the market productivity (i.e., log earnings) of every individual for each market activity status. These imputed measures are less affected by transitory events. One can also remove the influence of life cycle effects by imputing the market productivity of wives at a fixed age, say 40. Husband's imputed market productivity is set at 40 plus the actual husband-wife age differential. The imputed market productivity measures can be used as explanatory variables for determining the desired number of children.

(3) Nonmarket productivity. Both husband's and wife's schooling are often found to have independent effects on raising non-market productivity, including the production of child services. One might, therefore, wish to include them as additional regressors in the demand for children equations to proxy for variations in non-market productivity. Unfortunately the schooling variables are also highly correlated with measures of market productivity, thus making it more difficult to distinguish between the two effects. For this reason, it may be useful to see if the other results will be altered by excluding the schooling variables.

5. Empirical Results

This section interprets some of the major findings of the empirical work. Variables used in the analysis (including those reported only in the Appendices) are defined in Table 2 with summary statistics. Two samples of data are used in the estimation of the demand for children. One sample includes all women and the other only those who had given birth to at least one child. In both cases the dependent variable is defined as the log value of $N^* - 1$. Table 3 gives least squares estimates of the coefficients and their *t*-values. Both the linear and nonlinear AGE-15 adjustments are used.

[2] The test statistic for the reduced-form model is 42.0. The chi-square values at a 0.01 level of significance is 26.2 with 12 degrees of freedom.

When we compare the parameter estimates between the two specifications and between the two samples, it is evident that the coefficients have identical sign

TABLE 2
Mean and standard deviation of variables.[a]

	All families	Families with at least one child

	Mean	Stan. dev.	Mean	Stan. dev.
Number of children	3.0315	2.0332	3.3291	1.8838
log (number of children +1)	1.2492	0.5713	1.3719	0.4361
Husband's age	40.9207	9.1135	41.7218	8.7008
Wife's age	35.7386	8.2082	36.4402	7.9099
Husband's schooling	9.3275	5.0082	9.1433	5.0082
Wife's schooling	7.2107	5.1794	6.9408	5.1402
Wife's pred. log home work earnings	4.1734	0.1285	4.1721	0.1272
Wife's pred. log business earnings	7.0025	0.7946	6.9726	0.7641
Wife's pred. log employee earnings	6.2611	0.3649	6.2423	0.3528
Husband's pred. log employee earnings	6.9555	0.3336	6.9428	0.3296
Husband's pred. log business earnings	7.8144	0.4098	7.7991	0.4053
Extended family (dummy)	0.1690	0.3748	0.1751	0.3801
Subsidized renter (dummy)	0.4358	0.4959	0.4620	0.4986
Homeowner (dummy)	0.2289	0.4201	0.2346	0.4238
Wife home worker (dummy)	0.0748	0.2631	0.0804	0.2719
Wife family business (dummy)	0.0501	0.2182	0.0522	0.2226
Wife employee (dummy)	0.2374	0.4255	0.2133	0.4097
Husband employee (dummy)	0.7870	0.4094	0.7807	0.4137
Cases	4128		3768	

[a]Wife's and husband's various predicted log earnings were obtained from estimates given in appendix C, with wife's age set at 40 and husband's age at 40 plus the actual husband-wife age differential.

patterns and are often of similar magnitudes. The differences arise chiefly from biases due to truncation of the dependent variable and specification errors, some of which will be discussed later.

As expected an increase in wife's predicted log earnings in home work has a negative effect on the demand for children. The effect is almost always significant. An increase in wife's productivity in the family business, as proxied by her predicted log earnings in the family business, increases the demand for children significantly. This is usually interpreted as a result of entering a market activity, which is compatible with childcare. An alternative reason is that the price of children is lowered because if children work in the family business then their productive contributions subsidize parents' consumption. However, unless we have direct measures or proxies for these effects, it is not possible to distinguish between them. Home work is

TABLE 3
OLS and NLS estimates of the demand for children.[a]

	All Families			Families with at least one child		
Intercept	0.0436	-1.1190	1.0967	1.2878	-0.3042	2.2982
	(0.07)	(1.90)	(3.47)	(2.52)	(0.64)	(4.13)
Husband's schooling	-0.0143	-0.0146	-0.0110	-0.0120	-0.0125	-0.0073
	(5.87)	(6.32)	(3.47)	(6.06)	(6.82)	(2.86)
Wife's schooling	-0.0245	-0.0141	-0.0278	-0.0193	-0.0124	-0.0215
	(7.19)	(4.36)	(8.01)	(6.78)	(4.72)	(7.44)
Wife's pred. log home work earnings	0.2253	0.2397	0.2838	0.0914	0.1814	0.1145
	(3.19)	(3.59)	(3.82)	(1.52)	(3.27)	(1.81)
Wife's pred. log business earnings	0.0816	0.0731	0.0904	0.0837	0.0394	0.0827
	(2.67)	(2.52)	(2.89)	(3.27)	(1.67)	(3.17)
Wife's pred. log employee earnings	-0.1870	-0.1962	-0.1942	-0.2171	-0.1123	-0.2002
	(2.16)	(2.41)	(2.18)	(3.04)	(1.71)	(2.73)
Husband's pred. log business earnings	0.1877	0.2182	-	0.1212	0.1397	-
	(10.93)	(13.37)		(8.36)	(10.43)	
Husband's pred. log employee earnings	-0.0790	-0.0759	-	-0.0600	-0.0590	-
	(3.75)	(3.69)		(3.48)	(3.70)	
All husband's pred. log earnings	-	-	0.0036	-	-	-0.0060
			(0.07)			(1.46)
Wife's age - 15 (non-linear spec.)	0.2101	-	0.2046	0.2473	-	0.2431
	(48.56)		(48.58)	(45.76)		(45.90)
Wife's age - 15	-	0.0329	-	-	0.0261	-
		(33.69)			(32.44)	
Adj. *R*-square	0.3475	0.4050	0.3166	0.2975	0.4006	0.2780
Cases	4128	4128	4128	3768	3768	3768

[a]Absolute t-values in parentheses.

probably more closely identified with childcare compatibility than with productive utilization of child labor, and is therefore a better proxy for capturing childcare compatibility effects. An increase in wife's predicted log earnings in home work is found to have a significant positive effect on children. The shift of wife's time into a childcare compatible activity is conducive to the production of child services.

An increase in husband's predicted log earnings in wage employment has a significant negative effect on the demand for children. One can interpret this in two ways. If an interior solution exists for husband's allocation of time, then a negative effect implies either children are inferior (or are observed to be so) or husband's and children's time are complementary in the family

business. Alternatively, an increase in husband's predicted log earnings in wage employment increases the probability of specializing in it. Therefore, the role of children in the family business vanishes and the desired number of children is reduced. Specialization in either activity will be more likely if there are fixed costs of entry into either family business or wage employment. Regardless of which interpretation one may wish to emphasize, the importance of husband's activity status in determining fertility is clearly indicated. Note also that an increase in husband's productivity in the family business, as measured by predicted log earnings, has a significant positive effect on the demand for children, as is to be expected.

To confirm the importance of distinguishing between husband's choice of activity status, we reestimate the child regression equations and replace both husband's predicted business and employee log earnings variables with a new variable for husband's predicted log earnings. To construct this new variable we first estimate a husband's log earnings function using the sample containing all men. These new coefficients are used to impute the new value of husband's log earnings. The estimates are also given in Appendix 3. From Table 3 we find that the coefficients of this new husband's predicted log earnings variable are insignificant in the child regression equations. Could it be that the often weak and conflicting estimates of income and wealth effects in developing countries (see Mueller and Short 1983) may also stem from a failure to take into account husband's choice of activity status?

Both husband's and wife's schooling are found to reduce significantly the demand for children. The effect of wife's schooling on reducing child demand is usually larger than that of husband's schooling. Since husband's market productivity in wage employment and in family business has been held constant, schooling is a proxy for either tastes or efficiency in household production. The latter would imply positive effects if children are not inferior, and the former would imply negative effects if more schooling reduces one's tastes for children. Negative effects have also been found in some other studies. To account for it one may appeal to correlations between measures of market and of home productivity, tastes, or an observed negative income elasticity of demand for children. To test whether correlations between the schooling and the predicted log earnings variables might undermine some of our earlier findings, we reestimate the children regressions with both husband's and wife's schooling omitted. The results indicate that none of the included coefficients is significantly altered.[3]

In general, estimates of coefficients from families with at least one child are smaller in absolute magnitude and less significant statistically. This results from eliminating women who have no children. The coefficients are quite sensitive to the choice of linear or nonlinear age adjustment factors in the sample of families with at least one child. Since the natural fertility schedule is S-shaped, excluding women with no children will exaggerate the responsiveness of children to age when the nonlinear specification is used, and will understate the same responsiveness when the linear specification is used.

6. Conclusion

In this paper we emphasize two aspects of the demand for children in households who choose to work in the informal sector. First, children are more readily employed in a family

[3] These additional regressions may be obtained from the author upon request.

business. Second, wife's work in a family business or in wage employment at home is more compatible with childcare activities. Both effects imply that holding constant other characteristics, a higher desired stock of children will be demanded. These propositions are tested using micro data from the urban sector of Hong Kong.

We find evidence for both effects. Distinguishing between husband's and wife's choice of activity status is an important aspect of testing for these two effects in the absence of direct measures of the extent of work and childcare compatibility and of child labor contribution. This is because husbands usually spend very little time taking care of children, so that work and childcare compatibility effects are less relevant to his choice. His choice of activity status is, therefore, a better proxy for capturing the effects of child labor on the demand for children in the family business.

Previous studies on fertility demand in developing countries tend to focus on wife's market activity status and its compatibility with childcare. Although there are some discussions of the importance of child labor contributions to family income, the central role of husband's market activity status as a key determinant through which child labor contributions are often made has not always been systematically incorporated into the analysis. Furthermore, the respective roles of these two types of effects have often been confounded because of working with inadequate data. Progress has been achieved to some extent in this paper by using women's choice of wage employment at home versus away from home as capturing largely work and childcare compatibility effects, and by using husband's activity status choice to capture child labor effects.

It is not always possible to make such distinctions in other developing countries. In Japan, all individuals who work for more than an hour during survey week are counted in the labor force. As a result both husband and wife would report themselves as self-employed or family workers if they own a small family business. Such perfect overlap of parents' activity status will make it more difficult to separate work and childcare compatibility and child labor effects. To obtain measures of work and childcare compatibility one might have to make use of information on job content descriptions derived from detailed occupation and industry classifications. The loose way in which he informal sector is sometimes defined in the empirical literature often conceals rather than illuminates the true reasons for differences in fertility demand. A more refined effort at isolating the different effects is clearly indicated.

The question of how the size of the family interacts with parents' and children's allocation of time to different market activities is certainly much more complex than has been portrayed here. We have omitted the role of children in household production, the nuclear family may not be the appropriate unit of analysis, the market opportunities of children and investments in children have been neglected, and there is no treatment of any intertemporal aspect of the problem, especially about when children leave the household. The work here is a preliminary attempt at explaining some salient aspects of the demand for fertility in developing countries as they relate to husband's and wife's choice of market activity status.

Appendix A : Second-order conditions for an optimum

$$\begin{vmatrix} U_{NN}/i + Pf_{NN} & U_{NS}/i & Pf_{NT_F} & Pf_{NT_M} & Pf_{NK} & Pf_N - \pi_n^c \\ U_{NS}/i & U_{SS}/i & 0 & 0 & 0 & -\pi_s^c \\ Pf_{NT_F} & 0 & Pf_{T_FT_F} & Pf_{T_FT_M} & Pf_{T_FX} & 0 \\ Pf_{NT_M} & 0 & Pf_{T_FT_M} & Pf_{T_MT_M} & Pf_{T_MX} & 0 \\ Pf_{NK} & 0 & Pf_{T_FK} & Pf_{T_MK} & Pf_{xx} & 0 \\ Pf_N - \pi_N^c & -\pi_s^c & 0 & 0 & 0 & 0 \end{vmatrix} \begin{vmatrix} dN \\ dS \\ dT_{FB} \\ dT_{MB} \\ dK \\ di \end{vmatrix}$$

$$= \begin{vmatrix} t_N & dW_F & & & & f_N & dP \\ t_S & dW_F & & & & & \\ & dW_F & & & & -f_{T_F} & dP \\ & & & dW_M & & -f_{T_M} & dP \\ & & & & dr & -f_K & dP \\ T_F & dW_F & T_M & dW_M & -Kdr \quad dV & f & dP \end{vmatrix}$$

Appendix B

Y.-c. Wong, Husband's and wife's economic activity, fertility demand

TABLE B.1

Reduced-form maximum likelihood logit estimates of husband's and wife's choice of economic activity status.[a]

	Husband wage employee	Wife wage employee	Wife family business	Wife home worker
Intercept	2.2410	-2.3018	-3.4658	-2.9438
	(0.3643)	(0.3249)	(0.7413)	(0.6539)
Husband's age	-0.0348	-0.0272	0.0077	-0.0039
	(0.0085)	(0.0088)	(0.0156)	(0.0135)
Wife's age	0.0059	0.0360	0.0326	-0.0118
	(0.0096)	(0.0097)	(0.0180)	(0.0151)
Husband's schooling	0.0386	0.0028	-0.0532	-0.0346
	(0.0108)	(0.0108)	(0.0197)	(0.0168)
Wife's schooling	0.0063	0.0771	-0.0521	-0.0017
	(0.0111)	(0.0111)	(0.0207)	(0.0174)
Husband Hong Kong born	-0.5073	0.0143	0.1927	0.1026
	(0.1135)	(0.0964)	(0.2219)	(0.1700)
Wife Hong Kong born	-0.2450	-0.1231	-0.1849	0.3091
	(0.0998)	(0.0912)	(0.1962)	(0.1557)
Wife Chinese race	-0.1343	0.7234	0.9034	0.5551
	(0.2530)	(0.2362)	(0.5862)	(0.4912)
Subsidized renter	1.1091	-0.1140	-0.6440	0.8092
	(0.1023)	(0.0921)	(0.1901)	(0.1570)
Homeowner	-0.3986	-0.2688	0.4194	-0.0795
	(0.0996)	(0.1055)	(0.1863)	(0.2114)
Extended family	0.0068	0.4538	-0.0999	-0.2139
	(0.0171)	(0.0966)	((0.2093)	(0.1784)
-2 log likelihood	3780.45	7373.34		

[a]Asymptotic standard errors in parentheses.

In this appendix we discuss the reasons for including some of the variables in the logit models. Although we shall discuss some of the estimated results it is not our purpose to interpret reduced-form coefficients.

B1. Husband's Activity Status Choice

Human capital is expected to have significant affects on husband's choice of activity status. Formal schooling is often more valuable to workers than to entrepreneurs because of screening effects. Since activity status choices are often made in view of the resources commanded by family members, schooling of both husband and wife may be important determinant variables. Husband's schooling has a significant positive effect on choosing wage employment, and wife's effect is only insignificantly positive. Age is a proxy for life cycle effects. Also people become entrepreneurs only after accumulating some amount of experience in the labor market. Information about business practices and market conditions take time to learn. Furthermore, starting a business usually requires some initial capital fund, which can be borrowed or accumulated with greater ease the longer one has been in the labor market. Husband's age has a significantly negative effect on choosing wage employment, but wife's age effect is insignificantly positive. Since capital funds are important, families with more assets initially are more likely to become entrepreneurs. Two dummy variables were used to proxy for asset availability. Residence in government subsidized housing is assumed to indicate a lack of endowed assets or the inability to accumulate them over time. On the other hand, home ownership is assumed to indicate the opposite. The estimated coefficient for subsidized housing is significantly negative, and that for home ownership is significantly positive as expected. In general, we expect immigrant families to have a relative disadvantage in seeking wage employment because of the lack of location specific skills, at least in the beginning. This provides incentive to pool resources into a family enterprise to maximize total family earnings. We found that the dummy variables for whether husband or wife is born in Hong Kong to have significantly negative effects on choosing wage employment. The effect of race on choice of activity status is found to be insignificant. The dummy variable indicating an extended family is also found to be insignificant. This may be a result of conflicting forces, because additional family members can be used either to help in the family business or to relief other members from household work to concentrate in wage employment.

B2. Wife's Activity Status Choice

Both husband's and wife's age are entered to capture life cycle effects. Many of the estimated coefficients are found to be insignificant and some are difficult to interpret. Wife's schooling is expected to increase productivity in wage employment relative to other kinds of activity and is found to have a significant positive effect on choosing wage employment. It is also found to have a significant negative effect on choosing family business work. Husband's schooling captures a variety of effects and is found to have significant negative effects on choosing family business and home work. We assume that living in government subsidized housing is a proxy for lack of assets, and it is found that this has a significant negative effect on choosing family business work, but has a significant positive effect on choosing home work. The results are consistent with the views that starting a family business requires financial outlays and that home work are undertaken by unskilled women in poor families to supplement family incomes even during the child-bearing years. Similarly, home owners are assumed to be better endowed with capital assets

and we found that their wives are significantly more likely to be in a family business and less likely to be in wage employment. The place of birth and race dummies are entered to capture any systematic differences in productivity and discrimination effects. Almost all the estimated coefficients are not significant. The only exception is that a Chinese woman is much more likely to be a wage employee and probably reflects the lack of market opportunities of non-Chinese women. The extended family dummy is found to have a significant positive effect on choosing wage employment. It is likely that the additional help available in the household encourages the wife to take part in wage employment.

Appendix C

TABLE C.1

OLS estimates of husband's and wife's log monthly earnings by economic activity status with correction for selectively bias.[a]

	All husbands	Husband wage employee	Husband family business	Wife home worker	Wife family business	Wife wage employee
Intercept	6.0989	6.2705	7.7441	4.9825	5.8263	4.4611
	(35.52)	(32.25)	(14.49)	(3.49)	(2.49)	(9.35)
Schooling	0.0131	-0.0009	-0.0250	0.0514	-0.1725	-0.0028
	(1.69)	(-0.09)	(-0.88)	(2.60)	(-1.50)	(0.13)
Schooling-square	0.0026	0.0025	0.0033	-0.0029	0.0127	0.0049
	(12.05)	(10.90)	(5.81)	(-1.15)	(3.88)	(0.83)
Schooling x age	-0.0003	0.0001	0.0005	0.0003	0.0026	-0.0004
	(-1.82)	(0.53)	(1.00)	(0.01)	(1.05)	(0.87)
Age	0.0451	0.0388	0.0235	-0.0665	-0.0339	0.0588
	(6.08)	(4.86)	(1.18)	(-1.01)	(-0.31)	(3.05)
Age-square	-0.0005	-0.0005	-0.0005	0.0009	0.0003	-0.0007
	(-6.46)	(-5.86)	(-2.30)	(1.04)	(0.20)	(2.80)
Born in Hong Kong	-0.1268	-0.1729	-0.1511	-0.0181	-0.0761	-0.2133
	(-6.30)	(-8.30)	(-2.32)	(-0.17)	(-0.44)	(5.63)
Chinese race)	-0.1933	-0.1903	-0.2381	0.2939	1.6956	0.4927
	(-4.58)	(-4.62)	(-1.69)	(1.89)	(2.37)	(5.55)
-Lambda	-	-0.1660	-0.5664	-0.4980	-0.3866	-0.1395
		(3.07)	(-6.80)	(2.24)	(-1.12)	(-0.97)
Adjusted *R*-square	0.2989	0.3310	0.2530	0.3600	0.1544	0.4551

[a] *t*-values in parentheses. Lambda is the selection bias control variable constructed from estimates in appendix B using the method proposed by Lee (1983).

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1. We recognize that husband's choice of an activity status may not be independent of wife's choice, and vice versa. Therefore, the above specification may be inappropriate, however,

given that husbands have two choices and wives have four choices, the total number of observable combinations will be eight, with each cell in Table 1 representing a single outcome. Unfortunately this results in very small cell sizes for certain outcomes, so that it may be difficult to obtain reliable estimates of the joint probabilities. The large number of choice categories is also a troublesome feature when specifying an appropriate model for estimation purposes. The flexible multinomial probit model will be computationally far too cumbersome, but the simpler multinomial logit model contains the independence from irrelevant alternatives property, which is unlikely to be correct in this instance. Experiments with nested logit models had problems of converging. In view of the difficulties in getting correct estimates of the joint probabilities of husband's and wife's choice of activity status, we decided on the approach described in the text.

2. The test statistic for the reduced-form model is 42.0. The chi- square values at a .01 level of significance is 26.2 with 12 degrees of freedom.

3. These additional regressions may be obtained from the author upon request.

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