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CENTER DISCUSSION PAPER NO. 634

INTERNATIONAL DIFFERENCES IN LABOR FORCE
PARTICIPATION IN FAMILIES AND FIRMS

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ABSTRACT

This paper analyzes labor force participation rates for women and men, and the component rates in three types of employment: unpaid work in the family, self employment, and wage and salary. The goal is to account for variation across countries in these participation rates within a micro economic framework of individual and family optimizing behavior. Because the same male and female wage and wealth variables are likely to determine both marital status and participation, only the reduced-form equation is estimated for participation in terms of women's wage opportunities, men's wage opportunities, industrial structure, and wealth. The labor force in unpaid and self employment declines relative to that employed in firms (wage and salary) with development, and increases with education and urbanization. The total participation of men does not vary much along these various dimensions of the society, but for women total participation increase, except at the lowest income levels where women participate frequently as unpaid family workers. Women's education, my proxy for women's market wage opportunities, and men's education, my proxy for men's wage opportunities, are directly and inversely associated, respectively, with women's participation in wage and salary jobs. This positive own-education effect is substantially larger than the negative male education effect, suggesting that female wage employment increases across countries as the educational attainment of men and women increase together. Because women are gradually catching up to men in their educational attainment in the last thirty years, these estimates of participation rates imply that women are also likely to play an increasing role in the labor force, particularly in wage employment.

I. Introduction

The rate at which the adult population participates in the labor force varies across countries and appears to be changing in many regions, particularly for women (Schultz, 1990a). However, behavioral models are not currently used to explain and forecast these participation rates, despite some success of economic models of family behavior to account for cross sectional variation in labor force participation within countries. This paper combines existing evidence on the determinants of marital-specific labor force participation and marital status to infer the likely determinants of male and female total labor force participation rates. Without satisfactory international data on wage rates for women and men, education is used as a proxy for wage rates in the estimation of this model. Because of the ambiguities in measuring economic activity of individuals in family enterprises, labor force participation is disaggregated into unpaid family work, self employment, and wage and salary work. Cross country evidence is reported that shows the tendency for employment to shift from family enterprises to larger scale firms as economic development and urbanization proceed, and for the differences between the educational investments in men and women to govern the rate at which women leave family production to find wage employment.

Estimates of the size, growth, and age composition of national populations are routinely projected for ten to fifty years, under demographic assumptions regarding trends in fertility and mortality (United Nations, 1991; Zachariah and Vu, 1988). The analogous task

of projecting estimates of the labor force are undertaken by the International Labor Office, but are not yet based on a similarly explicit foundation of fact and assumption (ILO, 1977, 1990; United Nations, 1971). Time series observations on labor force participation rates within most countries of Africa and Asia are too limited to support within-country projections. Hence, the need for multivariate intercountry analysis to test hypotheses about the determinants of labor force participation rates and to develop improved methods to measure, study, and project the labor force, internationally.

This paper proposes to account for cross country variation in labor force participation rates in family employment and in wage employment. The model specification is based on the microeconomic framework of individual and family labor supply that has been refined for the last three decades (Mincer, 1963; Becker 1965; Heckman, 1971; Smith, 1980; Killingsworth, 1983). Although these microeconomic models of labor supply were first used to explain differences in labor force participation between aggregates, such as cities or states, they are used today primarily to investigate differences across individuals and families in participation and hours of work. Because relatively few studies of labor force participation deal with changes over time, and then mainly in high income countries (Nakamura and Nakamura, 1981; Mincer, 1985; Smith and Ward, 1985; Goldin, 1990), there are many obvious reasons why patterns estimated here from a cross section of countries may not

forecast changes that occur within countries over time. Nonetheless, these cross country data need to be consulted as a first step, despite the mixed quality of the data and the existence of many country-specific factors that cannot be illuminated in such an investigation.¹

Section II of this paper reviews the conceptual framework used to explain labor force participation patterns and the form of the empirical evidence. Section III outlines models proposed to explain the distribution of the population by marital status and participation of married and unmarried persons to illustrate how the parameters to the unconditional participation rate equation can be interpreted as derived from the parameters in these three underlying equations. Section IV discusses the sources and limitations of the data, and then presents patterns of participation for women and men by level of national income. Section V reports the benchmark estimates of the economic

¹ The most obvious reason for the lack of statistical studies of intercountry variation in participation rates is the conceptual ambiguity of measures of labor force activity, particularly with regard to those activities that occur within the family and contribute to family welfare without producing an output that is exchanged in the market. In principle, national data on the labor force might be adjusted toward a common definition, but in fact, such adjustments would require national labor force data reported by sex, job status, primary and secondary work activities by hours worked, and additional worker and job characteristics, such as age, education, marital status, industry and occupation. Unfortunately, few countries report tabulations of their data along all of these dimensions, and only a score release public-use-samples of the underlying household records from a census or representative survey that permit researchers to make appropriate conceptual adjustments in the definition of the "labor force".

determinants of labor force participation, whereas subsequent sections probe these results from alternative perspectives. Section VI considers the role of regions as an omitted covariate, while Section VII interprets the covariation of residuals across participation equations for men and women in different types of jobs. Section VIII projects the growth of the world's labor force on the basis of the estimated model to assess whether the time series implications of the basic model are plausible, and Section IX summarizes what has been found.

II. The Family Labor Supply Framework and the Empirical Evidence

Consumer demand theory extended to family coordination of labor supply and production has become the standard economic framework for studying participation and hours of work in the labor force (Becker, 1965; Heckman, 1971). The decision of individuals to participate in the labor force is derived as a reduced-form equation including three core economic variables: (1) the wage rate they can expect to receive in the labor force, (2) the wage rate offered to their spouse or other family member with whom they coordinate consumption and possibly home production, and (3) nonemployment or wealth income that can sustain market consumption without participation and raise their nonmarket productivity and hence reservation wage. Because the composition of the family, and in particular the marital status of individuals, modifies the individuals' set of alternatives, it is common practice to

disaggregate the population by sex and marital status and to estimate the effect of the variables conditioning participation within each group of individuals. (Durand, 1948; Bowen and Finegan, 1969; Mincer, 1963; Cain, 1966). Single men and women are thus studied without reference to the other gender, whereas the participation of married women and men is assumed to depend jointly on each other's productive opportunities and the family's pooled nonearned income (Becker, 1965; Heckman, 1971).

This plausible approach presumes that the decision to marry and stay married is not responsive itself to male and female wage opportunities and wealth, or preference orderings of the individual over labor market and consumption alternatives. These assumptions do not appear to be generally valid (e.g. Becker, 1981; Schultz, 1990b). Therefore, samples of married couples are not likely to be representative of the entire population, and estimates of labor supply parameters estimated conditionally for any particular marital status group are potentially biased. The marital status of many populations is also in flux, with the age at marriage often increasing for younger birth cohorts and the prevalence of female headed households also increasing.

Theories of marriage link the propensity to marry to the wage gap between men and women, for it is reasoned that the gains to market and nonmarket specialization by couples is larger when the returns to market work are more dissimilar for men and women (Becker, 1981). Because education is an important determinant of market wages for women and men, increases in the educational

attainment of women relative to men should strengthen women's economic status and independence, allowing them more readily to delay marriage and perhaps even rear children without a husband (Schultz, 1987) ².

To forecast how changing economic conditions are likely to affect labor force participation of men and women, an empirical analysis must, therefore, account for both the distribution of the population by marital status and the labor force participation behavior of persons in those marital status groups. One approach to this problem is to specify a structural model of the determinants of current marital status, and labor force participation by marital status, and estimate the parameters of this model with simultaneous equation or sample selection methods (Schultz, 1990b). An alternative approach is outlined below in Section III in which an unconditional participation equation or a reduced-form equation for participation among all women and all men is derived that implicitly embodies the marriage status equation and thereby avoids the need to identify the structural model or the sample selection problem.

² Another development with quite different implications has probably also contributed to the increase in the proportion of female headed households. Mortality rates have declined more for females than for males in virtually all counties, resulting in a growing imbalance between the number of elderly women and men. This increase in number of older currently unmarried women can lead to an increase in female headed households if these women have sufficient resources to maintain a separate residence from that of their children, but this development is presumably a minor factor in labor force participation rates and is not dealt with explicitly in this study.

Empirical Patterns and Parameter Estimates in High Income Countries

The development in the labor market that has attracted the most attention in the last 40 years has been the increase in participation of married women in industrially advanced countries. Many studies of the labor force participation of married women in high income countries have extended the framework first proposed by Mincer (1963). These have found that participation of married women empirically increases with their own-wage opportunities whereas participation decreases with an increase in the wage opportunities of their husbands. The (positive) own-wage elasticity of participation for married women is estimated to be larger in absolute value than their (negative) husband-wage elasticity. Consequently, these estimates provide an explanation for the increase in the participation of married women even in a period when wage rates for women do not appear to be increasing in all countries more rapidly than for men.³

Income that is not related to employment or labor supply is generally assumed to encourage an individual to demand more leisure, and presumably to increase the time allocated to activities outside of the market labor force. Most empirical studies, indeed, find family nonemployment income is associated

³ For example, wages of women relative to men were nearly constant in the United States from 1950 to 1980, whereas female participation in the labor force increased sharply (Smith and Ward, 1985; Goldin, 1990). The large majority of labor supply studies rely on U.S. data, with only a few cases cited in Killingsworth's (1983) survey based on data from the United Kingdom, Israel, or Canada. See also Killingsworth and Heckman, 1986.

with a reduction in the labor market participation of married women (Hall, 1973; Smith, 1980; Nakamura and Nakamura, 1981; Killingsworth, 1983; Mincer, 1985). Some studies, however, fail to exclude from nonemployment income transfers which are conditioned on labor supply, such as unemployment insurance, welfare benefits, social security, pensions and disability benefits. Even when nonemployment income is measured reasonably from a static viewpoint, the possibility remains that such forms of wealth income represent a return on past personal savings behavior that could be systematically related to a persisting propensity to engage in market work. It has not yet been demonstrated that this potential source of simultaneous equation bias is quantitatively serious.

Single women and female heads of households exhibit lower labor force participation elasticities with respect to their own market wage opportunities than do married women in the United States. Single women behave more like men, whereas married women have more leeway to engage in nonmarket production when their own market wage opportunities are less favorable (e.g. Hall, 1973; Killingsworth, 1983). The greater responsiveness of labor supply of married women may also reflect the fact that a larger proportion of single women work than married women, and as this proportion increase, its percentage variation diminishes. Most of the labor supply response of married women occurs in their participation rate, and not in the hours worked among participants. Indeed, among single women the hours response to own wage variation has

been estimated as negative or insignificant, just as it is often estimated for men (Hall, 1973). Even among married women, hours adjustment of labor supply among participants can be insignificant and small.

Men appear to have the lowest labor participation elasticity in part because virtually all males age 25 to 54 participate, and only single youth and elderly adjust their entry to and exit from the full time labor force in response to economic and institutional constraints. Hours of work of male labor force participants also appear to be inelastic to own wages, with some cross sectional studies of men finding negative or backward bending responses to own wage opportunities and little response to their wife's wage (Killingsworth, 1983; Pencavel, 1986; Schultz, 1981).

Evidence of Labor Supply from Within Low Income Countries

Estimations of labor supply responses to own and spouse's wages for married women are available for several low income countries, but most of these are from Latin America where women have obtained nearly as much education as men. These cross sectional studies in low income settings also find that married women participate more often in the labor force when their market wage opportunities are higher, while their participation is lower when their own husband's wage opportunities are higher (ECIEL, 1982; Schultz, 1981, 1990b; Mohan, 1986). Because the positive labor participation elasticity estimates with respect to their own

wage exceed in absolute value those with respect to their husband's wage (negative), a proportionate advance in education and wage levels for men and women would suffice to explain the recent increase, at least in Latin America, of married women's participation rates (Schultz, 1990a). Thailand also conforms to this pattern, though in contrast to Latin America Thai women are traditionally employed in agriculture. Consequently, economic development has not been associated with an increase in total participation of Thai women, but has been associated with an increase in women's participation in employment outside of family agricultural enterprises, particularly in wage employment (Schultz, 1990b).

Types of Jobs: Family versus Firm Employment

Participation in various types of jobs may respond differently to evolving economic opportunities of men and women, and wage and salary jobs are probably measured more comparably across countries than employment in unpaid family work or in self employment. With economic development, the share of the labor force employed by firms increases, particularly in manufacturing, commerce, services, transportation and utilities (Schultz, 1990a). This change in the composition of the labor force from the family to firms is closely related to the declining share of employment in agriculture or simply to urbanization.

Employment by firms can be constrained, however, by

distortions in the labor market that increase the cost of labor differentially to firms, and thereby encourage a shift of jobs back to families and other less formal subcontracting arrangements. Minimum wage legislation is one form of distortion that has also been linked to the reduction in the relative employment opportunities for women in firms (Schultz, 1990a). Governmental regulations on firms can extend the life of informal labor markets until relatively late in the development process (DeSoto, 1989).

Variation in the definition of the labor force can affect substantially the number of persons enumerated in family work. Boserup (1970) therefore framed her analysis of women's economic status in terms of women's share of wage and salary employment. In addition, employment of women in the family or on own account in traditional craft and trading occupations does not necessarily place women in a good position to advance economically, because modern economic growth generally erodes the economic viability of these occupations and sectors. The relative status of the self employed depends on difficult to quantify production relations, access to credit and new technology, and on who in the family actually controls the income generated by the self employment. For example, Hill's (1983) analysis of the labor force participation of Japanese women suggests that different factors impinge on women's decision to work as an employee or to work in a family production

setting, either as self employed or as an unpaid worker.⁴

There are then several reasons to examine participation rates in the labor force according to whether the job is held within the family (without pay), as self employed, or as an employee of a firm. The share of the labor force employed by firms increases in most sectors with economic development. Only in the agricultural sector of the economy does the firm not exhibit a growing dominance over employment as income per capita increases (Schultz 1990a).⁵ To control for the effect of the sectoral composition of the economy on patterns of participation, urbanization is included in the subsequent empirical analysis of labor force participation as a proxy for the proportion of the population with access to nonagricultural jobs.

⁴ Using a trichotomous logit model to explain Japanese women's participation in either (1) wage or salary workforce, (2) family labor force (either self employed or unpaid family worker), or (3) out of the labor force, Hill (1983) was able to reject confidently the likelihood that the woman's decision to enter these two types of labor force activity were similar. Disaggregation was needed. She concludes that the neoclassical family labor supply model is more consistent with her estimates of the decision to enter wage and salary work than it is of the decision to enter family employment, and suspects that complementarities between husband and wife effort in family production may not be suitably modeled by the conventional model of family labor supply.

⁵ Apparently, economies of scale in the use of labor does not preclude farm families from continuing to be an efficient sized unit of production even in more developed countries where firms dominate production in other sectors. Of course, this is not to suggest that the use of capital and land per unit of labor does not increase in agriculture in high income countries.

Comparisons of Participation Rates Across Countries

Many aspects of modern economic growth were quantified and analyzed by Kuznets (1957, 1971), and he compared labor force data from high income countries in this century and across countries in the 1950's and 1960's. Durand (1975) and Boserup (1970, 1990) extended the range of comparisons and developed hypotheses to explain differences in labor force participation rates across geographic areas, cultural regions, and zones with distinctive agricultural technologies.

Participation rates for adult males are generally lower in countries with higher real incomes per capita, even after adjustment for variations in the age composition of the population. But the range of variation is narrow, from about 85 to 95 percent (Durand, 1975).⁶ Time series information on industrially advanced countries also suggest that with development adult male participation rates decline gradually, at least among men over age 50 (Pencavel, 1986).⁷ It is not clear, however, whether this is

⁶The decline in participation at younger ages overstates the decline in economic activity, for the time youth spend in schools should be treated as a productive investment (Eisner, 1989).

⁷The decline in male participation rates at the end of the life cycle is generally interpreted as the decision to retire earlier, induced perhaps by the increased accumulation by workers of nonhuman wealth that can raise their level of retirement consumption. It might also be induced by a decline in current real wage, leading them to reallocate their time to nonmarket activities. There are also undoubtedly institutional developments that encourage earlier retirement, such as social security pension schemes and private contractual arrangements that permit wage profiles to rise over the life cycle conditional on a mandatory age of retirement. Disability insurance, (Parson, 1980) welfare and

due to rising levels of human capital, wealth or other institutional provisions, such as disability insurance, pensions and social security.

Women's labor force participation rates are more variable across countries. Durand (1975) concludes that some of these differences arise from variation in measurement conventions that arbitrarily differ in their enumeration of women as self employed or at work in unpaid capacities in home production. The differences across countries in measured female labor force participation rates are largest in agriculture, where there is substantial variation across cultural regions of the world in what women do in agriculture. For example, women are the primary agricultural workers in subSaharan Africa often working their own plots while in South-East Asia they are often engaged in casual labor. Conversely, in South and West Asia and North Africa, or even in Latin America, women are much less frequently engaged in these activities in the rural sector.

Surveying census and national survey data collected from 1946 to 1966 in all available countries, Durand (1975) concludes that female labor force participation rates across countries are converging toward more similar levels. Those countries starting after the Second World War with high female participation, such as

unemployment benefit levels may also affect the decision of adult males to be currently employed or not. Cross country estimates of the effects of these public and private retirement and welfare programs on participation rates are not widely recognized.

subSaharan Africa and Thailand, experienced declines, while societies in which female participation was initially relatively low, such as Latin America, report gradually rising rates. This convergence in women's labor force participation rates is linked by Durand to shifts in the population out of agriculture and into urban sectors where women and men engage in more similar roles across countries.⁸

III. Integrating the Study of Marriage and Participation

Theories of marriage identify factors that are thought to increase the gains from marriage and thereby increase the likelihood that an individual will want to be married as opposed to single. The most common theory of marriage assumes that gains from marriage arise from increased joint production that can be realized when husband and wife undertake specialized investment in skills that are relevant to either home-centered production or market-oriented production (Becker, 1981). Shared consumption of public goods within the family, such as companionship, sex and children, or merely economies of scale in consumption, can provide additional reasons for the gains from marriage, and shed additional light on

⁸ Urbanization is widely seen as a fundamental factor contributing to the relative decline in family centered production and employment and the corresponding increase in production by establishments. This shift of production from the family to the firm may be linked to improved economic circumstances of women relative to men. For example, women's schooling levels often improve relative to men in towns compared to the countryside, and their mortality declines faster than for men in urban versus rural areas of low income countries (Preston and Weed, 1976).

the composition of households or families (Lam, 1988). Anthropologists, psychologists, sociologists as well as economists recognize the role of such enhanced joint production-consumption possibilities as a motivation for couples to enter into more permanent unions (e.g. Goode, 1970; Wilson, 1987).

If the gains from division of labor between market and nonmarket work is a primary factor determining the proportion of the adult life that a woman desires to be married, the probability that a woman is currently married, M_f , is then a decreasing function of the market wage rate the woman is offered, W_f , an increasing function of the market wage offered to males, W_m , who represent the pool of her potential partners, and wealth per capita, V , which may increase or decrease the desirability of marriage, depending on who owns the wealth and whether it complements or substitutes for the services provided by marriage (Schultz, 1990b):

$$M_f = M_f (W_f, W_m, V, X_f, u_1) \quad (1)$$

Some theories (e.g. Becker, 1981) and most empirical evidence confirm the hypotheses that $dM_f/dW_f < 0$, $dM_f/dW_m > 0$, and where X_f refers to other characteristics of the woman, including regional conditions such as urbanization that may increase the resources available to women relative men and thereby alter the net benefits for a woman to be married, and u_1 is the error. In reality the

error captures the effects of omitted variables, approximations of functional form, and measurement error. The working assumption here is that the error is orthogonal to the observed explanatory variables and has zero mean and constant variance.

The probability that a woman who is married participates in the labor force, P_f^m , is assumed to be a function of her own wage opportunities and those of her husband, which are measured by the wage offers denoted above:

$$P_f^m = P_f^m (W_f, W_m, V, X_f, u_2) \quad (2)$$

where empirical evidence collected by most studies of the labor supply behavior of married women (Mincer, 1963; Smith, 1980; Mincer, 1985) confirm that $dP_f^m/dW_f > 0$, $dP_f^m/dW_m < 0$, $dP_f^m/dV < 0$, and u_2 denotes another error that at the aggregate level of national observations is assumed uncorrelated with the explanatory variables and the aggregate marriage equation error.

Single females or female heads of households are more inclined to participate in the market labor force, P_f^s , than currently married women, and they are generally found to adjust their participation rate positively with respect to their own market wage rate, but by less than married women. The wealth effect on participation of single females is likely to be negative, but there is insufficient evidence whether it is larger or smaller than that for married women:

$$P_f^s = P_f^s (W_f, V, X_f, u_3) \quad (3)$$

where $dP_f^m/dW_f > dP_f^s/dW_f > 0$, $dP_f^s/dV < 0$, and $\underline{P}_f^s > \underline{P}_f^m$, where the underline denotes the sample mean of that variable, and u_3 is a third independent error.

Because marital specific participation rates are infrequently tabulated by marital status in census and survey publications, empirical analysis deals here with the participation rate for all women, which is the sum of the marital status specific participation rates, weighted by the probability of being in the two marital statuses:

$$P_f = P_f^m M_f + P_f^s (1 - M_f) \quad (4)$$

Abstracting from interactions among the variables and nonlinearities, the derivatives of total female participation with respect to female and male wages and nonearned income can be calculated from equations (2), (3) and (4):

$$dP_f/dW_f = dM_f/dW_f (\underline{P}_f^m - \underline{P}_f^s) + (dP_f^m/dW_f - dP_f^s/dW_f) \underline{M}_f + dP_f^s/dW_f > 0$$

$$dP_f/dW_m = dM_f/dW_m (\underline{P}_f^m - \underline{P}_f^s) + (dP_f^m/dW_m) \underline{M}_f < 0$$

$$dP_f/dV = dM_f/dV (\underline{P}_f^m - \underline{P}_f^s) + (dP_f^m/dV - dP_f^s/dV) \underline{M}_f + dP_f^s/dV > 0$$

On the basis of the prior restrictions on the sign and relative size of the derivatives in equations (2), (3) and (4), one can show

that at the sample mean female wage opportunities unambiguously increase women's participation, whereas male wage opportunities decrease participation by women, and the sign of the effect of wealth is indeterminant.

The derivatives of the participation function for males, (single, married or total) are less well defined by theory, and the empirical literature has not reached a consensus on the sign of these parameters or their relative magnitudes (Pencavel, 1986). Consequently, it is not possible to hypothesize the sign of the coefficients on female and male wages in the reduced-form equation for male participation.

Econometric Issues

To estimate the long run effect of male and female wage rates on their labor force participation involves a variety of econometric and measurement problems. Wages paid to a worker today reflect a premium earned on her or his accumulated past experience in the labor force, or in prior participation in types of employment where acquired skills are partially transferable to the current job. Thus, unobserved individual persistent heterogeneity in preferences or other factors influencing willingness to work could induce a spurious correlation between observed wages and participation over time. The life cycle response of participation to market wage opportunities would then be estimated with bias if participation is conditioned on current wages. One method for dealing with this bias is to use an instrumental variable that is

correlated with the potential life cycle wage profile but is orthogonal to the individual worker's heterogeneity affecting wages and participation. The strongest predictor of wage rates tends to be "years of schooling" completed (Schultz, 1987). This correlation tends to be highest in low income countries where the slope of the logarithmic wage profile with respect to years of schooling is typically greater and the proportion of the log variance of wages explained by post-schooling experience and other training programs tends to be smaller than in industrially advanced countries.

However, if schooling is a satisfactory instrument for the wage rates of women and men, information on male and female wage rates are reported for only a handful of countries on a regular basis by the International Labor Office. In many of these cases, moreover, the wages are representative of only surveyed larger firms in a selected industry, such as manufacturing. There is no compelling reason to expect these sex-specific wage series to be representative of the level of, or changes over time in, male and female wage rates in even these countries. Nor can it be assumed that differentials between men and women in their marginal productivity in self employment and family occupations parallel precisely wage rates paid by firms. Lacking a basis to correct for the unrepresentative sample selection of such wage series, I use here the years males and females are enrolled in school as a proxy for the relative wages of adult men and women ten years later

(Schultz, 1987). This variable can be constructed from school enrollment data available for most countries since about 1950 from the UNESCO Statistical Yearbooks.

There are two obvious problems with assuming that years of education proxies relative wage differences. First, this assumption would be satisfied if the ratio of wages of male and female workers who differ by, say, one year of schooling were approximately constant across countries and over time. The empirical record is not this homogeneous. These relative wage differentials associated with schooling trend to be higher and more variable in low income countries than in high income countries, although not radically different for men and women (Schultz, 1988). Second, this assumption seems to imply that education is supplied in some manner to achieve a constancy of returns to schooling. It might be more realistic to imagine that people and governments invest in more education when the returns are higher or perhaps when alternative investments are less productive. The derived demands for educated labor are certainly not uniform across countries or over time. Disequilibrium rents are often earned by educated workers in periods of sustained rapid economic growth, but no one has convincingly disentangled what causes this form of growth to become established or how critical to this process is an ample supply of skilled labor.

The estimated effect of each explanatory variable on the total participation rate can be readily decomposed into the effects of

that explanatory variable operating through the three component job types, if parallel linear discriminant (OLS) models are estimated for each participation rate.⁹ The participation rate is, of course, a limited dependent variable, constrained between zero and one, and the standard errors of the reported ordinary least squares estimates are thus not necessarily consistent. But with only a modest degree of truncation, the participation rates are distributed approximately normally across the sample, in which case OLS has desirable properties. But because the data are in the form of country aggregates, a log-odds regression (logit) model implies estimates that are qualitatively very similar to those OLS estimates reported here; thus the OLS t ratios may not be seriously biased for the purposes of hypothesis testing. Regression standard errors are also potentially biased by neglect of the interdependence of repeated observations from a single country, at perhaps ten year census intervals. Tests of statistical significance should, therefore, be treated with caution.

IV. Data and Variation with Economic Development

Data from Censuses after 1950 are examined if they include

⁹ For example, the sum of the three coefficients on urbanization in the unpaid family, self employment, and wage and salary regressions reported in Table 2 equals the urbanization coefficient in the total participation equation, subject to rounding errors. Exploiting the interdependence in the component participation rates should improve the estimates. See later Table 4. Estimating the multinomial logit model would be reasonable with individual data and may be satisfactory for these country level aggregates.

tabulations of the labor force by sex and job status. The working sample is additionally restricted to those countries and census years for which there are population tabulations by age, real GNP estimates, foreign exchange rates, primary and secondary school enrollment rates by sex, and estimates of urbanization (see notes to Table 1). Most of the basic data on the labor force are from the International Labor Office's Yearbook of Labor Statistics (Table 2b), supplemented by the 1988 Demographic Yearbook (Table 40) of the United Nations.

Underlying census publications for specific countries were consulted to resolve inconsistencies in the data in ILO, UN or World Bank compendia.¹⁰ The final restricted sample includes 76 countries of which 21 are high income industrially advanced countries, and two of the 55 "low" income countries are Kuwait and Libya.¹¹ The total sample has 160 census observations, which are

¹⁰For example the distinction between de jure and de facto populations can be important when large temporary immigrant populations exist and labor force or population data are not uniformly reported, or special occupational groups are excluded from the conventional three job-status of categories analyzed in this paper. Unemployed seeking their first job can account for one to five percent of the labor force and are excluded. If unallocated groups amount to more than a tenth of the population aged 15 to 65, the underlying census is examined to help allocate additional identifiable groups by job status. If this is not possible, the census is eliminated from the sample. This selection criteria may introduce a bias in the subsequent analysis, but reintroducing these additional 12 observations did not change the patterns noted below, though it does, of course, lower the average levels of participation for both sexes.

¹¹In 15 censuses out of 160 the labor force total participation rate exceeded one for males, presumably because the definition of the labor force includes youth under age 15 and may in most

regionally distributed with 35 from Latin America, 15 from East and South-East Asia, 28 from South and West Asia, and 23 from Africa.¹²

Table 1 summarizes the proportions of the population age 15 to 65 in the three jobs statuses, for males and females, as well as the variables that will later be used to explain these participation rates. Four regions are distinguished, as noted above, for the low income countries, and contrasted as a whole with the high income countries.

The univariate association between participation rates and the level of national income is first examined, and then in Section V. the multivariate relationships suggested by the microeconomic model

countries include some persons over age 65. In these cases, mostly in Africa, the difference between the total participation rate for males and .99 is subtracted from the participation rates in the family and self employment in proportion to the size of these two segments of the labor force. The country/year observations for which male participation rates summed to more than one, and were therefore adjusted included: Burundi, 1969; Mauritius, 1952; Rwanda, 1978; Mozambique, 1970; Egypt, 1960; Botswana, 1964; Mali, 1976; El Salvador, 1961; Mexico, 1960; Nicaragua, 1963; Thailand, 1969; Bangladesh, 1961; India, 1961; Ireland, 1951; Portugal, 1960.

¹² For the purposes of comparing regions with more homogeneous patterns of labor force participation, Africa should be disaggregated. The Northern tier of Africa provides 10 observations and exhibits very low female participation; subSaharan Africa provides 9 observations with generally very high female participation rates, and four are accounted for by Mauritius and Reunion, islands that may not appear to be particularly representative of Africa. Southern Anglophone Africa also exhibits a distinctive pattern in which women remain economically active in the labor force, but they have also received almost as much education as have men. This near parity in educational attainment of men and women is not observed in North, East, West or Central Africa. The lack of sufficient observations for the subregions of Africa precludes disaggregation in this analysis, but the reader is cautioned against viewing this region as anything but highly diverse.

of family labor supply and marriage are estimated. Figure 1 and 2 illustrate how an indicator of economic development, a country's real GNP per adult (age 15 to 65), is associated with the six components of a country's labor force participation. The total labor force participation rate in columns (4) and (8) is merely the sum of the three specified job types, and thus excludes some unallocable workers (see notes to Table 1). To avoid imposing a particular functional form on the relationship between income and participation, such as linear or quadratic, a more flexible approach is adopted. Each observation is assigned to one of the deciles of the sample ordered by real income per adult. The regression coefficients for these decile dummy variables are then plotted as circles to visualize the pattern of income effects on each form of labor force participation, and the error bars represent the confidence intervals or the standard errors associated with the regression coefficients.

The participation rate in family unpaid work declines for both men and women with rising income. Self employment participation also declines with income, but the largest drop in both of these informal job statuses occurs from the first to the third decline, because of the large number of subSaharan African countries in the first decile with high participation rates in family and self employment. Wage and salary participation rates increase irregularly with income, but in the lower half of the income

TABLE 1

Regional Means and Standard Deviations in Labor Force
Participation, Income and Education for a Sample of 78 Countries

<u>Dependent Variables:</u>	Latin America	East and South-East Asia	South and West Asia	Africa	Low Income ^a	High Income ^a	Total Sample
Participants in Job Class per Person Aged 15-65:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Male:							
Family Unpaid	.07 (.05)	.12 (.11)	.08 (.08)	.10 (.11)	.09 (.09)	.04 (.04)	.07 (.08)
Self Employed	.32 (.10)	.31 (.14)	.41 (.19)	.36 (.19)	.36 (.16)	.19 (.07)	.29 (.16)
Wage and Salary	.48 (.13)	.42 (.21)	.40 (.18)	.41 (.22)	.44 (.18)	.65 (.11)	.52 (.19)
Total Specified ^b	.88 (.10)	.85 (.08)	.90 (.09)	.89 (.11)	.88 (.09)	.88 (.08)	.88 (.09)
Female:							
Family Unpaid	.02 (.06)	.17 (.23)	.13 (.19)	.13 (.22)	.10 (.18)	.05 (.07)	.08 (.15)
Self Employed	.07 (.04)	.08 (.05)	.08 (.14)	.14 (.23)	.09 (.14)	.04 (.02)	.07 (.11)
Wage and Salary	.16 (.08)	.21 (.14)	.08 (.06)	.06 (.06)	.12 (.10)	.31 (.11)	.19 (.13)
Total Specified ^b	.26 (.12)	.46 (.20)	.29 (.20)	.33 (.31)	.31 (.22)	.40 (.11)	.34 (.19)
Explanatory Variables:							
GNP per person aged 15-65 in 1970, \$ ^c	942. (396.)	962. (888.)	1206. (1908.)	568. (541.)	933. (1124.)	3336. (1547.)	1819. (1738.)
Female Years of Schooling (Primary & Secondary) ^d	7.36 (2.11)	8.10 (1.74)	5.29 (2.84)	4.36 (2.47)	6.21 (2.74)	10.1 (1.18)	7.65 (2.96)
Male Years of Schooling (Primary & Secondary) ^d	7.66 (1.94)	8.74 (1.41)	7.91 (2.43)	6.52 (2.66)	7.63 (2.28)	10.3 (1.02)	8.60 (2.29)
Urbanized Population (%) ^d	46.4 (16.5)	49.8 (33.8)	35.0 (24.0)	27.2 (14.7)	39.4 (23.0)	63.6 (17.9)	48.3 (24.2)
Number of Countries ^e	21	7	11	16	55	21	76
Number of observations ^e	35	15	28	23	101	59	160

Notes on next page

Table 1, continued

^a High income countries includes the OECD countries of Western Europe, North America, Australia, New Zealand, Japan, plus Israel. The other countries are referred to as low income countries for short (a sum of those in the first four regional columns), including high income oil exporting countries such as Kuwait. The centrally planned socialist countries are not included for lack of convertible currency and GNP estimates with the exception of Yugoslavia. Variables are reported for the countries and years observed in the sample in Appendix A, available from the author.

^b The "total specified" labor force is the sum of the three specified job-type categories: unpaid family; self employed, own account, and employers; and wage and salary (employees). This total specified sum excludes the following: (1) unemployed looking for their first job, and hence not able to report previous job type, (2) unclassified due to inability to report job type or industry, and (3) some categories treated as special in certain countries, such as the armed forces. Some studies of labor supply have argued that unemployed and nonparticipants are more homogeneous than unemployed and employed, thus justifying analysis that focuses on the employment/nonemployment dichotomy. When the proportion of the labor force in the second and third categories that are unable to report job type, plus special exclusions exceeds ten percent, the observation is deleted from the estimation sample. Unfortunately, this has occurred in several recent censuses for unexplained reasons, such as the 1980 censuses of Mexico and Panama.

^c GNP is measured in deflated local currency, and converted to U.S. dollars by the foreign exchange rates IMF reports in the three year period 1969-1971. Alternative GNP comparisons were performed based on conversions of currencies according to the Summer and Heston's Purchasing Power Parity GNP estimates for all but a few of the sample countries that are not included in this alternative series. None of the patterns reported here were notably affected.

^d Years of schooling is defined as six times the gross primary school enrollment rate plus six times the gross secondary school enrollment rate, as reported by sex, in the annual UNESCO Statistical Yearbooks. Adult literacy is available from the same source, but is not generally disaggregated by sex. Urbanization figures are from the World Bank data file, and supplemented when missing from alternative World Bank publications or United Nations sources.

^eThe country/year censuses included as observations in the sample include: Burundi, 1979; Malawi, 1977; Mauritius, 1952, 1962, 1972; Mozambique, 1970; Reunion, 1967; Rwanda, 1978; Cameroon, 1976; Algeria, 1954, 1966; Egypt, 1960, 1966, 1976; Libya, 1964, 1973; Morocco, 1960; Tunisia, 1966, 1975; Botswana, 1964; Liberia, 1962; Mali, 1976; Togo, 1981; Guadeloupe, 1967; Haiti, 1971; Jamaica, 1953, 1960; Martinique, 1961, 1967; Trinidad/Tobago, 1960; Costa Rica, 1963, 1973; El Salvador, 1961, 1971; Guatemala, 1973, 1981; Honduras, 1961, 1974; Mexico, 1960; Nicaragua, 1963, 1971; Panama, 1960, 1970; Chile, 1960, 1970; Uruguay, 1963, 1975; Bolivia, 1976; Colombia, 1964; Ecuador, 1982; Guyana, 1960;

Paraguay, 1972, 1982; Peru, 1961, 1972, 1981; Venezuela, 1961, 1971; Japan, 1955, 1965, 1980; Hong Kong, 1966, 1971, 1981; South Korea, 1966, 1975; Indonesia, 1971, 1980; Malaysia, 1980; Philippines, 1960, 1970, 1975; Singapore, 1970, 1980; Thailand, 1960, 1970; Bangladesh, 1961, 1984; India, 1961, 1971, 1981; Iran, 1966, 1976; Nepal, 1961, 1971, 1981; Pakistan, 1961, 1981; Sri Lanka, 1963, 1971, 1981; Iraq, 1977; Kuwait, 1965, 1970, 1975, 1980; Syrian Arab Republic, 1960, 1970; Cyprus, 1960; Israel, 1961, 1972; Turkey, 1960, 1965, 1970, 1975, 1980; Australia, 1954, 1961, 1966, 1971, 1976, 1981; New Zealand, 1951, 1961, 1966, 1976, 1981; Canada, 1951, 1961; Denmark, 1970; Finland, 1960, 1970, 1976, 1980; Ireland, 1951, 1961, 1966, 1971, 1981; Norway, 1960, 1970, 1980; Sweden, 1950, 1960, 1965, 1975; United Kingdom, 1961; Greece, 1951, 1961; Italy, 1961, 1971, 1981; Portugal, 1960, 1981; Yugoslavia, 1961, 1971, 1981; Austria, 1951, 1961, 1981; Belgium, 1961, 1970, 1981; France, 1954; Luxembourg, 1966, 1970; Netherlands, 1960, 1971; Switzerland, 1960, 1970.

Figure 1: Male Labor Force and Income,

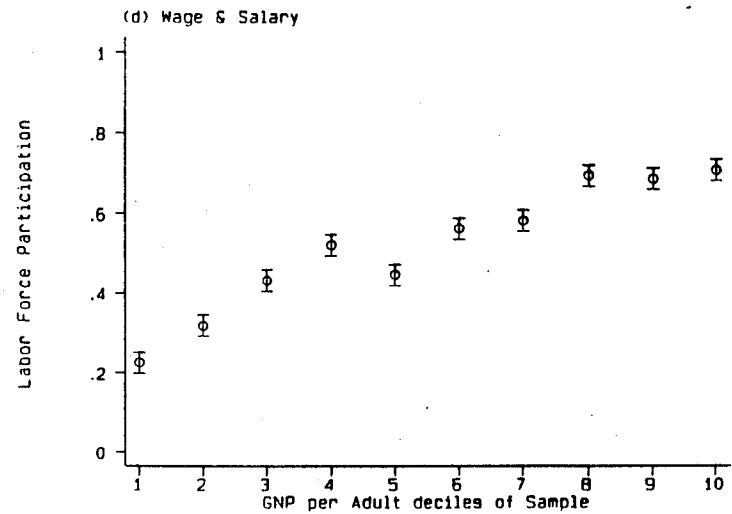
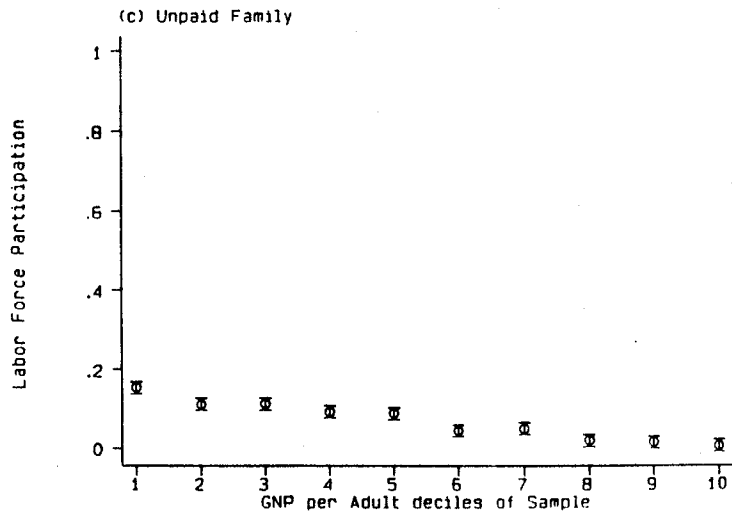
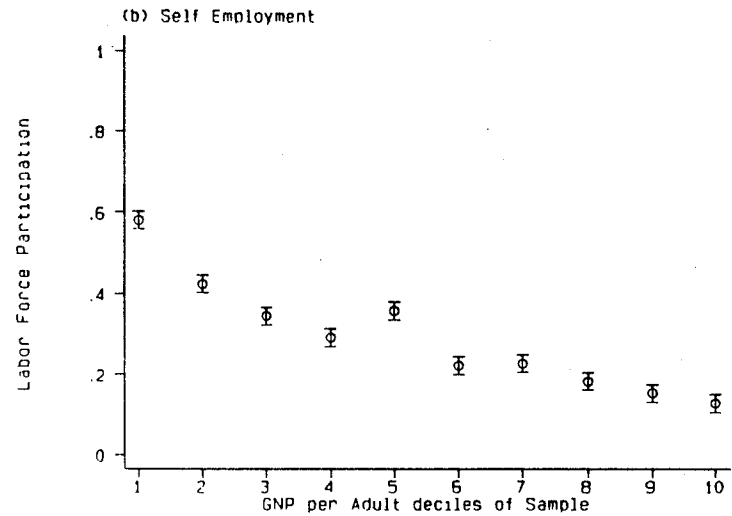
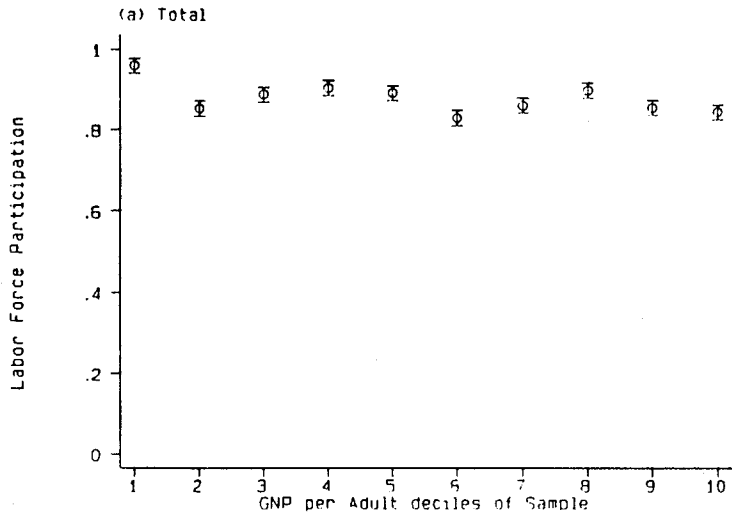
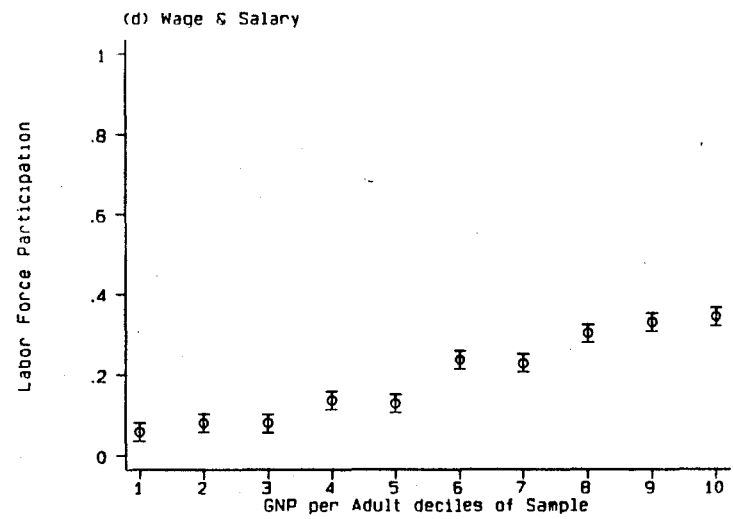
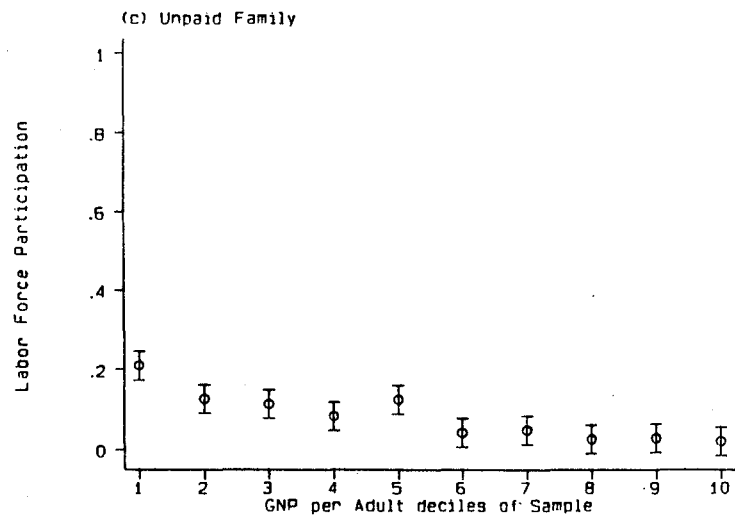
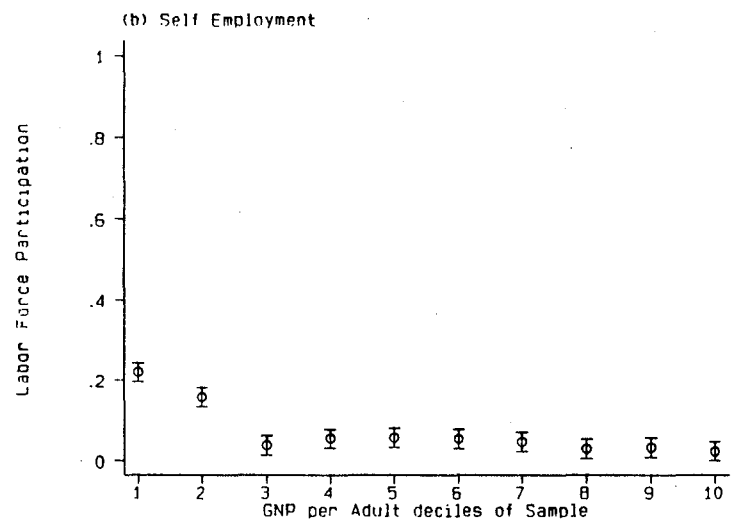
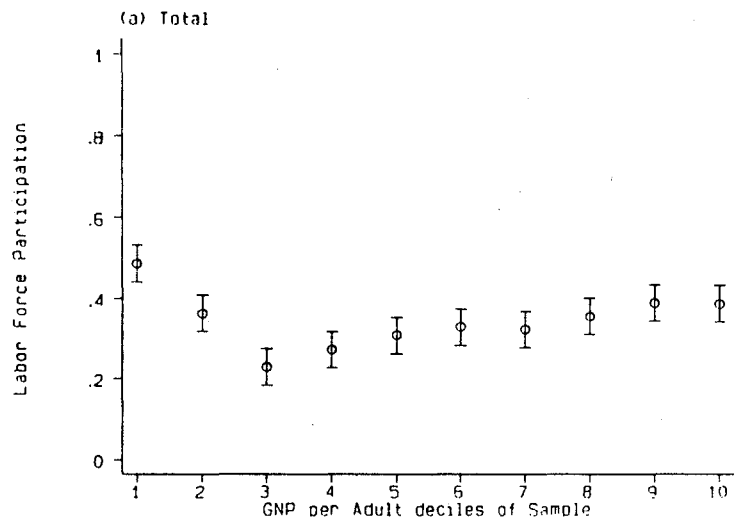


Figure 2: Female Labor Force and Income,



observations women represent about a quarter of wage and salary workers, whereas in the upper half of the income observations, 6th to 10th decile, women employees represent a third. The total of these three forms of participation for males does not vary much with income. The total participation for females suggest a "U" shaped pattern as Durand (1975) found. With the exclusion of the first decile, for which family related participation of women is exceptionally high, there is only modest variation among the 2nd through 10th decile.¹² The shifting composition of participation from family to firm is perhaps the most salient consequence of the development process.

V. Fitting the Labor Supply Framework

A linearized approximation of the reduced-form equation is estimated for the total participation rate and the participation rates by three job statuses, for men and women. The first specification (I) is reported in the upper panel of Table 2 and includes three explanatory variables: female enrollment (proxy for the logarithm of female wage opportunities), male enrollment (proxy for the logarithm of male wage opportunities), and percentage of population residing in an urban area (proxy for opportunities for nonagricultural employment). The family labor supply and marriage model indicates it would also be desirable to estimate the partial

¹² The coefficients estimated on the 2nd through 9th deciles are not jointly statistically significant at the 5 percent level.

effect of personal wealth income, V. Because this wealth variable is not available across countries, the second panel of Table 2 includes real income per adult as a linear effect, and in the third panel (III) income deciles are added to control more flexibly for the effect of income. The income variable is intended to capture the effect of differences in natural resources, reproducible wealth, and institutions that contribute to national income per adult, holding constant for the education of the labor force, such as might be important for Libya and Kuwait, for example. A second order quadratic specification may also be appropriate, given the multiplicative form of the reduced form model, and this specification is summarized in appendix Tables A-1 and A-2.¹³

The family labor supply framework is most germane for

¹³ Because of the multiplicative interactions of the marital status specific participation functions and the marital status equation, it is to be expected that the reduced-form total participation equation will be nonlinear, even if the three underlying structural equations were approximately linear. There is potentially an important role for interactions among the variables that enter both the marriage and participation equations. However, with national aggregate data these nonlinear and interaction effects are difficult to resolve because the linear and quadratic and interaction variables are highly intercorrelated. For example, the correlation between female education squared and the male-female education interaction is .98, and that between the male education squared and the interaction of male and female education variable is .95. It is unreasonable in the presence of such high collinearity among regressors to expect data to determine the five central parameters in the reduced form participation equation with any confidence. They are reported, for example, for the female wage and salary participation equation in Appendix Table A-1. Although the individual coefficients are not estimated precisely, the derivatives of the estimated functions with respect to the core variables do not change dramatically at sample means as shown in Table A-2.

understanding female labor force participation, and the measurement of women's participation is likely to be more comparable across countries when restricted to wage and salary jobs. The primary focus of this paper is, therefore, accounting for female wage and salary participation (Col. 7), and more generally developing a method for predicting the total participation rate of women (Col. 8) and men (Col. 4). In the top panel of Table 2, a year of additional female education is associated with an increase of 4.6 percentage points in wage and salary participation by women. This would represent an increase of nearly a quarter for women's wage employment from the sample mean of 19 percent (Table 1).¹⁴ An additional year of male education reduces female wage and salary participation by half as much, 2.6 percentage points. The effect of female education on female wage and salary participation declines to 4.1 percentage points when income is controlled in the regression in either the linear or more flexible specifications (II and III). The male education coefficient is virtually unchanged by the introduction of the controls for income.

A ten percent increase in the fraction of a society living in urban areas is associated in the top panel of Table 2 with an increase in female wage and salary participation of 1.2 percentage

¹⁴ For example, the correlation between female education squared and the male-female education interaction is .98 and that between the male education squared and the interaction variable is .95. It is unreasonable in the presence of such high collinearity among regressors to expect data to determine the five parameters in the reduced form participation equation (5).

points. Urbanization is, however, also associated with a decline in female and male participation in family unpaid and self employment participation. Moreover, the estimate of the urbanization effect on female wage and salary participation is reduced to zero when income is controlled in either specification II or III. Apparently, changes in derived demands for female labor, associated with women finding more wage and salary jobs, is more closely associated with rising income levels in the national economy than with urbanization, per se. Urbanization, however, continues to be associated with the decline in female participation in family and self employment, even after controlling for income in the linear and flexible form. Thus urbanization without rising incomes is not associated with increased participation of women. The total participation rate for women, that combines family and firm employment, increases 5.0 percentage points with an additional year of female education, but declines by 3.7 percentage points with an additional year of male education. Including a linear control for income, the effect of female education declines to 3.7, whereas the addition of the flexible control for income leads to an increase in this coefficient to 5.4. The coefficient for male education is more stable in the presence of the alternative controls for national income. Urbanization is on balance associated with a decline in total labor force participation of

Table 2
 Regressions on the Proportion of Men and Women Aged 15 to 65
 in Various Types of Employment, Linear Effects Model With and Without Income

Explanatory Variables:	M A L E S				F E M A L E S			
	Family Unpaid	Self Employed	Wage & Salary	Total Labor Force	Family Unpaid	Self Employed	Wage & Salary	Total Labor Force
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
I. Years of Primary & Secondary School Enrollment:								
Females	.0024 (.62)	-.0223 (3.65)	.0207 (2.62)	.0007 (.17)	-.0010 (.11)	.0054 (.87)	.0459 (8.85)	.0503 (4.49)
Males	-.0124 (2.58)	.0000 (.00)	-.0075 (.77)	-.0199 (3.54)	.0009 (.08)	-.0120 (1.56)	-.0257 (3.99)	-.0368 (2.65)
Urbanization (%)	-.0012 (4.32)	-.0028 (6.40)	.0043 (7.53)	.0003 (.79)	-.0023 (3.51)	-.0018 (3.97)	.0012 (3.17)	-.0029 (3.55)
Intercept	.216 (10.5)	.600 (18.4)	.215 (5.12)	1.031 (42.7)	.192 (4.01)	.220 (6.63)	.0042 (.15)	.416 (6.97)
R ²	.373	.628	.562	.241	.138	.225	.638	.141
II. Years of Primary & Secondary School Enrollment:								
Females	.0037 (.95)	-.0199 (3.27)	.0156 (2.05)	-.0007 (.15)	-.0006 (.06)	.0047 (.74)	.0412 (8.72)	.0452 (4.07)
Males	-.0123 (2.60)	.0000 (.00)	-.0077 (.82)	-.0120 (3.58)	.0009 (.08)	-.0120 (1.56)	-.0258 (4.46)	-.0370 (2.72)
Urbanization (%)	-.00085 (2.61)	-.0022 (4.23)	.0029 (4.51)	-.0002 (.35)	-.0022 (2.84)	-.0020 (3.74)	-.0001 (.27)	-.0043 (4.57)
Real GNP per Adult Aged 15-65 in 1000 US\$ 1970	-.00883 (2.07)	-.0164 (2.43)	.0349 (4.16)	.0100 (1.93)	.0026 (.26)	.0049 (.70)	.0322 (6.19)	.0345 (2.82)
Intercept	.204 (9.69)	.579 (17.4)	.260 (6.28)	1.043 (42.1)	.189 (3.80)	.226 (6.58)	.0457 (1.78)	.461 (7.61)
R ²	.390	.642	.606	.259	.138	.228	.710	.182
III. Years of Primary & Secondary Enrollment:								
Female	.0073 (1.76)	-.0118 (2.07)	.0047 (.65)	.0002 (.04)	.0060 (.61)	.0075 (1.16)	.0405 (8.01)	.0540 (4.68)
Male	-.0127 (2.65)	.0007 (.11)	-.0078 (.94)	-.0198 (3.66)	.0006 (.05)	-.0103 (1.39)	-.0248 (4.26)	-.0345 (2.60)
Urbanization (%)	-.0006 (1.62)	-.0011 (2.16)	.0013 (2.11)	.0003 (.80)	-.0017 (1.97)	-.0011 (2.10)	-.0002 (.45)	-.0031 (3.01)
R ²	.420	.743	.707	.346	.173	.336	.726	.277

Sample Size is 160

Income deciles are controlled in Panel III and are plotted in Figures 3 and 4. When the intercept is suppressed the standard calculation of the R squared becomes inappropriate, and I report that from the analogous regression with an intercept but omitting one GNP decile. Absolute values of T ratios are reported in parentheses beneath regression coefficients.

women.¹⁵

In the case of male participation, urbanization is also expected to contribute to a reduction in family and self employment and an offsetting increase in wage and salary participation. Empirically no net effect of urbanization is noted on male total labor force participation regardless of controls for income. Male schooling reduces total male labor force participation. However, before interpreting this pattern as suggesting a backward bending labor supply response of male participation to their own wage, it should be noted the response is largely concentrated in a reduction in family unpaid work by males, not by any decline in wage and salary participation. This pattern of declines in male participation within the family might be directly explained by youth who are extending their education beyond age 15, but this hypothesis cannot be tested here because most countries in our sample do not report age disaggregated data within job status classes. Female education is associated with fewer men working in self employment, and with more men working in wage and salary employment. This latter pattern does not remain statistically significant though, when income is controlled by the decile specification III.

The coefficients from the income deciles estimated jointly in

¹⁵ As it should not be concluded that the overall economic status of women is therefore lower in urban than in rural settings. On the contrary, sex specific mortality, nutrition and school attendance suggests the opposite is common. See Schultz 1981, United Nations, 1988, Preston and Weed, 1976.

the third panel of Table 2 are plotted in Figure 3 and 4. The confidence limits around the income decile estimates are larger than they were before, because more of the variance in participation rates is now accounted for by the other three variables. The effect of income on the decline in family and self employment and on the rise in wage and salary employment is somewhat smoother with the partial effects of education and urbanization included, but the pattern is still not linear in income. In summary, the participation effects of female and male education are not modified greatly by the inclusion of controls for income, whereas the effect of urbanization is radically diminished for women's wage and salary participation.

VI. Are Regional Patterns in Participation Explained?

There are regional patterns in labor force participation of men and women, seen in Table 1. Are they explained by the differences emphasized here in national economic development, education of men and women, or urbanization? The top panel of Table 3 reports the regression coefficients on four dummy variables representing the low income regions distinguished in Table 1. Participation in family unpaid work or self employment is more common for men in all four regions of the low-income world, and conversely fewer men participate as employees in these regions. The total participation rates for men in the low-income regions, however, do not differ significantly from those in the industrially advanced countries.

Figure 3: Male Labor Force and Income, Controlling for Adult Male and Female Education and Urbanization

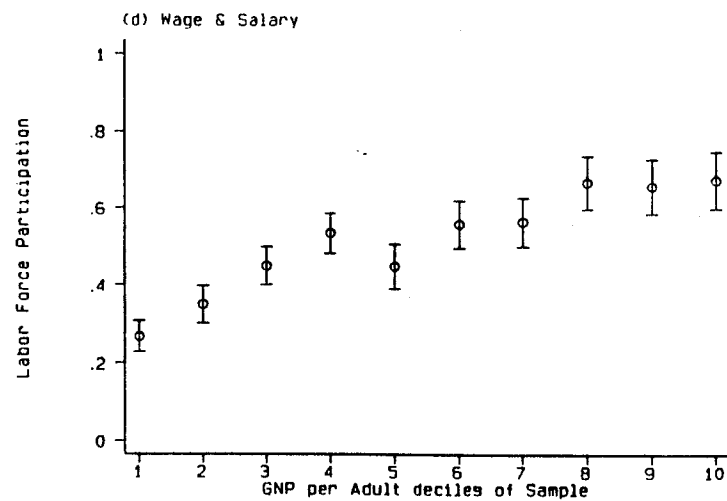
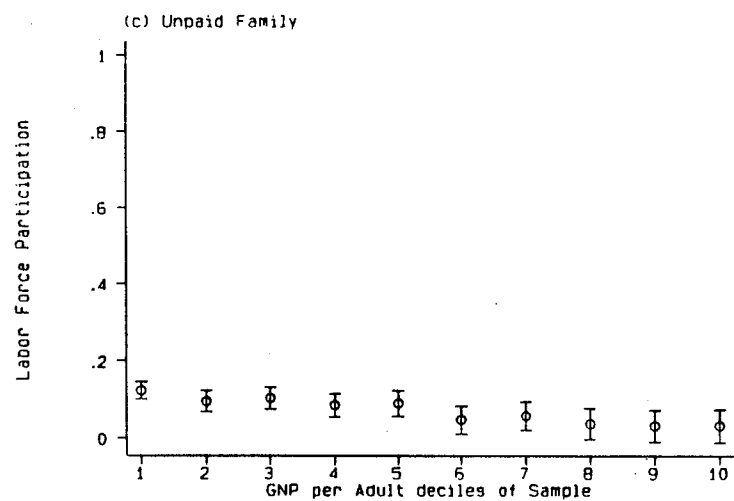
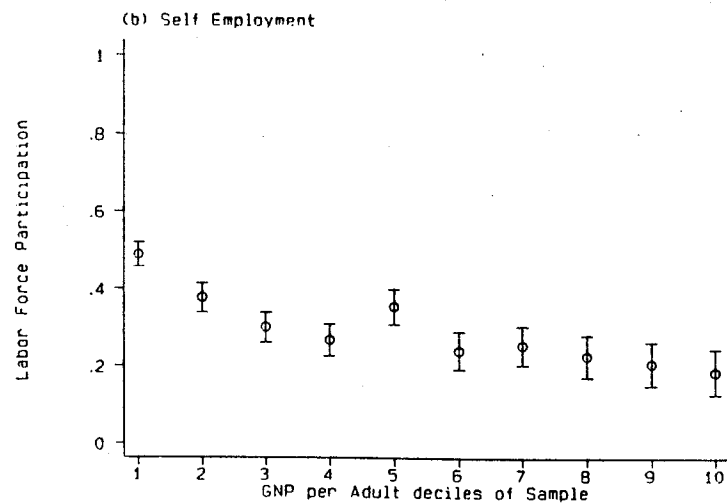
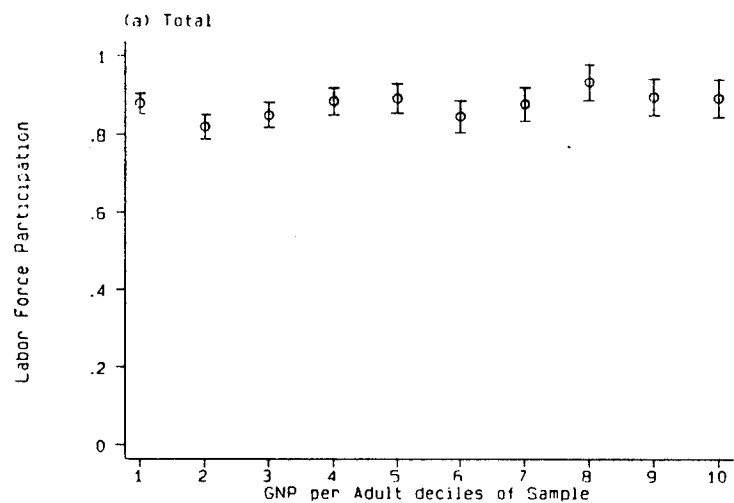


Figure 4: Female Labor Force and Income, Controlling for Adult Male and Female Education and Urbanization

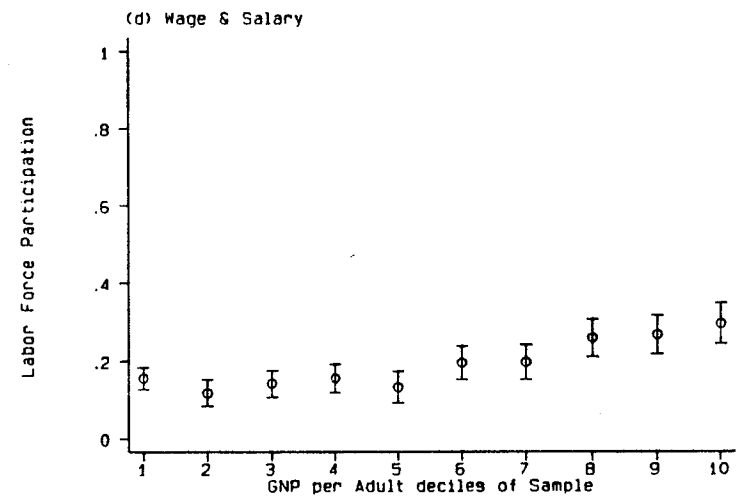
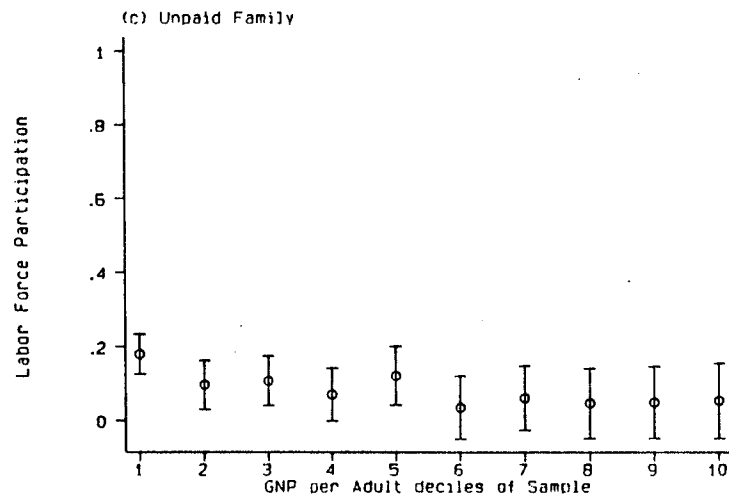
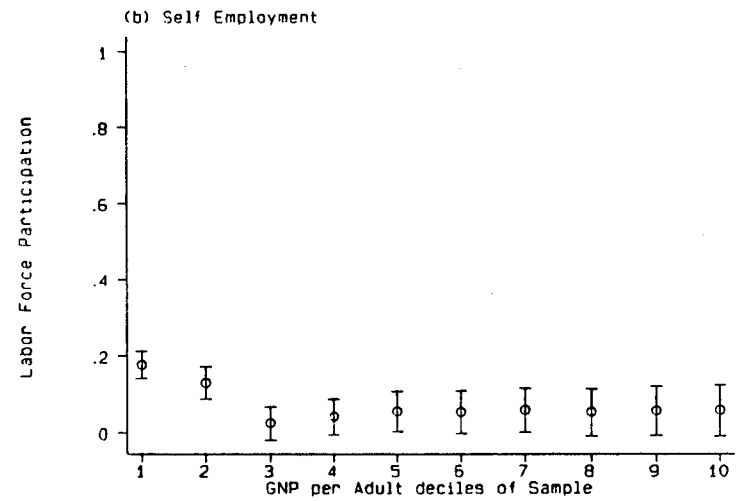
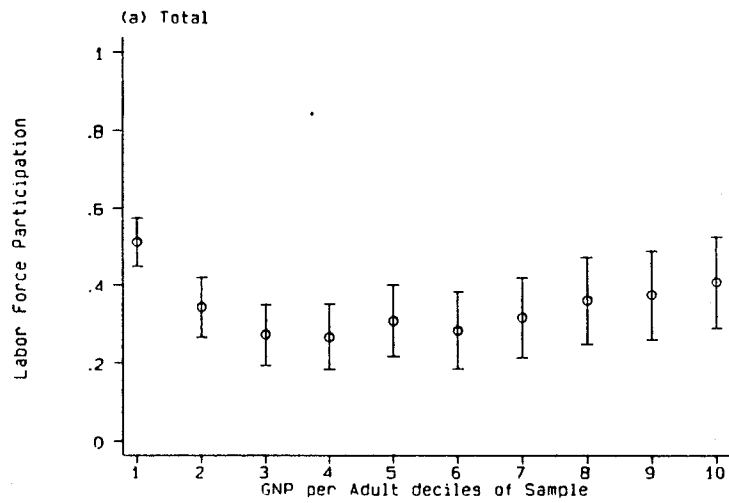


Table 3
Regional Differences in Labor Force Participation Rates, With and Without
Controlling for Income, Education by Sex and Urbanization¹

Participation Dependent Variable:	M A L E				F E M A L E S			
	Family Unpaid	Self Employment	Wage & Salary	Total Labor Force	Family Unpaid	Self Employed	Wage & Salary	Total Labor Force
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
I. Regions:								
Latin America	.035 (2.31)	.131 (4.60)	-.158 (4.80)	.008 (.44)	-.027 (.89)	.028 (1.25)	-.143 (7.26)	-.142 (3.72)
East and South East Asia	.079 (3.78)	.123 (3.18)	-.229 (5.12)	-.028 (1.18)	.121 (2.89)	.038 (1.23)	-.098 (3.68)	.060 (1.17)
South and West Asia	.045 (2.75)	.222 (7.27)	-.248 (6.99)	.020 (1.05)	.078 (2.36)	.042 (1.72)	-.226 (10.7)	-.106 (2.57)
Africa	.066 (3.75)	.170 (5.20)	-.236 (6.20)	.001 (.03)	.076 (2.13)	.103 (3.92)	-.249 (10.9)	-.071 (1.61)
R ²	.135	.297	.329	.022	.111	.092	.543	.127
II. Regions:								
Latin America	-.052 (2.74)	.002 (.09)	-.018 (.52)	-.067 (3.05)	-.134 (3.02)	.020 (.65)	-.038 (1.63)	-.153 (2.93)
East and South East Asia	.018 (.85)	-.041 (1.43)	-.041 (1.07)	-.064 (2.68)	.0814 (1.64)	-.015 (.43)	.007 (.28)	.074 (1.27)
South and West Asia	-.046 (2.09)	-.047 (1.56)	.035 (.88)	-.058 (2.35)	.0025 (.05)	-.025 (.71)	-.052 (1.90)	-.075 (1.23)
Africa	-.044 (1.93)	-.109 (3.49)	.050 (1.22)	-.102 (4.00)	-.005 (.10)	.041 (1.13)	-.057 (2.02)	-.021 (.34)
Enrollment Schooling:								
Female	.0019 (.36)	-.0253 (3.43)	.0167 (1.72)	-.0067 (1.10)	.0158 (1.25)	.0058 (.67)	.0322 (4.80)	.0539 (3.64)
Male	-.0122 (2.06)	.0114 (1.41)	-.0184 (1.73)	-.0192 (2.89)	-.0208 (1.50)	-.0043 (.46)	-.0208 (2.81)	-.0459 (2.82)
Urbanization	-.0006 (1.52)	-.0011 (2.16)	.0017 (2.56)	.0001 (.12)	-.0016 (1.84)	-.0010 (1.72)	-.0002 (.45)	-.0029 (2.77)
R ²	.480	.771	.719	.422	.278	.364	.741	.361

¹In the upper panel the regressions only include an intercept (for high income countries) and the four regional dummy variables reported. In the lower panel the real GNP per adult by deciles (not reported) male and female school enrollments, and urbanization are included.

Participation of women in wage and salary jobs is lower in all low-income regions than in the high-income countries (top panel of Table 3). Self employment is more common among women in Africa, and family unpaid work is more common for women in both portions of Asia and in Africa.

The bottom panel of Table 3 shows estimates of the differences in participation associated with low-income regions, adjusting for male and female school enrollments, urbanization, and the income deciles (not reported for brevity). These adjusted total participation rates for men are 6 to 10 percent lower than expected in all low-income regions. This is in part due to 4-5 percent lower family unpaid participation by men in Latin America, South and West Asia and Africa. Adjusting for human capital, urbanization and national income results in female wage and salary participation rates are 6, 5, and 4 percent lower than in high income countries in Africa, South and West Asia, and Latin America, respectively, but this shortfall is a small fraction of the unadjusted regional difference in panel I. The adjusted total participation rates of women are not statistically significantly different from those in the high income countries, except for Latin America. In this one region, adjusted total female participation remains 15 percent below that which would be expected in high income countries, and most of this shortfall is associated with the 13 percent lower rate of female participation in family unpaid work. One explanation proposed for the deficit of wage workers in

Latin America is the Continent's relatively high levels of minimum wages that raises the cost of labor to firms and fosters a segmented informal labor market (Schultz, 1990a). This explanation is consistent with these estimates for men, but not for women because their lower participation rate can be traced to lower levels of work in the family.

Interregional disparities in women's labor force participation rates are related to interregional differences in the schooling received by women and men. Women's participation rates were observed to be very different between East and South East Asia and South and West Asia. If the higher male and female enrollment rates reported in East and South East Asia were achieved in South and West Asia (Table 1), the regression estimates reported in Table 2 (III) would suggest that three-fourths of the difference between the wage and salary participation rates of women in the two regions, .21 and .08, would be eliminated, holding incomes and urbanization unchanged. Alternatively, more than half of the differences between the total labor force participation rates of women in the two regions, .46 and .29, can be explained merely by these regional differences in enrollment levels. Even if the absolute gender gap in enrollments remained unchanged, and men and women both receive one year of additional schooling, the wage and salary participation rate of women would increase by a fifth in South and West Asia. A noted convergence in educational attainment between women and men is associated with higher national

income in the cross section, and increased income per adult over time (Schultz, 1987). If this narrowing in the gap between the educational attainments of women and men continues with economic development, the regularities observed here in labor force participation imply that this change in educational differentials will be associated with an increase in the proportion of women entering the labor force in low income countries, particularly in wage employment.

VII. Sources of Variation in Participation That Remain Unexplained

Another way to view these empirical patterns is to hypothesize what omitted factors could account for the variation in labor force participation rates that is not explained by sex specific school enrollment levels, urbanization, and income per adult. Although three quarters of the variation in women's and men's wage and salary participation rate is explained by the three economic variables, only a third or less of the variation in the total participation of either men or women has been accounted for (Table 2, panel III). Variation in family participation rates thus appear to be largely outside of the simple economic framework and not adequately explained by broad regional patterns (Table 3). The sign and strength of the correlation between residuals in different participation rate regressions are reported in Table 4 to provide insight into the factors omitted from this analysis.

A first hypothesis is that the residuals reflect "errors in

**Simple Correlations Between Residuals from Regressions
Reported in Table 2**

Dependent Variables:	Females				Males			
	Unpaid Family (1)	Self Employed (2)	Wage & Salary (3)	Total Specified (4)	Unpaid Family (5)	Self Employed (6)	Wage & Salary (7)	Total Specified (8)

Female:

1. Unpaid Family	1.0			
2. Self Employed	-.067	1.0		
3. Wage and Salary	-.199	.012	1.0	
4. Total Specified	.664	.551	.310	1.0

Male:

5. Unpaid Family	.690	-.328	-.356	.188	1.0			
6. Self Employed	.058	.705	-.250	.353	.030	1.0		
7. Wage and Salary	-.376	-.328	.423	-.300	-.447	-.674	1.0	
8. Total Specified	.039	.031	.085	.088	.142	.144	.428	1.0

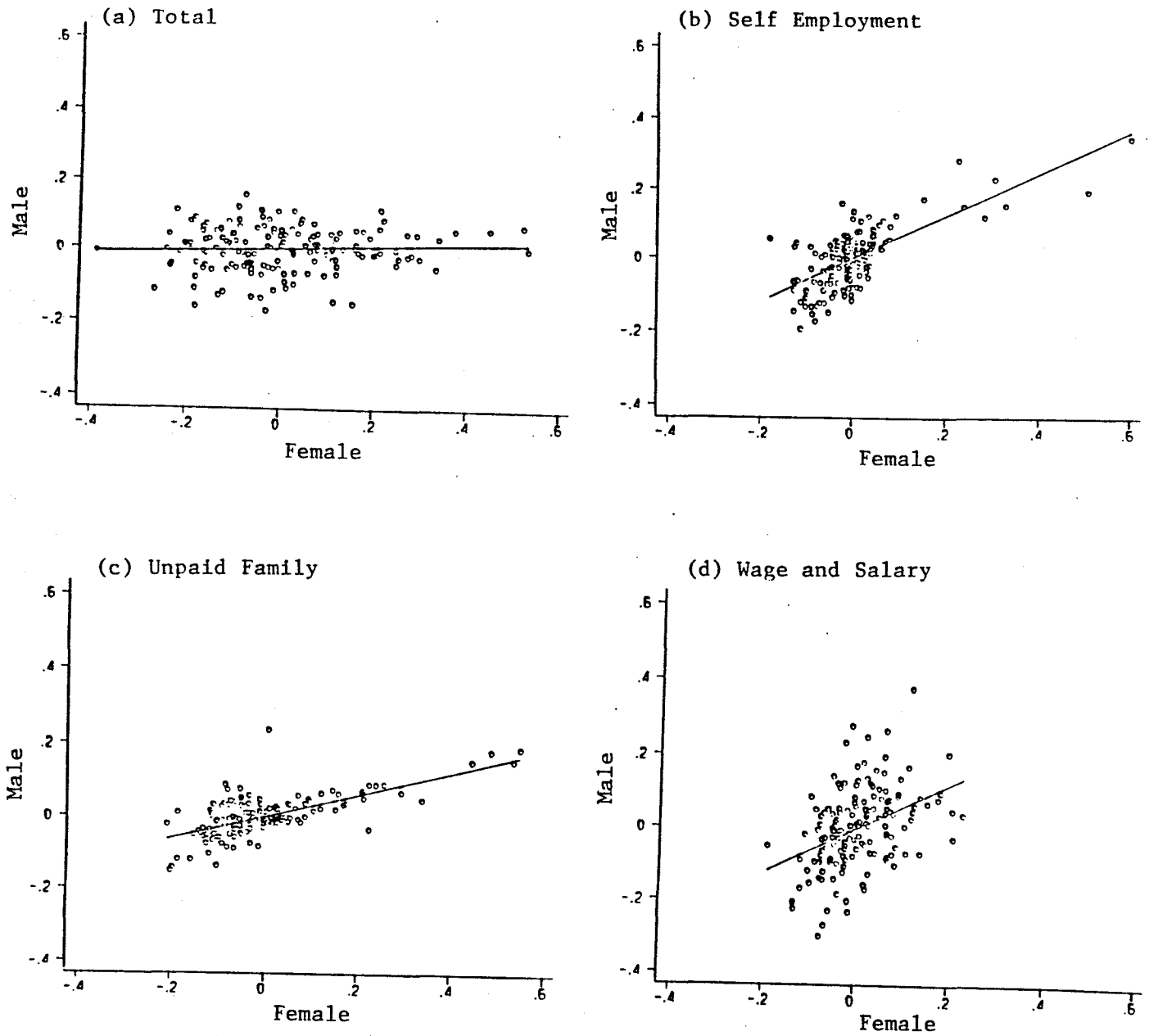
"measurement" due to variation across countries in the protocol of their Censuses that define whether persons are in (or out of) the labor force. As noted earlier, efforts to standardize concepts of economic activity and implement them are inadequate and difficult to unify across cultures and countries at different stages of development. If the restrictiveness of the definition of who is counted in the labor force applied uniformly to men and women, the measured participation rates for men and women should deviate in the same direction, if not by the same amount. This hypothesis is consistent with the large positive correlations between the male and female residuals in the unpaid family worker regressions, .69, the self employed regressions, .71, and even the least ambiguous job class, that of employees, .42. All of these correlations are statistically unlikely to occur at random. The lack of correlation in the residuals from the total participation rate equations for men and women suggest that the national differences in labor force definitions do not exert a common effect on males and females being categorized as being in or out of the labor force, though they may explain across genders the allocation of workers among job types. Another interpretation of this pattern in residuals is that omitted features in the structure of the economy account for more and less demand for labor in families or firms, and these differences in derived demand for workers expresses itself in the job status participation rates of both men and women.

The residuals from the male and female participation equations

are plotted in Figure 5. Economic activity in unpaid work within the family is probably the most difficult to define comparably across countries. Although the sample average family participation rate is similar for men and women, 7 versus 8 percent as shown in Table 1, the regression fit to the residuals shown in Figure 5 (c) indicates that a country with family unpaid worker participation for women that is 3 percent higher than explained is likely to report male family participation only one percent higher. Women are disproportionately in these "marginal" jobs.

With wage and salary work and self employment, where men participate three to four times as often as do women in the overall sample, a country with female participation in either of these job-types that is four percent higher than can be explained tends to report male participation only three percent higher. For whatever reason a nation has unusually high or low participation in a particular type of job, women's participation adjusts by a larger amount than does men's to fill these jobs. This greater elasticity of women's labor force participation than men's within job status categories may be another indicator that women are disproportionately drawn into those sectors or merely that the enumeration of women by category of employment is subject to more cultural and statistical variability. These data unfortunately leave unanswered the question whether the national variation in participation rates by job status is due to different economic and institutional structures that create a demand for workers of this

Figure 5

Plots of Residuals of Male and Female
Participation Regressions

category, or whether conventions determining the measurement of the labor force vary. The lack of correlation between the residuals from the male and female total participation rates shows that disaggregating the labor force by job status categories reveals patterns that would be overlooked at the aggregate level.

A second or auxiliary hypothesis is that the residuals represent the effect of omitted factors in the analysis that increase the probability of individuals in one country participating in one job category and thereby decrease the likelihood of these individuals participating in another job category, or remaining nonemployed. This tendency toward substitution across types of employment is partly an artifact of the requirement that the sum of the three participation rates cannot exceed one. A strong displacement effect would encourage a joint estimation of various employment choices in future work.¹⁶ This displacement effect for men is evident from the correlations among residuals, where self employed and wage and salary residuals are correlated at $-.59$, and self employment and unpaid family residuals are correlated at $-.45$. Such a tendency is less evident for women, for whom the sum of the three participation rates is much less than the one.

¹⁶For example, a multinomial logit model could be estimated based on four mutually exclusive states for either men or women, with the fourth state being nonparticipation. Within this specification of the model, the qualitative effects of education and income were the same as in the linear model reported here, and the derivatives at sample means were similar. It is not clear whether joint estimates for men and women is a suitable next step.

A third hypothesis for the source of the residuals is that they represent unobserved variables affecting jointly male and female specialization within the family and thus perturb participation of men and women in compensating directions. This hypothesis would suggest that there should be substitution of the time of husband and wife in labor force activity within each sector. Suppose for the purposes of illustration that in Muslim cultures women are discouraged from working outside of the home. This could encourage men to work more than the expected amount in wage and salary jobs outside the home to compensate for women working more in unpaid family participation. Residuals from these participation rate equations are, however, negatively correlated (-.38) and not positively as implied by the hypothesis. Alternatively, if in our example women are simply less frequently counted as being in any segment of the labor force in Muslim culture, then the correlation between the residuals from the total participation equation of women and the wage and salary equation for men should be negative, which it is, -.30. The role of unobservables fostering family specialization between men and women is thus rejected, unless nonparticipation of women is treated as an alternative category of activity that complements men's participation in wage and salary employment. The evidence from the observables, specifically the robust inverse association between male education and female wage and salary and total participation, confirms the role of the family in coordinating the labor supply

between women and men and the value of education as a proxy for human capital.

VIII. Projecting the Labor Force

In projecting the growth of the world's labor force, how would these estimates of participation modify standard forecasts based primarily on population projections by age and sex? How important are changes in income, education of women and men, and urbanization as estimated here from a cross section of countries in forecasting future growth in the total labor force? Table 5 reports labor force projections from 1975 to 2000 of the International Labor Office based on publications issued in 1977 and recently updated in 1990. To use the estimates reported in Table 2 for projections, the conditioning variables must first be forecasted.

From 1965 to 1988 the proportion of the world population living in urban areas increased from 34 to 47 percent.¹⁷ Given this pace of urbanization, I have assumed that urbanization will increase by 15 percentage points from 1975 to 2000. Gross domestic product per capita in constant prices increased 1.5 percent per year from 1965 to 1988, and this pace is assumed to continue until the end of the century. Educational enrollments are higher for men than for women. The gender gap between the years of schooling of

¹⁷ It should not be concluded that the overall economic status of women is therefore lower in urban than in rural settings. On the contrary, sex specific mortality, nutrition and school attendance suggests the opposite is common. See Schultz 1981, United Nations, 1988.

men and women tends to be larger for the less developed countries (Schultz, 1987). From 1965 to 1988, male enrollments in primary and secondary school increased by 2.22 years, whereas female enrollments increased more rapidly by 3.00 years. Extrapolating these trends to the end of the century the changes would be 2.5 additional years of male schooling and 3.4 additional years of female schooling.

These extrapolations of trends for education, urbanization and income (using the linearized income effect in Table 2, II) imply changes in participation rates according to our regression framework as reported in Table 5. Male participation rates are forecasted to decline 5.2 percentage points in this 25 year period, while female participation rates increase 1.5 percentage points. The 1977 ILO estimates forecast a somewhat lower male participation rate by the year 2000 than the regression model, but a substantially lower female participation rate, 6.3 percentage points lower. The ILO estimates of last year suggest a higher male participation rate than forecasted by the regression model, but still a somewhat lower rate for females. The ILO projections are not disaggregated by job status, and no other predictions were found to compare with those obtained here for the shifting composition of the labor force between family and firm employment.

Nor is it possible to deduce from the ILO projections how responsive the size of the labor force is to aspects of the development process.

Table 5
Comparison of Labor Force Projects by ILO for the Year 2000
and Those Implied by the Regression Model

	Actual 1975			Projected 2000		
	Total	Men	Women	Total	Men	Women
I. <u>World Totals</u>						
Population Age 15-65	2313	1161	1152	3833	1938	1896
Labor Force Projected						
ILO (1977, Table 5)	1646	1070	576	2546	1668	878
ILO (1990, Table 1, Vol 5)	1646	1070	576	2753	1775	977
Regression Model	1646	1070	576	2679	1682	997
Labor Force Total						
Participation Rate (%)						
ILO (1977, Table 5)	71.2	92.0	50.0	66.4	86.1	46.3
ILO (1990, Table 1, Vol 5)	71.2	92.0	50.0	71.8	91.6	51.5
Regression Model (%)	71.2	92.0	50.0	69.9	86.8	52.6
Difference in participation rates (%)						
Between Regression - ILO (1977)				+4.4	+ .7	+6.3
Between Regression - ILO (1990)				-1.9	-4.8	+1.1
II. <u>Decomposition of Regression Model's Projection of Change in Men's and Women's Labor Force Participation Rates</u>						
Effects of Conditioning Variables in Regression Model Between Year 1975 and 2000						
Schooling Women				+ 0.1	+15.4	
Schooling Men				- 5.8	- 9.2	
Income per Adult (linear)				+ 0.8	+ 2.8	
Urbanization				- 0.3	- 6.4	
Total of Four Effects				- 5.2	+ 2.6	

The bottom panel of Table 5 disaggregates the regression predicted changes in male and female participation into the components that are due to extrapolated change in the four conditioning variables. Increasing education of men has the major impact reducing male participation but also reduces female participation by the cross wage effect emphasized in this paper. Schooling of women, however, has a large effect increasing female participation, whereas urbanization reduces somewhat female participation. But as noted earlier, this reduction occurs largely because women in urban areas work much less frequently as unpaid family workers or as self employed.

The shift in the composition of employment of women and men may be as important from a demographic and economic viewpoint as any movement in overall participation rates. The decline in fertility that has taken place in most parts of the world in this century can be interpreted as another reflection of this fundamental reallocation of time from work in the family to that coordinated in firms. This decline in fertility is also linked to the increase in women's education in most studies, and not surprisingly this demographic transition is proceeding relatively slowly in South and West Asia and is only beginning to emerge in SubSaharan Africa, both regions where women lag behind men in their school enrollment levels (Schultz, 1981, 1987).

IX. Conclusions

This paper has analyzed labor force participation rates for women and men, and the component rates in three types of employment: Unpaid work, self employed, and wage and salary. The goal was to account for variation across countries in these participation rates within a micro-economic framework of individual and family optimizing behavior, using data from all available recent censuses and national surveys.

An explanation of labor force participation appears to require a model that explains the distribution of the population by marital status, and participation rates by sex and marital status. However, the same male and female wage and wealth variables are likely to be microeconomic determinants of both marital status and participation. Moreover, it is not clear what exclusion restrictions would identify statistically the marriage and labor supply equations, even if data were available to estimate such a structural model. Section III outlines, therefore, how the unconditional participation equation estimated here can be interpreted as a reduced form for marriage and labor supply, which still has informative implications for the effect of economic variables: Women's wage opportunities will increase women's participation whereas men's wage opportunities will decrease women's participation.

The labor force working in family enterprise, associated with unpaid family work and self employment, declines relative to that

working for firms, in wage and salary jobs, as factor productivity and the share of production in nonagricultural activities increase. The total participation of men in both family and firm employment does not vary much along either of these dimensions of economic development, but there appears to be a decline in male total participation with increasing education. But this decline in male total participation appears to be associated with youth working less frequently in family enterprise and investing that time in an extended periods of school enrollment. If schooling is treated along with labor force participation as economic activity, it is unclear whether there is evident in these data any decline in male economic activity with development.

The variation in female participation is more substantial across countries than for men and more readily interpreted in a microeconomic framework. For women the same shift in employment from family based production to firm employment occurs with increasing income per adult and urbanization. But in the case of women, the increase in wage and salary employment is larger than the decrease in family and self employment, entailing an increase in total participation as income per adult increases. Women's education, my proxy for women's market wage opportunities, and men's education, a proxy for men's wage opportunities, are strongly associated with women's participation in wage and salary jobs. The positive own education effect is substantially larger than the negative male education effect, suggesting that female employment

in firms increases as education levels of both men and women rise, so long as women do not lose out further in their investments in schooling. Even at the level of the total participation rate for women, including the more difficult to measure family roles of women, the positive female education effect and the negative male education effect remains statistically significant in all variants in the basic regression model.

The entry of women into the labor force, particularly the labor force employed outside of the family, is shown to be governed by the educational skills obtained by women relative to the skills obtained by men. With women gradually catching up to men in their educational attainments in the last thirty years (Schultz, 1987), we can expect to see women playing an increasing role in the labor force across countries.

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Appendix Table A-1

Alternative Specifications of the Female Wage
and Salary Participation Equation

Explanatory Variables (means):	<u>Female Wage and Salary Participation</u>			
	(1)	(2)	(3)	(4)
Female Education (7.65)	.0255 (2.61)	-.00031 (.01)	.0376 (4.01)	.0052 (.25)
Male Education (8.60)	-.0369 (4.72)	.0226 (.72)	-.0283 (3.87)	.0342 (1.19)
Interaction (71.8)	.00224 (2.45)	-.00938 (1.48)	.00050 (.56)	-.00714 (1.22)
Female Education Squared (67.2)	-	.00946 (3.13)	-	.00736 (2.62)
Male Education Squared (79.1)	-	.00027 (.07)	-	-.00137 (.38)
Urbanization (48.3)	.00117 (3.14)	.00118 (3.36)	-.00007 (.17)	.00003 (.08)
Income per Adult (1.82) in 1970 \$1000	-	-	.0311 (5.59)	.0286 (5.37)
Intercept	.0971 (2.08)	-.0406 (.61)	.0651 (1.51)	-.0688 (1.12)
R ²	.652	.693	.710	.742
Sum Squared Residuals	1.0066	.8862	.8367	.7450
Degrees of Freedom	155	153	154	152

Appendix Table A-2

**Effect of a Unit Change in Explanatory Variables
On Female Wage and Salary Participation,
for Alternation Model Specifications**

Variations in Model Specification:	<u>Derivatives With Respect to Explanatory Variable</u>			
	<u>Schooling Years</u>		Urbanization (Percent)	Income per Adult (Thousands of 1970 \$)
	Female	Male		
Without Income Control				
Linear	.0459	-.0257	.0012	-
Linear and Interaction in Educations	.0448	-.0198	.0012	-
Full Quadratic	.0637	-.0446	.0012	-
Within Linear Control for Income				
Linear	.0412	-.0258	-.0001	.0322
Linear and Interaction in Educations	.0410	-.0245	-.0001	.0311
Full Quadratic	.0564	-.0484	.00003	.0286

Source: Table 2 and A-1