FACULTY WORKING PAPER 92-0158

A Dynamic Labor Supply Model for a Developing Country: Consequences for Tax Policy

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August 1992

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DRAFT: NOT FOR QUOTATION

A DYNAMIC LABOR SUPPLY MODEL FOR A DEVELOPING COUNTRY: CONSEQUENCES FOR TAX POLICY

By Sri Mulyani Indrawati and Jane H. Leuthold

August, 1992

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Abstract

Having good estimates of the sensitivity of labor supply to a change in the wage is important for tax policy in developing economies. This paper provides estimates of the intertemporal labor supply elasticities for male and female employed taxpayers in a representative developing economy, Indonesia. The approach uses consumption to proxy for the unobserved marginal utility of wealth in a dynamic labor supply model, thus allowing the use of cross-sectional household data to estimate the model. The results indicate that male labor supply in Indonesia is more wage sensitive than in the typical developed economy, but that the estimated elasticity of female labor supply for Indonesia is consistent with developed country elasticity estimates for females. Further, the study found that the labor supply of Indonesian women tends to be more wage sensitive than that of Indonesian men, a result common to developed economies.

A DYNAMIC LABOR SUPPLY MODEL FOR A DEVELOPING COUNTRY: CONSEQUENCES FOR TAX POLICY

I. Introduction

The study of labor supply behavior in developing economies is in its infancy, in part because adequate household data have not been available in developing economies for the estimation of labor supply models and, in part, because the problems of surplus labor and underemployment have overwhelmed the study of developing economy labor markets. The first of these problems, inadequate data, is beginning to be solved in many developing countries as efforts have been directed fruitfully toward improved data collection. The second problem, poorly functioning labor markets, has been mainly approached from the demand side, based on the premise that unemployment problems in developing economies are more of a demand-side than a supply-side problem.[1]

This study focusses on the labor supply of urban workers with at least a junior high education. This was done in part because this group most closely corresponds to the taxpaying population and in part to minimize demand-side problems. The objective of the study is to estimate the intertemporal substitution elasticity of labor supply for a change in the wage rate for male and female workers in a representative developing economy. The intertemporal substitution elasticity measures the effect on labor supply of a change in the wage holding full income and the marginal utility of wealth constant. This elasticity is important for policy purposes because it is the intertemporal substitution elasticity that determines the efficiency and equity of policy changes.

The country of study is Indonesia, fifth largest country in the world, with its population spread across 13,667 islands. Indonesia, with a per-capita income of U.S. $430 in 1989, is a middle-income developing economy. In 1983, Indonesia enacted a major reform of its individual income tax, simplifying the definition of income, reducing the number of tax brackets, and lowering tax rates. Within one year, the number of individual taxpayers increased by 85 percent. It is the labor supply of the taxpaying population that is the target of this study.

This study takes a life-cycle perspective to the study of labor supply. Earlier static studies focus on the relationship between current labor supply and the current (disposable) wage and nonwork income. Dynamic models permit the study of the effect on labor supply of out-of-period wage and tax changes, treating nonwork income as an endogenously determined flow from savings rather than as an exogenously determined magnitude. To the extent that saving and labor supply decisions are made simultaneously to satisfy the objectives of the household, dynamic labor supply models give a more complete and accurate picture of household behavior than do the older static models.

The estimation follows an approach suggested by MaCurdy (1983) and adopted by Altonji (1986) permitting the use of cross-section household data to estimate a dynamic labor supply model. The technique requires information on household consumption expenditures, as well as data on labor supplies, wage rates, and household characteristics. These data are conveniently available for Indonesia in two large household data sets for 1985 and 1987. By combining data from these data sets, we are able to estimate the intertemporal substitution elasticities for male and female employed taxpayers in Indonesia. The results suggest that intertemporal substitution elasticities tend to be slightly higher than for developed economies, but that patterns of male-female labor supply response are similar to patterns uncovered for workers in developed economies.

The organization of this paper is as follows: section II contains a brief review of the literature on life-cycle labor supply while section III presents the theoretical model and estimation approach. Section IV covers the data selection problem and the measurement of variables. Section V presents the results while section VI evaluates the results and discusses policy implications.

II. Studies of Life-Cycle Labor Supply

Life-cycle labor supply functions are derived from the dynamic optimization of lifetime utility functions subject to a lifetime budget constraint. In the typical life-cycle labor supply study, individuals at time t are assumed to maximize a lifetime utility function that depends on utility in each period and on the individual's rate of time preference, ρ:

$$(2.1) \qquad \max U = \int_0^T e^{-\rho t} U_t \, dt$$

Utility at time t, U_t, is a concave function of consumption in time t, C_t, and leisure in time t, L_t. The consumer starts life with initial assets A_0 and expects to leave no bequest. Hence, over the lifetime, choices must be made to satisfy the lifetime budget constraint:

(2.2) $$A_0 = \int_0^T e^{-rt} [C_t - W_t H_t] \, dt$$

where r is the rate of interest, W_t is the wage at time t, and H_t, equal to 1 - L_t, is the fraction of time devoted to work.

Under the assumption of an interior solution, conditions for an optimum are satisfaction of the lifetime budget constraint, (2.2) and:

(2.3a) $$U_C = \lambda_t \, e^{\rho t}$$

(2.3b) $$U_L = W_t \, \lambda_t \, e^{\rho t}$$

(2.3c) $$\lambda_t = \lambda_0 \, e^{-rt}$$

where λ_t is the marginal utility of wealth in period t. Using (2.3c) to eliminate λ_t, equations (2.3a) and (2.3b) can be solved for consumption and labor to yield:

(2.4a) $$C_t = C[\lambda_0 \, e^{(\rho - r)t}, \, v_{ct}]$$

(2.4b) $$H_t = H[W_t, \, \lambda_0 \, e^{(\rho - r)t}, \, v_{ht}]$$

where v_{ct} and v_{ht} are individual characteristics that affect consumption and labor supply, respectively.

The main problem in estimating the life-cycle labor supply function (2.4b) is λ_0, which is unobserved. While the value of λ_0 is theoretically possible to compute through substitution of (2.4a) and (2.4b) into the lifetime budget constraint (2.2), the complicated nature of the equations usually make solution for λ_0 impossible as a practical matter. Hence, λ_0, which is a function of initial assets, lifetime wage rates, rates of time preference, the interest rate, and consumer preferences, must either be estimated or eliminated from the labor supply equation.

Various approaches to the estimation of λ_0 are followed. Since λ_0 is correlated with exogenous wage and wealth variables, treating λ_0 as a random factor would bias the estimated parameters of the labor supply function. Hence, most studies avoid this bias by treating λ_0 as an individual fixed effect, because λ_0 depends only on information outside the current period. While λ_0 varies across individuals, it does not vary over time.

When panel data (cross-section data over time) are available, they are useful for estimating the life-cycle labor supply function. With panel data, λ_0 can be eliminated from the estimation by taking first differences. Hence, with the elimination of λ_0, life-cycle labor supply depends only on current variables. Alternatively, when multi-year panels are available, it is possible to use a two-stage approach in which λ_0 is estimated in the first-stage as a fixed effect and used as a regressor on lifetime variable in the second stage. This approach has been followed in many studies of developed economy labor supply.[2]

Panel data are infrequently available in developing economies, making the above approach impossible. Even when panel data are available, they suffer from problems of attrition and measurement error that may be exacerbated by first-differencing variables.[3] Hence, to estimate life-cycle labor supply in a developing country, simple cross-section data must usually be used.

Two techniques are available for estimation of dynamic labor supply models with cross-section data: the cohort approach and the consumption approach. The cohort approach, pioneered by Ghez and Becker (1975) and Smith (1977), involves manipulation of the cross-section data to create synthetic cohorts to represent an individual lifetime path. While this approach permits estimation of the life-cycle labor supply function of each representative individual, it encounters two serious disadvantages. First is the existence of cohort bias that arises because the mean of each cohort variable is calculated using the number of members of each age group as its denominator. Since the proportion of the population at work is usually low for both young and old ages, the denominator values are also low at those two age groups. This implies that the mean values of young and old cohorts may not represent true population values. While the problem of cohort bias can be addressed by using synthetic cohorts constructed in several different calendar years, to do so requires panel data.[4]

Second, the cohort approach implicitly assumes that in n years, an individual of age j in 1990 will be in a situation identical to an individual of age n+j in 1990. Consequently, the synthetic cohort data confound the effects of time/age with the effects of "vintage."[5] To avoid these problems, this study uses the consumption approach, proposed by MaCurdy (1983) and Altonji (1986), to estimate the life-cycle labor supply function with cross-section data.

The consumption approach uses cross-section consumption data to proxy for the unobserved λ_0. Solving for λ_0 in the consumption equation (2.4a) and substituting into the labor supply equation (2.4b) gives labor supply as a function of consumption, the current wage, and current period household characteristics:

(2.5) $$H_t = H[C_t, W_t, v_{ct}, v_{ht}]$$

Since consumption is endogenous it will be correlated with the error term and must be instrumented in the estimation. A two-stage approach is required, first relating consumption to lifetime variables such as lifetime wages, wealth, and education level, and then regressing labor supply on predicted consumption, the current wage, and household characteristics. An advantage of this approach is that it does not need strong assumptions about expectations, such as perfect foresight or rational expectations, and it is not sensitive to the assumption of a perfect credit market.[6]

The consumption approach is not without problems, however. One is the problem that plagues all labor supply studies, measurement error. This is particularly acute since wage rates are not generally available in cross-section data and must be imputed by dividing earnings by hours worked. Secondly, the consumption approach requires data on consumer expenditures, information that is not usually available in cross-section data sets that also contain labor supply information. Altonji (1986) had to be content with using household food expenditures as a proxy for consumption because total household expenditures were not available in his data set. We are particularly fortunate with this study to have total household expenditures available in the Indonesian data set.

The life-cycle model and estimation technique are further detailed in the next section.

III. Methodology

The model assumes that the individual utility function in time t has the form:

$$(3.1) \qquad U_t = \left(\frac{\alpha}{1+\alpha}\right) C_t^{1+\frac{1}{\alpha}} + \left(\frac{\beta}{1+\beta}\right) b\, H_t^{1+\frac{1}{\beta}}$$

where α and β are time invariant parameters common across individuals. Strict concavity of the utility function requires that $\alpha < 0$ and $\beta > 0$.

Now equations (2.4a) and (2.4b) can be written explicitly as:

$$(3.2a) \qquad C_t = \lambda_0^{\alpha}\, e^{\alpha(\rho-r)t}$$

$$(3.2b) \qquad H_t = \lambda_0^{\beta}\, e^{\beta(\rho-r)t}\, b^{-\beta}\, W_t^{\beta}$$

As explained above, (3.2b) cannot be estimated as it stands because λ_0 is unobserved. However, λ_0 can be eliminated from (3.2b) by solving for λ_0 in (3.2a) and substituting into (3.2b). After taking logs, this gives:

$$(3.3) \qquad \ln H_t = (\beta/\alpha) \ln C_t - \beta \ln b + \beta \ln W_t$$

Assuming that the utility parameter b is a function of individual characteristics, ln b can be written:

$$(3.4) \qquad \ln b = \gamma_0 + \gamma_1 X_i + \epsilon_i$$

where γ_0 and γ_1 are constants, X_i is a vector of characteristics such as age, number of children, and education level, and ϵ_i is a stochastic disturbance. Substituting into (3.3) gives:

$$(3.5) \qquad \ln H_t = a_0 + a_1 \ln C_t + a_2 \ln W_t + a_3 X_i + \epsilon_i$$

where $a_0 = -\beta\gamma_0$, $a_1 = \beta/\alpha$, $a_2 = \beta$, and $a_3 = -\beta\gamma_1$. Equation (3.5) is our estimation equation.

Several estimation problems must be dealt with. First, since consumption is endogenous and correlated with the disturbance, it must be instrumented by regressing it on variables that are related to wealth and to the distribution of lifetime wages. Then, actual consumption is replaced by predicted consumption in equation (3.5).

The wage variable, which captures the tax effect, must likewise be modified to incorporate taxation. Since the Indonesian income tax treats each adult in the family as an individual for tax purposes, and since the tax is a bracket tax, the wage is multiplied by $(1-\theta)$ where θ is the bracket tax rate. Hence, W_t is replaced by $(1-\theta)w_t$ in equation (3.5) where w_t is the nominal pre-tax wage rate. The bracket nature of the tax is otherwise disregarded in the estimation of the labor supply function even though it introduces kinks into the budget constraint and causes possible bias in the estimation. Disregarding the kinks is justified in this case because there are only three brackets in the Indonesian income tax, and movement between brackets in not likely to cause an estimation problem.[7]

Because taxes depend on hours worked, and because the wage is especially prone to measurement error, the wage is also instrumented in the estimation. This is done by regressing the wage on wage determination variables such as experience (proxied by age) and education level. The wage is then imputed to each individual.

Finally, we must deal with the problem of selection bias for the females in our sample. Excluding females who do not work outside the home from our estimation, without making any correction, would bias the coefficients since less than half the females in our sample work outside the home. We addressed this problem by using the Heckman (1979) technique. First, a probabilistic model over all females in the sample was estimated to generate the Mill's ratio.[8] This ratio was then used as a regressor in the second stage to correct for selection bias.

Problems of measurement are covered in the next section, together with a description of the data.

IV. Data and Measurement of Variables

The data are contained in two cross-section data sets from Indonesia, SUPAS 1985 and SAKERNAS 1987.[9] Both data sets are constructed from surveys conducted by the Indonesian Central Bureau of Statistics. The surveys cover over 100,000 households or more than 600,000 individuals from 27 provinces in Indonesia. Most of the data for this study come from the SUPAS 1985 data set. As explained below, only the wage rate variable, which was not available from the SUPAS 1985 data set, was drawn from the SAKERNAS 1987 data set.

Hours worked were measured as the number of hours worked during the week of the survey. They combine hours worked on the main job and on additional jobs. Number of children and dependents was inferred from using information on the relationship between household members and the head of the household. Dependents include extended family members for whom the head of the household bears responsibility, such as parents, parents-in-law, grandchildren, etc. Since we selected only married households with spouse present, it was not necessary to include the spouse in the count of dependents.

Consumption was measured by average household expenditure. This includes both food and non-food expenditure. Consumption was instrumented using variables related to individual wealth and the distribution of lifetime wages as instruments. The results of this estimation are reported in Table 1.

Educational attainment was categorized into four levels, primary school or lower (including those without formal education), junior high, senior high, and college/university (both degree and non-degree types). Junior high and senior high are divided into two categories, general and vocational schools. Since we were most concerned with taxpaying households, those with the lowest education level (primary school or lower) were excluded from the sample.

Wealth was represented by two variables, building and floor/land sizes. The data set also contained information on the quality of the building and floor, and on the ownership status of the house and land. Other variables included age, marital status, employment status, type of industry, and household location (provinces, sub-provinces, and rural or urban areas).

Since the wage rate was not available in the SUPAS 1985 data set, it was imputed using the SAKERNAS 1987 data set. The latter data set contains individual employment information such as weekly hours worked and total weekly earnings. Following standard procedure in labor supply analysis, total weekly earnings were divided by weekly hours worked to obtain an estimate of the wage rate. The wage rate was then regressed on a set of variables common to the two data sets (age, education, employment status, work sector, and region) and the results (see Table 2) were used to impute a wage rate to each person. Male and female wage rates were imputed separately. Adjustment for inflation was not necessary because everyone in the cross-section sample faced the same inflation rate. Hence, inflation effects were captured in the constant.

The bracket tax rate for each individual likewise had to be calculated. It was assumed that each person has only one income source, earnings, and that each person claims the tax free income limit. The 1984 tax law was then applied, assigning tax rates of 15%, 25%, and 35% to individuals as appropriate. The imputed wage rate was then multiplied by one minus the bracket tax rate.

A subsample of the larger data set was then selected with the intention of including only those households that were most likely to be taxpaying. Applying the following selection rules, a sample of 9,687 households was drawn:

1. married households with both spouse present;
2. households residing in urban areas;
3. households with heads between 18 and 55 years of age;
4. individuals who work at least 10 hours per week;
5. individuals with education levels of junior high or above.

The age restriction was applied to eliminate retirement decisions at older ages and education decisions at younger ages. The minimum working hours were set to eliminate outlier cases. Almost all household heads were male (only 50 were female). Applying the restrictions, 9,632 male workers and 1,840 female workers were chosen. The estimation results are described in the next section.

V. Estimation Results

Equation (3.5) was estimated for all individuals in the subsample. First the results for males are presented, then the results for females.

Results for Males

The results for males are reported in Table 3. A .60 random sample was selected to reduce computation costs. This left 5,969 males in the subsample. The fit of the equation, as measured by the R^2 statistic, was consistent with Altonji's (1986) results for U.S. data.[10]

The coefficients of the consumption and wage variables are negative and positive, respectively, as predicted by the theory. The wage coefficient provides an estimate of the intertemporal substitution elasticity. For males, this turns out to be .845.

The number of children has a positive and significant effect on the father's labor supply. Children increase the financial burden on the father. The number of dependents, on the other hand, does not appear to have a significant impact. For the head of household, dependents are both a source of outside income if they work and an income burden if they do not work. These opposing effects are not easy to sort out in aggregate.

The coefficient of age is negative suggesting that labor supply decreases as male workers grow older. Since the coefficient of age squared (Age^2) is not significantly different from zero, the age effect is constant with age.

Education is measured by a series of dummy variables. ED1 indicates college level, ED2 general high school, ED3 vocational high school, and ED4 is for vocational junior high. General junior high is the omitted category. The negative and significant coefficients of ED1 through ED3 and the positive and significant coefficient for ED4 suggest that males hours worked decrease with education level in Indonesia. Indonesian workers with high educational levels usually work in the formal sectors at regular time schedules. On the other hand, most workers with low educational levels work in the informal sectors, which are characterized by irregular time schedules. These workers commonly work overtime, or have secondary jobs to earn extra income. Hence, their hours of work tend to be high.

Variables EM1 and EM2 are employment status variables representing self-employed workers without employees and self-employed workers with employees, respectively. The omitted employment classification is employee. Both dummy variables are significant and positive, suggesting that self-employed males work longer on average than employees.

Regional dummy variables represent Sumatra, Java, Nusa Tengara and Bali, Kalimantan, and Sulawesi. The omitted regions are Maluku and Irian Jaya. The results suggest that males in Java, Sumatra, and Sulawesi work longer hours than those in Maluku and Irian Jaya. The higher level of industrialization in the former regions may explain the longer working hours.

Results for Females

In order to address the sample selection biased introduced by selecting only females who work outside the home, a probabilistic model was first estimated and used to generate the Mill's ratio. The Mill's ratio was then used as a regressor in the labor supply equation to correct for selection bias.

The results of the probit estimation for females appear in Table 4. The Maddala R^2 indicates a good fit for the probit regression.[11] As with the male regression, sample size was reduced by a random sampling. The results indicate that the probability of the female's labor force participation is negatively related to the number of her children, but positively related to the number of extended family members in the household. Children are demanding of the mother's time and their presence reduces her probability of working. However, the presence of extended family members provide the wife with a possible source of child care help, encouraging her labor force participation.

Age has a positive and significant effect on the labor force participation of wives, but the magnitude of the effect decreases with age. School 9-12 and 13-18 are included as dummy variables and found to have a positive effect on female labor force participation.

The second-stage results for female labor supply are shown in Table 5. The coefficient of the Mill's ratio was not significantly different than zero, suggesting the sample selection bias was probably not a problem with this sample. The fit of the regression, as measured by the R^2, was acceptable for cross-section data.

The coefficient of the female wage variable measures the intertemporal substitution elasticity for females, in this case .896, slightly larger than for males. The coefficient of consumption is negative and significant as expected by theory.

The husband's wage was also included in this regression to pick up family influences. The coefficient was negative and significant indicating wives with higher paid husbands work fewer hours than those with less highly paid husbands.

The number of children has a positive but insignificant effect on the mother's hours worked (recall that the effect on labor force participation was negative) perhaps explained by the additional financial burden children place on the family. Once the wife decides to work outside the home, she works longer hours the more children she has. Number of dependents, surprisingly, has a negative effect on hours worked. An opposite effect was expected.

In contrast with males, years of schooling have a positive effect on the hours worked of females. Better educated women probably get better jobs in the formal sector with more regular hours.

VI. Conclusions

The object of this study was to estimate the intertemporal substitution elasticities of labor supply for males and females in a representative developing economy, Indonesia. For males, we estimated an intertemporal substitution elasticity of .845, and for females, .896. Killingsworth (1983) and Pencavel (1986) provide lists of the estimated intertemporal elasticities from studies of developed countries. The elasticities rate from .06 to .40 for males, and from .41 to 1.0 for females. Our estimate for males was above the range of estimates for developed economies, but our estimate for females was consistent with developed country estimates. We confirmed for Indonesia the result common to developed economies, that the elasticity for females tends to be larger than the elasticity for males.

Very few studies have attempted to estimate labor supply elasticities for developing economies. Bardhan (1984) estimated a static labor supply model for a rural agrarian economy (West Bengal). His wage rate coefficients ranged from .90 to 1.6 for all farm workers, and from 1.2 to 1.3 for adult male workers. Rosenzweig (1984), in a study of labor supply in rural India, finds that the wages of husbands negatively affect female labor supply (consistent with our findings) and that females exhibit a positively sloped labor supply function.[12] He also found that for males, higher schooling levels associated with lower labor supplies (again, consistent with our findings).

The only study other than this one using modern econometric techniques to study Indonesian labor supply was by Rochjadi (1991). Rochjadi estimated a static labor supply model using an earlier version of our data set. He found for males, the compensated elasticity of substitution of labor supply with respect to the wage ranges from .33 to .58. Our results, using newer data and a dynamic labor supply model, turned up somewhat larger elasticities.

The only other known life-cycle model of labor supply in a developing country was by Blau (1985). The focus of his study was on the determinants of market wage rates and self-employment earnings of married couples in Malaysia. He uses a "panel" of data that combines cross-section and time-series data. Using a two stage least squares estimation approach, he finds an intertemporal elasticity of substitution of annual hours worked with respect to the wage rate for husbands ranging from .17 to .33, substantially below ours.

One use that is sometimes made of the substitution elasticity is to measure the marginal excess burden taxation. Marginal excess burden is the welfare loss associated with increasing the tax by one currency unit. It provides a measure of the efficiency cost of the tax. Following Browning (1987), the marginal welfare cost is formulated as follows:

$$(6.1) \qquad MWC=\left(\frac{\theta + .5\ d\theta}{1-\theta}\right) \epsilon \frac{d\theta}{dt}$$

where MWC is the welfare loss per dollar of tax revenue, θ is the marginal (bracket) tax rate, $d\theta$ is the change in the marginal tax rate, $\frac{d\theta}{dt}$ measures the progressivity of the tax structure, and ϵ is the compensated labor supply elasticity. Applying the results of this study for ϵ, the welfare loss per dollar of income tax revenue in Indonesia is between 15 and 31 cents.[13] This turns out to be slightly lower than Browning's (1987) preferred estimates for the marginal welfare cost of a labor income tax in the U.S., 32 to 47 cents.[14]

The substitution elasticity is also important for assessing the distributional consequences of tax policy. Tax shifting is a consequence of the underlying elasticity of substitution. Often, tax policy models for developing economies assume labor supply elasticities similar to estimated elasticities for developed economies. For example, Dahl and Mitra (1991) employ a labor elasticity of 0.50 for their "central case" model of Bangladesh, but then go on to show how sensitive their results are to changes in this assumption. The results of the present study indicate that labor supply elasticities in the 0.80 to 0.90 range are most appropriate for studies of tax incidence in Indonesia.

This study attempts to provide a better understanding of labor supply in developing countries. It was made possible by the existence of an excellent data set. Hopefully, evidence from other countries will soon contribute to this beginning. Panel data for developing economies, soon to become available in Indonesia, offer even more possibilities for the estimation of dynamic labor supply models for developing countries. Rational tax policy depends critically on good econometric estimates of relevant elasticities. Too long have developing countries had to rely on estimates based on developed country data. It is time this econometric monopoly ended.

NOTES

[1]Gary Fields (1987), p. 265.

[2]See particularly Heckman and MaCurdy (1980) and MaCurdy (1981).

[3]Pencavel (1986).

[4]Browning, Deaton and Irish (1983).

[5]Killingsworth (1983), p. 284.

[6]See Altonji (1986), p. S186.

[7]Taking the bracket nature of the income tax into account would complicate the estimation procedure because knowledge of the entire preference structure would be required to do so. See Hausman (1981).

[8]The Mill's ratio is the ratio of the tail area to the ordinate of a standard normal distribution. This ratio is a monotone decreasing function of the probability of sample selection. Heckman (1979).

[9]Professor Walter W. McMahon, with permission from Dr. Boediono, Head of the Center for Informatics of the Indonesian Ministry of Education and Culture, made the SAKERNAS 1987 data set available for the study. The SUPAS 1985 data set was made available by Dr. Aris Ananta from the Demographic Research Institute of the Department of Economics, University of Indonesia.

[10]Altonji (1986), p. S203.

[11]Maddala (1983, Eq. 2.44).

[12]Khandker (1988) found similar results for women in rural Bangladesh.

[13]Following Browning, $d\theta$ is set equal to .01. $d\theta/dt$ is allowed to range between 1 and 2.

[14]This is explained by the fact that while Browning (1987) uses a lower compensated elasticity in his formula, he applies a higher marginal tax rate for U.S. taxes.

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Table 1
Regression of ln C_t on Explanatory Variables
(t-ratios in parenthesis)

Explanatory Variables	Coefficients
Intercept	8.973[b] (2.175)
ln Wage	.610[a] (10.536)
Age	.023[b] (2.175)
Age^2	-.0003[b] (-2.196)
Wife's schooling	.032[a] (6.925)
Number of dependents	.065[a] (8.221)
Number of children	.004 (0.405)
Floor size	.002[a] (13.228)
Building size	.000 (0.632)
Adjusted R^2	.415
F-Value	83.663
Number of observations	2,978

[a] Significant at the .01 level.
[b] Significant at the .05 level.

Table 2
Wage Regressions for Males and Females
(t-ratios in parenthesis)

Explanatory Variables	Males	Females
Intercept	4.326[a]	4.198[a]
	(18.111)	(13.522)
Age	.075[a]	.090[a]
	(5.554)	(4.866)
Age2	-.0005[a]	-.0008[a]
	(-2.796)	(-2.855)
PROV1	.047	.042
	(1.235)	(.702)
PROV2	.109[b]	
		(2.167)
PROV3	.142[b]	.047
	(2.511)	(.673)
PROV4	.101	.176[b]
	(.304)	(2.141)
PROV5		.130[b]
		(-1.979)
ED1	.321[a]	.259[a]
	(7.147)	(4.387)
ED2	-.014	-.176[a]
	(-.351)	(-3.363)
ED3	-.302[a]	
	(-7.447)	
ED4	-.321[a]	-.563[a]
	(-5.399)	(-8.013)
ED5		.633[a]
		(-5.028)
Agriculture worker	-.114	-.619
	(-.860)	(-1.492)
Manufacturing worker	.010[c]	.230[b]
	(1.811)	(2.395)

Table 2 Continued

Explanatory Variables	Males	Females
Service worker	-.018	-.035
	(-.253)	(-.388)
Construction worker	.062	.031
	(1.463)	(0.512)
Adjusted R^2	.403	.344
F-Value	59.490	31.203
N Observations	5969	805

[a] Significant at the .01 level.
[b] Significant at the .05 level.
[c] Significant at the .10 level.

Table 3

2SLS Regression of Male Labor Supply on Explanatory Variables
(t-ratios in parenthesis)

Explanatory Variables	Coefficients
Intercept	-1.735[a] (-21.270)
ln Wage	.845[a] (125.408)
ln Consumption	-.123[a] (-9.633)
Number of children	.009[a] (5.002)
Number of dependents	.0003 (.163)
Age	-.032[a] (-15.926)
Age^2	.00002 (1.093)
ED1	-.271[a] (-41.947)
ED2	-.047[a] (-9.535)
ED3	-.031[a] (-7.538)
ED4	.130[a] (14.861)
EM1	.072[a] (13.926)
EM2	.081[a] (13.512)
Sumatra	.049[a] (5.784)

Table 3 Continued

Explanatory Variables	Coefficients
Java	.106[a]
	(13.109)
Bali	.011
	(1.110)
Kalimantan	-.045[a]
	(-4.784)
Sulwesi	.041[a]
	(4.363)
R^2	.094
Number of observations	5,969

[a] Significant at the .01 level.

Table 4
Probit Model of Labor Force Participation for Females
(t-ratios in parenthesis)

Explanatory Variables	Coefficients
Intercept	-1.185[a]
	(-13.582)
Age	.018[a]
	(12.880)
Age^2	-.0002[a]
	(-10.030)
Number of children	-.021[a]
	(-10.371)
Number of dependents	.117[a]
	(8.581)
School 9-12	.289[a]
	(4.085)
School 13-18	1.415[a]
	(18.839)
Maddala R^2	.309
Number of observations	3,000

[a] Significant at the .01 level.

Table 5
Regression of Female Labor Supply on Explanatory Variables
(t-ratios in parenthesis)

Explanatory Variables	Coefficients
Intercept	1.438[a] (5.947)
ln Wage (female)	.896[a] (4.716)
ln Wage (male)	-.565[b] (-2.565)
ln Consumption	-.0003[a] (-3.943)
Number of children	.004 (.981)
Number of dependents	-.038[c] (-1.933)
Age	.078 (1.066)
School	.029[b] (2.420)
Mill's ratio	.460[c] (1.839)
R^2	.112
Number of observations	1,658

[a] Significant at the .01 level.
[b] Significant at the .05 level.
[c] Significant at the .10 level.