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A REANALYSIS OF THE INTERNATIONAL RELATIONSHIP BETWEEN INCOME AND LABOR SUPPLY

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ABSTRACT

International data for approximately 40 countries and 20 years are used to test hypotheses about the labor supply function. The relations between labor supply and various economic and demographic variables, like wage rates, income, age, and fertility are important to understand for many predictive and policy purposes in labor market analysis. A general motivation for this study is the need to use data from a variety of independent sources in estimating parameters of labor supply functions. The specific motivation is to replicate and improve upon the 10-year-old cross-section study of Gordon Winston, which is notable in two respects: it is the only previous estimation of a labor supply function using international data, and it yielded estimates of a negatively sloped supply curve that were strikingly consistent with estimates from a variety of different sources. Winston's negatively sloped supply curve of labor for males was replicated with recent data, and the finding was strengthened by testing the relation with change-over-time data. However, this relation was shown to be quite unrobust in the face of different definitions of labor supply. The supply curve of women had not been analyzed before with these data; and the results of this study regarding economic hypotheses were mixed. A forward sloping supply curve of labor was found, as expected, with cross-section data, but the income variable had a stronger positive effect on labor supply than did the wage variable, which is counter-theoretical. Furthermore, the change-over-time data did not yield a significant positive wage or income relation for women.

A Reanalysis of the International Relationship Between Income and Labor Supply

This paper examines the empirical relationship between several measures of labor supply and per capita income or wage rates among the entire set of nations for which two decades of data are available. Several objectives motivate the study. One is to test whether the evidence for a negatively sloped, cross-section relation provided by Winston (1966) over 10 years ago is still substantiated. A second is to examine the change-over time relationship between wages and labor supply, which is, of course, the main interest even when a cross-section relation is estimated. A third is to take advantage of the opportunity to estimate, for the first time with international data, the supply curve of labor for women. The large increases in recent years in the proportion of the labor force that is female makes this an important issue. The final objective is to take a fresh look at the methodological underpinnings of the empirical relationship.

Behind these direct objectives lies a more general motivation: that of testing important hypotheses in economics with the wide variety of data and the diversity of "quasi experimental" settings that must be our substitute for the controlled experiments available to other sciences. Winston's original paper both benefited from and contributed to evidence, from a variety of different sources and time periods, of a negatively sloped relation between labor supply and wage rates. Several recent developments, however, have raised questions about this empirical generalization. Studies by Jones (1974), Owen (1977), and Kniesner (1976)

have found that in the U.S. average hours worked per week by adult males have not declined in the past 30 years, in contrast to the pronounced decline in the preceding 50 years (see Jones, 1963), although the rise in wages was about the same in both periods. Table 1 shows a similar but weaker finding for all the nations with data to permit a matched comparison: The work week has declined only 1 to 1.5 hours over approximately a twelve-year period from 1957 to 1969.[1] Although a negative relationship between income (or wage) changes and labor supply might still hold in the U.S. if the lower labor force participation of young people and the aged were measured, the virtual cessation of the decline in the work week is notable and puzzling. The household as a unit of analysis is even less likely to show a negatively sloped supply curve of labor over time, because of the sharp increase in the labor force participation of women--mainly wives.

The basic price-theoretic model used to examine the supply curve of labor is well known. Wage rate changes embody income and substitution effects that are expected to be negative and positive, respectively, on the supply of labor of a person or household. The time series spanning the period from, say, 1900 to 1970 shows a decline in the time spent at work by males in the face of rising wages, which is conventionally explained by the apparent dominance of the negative income effect. This simple one-variable model, adopted in empirical work because of data limitations, tacitly assumes either random or offsetting variation in the time series of the following variables: preferences (for work or leisure), age composition, nonlabor income, laws relevant to work

Table 1

Average Hours Worked per Week, Countries with Available Data for Two Periods, Averages for 1953-1960 and 1964-1974[a]

Country	General Hours 1953-1960 (1957)*	General Hours 1964-1974 (1969)*	Manufacturing Hours 1953-1960 (1957)*	Manufacturing Hours 1964-1974 (1969)*
Austria			44.6	37.7
Canada			40.7	40.0
Columbia			53.2	50.0
Cyprus	44.8	44.0	43.5	44.0
Ecuador			46.7	46.4
El Salvador			46.3	47.2
Egypt	50.4	52.0	50.5	51.7
Finland			43.8	40.1
France	45.5	45.6	45.0	44.9
W. Germany	45.6	43.5	47.1	43.3
Guatamala			45.9	46.2
Ireland	45.0	43.4	45.0	43.1
Italy			44.3	47.1
Japan	51.8	43.7	49.6	43.6
Malta	48.9	44.9	___	___
Netherlands	49.5	45.0	48.9	44.8
New Zealand	39.1	38.3	40.1	40.3
Norway			44.0	35.1
Peru	45.5	47.9	44.9	47.3
Philippines	44.6	47.0	43.7	44.3
Puerto Rico			36.0	37.2
Singapore	48.2	48.0	47.6	48.3
Sri Lanka			46.7	54.4
Sweden			40.2	35.7
Switzerland			47.2	44.7
United Kingdom	46.5	43.2	46.2	42.6
United States	40.4	37.7	40.0	40.6
Yugoslavia	___	___	45.8	43.9
Total Number	14	14	27	27
Average	45.03	43.47	45.09	43.87
Difference,	1957-1969	1.56		1.22

Sources: 1953-1960, Gordon Winston, "An International Comparison of Income and Hours of Work," Review of Economics and Statistics, Feb., 1966, p. 30, based on same source as for 1964-1974 (see below).

1964-1974, International Labour Office, Year Book of Labour Statistics, 1974 (Geneva, 1974), Tables 12 and 13

[a]Countries selected were all those for which the two-period comparison could be made, beginning with the countries found in the table prepared by Winston.

*Approximate mid-point year. Not all years were available for all countries.

and prices of goods complementary and substitutable with respect to work and leisure. A less restrictive, and sometimes more reasonable, assumption is that changes in these variables have been effects rather than causes of the wage and labor supply changes.

The increase over time in female wages, in contrast, has induced wives to work more. The rise in the female labor force participation rate (LFPR) is primarily a reflection of this increase by wives, since some female demographic groups, like young single women, have not increased their LFPRs. The price-theory interpretation is that, in contrast to men, the positive substitution effect dominates because of the greater substitution possibilities that wives have between home and market work.

These interpretations of the empirical relations between wage rates and the supply of labor by males or females have withstood considerable testing with diverse data sources and time periods, and under conditions in which a variety of variables were available to relax the assumptions implicit in the one-variable model.[2] The study by Winston was the first and only one to use international data.

1. ESTIMATES OF A CROSS-SECTION LABOR SUPPLY FUNCTION WITH INTERNATIONAL DATA

The Winston study dealt with 29 countries for which data were available for a labor supply variable--specifically, hours worked per week and labor force participation rates--and for an income (or a wage rate) variable for the period between 1953 and 1960. By means of regression analysis, Winston found that the elasticity of labor supply with respect to per capita income (or the average wage rate) was approximately -.08 and highly significant statistically.

(These results are shown in Table 2 and discussed below.) He summarized his work as follows:

> The primary objectives of this study have been (a) to discover the relationship between income and the allocation of effort to income acquisition or leisure in aggregate international data, and (b) to determine thereby whether the negative work incentive effects of higher incomes reported in earlier studies did or did not describe a typical and expected human response. Both of these objectives can be considered satisfied. International data show that there is a significant negative correlation between income and the aggregate allocation of effort to income acquisition, and the values of the estimated relationship are strikingly similar to those from earlier studies of very different data. (p. 38)

Before criticizing any aspect of Winston's study or reporting the results of my replication, it is useful to explain why we should be interested in a study of this design. Let us review some of the key reasons why Winston's negative labor supply elasticity might be interpretable as a stable "structural" parameter.

(a) The use of grouped data may justify omitting "tastes," usually an unmeasurable variable, from the model. A crucial assumption of Winston's model, which will be relaxed in the work reported in this paper, is that, across countries, preferences (or tastes) for work and leisure vary negligibly or randomly with respect to income. By contrast, studies for a particular country often use survey data for individuals, where the assumption that tastes for work are uncorrelated with the individual's wage rate or income is dubious. Another related advantage of cross-national data is that international migration is negligible relative to within-country migration, so there should be little "selectivity bias" in the distribution of work forces by income (or wage) classes.[3]

(b) Errors in the measurements of the variables are small relative to their true variation. The fact that the variables are all averages

for large aggregations of individuals and in some cases are averages for eight yearly observations further helps to minimize errors. In particular, business cycle effects and other transitory influences should be small.

(c) The wide range in variation in per capita income (or the wage) is an important advantage of these data for two reasons. First, the causes of this variation are known to stem mainly from the resource endowments and other long-standing characteristics of the environment and culture of the nation. Thus, the effect on per capita income of variation in hours worked or labor force participation rates must be minimal. It is, therefore, reasonable to assume that income is exogenously determined and causal with respect to labor supply in the international context. (In other contexts the simultaneous determination of labor supply and wages or income poses a difficult econometric problem.) Second, the large variance in per capita income (and the wage rate) permits greater reliability in the estimated labor supply elasticity.

(d) Other prices, specifically prices of goods that are complementary (or substitutable) with leisure (or work) should not lead to any important biases. The vector of goods related to work and leisure is extensive, and there are likely to be as many expensive commodities that are complementary to work as to leisure, and similarly with respect to cheap commodities. In other words, positively and negatively correlated prices are likely to be offsetting in these regressions--with two exceptions that deserve mention. Among males the importance of agriculture in the economy may indicate a price-of-time in an activity or a set of

institutional arrangements that systematically reflects long working hours and low measured wage rates. Among females, the extent of agriculture and, perhaps more importantly, the fertility rate in the population may indicate a relatively high price-of-time for nonmarket activities in countries where wages are low. I deal with these "intervening variables" in my replications of the Winston study with more recent and more complete data.

(e) The price effect (or elasticity) is important to measure and may be assumed to be a stable parameter. Actually, Winston's use of a single independent variable measuring income (or the wage rate) forces him to interpret the elasticity as a combined income and substitution effect, so he measures (at best) a price effect rather than the separate structural income and substitution parameters. Nevertheless, there is sufficient interest in the gross price effect and sufficient difficulty in separating labor and nonlabor components of the income variable that I do not find this approach inappropriate.

In summary, there are several sound reasons why the data and model Winston uses to test the backward bending supply curve are worth our attention.

The first question is whether the same countries Winston used for his 1953-1960 period will show the same parameter estimate when replicating the model with recent data for the period 1964 to 1974. Rows 1 and 2A and rows 3 and 4A in Table 2 address this question and show a remarkable stability in the estimated wage elasticity for the two periods. The dependent variable in these four regressions is usually a measure of labor supply with two components. One is the average hours of work per

week in the manufacturing sector, which should be a fairly accurate representation for the average hours prevailing in the economy. The other component of the dependent variable is one of two labor force participation rates (LFPRs): (1) the "Total LFPR" for all ages and both sexes, and (2) the "Prime-Age Male LFPR", for males age 20 to 64 for Winston's data and 20 to 59 for mine. Both are standardized to remove the effects of differing age distributions across countries. The "Total LFPR" is the broadest measure of the economy's labor force activity, but it is sensitive to reporting errors and to different reporting practices among younger, older, and agricultural workers in particular. The "Prime-Age Male LFPR" is more consistently reported but may miss "real" variation in labor supply that is revealed in the decisions about participation in the younger and older ages. It turns out that the basic conclusion of a significant negative wage elasticity is found with both dependent variables. Indeed, Winston tried several other definitions of labor supply with similar results. The choice of independent variable--income or wage--makes little difference in the qualitative results, but the larger negative effect for the wage variable is counter-theoretical. (See rows 2B and 4B.)

The Winston relationship is thus strongly supported when a straight replication is performed. The remaining rows in Table 2, however, raise some important questions and qualifications. First, rows 5A and 5B show that the female labor force participation rate is positively related to either income or the wage rate. (Winston had not computed separate regressions for the female labor force.) By itself, this result is not inconsistent

Table 2

Labor Supply Regressed on Income Level or Wage Rate, A Comparison of 1957 (1953-1960) to 1969 (1964-1974) for 27 Matched Countries[a] (Regressions in Logarithms)

Row	Time Period of Data[b]	Dependent Variable[c]	Regression Coefficient (= Elasticity) of Independent Variable (t-ratio in parentheses) Per Capita Income[d]	Wage Rate	R^2
1	1957	Total LFPR X Hours		- .052)** (2.65)	.22
2A	1969	Total LFPR X Hours		- .072** (2.04)	.14
2B	1969	Total LFPR X Hours	- .039 (1.56)		.09
3	1957	Prime-Age Male LFPR X Hours		-0.62** (4.50)	.42
4A	1969	Prime-Age Male LFPR X Hours		- .109** (4.05)	.40
4B	1969	Prime-Age Male LFPR X Hours	- .068** (3.56)		.34
5A	1969	Prime-Age Female[e] LFPR X Hours		.237** (2.20)	.16
5B	1969	Prime-Age Female LFPR X Hours	.193** (2.77)		.20
6	1969	Prime-Age Male LFPR[f]		- .011 (0.78)	.02
7	1969	Unweighted All-Male[g] LFPR		.038 (1.42)	.07

Sources: 1957, Winston; 1969, Data from International Labour Organization, Year Book of Labour Statistics, 1974, and World Bank, World Bank Atlas, 1975.

**Coefficient is statistically significant at the 5% level, two-tailed test.

[a]Winston's regressions were originally computed for 29 countries, but data were not available for two, so the Winston regressions were recomputed with the 27 matched countries.

(Notes to Table 2, continued)

[b]1957 refers to the extended period, 1953-1960, for which Winston averaged hours worked and manufacturing wages, along with using single-year measures of labor force participation rates (LFPRs) and per capita income. The LFPRs were derived from the total population (all age groups and both sexes) and for the male prime-age population (ages 20-64) and were standardized by the Swedish age-sex distribution.

1969 refers to the 1964-1974 period for which hours worked, manufacturing wages, and per capita incomes were averaged, along with using a single-year measure of LFPR for 1971. The LFPRs were derived for the total population (all age groups and both sexes) and for the prime-age males (ages 20-59) and were standardized by the U.S. age-sex distribution for 1971, except for row 7.

[c]"Hours" refers to average manufacturing hours, averaged for the number of years reported, and LFPRs are defined in footnote a.

[d]The per capita income variable was used by Winston only for the 17 countries that reported "general hours" (for all nonagricultural industries). The results for these regressions were similar to those with manufacturing hours and the manufacturing wage rate.

[e]Winston computed no regressions for the female population.

[f]Winston computed no regressions with the prime-age male LFPR as a dependent variable.

[g]Winston did not collect data for the unstandardized male LFPR.

with economic theory and is, indeed, consistent with the previously discussed research showing the forward sloping curve of labor for married women, who constitute a majority of adult women. What this result does signal is the inherent ambiguity in testing the hypothesis about labor supply with the total labor force as the dependent variable, and the need for separate identification of income and substitution parameters if the tests of labor supply theory are pursued among men and women separately. As matters now stand, the investigator can only speculate that the income effect is large relative to the substitution effect for men and vice versa for women. As noted in the discussion of Table 3 below, the economic hypothesis of negative income effects and positive substitution effects are not obtainable with these data.

Another reservation about the Winston model and its replication is the model's apparent total reliance on hours worked in manufacturing to achieve a significant negative relation with respect to the wage rate or to per capita income. As shown in rows 6 and 7, the LFPR for males is not significantly related to the wage rate (or to per capita income in regressions not shown). The LFPRs for the total population or for females are even less negatively related to the wage rate (regressions not shown). Although there is a strong argument for including hours worked per week in a labor supply measure, it is disturbing that the hypothesized negative relation does not show up in other dimensions (or definitions) of labor supply. It might be added that row 7 indicates a need to standardize the LFPRs by age to allow for the fact that low income nations have a larger fraction of their labor force in the age group under 20, where LFPRs are low.

A final reservation about the Winston model is the point made previously about the possible importance of the percent of the economy engaged in agriculture and of fertility rates in a labor supply model. These issues are particularly relevant in analyzing women's labor supply.

Table 3 deals with these and other issues with an enlarged sample, using data from the period 1964-1974. There are 42 countries with usable data, including the age-specific fertility rate of the female populations. I should note at this point that a variable defined as the percent of the labor force engaged in agriculture was tried in a number of equations and, in the presence of the income (or wage) variable, was never found to be significant. It also had little effect on the coefficients of the other variables in the model. Thus, concern about the size of the agricultural sector as a source of bias in the estimated income or wage elasticities was apparently unfounded.

The results shown in Table 3 reinforce some of the reservations expressed about Table 2, but also support the "positive" findings. Replicating the Winston model for males with either the manufacturing wage, in row 1, or with per capita income (regression not shown), shows a negatively sloped supply curve of labor. The wage elasticity is -.09, which is close to the earlier results and to the size found in many within-country studies of males. As shown in row 2, per capita income and the wage are too highly correlated to obtain separate estimates. In row 3 we again see that only hours per week (and not LFPRs) are significantly negatively related to wages.

The regression results for females reveal more failures than successes for the strictly economic model. An overall positive wage elasticity is not found when fertility is included in the model as shown in row 4. In row 5

Table 3

Labor Supply Regressed on Per Capita Income, Wage Rate, and Fertility Rate, For 42 Countries for 1969 (1964-1974)
(Regressions in Logarithms)

Row	Dependent Variable	Regression Coefficients (= Elasticities) with t-ratios in parentheses			R^2
		Per Capita Income	Wage Rate	Fertility Rate	
1.	Prime-Age Male LFPR x HRS		-.088** (4.76)		.36
2.	Prime-Age Male LFPR x HRS	-.006 (0.18)	-.080* (1.72)		.36
3.	Prime-Age Male LFPR		-.004 (0.41)		.00
4.	Prime-Age Female LFPR x HRS	.225 (1.13)	-.278 (1.06)	-3.07** (1.99)	.20
5.	Prime-Age Female LFPR x HRS	.389** (2.06)	-.399 (1.51)		.12
6.	Prime-Age Female LFPR		.183* (1.64)		.06
7.	Prime-Age Female LFPR x HRS		.099 (0.90)		.02

Sources: Dependent variables and wage rate, International Labour Organization, Year Book of Labor Statistics, 1974.

Per capita income: World Bank, World Bank Atlas, 1975.

Fertility rate: Keyfitz, Nathan and Fleiger, Wilhelm, World Population: An Analysis of Vital Data (Chicago: University of Chicago Press, 1968) Table 1.

(Note, a few countries with missing data in one or more variables, mainly fertility, were filled in with regression estimates based on supplementary data.)

*Significant at the 10% level, two-tailed test.

**Significant at the 5% level, two-tailed test.

fertility is excluded, which may be justified on grounds that both fertility and labor supply are endogenous--jointly determined decisions that depend on wage rates and income. The results are disappointing in that the per capita income variable is positive while the wage variable is negative, which are opposite to the predictions from the standard price-theory model. Given the collinearity between income and wages, there is justification in using only one variable, as in rows 6 and 7. But the wage variable, by itself, produces a significant coefficient only when the dependent variable is an LFPR that is not weighted by hours worked per week. The elasticity, 0.18, is low compared to the values found in within-country studies. (See Cain and Watts, 1973, pp. 336-337.)

No results are reported for a dependent variable defined for the total population. The economic model predicts different parameters in the labor supply functions for the two sexes, so little insight is obtained when the two groups are merged.

2. ESTIMATES OF A CHANGE-OVER-TIME LABOR SUPPLY FUNCTION WITH INTERNATIONAL DATA

The foregoing estimates of wage and income effects on the supply of labor have been based on Winston's very questionable assumption that tastes for work (or leisure) are approximately the same across the fixed-age composition of populations in the different countries. "Tastes" is here the economist's shorthand expression for a variety of cultural, legal, and institutional factors which might be more fundamental causes of (or antecedent variables correlated with) income, wages, fertility,

and labor supply. A dramatic example is the low female LFPRs in Arab countries, reflecting the Moslem traditions about the status of women.

Variables to measure these "tastes" differences are exceedingly difficult, if not impossible, to obtain. Given this situation we adopt a weaker assumption that the differences among nations are approximately unchanging over time; for example, the Moslem religion affects labor supply in the same way in 1957 as it does in 1969. On this basis we may regress the 1957-1969 change in labor supply (really the changes in averages over the two periods, 1953-1960 and 1964-1974) on the 1957-1969 changes in per capita income, wage rates, or (for females) fertility. Because the dollar magnitudes of levels of income and wages are so different across countries, the proportionate change is used as the independent variable—that is, the 1969-1957 change (in 1957 prices) divided by the 1957 level. (A few changes were negative, so logarithms were not used.)

The results of these regressions are shown in Table 4, and they generally support the findings of Table 3. First, the negatively sloped supply curve of labor is found for males, but only in row 2 when the average weekly hours in manufacturing industries is (or is a component of) the dependent variable. The independent variable shown in Table 4 refers to manufacturing wages, but using per capita income produces nearly identical results. Second, a forward sloping supply of labor for women emerges weakly in rows 4 and 6, but the wage coefficient is not statistically significant at conventional levels. A weak positive effect of per capita income was also found in Table 3; but there the fertility rate was highly significant, and it is insignificant in Table 4. It turns out that the

Table 4

Change in Labor Supply Regressed on Changes in Per Capita Income, Wage Rate, and Fertility Rate, 1957 (1953-1960) to 1969 (1964-1974), for Matched Countries

Row	Dependent Variable[a]	Number of Observations[b]	Regression Coefficient (t-ratios in parentheses) Real proportionate change in:[c] Per Capita Income	Wage Rate	Change in Fertility[d]	R^2
1.	Change in Male LFPR	24		-.003 (.41)		.01
2.	Change in Male LFPR x HRS	24		-1.78** (2.07)		.16
3.	Change in Female LFPR	24	.006 (.50)			.01
4.	Change in Female LFPR	17	.031 (1.53)		-.000 (.53)	.15
5.	Change in Female LFPR	24		.010 (.79)		.03
6.	Change in Female LFPR	17		.023 (1.45)	.000 (.36)	.14
7.	Change in Fertility	17		19.58** (2.59)		.31

Sources: Winston (1966) and same as Table 3, except that the change in fertility rate was obtained from the United Nations Demographic Year Book.

**Coefficient is statistically significant at the 5% level, two-tailed test.

[a]See footnote b in Table 3 for the source and derivation of the dependent variable in rows 1-6.

[b]Fertility rate changes were available for only 17 of the 24 countries.

[c]Dollar amounts were expressed in 1957 prices and the proportionate changes are: 1970-1957/1957.

[d]Fertility change is for the period 1970 - 1960 and uses "births per 1000 females, age 10-49 years" for the fertility rate in each year.

change in fertility, 1960 to 1970, is strongly positively related to the proportionate change in per capita income (see row 7)--an unexpected result.

3. CONCLUSION

Winston's evidence, using international data, in support of the negatively sloped supply curve of labor has been an important contribution to the empirical study of labor supply. The data are weak in many respects, but, as noted above, they do have some unique advantages. Moreover, some of the shortcomings of Winston's original data and methods--particularly the small sample size, the inattention to women in the labor force, and the heroic assumption of constant (or random) tastes across nations--can be largely corrected with more recent data. The attempt in this paper to replicate and improve upon the Winston analysis has produced mixed evidence regarding the relevant economic hypotheses.

1. Regarding the mere test of empirical stability of a particular formulation of a labor supply relation, the replication supported Winston's findings that either per capita income or manufacturing wages are negatively related to measures of labor supply for the population (or for males) that use average weekly hours in manufacturing.

2. This empirical result for males was supported by the use of within-nation, "change-over-time" data--which thereby relaxed the heroic assumption about tastes.

3. The hypothesis of a negatively sloped labor supply curve, using labor force participation rates to measure labor supply, was rejected

with these international data. Moreover, the a priori expectation that the per capita income elasticity would be more negative than the (manufacturing) wage elasticity, on grounds that the latter embodies a stronger substitution effect, was not supported.

4. The labor supply function for women did not show the consistently positive slope that other studies have led us to expect and, indeed, several theoretical predictions about parameter estimates were not consistently supported. In the cross-section analysis, per capita income was more positively related than wages to female labor supply, but neither was significant when a fertility variable was used. In the "change-over-time" analysis, none of the variables, including the fertility variable, was significant, although the income (or wage) effects were positive, as expected.

In conclusion, the contribution of international data to the mosaic of evidence for the shape and sizes of the labor supply function and its parameters must be considered more ill-fitting than we had previously believed.

NOTES

[1]There are undoubtedly some difficulties in interpreting the data in this table. Two sets of hours data are shown, and general hours, for the entire nonagricultural sector, may reflect the behavior of a work force that includes a large proportion of part-time workers. The manufacturing sector may be more consistently representative of full-time workers, but fringe benefits involving hours of work may be important and may not be accurately reflected in the statistics.

[2]This point and a number of references are discussed in Cain and Watts (1973).

[3]"Selectivity bias" may be defined with the aid of an example. Assume that persons who have strong work motivations, and who work more on this account, move to high wage areas or to high wage industries. Then the resulting positive correlation between work and wage rates is, therefore, partly due to the migration selectivity process. The bias arises, therefore, when persons sort themselves into various categories according to characteristics or circumstances that are not part of the empirical model of behavior and that are correlated with variables in the model. Clearly, geographic mobility is not necessary; the bias might occur in processes by which people acquire higher levels of schooling--because, say, of their higher intelligence--and lead to biases in the measured returns to schooling.

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