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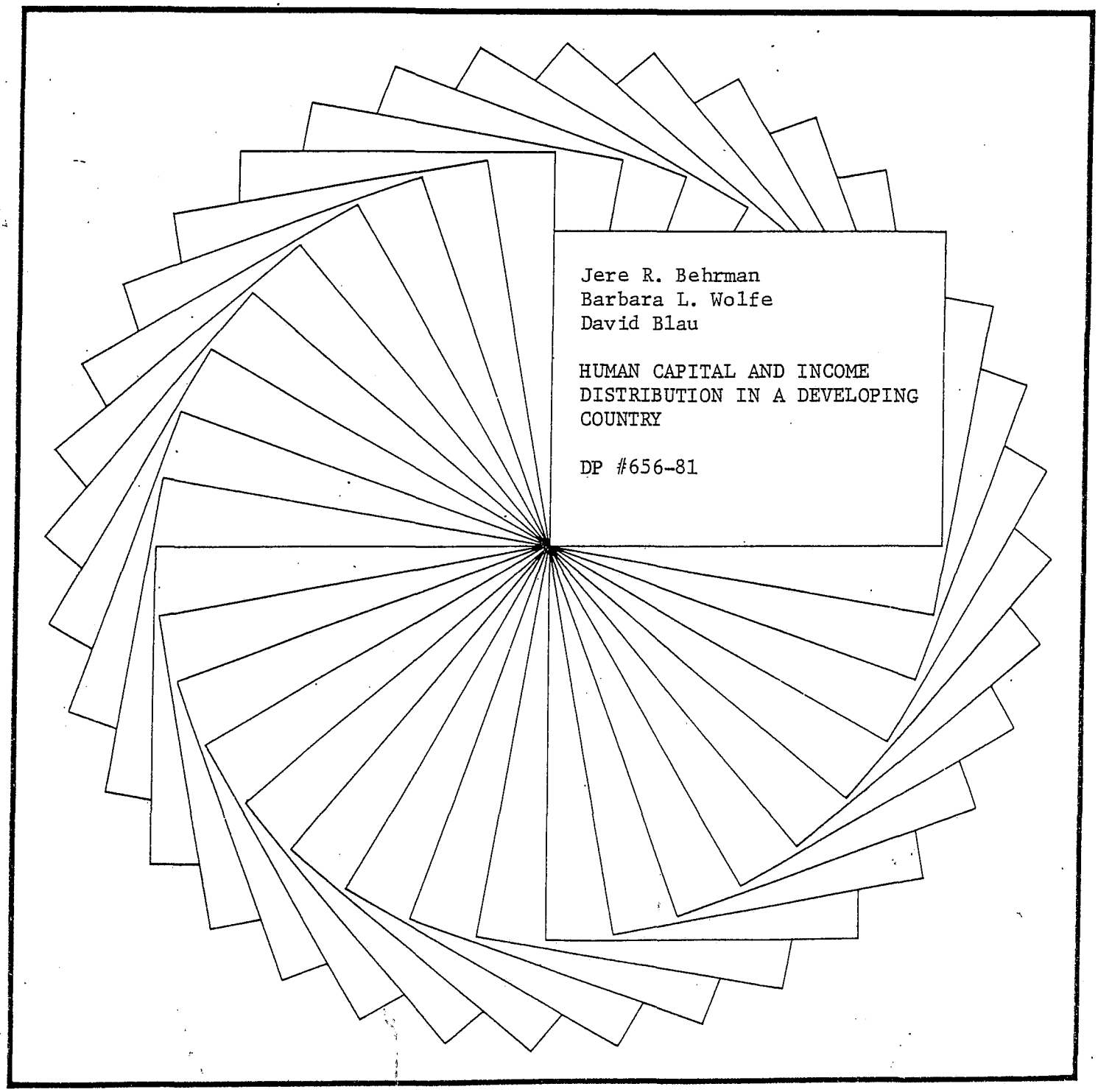

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HUMAN CAPITAL AND INCOME DISTRIBUTION IN A DEVELOPING COUNTRY

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Human Capital and Income Distribution in a Developing Country

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ABSTRACT

The effect on the income distribution in a developing country of a number of potential changes in human capital--schooling, nutrition, and health--are explored. The microdeterminants of the probability of receipt and amount received conditional on receipt of four income components are estimated. The components are women's earnings, male companions' earnings (if companion present), transfers, and other income. They are estimated separately for the central metropolis, other urban areas, and rural areas. Ten simulations of hypothetical changes in human capital distributions are conducted: adding human capital, raising rural to urban levels, bringing women's averages up to men's. Changes of schooling and nutrition have more impact than those directed toward health. Many estimated changes have complex effects on the two estimates of income distribution used: the Gini coefficient and share of the lowest 40% of households.

Human Capital and Income Distribution in a Developing Country

One of the dominant concerns in development economics in recent years has been the nature of the distribution of income or other measures of well-being (1, 2, 23, 24, 26, 36, 53). While there is some disagreement about the desired degree of overall equality, there is a strong concensus about the need to improve the position of the poorest members of society. A common hypothesis, first enunciated by Kuznets (30), is that there are U-shaped associations between both equality of income distribution and the position of the poorest on one hand and economic development on the other: as modern economic development occurs, income equality and the share of the poorest first fall, but eventually increase. These associations are widely observed empirically.

The World Bank (53) and a number of prominent development economists (e.g., Adelman, 1) have advocated substantial human capital investments as one major set of policies directed toward improving income distributions.[1] Recent empirical estimates of the returns to some human capital investments, particularly schooling, are consistent with the possibility of changing the income distribution by such investments (8, 15, 16, 18, 25, 27, 32, 35, 37, 38, 40, 53). However, we have little systematic knowledge concerning how different patterns of human capital investments might affect the distributions of household income and its major components in rural and urban areas of developing countries.

In this paper we investigate this topic using a rich integrated micro data set from a stratified random sample of women aged 15-45 in

Nicaragua.[2] These data permit the estimation of the micro determinants of the household distribution of income and the simulation of the impact of specific human capital changes. Because the income distributions and their determinants differ significantly with the degree of urbanization, in our analysis we distinguish among three regions: the central metropolis, other urban areas, and rural areas. For similar reasons, within each of these regions we distinguish among four major household income components: women's earnings, men's earnings, transfers, and other income.

Our method is to estimate econometrically the determinants both of the probability that a household receives a given type of income and of the magnitude of income of each type received, conditional on it being a positive amount. Included in these relationships as explanatory variables are a variety of human capital and other factors which are suggested by economic theory. We next use the estimated equations to construct the expected medium-run household income distributions, given the observed distributions of human capital variables. We then simulate the changes that are induced in these expected income distributions by hypothetical human capital variations.[3]

Through this procedure we gain insight into the answers to some important questions: Would specific human capital investments change the equality of the household distributions of income? Would they change the relative shares of the poorest households? If the answer to either of these questions is positive, additional questions arise: What human capital investments are important? Are the effects similar or different in the various regions? Do they work through particular components of income?

In Section 1 we characterize the actual distributions of income and its four major components in the central metropolis, other urban, and rural areas of the country. In Section 2 we describe the distributions of certain relevant human capital variables in these three areas. In Section 3 we discuss how these human capital factors enter into our estimated determinants of each of the four income components in each of the three regions. In Section 4 we simulate how various human capital changes would alter each of the income component-regional distributions and the overall regional distributions. In Section 5 we give our conclusions.

SECTION 1. THE DISTRIBUTION OF INCOME AND ITS COMPONENTS IN THE CENTRAL METROPOLITAN, OTHER URBAN, AND RURAL AREAS

We consider four components of income in our analysis because the human capital determinants vary significantly across these components (see Section 3, below) and because the distributions vary substantially for these components (Section 2). Our four components are: (1) women's earnings, (2) male companions' (if any) earnings, (3) transfers from parents and other relatives, friends, former companions (particularly for child support), and public welfare programs (which are relatively unimportant in comparison with situations in most more developed and in many developing countries), and (4) other income (primarily from income-producing assets).

We consider only actual or nominal income (including payments in kind) rather than Beckerian (4) "full" or "social" income with its

imputation of values for child quality and quantity and other elements of household production.[4] We focus on the household as the recipient unit.[5] Both of these definitional decisions permit relatively great comparability with other studies. Because we expect differences in the relations determining the income components with different levels of urbanization, we disaggregate our analysis by degree of urbanization, considering separately: (1) the central metropolis (Managua), with a population of approximately 500,000 inhabitants--about a quarter of the country's population--and which is the political, economic, and commercial center for the country; (2) other urban areas which have populations from 500 to 80,000 and which often are local or regional political and commercial centers; and (3) rural areas, excluding households which are primarily own-farm operators. We exclude own-farm operators because of the difficulty of defining comparable income concepts for them. Because of extreme skewness in the distribution of land ownership at the time of our survey, however, many rural households depend substantially on income sources other than own-farm production and are eligible for our sample.

In Table 1 we present the mean values of various income components for the three regions for those households that have nonzero values and the percentages of households that have nonzero values. In Table 2 we give two summary measures of the income distributions for each income component in each region, including all households (recipients and nonrecipients): the Gini coefficient[6] and the percentage share of the

Table 1

Mean Biweekly Values of Income Components for Households Which Receive Income and Percentages of Households Which Receive Income Components by Regions

	Central Metropolis	Other Urban	Rural Areas
Mean Magnitude of Income Component for Households Which Have Nonzero Values[a]			
Women's earnings	276	221	148
Men's earnings	659	626	257
Transfers	227	361	510
Other income	447	340	353
Total income	553	647	363
Percentage of Household with Nonzero Values			
Women's earnings	45	44	22
Men's earnings[b]	60	57	62
Transfers	34	35	30
Other income	16	17	11

[a]All income components are in cordobas per fortnight (7 cordobas equal 1 U.S. dollar).

[b]For households with male companions the respective percentages are 92, 78, and 85%.

Table 2

Gini Coefficients and Percentage Shares of Lowest 40 Percent for Major Income Components for all Households in Central Metropolis, Other Urban, and Rural Areas

	Gini Coefficients			Percentage Share of Lowest 40 Percent		
	Central Metropolis	Other Urban	Rural Areas	Central Metropolis	Other Urban	Rural Areas
Women's Earnings	.76	.75	.87	0	0	0
Men's Earnings[b]	.43	.45	.32	15	15	22
Transfers	.89	.92	.96	0	0	0
Other Income	.94	.94	.97	0	0	0
Total	.48	.43	.46	12	15	16
Total minus Women's Earnings	.52	.44	.46	9	15	16
Men and Women's Earnings	.50	.43	.34	10	15	20
[a]N(except men's)	1,099	479	287			
N men	962	593	349			

[b]Among households with male companions.

lowest 40% of the households. We consider both measures since a given value of the Gini coefficient is consistent with a wide range of percentage shares for the poorest households and we are particularly interested in what happens to the poorest households. We now summarize the information in these two tables with regard to the distributions of income components.

Women's Earnings

For households with the woman participating in the paid labor market, mean women's earnings are much larger in the two urban areas than in the rural areas (276 vs. 221 vs. 148).[7] Almost half of the households receive such income in the urban areas, but only about a quarter do in the rural area in which many more women work in the households' own-farm activity (45, 44 and 22%). For the urban areas women's earnings are a relatively common source of income--second only to men's earnings. In contrast, in the rural areas almost three times as many households receive income from men's than from women's earnings and a somewhat higher percentage receive transfers than receive women's earnings. Even in the urban areas, however, the female participation rates are low enough (i.e., below 60%) so that the lowest 40% of the households in this distribution receive no income from this source. Partly for the same reason, not surprisingly, the Gini coefficients are quite high, and higher for the rural than for the urban areas (.76, .75, and .87).

However, a comparison of the Gini coefficients for total versus total minus women's earnings indicates that women's earnings tend to equalize slightly the overall distributions in urban areas as compared

to a situation in which all households had zero earnings from women. A similar comparison for the percentage shares of the poorest households points to a similar effect for the central metropolis. Apparently women from otherwise poorer households are more likely to participate in the paid labor force and to earn relatively more (in comparison with other income sources) than are women from otherwise higher-income households, particularly in more urban areas. Therefore the impact of women's earnings tends to be equalizing in the urban areas and to improve the relative share of the poorest in the largest urban area.[8]

Men's Earnings

The set of households that receive this kind of income includes most households in which the women respondents have male companions, since the adult prime-age male participation rates are relatively high (see note b to Table 1). Approximately three-fifths of the households in each area receive income from this source (60, 57, 62%), which is the highest proportion for any income source in each area. For the households that receive men's earnings, the means (659, 626, 257) are even higher in the urban areas relative to the rural areas than is the case for women's earnings. In all three areas these means also are much higher than are the means for women, but the absolute and the percentage differences are much larger in the urban areas than in the rural areas. Ceteris paribus, urbanization seems to be associated with widening sexual earnings disparities. For the recipient households, finally,

this is the largest source of income on the average in the urban areas--although a distant third behind transfers and other income in the rural areas.

Among households with male companions, the distribution of men's earnings is much more equal than are the distributions of the other three income components among all households; the Gini coefficients are .43, .45, and .32. Comparing across regions, equality and the percentage share of men's earnings of the poorest households with male companions both are greatest in the rural areas, with the central metropolis next on both counts. The greater equality in the rural areas probably reflects the relatively low human capital investments and the low returns to such investments there, which we and others note elsewhere (8, 16, 37, 38). However, the association of greater inequality of men's earnings with urbanization is not monotonic. Even though average investments in schooling and other forms of human capital and average returns from those investments do not vary significantly between the other urban and central metropolitan areas, the inequality in men's earnings is greater in the other urban areas because the variance in such human capital investments is greater there than in the central metropolis.

Transfers

For households which receive them, the mean value of transfers is inversely associated with the degree of urbanization (227, 361, 510). For such households, on average transfers are the most important source

of income in rural areas, second to men's earnings (if any) in other urban areas, but least important of all sources in the central metropolis. Given that about one out of every three households in all three areas receives such transfers (34, 35, 30%), great inequality in their distributions across all households is not surprising.

Other Income

For households which receive other income the mean amounts received are quite considerable and somewhat larger in the central metropolis than elsewhere (447, 340, 353). But the proportions of households that receive this type of income are substantially smaller than for the other three income components (16, 17, 11%), with very high Gini coefficients implied (.94, .94, .97). The great concentration of other income reflects the very great concentration of income-generating assets in all three regions of the country.

Total Income

Mean total income is highest in the other urban areas, next in the central metropolis, and significantly lowest in the rural areas. Once again the association is not a simple monotonic one between mean household income and degree of urbanization. On the average households have higher incomes in the other urban areas than in the central metropolis.

The equality in the distribution of total income, as measured by the Gini coefficients, has a U-shaped relation with the degree of urbanization and modernization (.48, .43, .46). This contrasts with

the inverse association that many expect. Examination of the distributions indicate that this result is due to the equalizing effects of transfers and other income in the central metropolitan area in contrast to their unequalizing effects in rural areas. The distributions of total earnings are most equal in the rural areas and most unequal in the central metropolis (for the reasons we mention above): .50, .43, .34. The effect of adding in transfers and other income is to reduce inequality in the central metropolis, but to increase it in the rural areas. Despite the resulting association between urbanization and relative equality as measured by the Gini coefficients, however, the proportional share of the lowest 40% of the households is largest in the rural areas at 16% (with other urban areas at 15% and with the central metropolis at 12%).

SECTION 2. REGIONAL DISTRIBUTIONS OF HUMAN CAPITAL VARIABLES

As stated earlier, our primary interest in this paper is to examine how various human capital investments might affect the medium-run Gini coefficients and shares of the poorest households in the distributions of income and its major components. In the simulations of Section 4, below, we consider the impact of changes in five human capital variables: women's schooling, men's schooling, women's health (days ill), men's health (days ill), average household nutrition (standardized protein intake). In our modeling of the determinants of the various income components another human capital variable, cumulative work experience, enters in. For women, experience is an intervening variable for some

of the above human capital variables of interest. We now discuss the summary statistics in Table 3 for the actual distributions of these human capital variables.

Women's Schooling

For women and for men we have the completed grades of schooling (not years of attendance) as reported by the respondent. We assume that such schooling is exogenous.

In the urban areas women average much more education than in the rural areas--5 grades as opposed to 1.4. The standard deviation in the rural areas also is much smaller than in the urban areas, with very few highly educated women in the rural areas.

Men's Schooling

In urban areas men average over 6 grades of schooling (over a year more than the women) and in rural areas men, like women, average 1.4 grades of schooling completed. For men as for women, the dispersion of schooling is greater in the urban than in the rural areas, although in all three regions the dispersion is greater for men than for women.[9] Also for men, as for women, the dispersion is greatest in other urban areas, but the difference is more pronounced among men than for women. The relatively great variance in men's schooling in other urban areas underlies in part the relatively great inequality in men's earnings there which we note in the previous section.

Table 3

Means and Standard Deviations for Distributions of Human Capital Variables for Central Metropolis, Other Urban, and Rural Areas

	Central Metropolis		Other Urban		Rural Areas	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Schooling (Grade Completed)						
Women	5.1	3.3	5.0	3.6	1.4	2.0
Men	6.5	3.7	6.3	4.8	1.4	2.4
Health (Days Ill Last Year)						
Women	6.1	19.0	6.4	17.6	5.7	16.2
Men	6.1	16.3	6.2	16.3	10.9	22.5
Nutrition (Proportion of International Protein Standard Satisfied)						
Household	1.5	0.4	1.6	0.4	1.1	0.3
Cumulative Work Experience[a]						
Women	6.6	7.1	6.7	7.7	5.4	7.1
Men	17.6	10.0	18.5	11.1	20.6	11.5
Proportion of Women Who Have Had[b]						
Medically Preventable Disease	.42	.49	.40	.49	.39	.49
Therapeutically Treatable Disease	.31	.46	.38	.49	.30	.46
Generally Preventable Disease	.41	.49	.58	.49	.54	.50
Parasites	.40	.49	.57	.50	.54	.50

[a]For women this is actual years of work experience based on recall data. For men this is "Mincerian" (31) experience defined by age minus years of schooling minus six. Because male labor force participation rates are very high, the Mincerian definition generally probably does not bias upwards the estimates very much for men.

[b]These disease categories are defined by the respondent acknowledging having had diseases in categories which were suggested by medical researchers: medically preventable (pneumonia, bronchitis, asthma, typhoid, tumor, skin disease, high blood pressure, hernia), therapeutically treatable (anemia, tetanus, veneral disease), and generally preventable (tuberculosis, croup, diphtheria, or parasites). Parasites are also given separately because they are the most commonly reported single disease.

Women's Health

For both women and men we have only one index of health--reported days too ill to perform work or to fulfill other similar functions. Of course this measure may depend on whether or not other income allows one the possibility of missing work, and thus biases upwards the indicated health state of poorer individuals. Across regions such a bias possibly could overstate the relative health status in the rural areas. However, in another study in which we are investigating the determinants of adult health status (as measured by days ill or by having had various diseases), to date we have not found strong systematic associations with income (46). These results also support the exogenous treatment of health status with regard to current labor force participation and earnings in the next two sections.

Women in all three regions averaged about six days ill since the beginning of the year, with a slightly smaller one in rural areas. The dispersions of the distributions are associated with the degree of urbanization, but without large differences across regions.

For women (but not for men) we also have medical histories which indicate whether or not the respondents have had diseases which are classified in three major categories: medically preventable diseases, therapeutically treatable diseases, and generally preventable diseases. At the bottom of Table 3 we give these proportions, with the definition of the categories in note b of this table. We also give separately the proportions for the most commonly reported disease, parasites.

Of course women may have had a disease without reporting it or may report having had a disease when in fact they did not. Although presumably more educated and more informed women report more accurately, it is not clear whether under- or overreporting prevails among the less well informed. Nor is it clear that there is a systematic bias across regions.

The proportions of women who report having had medically preventable diseases is about 0.4, with little variance across regions. The proportions who report having had therapeutically treatable diseases is about 0.3 in the central metropolis and rural areas, but closer to 0.4 in other urban areas. The proportions who report having had generally preventable diseases--including parasites--is 0.4 in the central metropolis, but over half in the other two areas (and almost 0.6 in other urban areas). The picture which emerges from these data includes a fairly high frequency of all disease categories with the highest reported incidence among the regions in other urban areas and with the highest reported incidence among the disease categories for generally preventable diseases (usually parasites) outside of the central metropolis. In some of our relations for women which we discuss in Section 3 we use these disease categories in addition to or instead of days ill, particularly for relations which refer to past events (e.g., accumulated work experience) or in cases in which days ill has no significant impact.

Men's Health

In the urban areas men average almost the same number of days ill as do women, with slightly smaller standard deviations.[10] In rural

areas, however, men average 11 days ill since the start of the year, which is almost twice the 6 days average for men in urban areas and for women everywhere. The standard deviation, not surprisingly, is also somewhat higher for men in rural areas than for men elsewhere and women everywhere. But it is not as high as it would be if the differences in the means were due primarily to the happenstance of a few very sick men in the rural areas. Instead, more illness among men seems to be fairly widespread in the rural regions. In part this may reflect different hazards that arise in the sexual division of labor in the rural areas. Men day laborers may be more exposed than women, for example, to illness from the noxious chemical pesticides and herbicides which are used for some commercial crops like cotton. They also may be more subject to the very poor living conditions of seasonal migrant laborers. However, we expect that part of the explanation is in the widespread alcoholism which affects men in rural areas much more than women, in part because social customs limit much more severely the extent to which women consume alcoholic drinks.

Nutrition

We have a measure of the proportion of international protein standards satisfied by the household based on overall reported food intake and household composition, but we are not able to untangle directly the allocation among household members.[11] Since this nutrition intake is for a recent period, with it more than with our other human capital variables we run the risk of violating the exogeneity assumption

of the next two sections. For women domestic workers who receive part of their earnings in the form of board, the simultaneity problem between nutrition and earnings may be particularly important (8, 18, 40).

However, our earlier studies lead us to believe that in the present study the simultaneity between nutrition and income components probably is not too severe. The estimated income impact in the demand for nutrients is quite small and domestics are a small proportion of the women, particularly outside of the central metropolis (8, 17, 18, 40, 48-50). Nevertheless, the possibility of some simultaneity must be kept in mind in the interpretation of the results of the next two sections.

By our measure of standardized household nutrition, the striking difference is between the distributions for urban and for rural areas. The means for the urban areas are 50 or 60% above the international minimum standard, and the standard deviations indicate that relatively few households fall below these standards. In contrast, in the rural areas the mean is barely above the international minimum standard and many households fall below it. In terms of human capital investment in nutrition, as in schooling, rural households are relatively disadvantaged.

Women's Cumulative Work Experience

We measure women's paid labor force work experience by recall data on their actual work history, not by Mincerian (33) years of potential experience since completing school. Since women often drop out of the labor force for care of small children, this distinction is important. By our measure women in urban areas have on the average a little less

than seven years of work experience, and women in rural areas have a little more than five years. Since women in urban areas average more education than do women in rural areas, the urban-rural experience differential is even larger if it is considered relative to post-schooling years--with urban women averaging paid labor force participation approximately 37% of the time and rural women averaging only 25%.[12] The difference between the urban and rural areas probably is due to more options in rural areas for home production by working on household agricultural activities.[13] This difference presumably would be even larger if we were to include rural households which receive their income primarily from their own farm production.

Men's Cumulative Work Experience

For men, unfortunately, we do not have data on actual work experience. We therefore adopt the Mincerian (33) experience definition of age minus completed schooling minus pre-schooling years. This tends to overstate their work experience because at times men do not participate in the paid labor force and because at times they repeated grades of schooling or started school late (particularly in rural areas). It understates work experience to the extent that they worked while in school. For men, of course, the upward bias in using Mincerian potential experience to represent actual experience is much less than it would be for women because paid labor force participation is much more extensive for men than for women (see Table 1 and the related discussion).

By our measure, men's work experience averages 17.6, 18.5, and 20.6 years for our three regions. The difference between the means for the

central metropolis and other urban areas is due to a slightly older average male population in the latter. The difference between the means for the urban and the rural areas is due to much less schooling in the latter, which more than offsets a slightly lower average age. In all three regions the average male experience is much greater than the average female experience (and somewhat more so for more rural areas). In part this pattern reflects upwards biases in our measure for males and, for the urban areas, older average ages of a year or two for males than for females.[14] But most of the differences are due to the cumulative effect over time of the differential male-female paid labor force participation.

SECTION 3. IMPACT OF HUMAN CAPITAL ON INCOME COMPONENTS

In order to estimate the effects of these human capital characteristics on the income distributions, we estimate probit equations to explain the probability that a household receives each type of income and OLS regressions to explain the magnitude of each income component received, conditional on it being positive. We use the Heckman (29) procedure in the OLS regressions to control for selectivity bias.[15] These equations contain the human capital variables described above, along with other relevant variables, such as demographic factors, to lessen possible missing variable biases. Separate equations are estimated for each of the three regions since χ^2 tests (for the probit equations) and F tests (for the OLS regressions) reject the null hypothesis of no structural differences

across regions. The following discussion focuses on the estimated coefficients of the human capital variables, which are given in Table 4. The appendix gives the rest of the estimated relations. For discussions of the coefficient estimates of the non-human capital variables, see (8, 15, 16, 18, 40).

1. Women's Earnings

Women's current labor force participation (receipt of earnings). Economic theory suggests that women's labor force participation reflects a comparison between gains from market earnings and the opportunity costs in terms of foregone household production in child care and in other activities for a given level of household income from all other sources (8, 18, 28, 31, 40, 41). Increased income from other sources is likely to reduce the relative gains from market participation.

Our estimates suggest that women's schooling increases the probability of their labor force participation significantly in urban areas, but not in rural areas.[16] The state of nutrition has positive impact in all three regions, although only at the 10% level in rural areas.[17] In contrast, we find no evidence of a significant impact of health status in any of our regions. Finally, in all three regions past work experience has a significantly quadratic impact with a maximum after about two decades. Apparently there is strong serial correlation in labor force participation because of differences across individuals in the tastes, needs, and returns from paid labor market participation. The last of these may be increased by on-the-job training

Table 4

Estimated Coefficients of Human Capital Variables in Probits for Probabilities of Positive Values of Four Major Income Components and for Magnitudes of Components if Positive[a]

Relations and Coefficient Estimates for Human Capital Variables	Central Metropolis	Other Urban Areas	Rural Areas
1. Women's Labor Force Participation, Experience, and Earnings			
Labor Force Participation			
Schooling	.058 (4.5)	.048 (3.4)	.034 (1.0)
Experience	.17 (12.7)	.24 (13.9)	.17 (6.6)
(Experience)^2	-.0038 (7.2)	-.0060 (9.2)	-.0041 (4.2)
Nutrition	.37 (3.7)	.35 (2.6)	.34 (1.7)
Health (has had parasites)	.029 (0.4)	-.043 (0.4)	-.036 (0.3)
Labor Force Experience			
Schooling	-.35 (1.7)	-.26 (1.1)	-1.1 (2.1)
Schooling x Age	.01 (0.7)	.01 (0.7)	.043 (2.3)
Has Had Generally Preventable Disease[b]	.94 (2.9)	.13 (0.3)	.50 (0.9)
Has Had Medically Preventable Disease[b]	-.19 (0.6)	.51 (1.2)	.25 (0.4)
Has Had Therapeutically Treatable Disease[b]	.58 (1.7)	.63 (1.5)	-.01 (0.0)
Ln Earnings (if positive)			
Schooling	.13 (15.6)	.12 (12.6)	.05 (1.4)
Experience	.065 (5.3)	.068 (4.3)	.011 (0.3)
(Experience)^2	-.00097 (2.5)	-.00152 (3.0)	.00045 (0.4)
Nutrition	.16 (2.2)	.34 (3.2)	.50 (2.2)
Health (days ill)	-.003 (1.6)	-.001 (0.7)	-.004 (1.0)

Table Continues

Table 4 (cont'd)

Relations and Coefficient Estimates for Human Capital Variables	Central Metropolis	Other Urban Areas	Rural Areas
2. Men's Labor Force Participation and Earnings			
Labor Force Participation			
Schooling	-.01 (0.6)	-.043 (2.0)	.051 (0.6)
Experience	.103 (4.1)	.06 (2.6)	-.07 (1.2)
(Experience)^2	-.0018 (3.9)	-.0014 (3.3)	.0014 (1.1)
Nutrition	.33 (1.0)	.68 (2.5)	.09 (0.7)
Ln Earnings (if positive)			
Schooling	.097 (16.5)	.075 (10.0)	.037 (2.4)
Experience	.050 (4.9)	.033 (3.3)	.020 (2.1)
(Experience)^2	-.00080 (4.1)	-.00063 (2.8)	-.00037 (2.2)
Nutrition	.40 (6.9)	.53 (5.6)	.14 (1.7)
Health (days ill)	-.0024 (1.8)	.0019 (1.3)	-.0005 (0.4)
3. Transfers			
Probability of Positive Transfers			
Woman's Schooling	.027 (2.3)	.018 (1.4)	-.011 (0.3)
Woman's Experience	-.008 (1.2)	-.009 (1.3)	-.018 (1.7)
Woman's Health (days ill)	.001 (0.6)	.002 (0.7)	-.003 (0.9)
Has Had Generally Preventable Disease[b]	.018 (0.2)	.076 (0.9)	.20 (1.6)
Has Had Medically Preventable Disease[b]	.075 (1.0)	-.13 (1.5)	.003 (0.0)
Has Had Therapeutically Treatable Disease[b]	-.023 (0.3)	.092 (1.1)	-.20 (1.4)

Table Continues

Table 4 (cont'd)

Relations and Coefficient Estimates for Human Capital Variables	Central Metropolis	Other Urban Areas	Rural Areas
Ln Magnitude of Transfers (if positive)			
Woman's Schooling	.096 (4.4)	.037 (1.3)	-.089 (0.8)
Woman's Experience	-.21 (2.1)	-.038 (3.3)	.000 (0.0)
4. Other Income			
Probability of Positive Other Income			
Woman's Schooling	.061 (4.6)	.025 (1.7)	.001 (0.0)
Woman's Experience	.014 (2.2)	.018 (2.8)	.013 (1.2)
Male Companion's (if any) Schooling	.017 (1.5)	-.008 (0.7)	.037 (1.1)
Ln Magnitude of Other Income (if positive)			
Woman's Schooling	.070 (3.0)	.096 (3.4)	.24 (1.8)
Woman's Experience	.009 (0.7)	-.000 (0.0)	-.012 (0.4)
Male Companion's (if any) Schooling	.037 (1.8)	.007 (0.3)	-.003 (0.0)

[a]The appendix gives the rest of the estimated relations. Beneath the point estimates in parentheses are the absolute values of t-statistics (asymptotic for the probit estimates). For the number of observations in our sample, a t value of 2.0 is significantly nonzero in a two-tailed test at the standard 5% significance level (and a value of 1.7 at 10%).

[b]See note b in Table 3 for definitions.

and the development of good work habits and contacts (see our estimates of earnings functions, below). Thus, we estimate that human capital investment in women's schooling, nutrition, and on-the-job training all may have returns in terms of increasing the probability of current labor force participation, particularly in the urban areas.

Women's cumulative work experience. Women's previous work force experience reflects the integral over time of past period-by-period labor force participation decisions. Therefore the determinants are the accumulated effects of variables such as those mentioned above, although some modifications are required.

For example, more schooling delays initial work force participation even though it increases the probability of labor force participation in post-schooling years. Therefore we include an interaction term between age and schooling in addition to a schooling term. As we would expect, the schooling-age variables all have positive coefficient estimates and the schooling ones all have negative ones. The only significantly nonzero ones at the standard 5% level, however, are for the rural areas (the schooling coefficient for the central metropolis is significantly nonzero at the 10% level). In this case the estimated effect of more schooling on work experience is positive for women over 26 years of age. It is of interest that we obtain significant effects of schooling on past experience only for the one of our three regions for which we do not find a significant estimate for the impact of schooling on current labor force participation. Perhaps in the case of the rural sector

there is an effect of schooling on current labor force participation which is being picked up by the experience terms.

We do not include any nutrition variables among the determinants of past work experience because we do not have any measures of past nutrition inputs. To represent health status we include the variables for having had the various disease categories in the past since they seem more germane to past participation decisions than the days ill in the current year alone. However, we do not obtain any evidence that past poor health limited past work force participation. In fact the only significantly nonzero coefficient estimate which we obtain is a positive one for having had a generally preventable disease in the relation for work experience in the central metropolis (also in this relation having had a therapeutically treatable disease has a positive coefficient estimate which is significantly nonzero at the 10% level). This result probably reflects reverse causality in one of two ways. First, working women may be more susceptible to diseases because they are more run-down and more exposed to carriers of infectious diseases. Second, working women may be more conscious of certain diseases through the awareness created by interaction with knowledgeable co-workers and employees. In any case it probably would be misleading to interpret this estimate to mean that better health would lower work experience for women in the central metropolis, even though such a result is possible if better health increases the opportunity cost in non-market activities.[18]

Ln women's earnings. We posit that ln women's earnings depends on accumulated human capital with a control for labor force participation

selectivity. We extend the definition of human capital to include nutrition and health status (8, 18, 40).

Our estimates suggest a relatively high return of 12 or 13% to women's schooling in the form of earnings in the urban areas under a Mincerian (33) interpretation.[19] There also are significant quadratic returns to past experience in the urban areas, with estimated peaks after over three (central metropolis) or two (other urban areas) decades.[20] These returns to the standard human capital variables do not differ significantly between the central metropolis and other urban areas. But the contrast is sharp between the urban and the rural areas. In the rural areas we find no significant evidence of returns to the standard human capital variables of schooling and work experience. Apparently the dominant day labor work requires very little training and has virtually no returns to skills.[21]

For nutrition status, in contrast, we find significantly positive returns in all three regions, with the magnitude of the point estimates inversely associated with the degree of urbanization.[22] The higher returns in the rural sector than elsewhere are plausible because only in this sector are large numbers of households below the minimum standards. Therefore, if there are sharply diminishing returns in productivity due to nutrition above the international standards, only in this region are there large numbers of households for which productivity returns to nutrition are likely to be large.

Our estimated coefficients for the days ill variables are negative for each region, as is implied by the hypothesis that better health

increases productivity and earnings. However, they are not significantly nonzero even at the 10% level.[23]

2. Men's Earnings

Men's labor force participation. The same general model applies for men as for women. However, the trade-off between home production and paid labor force participation is much different for men than for women, with resulting much higher male participation rates.[24] Partly for this reason we find much less evidence of significant effects of human capital variables on men's labor force participation. More specifically, we find that schooling has a significant impact, that both of the quadratic experience terms are significantly nonzero only in the central metropolis (although experience squared is significant for the other urban areas),[25] and that nutrition is significant only in other urban areas.[26] For the most part prime-age males participate in the labor force regardless of their human capital stocks. There is therefore much less potential for increasing males' labor force participation by investing in their human capital than for increasing women's participation through this route.

Men's past labor force experience. We do not estimate a relation for men's past labor force experience because our Mincerian definition of male experience does not allow a very interesting exploration.

Ln men's earnings. The general form of our ln earnings function for men is the same as is that for women, with an extended human capital

definition and a control for labor force participation. Although control for such selectivity generally is not thought to be important for men, we obtain significantly positive coefficient estimates at the 10% level for the selection of men into the labor force in urban areas and a significantly negative one at the 5% level in the rural areas. We speculate that this urban-rural difference may be due to a negative association in rural areas between ability and labor force participation since more able men can obtain higher returns in home farm activities than in the rural day labor market with its low returns to skills. If so, this contrasts with the usual assumption of selectivity bias due to a positive association between unobserved ability and labor force participation.

We obtain estimates of the marginal return to schooling in terms of earnings for men of 9.7 and 7.5% in the urban areas, but only of 3.7% in rural areas. As for women, the returns to men are higher in the urban than in the rural areas. However, the differences are not as large as for women and the estimate for the rural area is significantly nonzero, in contrast with the result for women.

Also of interest in comparing the results between the sexes is the significantly smaller estimates for the marginal returns to men than to women for schooling in the urban areas (7-10% versus 12-13%). This probably reflects a combination of somewhat sexually segmented labor markets and the relatively smaller number of highly educated women participants.

However we emphasize that these results refer to marginal, not average returns. The higher marginal returns to women's schooling suggest that the sexual discrepancies in average earnings may be lowered by increasing schooling equally for both males and females as well as by increasing female schooling to the levels of males. More than marginal changes, however, may lower the relatively high marginal returns to women's schooling by increasing the supply of human capital relative to the demand for it.

We now turn to the estimated returns in terms of men's earnings of their past work experience. Our estimates suggest significant returns to men's experience in all three areas. The differential between the urban and rural areas is less than that found for women, with other urban areas between the central metropolis and rural areas instead of a sharp urban-rural dichotomy. As for schooling, the estimated marginal returns to men's experience in the urban areas are smaller than are those for women, but the average earnings for men exceed those for women with the same experience (ceteris paribus). As with schooling, therefore, increases in investment in women's human capital in the form of on-the-job training and work experience tend to reduce sexual discrepancies in average earnings.

Our estimates for the coefficients of nutrition imply significant returns in terms of productivities and earnings for men in urban areas, but only at the 10% level in rural areas. This pattern contrasts with the inverse association between similar coefficient estimates and urbanization for women. The point estimates also are significantly higher

for men than for women in the urban areas, particularly so in the central metropolis.

Finally, we report on our estimated impact of health status on men's earnings. We find even less evidence for such an impact than the very limited evidence which we discuss above for women.

3. Transfers

Gross transfers[27] are received primarily from relatives and friends and former companions. They depend upon perceived needs ("demand") and availability of resources among potential donors with interdependent utility functions ("supply"), although often it is difficult to identify the demand versus the supply factors.

In the central metropolis, women's schooling is significantly associated with the probability of receiving transfers and with their magnitude given that they are positive. We interpret these estimates to reflect resources of potential donors in that more-schooled women tend to come from better-off families (10) and to have more-educated former companions, if any, due to assortive mating by schooling levels (50).

Women's work experience is significantly negatively associated with the magnitude of transfers in urban areas and (at the 10% level) with the probability of receiving transfers in rural areas. This pattern may be due to demand (women who work more are seen to be less in need) or supply considerations (women who have poorer or fewer potential donors now and in the past worked more in the past).

We do not find any other significantly nonzero coefficient estimates for our human capital variables, including those related to health, even at the 10% level. Therefore we conclude that we have evidence--but very limited, and in some cases ambiguous--of effects of human capital investments on this income component.[28]

4. Other Income

Other income comes from ownership of income-generating assets or from earnings of household members other than the nuclear family. Assets generally are acquired from parental families or other relatives or from acquisitions financed by past savings out of the households' own past income. Factors that affect earnings will, therefore, also affect other income.

We find a significant impact of the women's education on the probability of receiving such income in urban areas (although only at the 10% level in rural areas). In contrast, we find a significantly nonzero coefficient estimate for men's education only for the magnitude of other income in the central metropolis and in this case only at the 10% level. We also find significant coefficient estimates for women's experience in the relations for the probabilities of receiving other income in urban areas.

This pattern of estimates suggests that savings with which to acquire income earnings assets may come largely from women's earnings. Of course this suggestion must be qualified due to the identification problem noted above and the somewhat ad hoc nature of our specification.

SECTION 4. SIMULATIONS OF IMPACT OF HUMAN CAPITAL INVESTMENTS ON DISTRIBUTIONS OF INCOME COMPONENTS

In this section we simulate what the impact would be on the medium-term distributions of major income components of hypothetical human capital investments. We use the region-specific estimated determinants of the probabilities of receiving different income components and of the magnitudes of these components conditional on their being positive (Section 3, above). With these estimated relations we simulate the "base" income distributions by using the actual distributions of human capital. We also simulate alternative income distributions using hypothetical changes in human capital distributions. Finally, we note the differences. In Tables 5 and 6 our simulated distributions are summarized with Gini coefficients and the percentage of the total received by the lowest 40% of households for all the regional-income component distributions. We begin by discussing our base simulations and then turn to the effects of the hypothetical human capital changes.

Base Simulations

Our base (or reference) distributions are "expected distributions" calculated by multiplying for each household the probability of receiving the relevant income component times the magnitude of the relevant income component conditional on the magnitude being positive.[29] For these base distributions we use for each household the actual values of its human capital and other characteristics. In our investigation of the impact of hypothetical human capital investments, below, we also use the actual

Table 5

Gini Coefficients for Major Components of Household Income in Simulated Predicted Base Distributions and Under Hypothetical Human Capital Distribution Changes for Central Metropolis, Other Urban and Rural Areas

Simulations	Women's Earnings			Men's Earnings			Total Earnings		
	Central Metropolis	Other Urban	Rural Areas	Central Metropolis	Other Urban	Rural Areas	Central Metropolis	Other Urban	Rural Areas
Expected Distribution (Base)	.39	.45	.42	.24	.26	.13	.35	.27	.16
Simulations of Hypothetical Human Capital Change									
1. Add 2 Years of Schooling for Men and Women	.38	.42	.43	.24	.26	.12	.34	.27	.16
2. Bring Rural Schooling up to Urban Average	.39	.43	.43	.24	.26	.12	.35	.27	.16
3. Bring Women's Schooling up to Men's Average	.39	.43	.42	.24	.26	.13	.34	.27	.16
4. Cut Days Ill in Half for Men and Women	.39	.43	.42	.24	.27	.13	.35	.27	.16
5. Bring Rural Men's Days Ill Down to Urban Average	.39	.43	.42	.24	.26	.13	.35	.27	.16
6. Raise Nutrition by 15%	.38	.42	.42	.24	.26	.12	.35	.27	.16
7. Bring Average Rural Nutrition up to Urban Average	.39	.43	.41	.24	.26	.12	.35	.27	.16
8. Bring All With Nutrition Below International Standards to this Standard	.39	.43	.40	.24	.26	.12	.34	.27	.16
9. All Rural Simulations (2) + (5) + (7)	.39	.43	.41	.24	.26	.12	.35	.27	.17
10. All General Simulations (1) + (4) + (6) + (8)	.38	.42	.41	.24	.26	.12	.34	.27	.16
Sample Size	1,099	479	287	962	593	349	1,099	479	287

Table Continues

Table 5 (Cont'd)

Simulations	Transfers			Other Income			Total Income			Combined Across Regions
	Central Metropolis	Other Urban	Rural Areas	Central Metropolis	Other Urban	Rural Areas	Central Metropolis	Other Urban	Rural Areas	
Expected Distribution (Base)	.59	.52	.66	.46	.36	.46	.32	.27	.19	.36
Simulations of Hypothetical Human Capital Change										
1. Add 2 Years of Schooling for Men and Women	.59	.52	.65	.45	.37	.50	.32	.27	.19	.35
2. Bring Rural Schooling up to Urban Average	.59	.52	.64	.46	.36	.51	.32	.27	.20	.34
3. Bring Women's Schooling up to Men's Average	.59	.52	.66	.46	.37	.46	.31	.28	.19	.36
4. Cut Days Ill in Half for Men and Women	.59	.51	.66	.46	.36	.46	.32	.27	.19	.35
5. Bring Rural Men's Days Ill Down to Urban Average	.59	.52	.66	.46	.36	.46	.32	.27	.19	.36
6. Raise Nutrition by 15%	.59	.52	.66	.46	.36	.46	.33	.27	.19	.36
7. Bring Average Rural Nutrition up to Urban Average	.59	.52	.66	.46	.36	.46	.32	.27	.19	.35
8. Bring All With Nutrition Below International Standards to this Standard	.59	.52	.66	.46	.36	.46	.32	.27	.19	.35
9. All Rural Simulations (2) + (5) + (7)	.59	.52	.64	.46	.36	.51	.32	.27	.20	.33
10. All General Simulations (1) + (4) + (6) + (8)	.59	.52	.65	.45	.37	.50	.32	.27	.19	.35
Sample Size	1,099	479	287	1,099	479	287	1,099	479	287	1,865

Table Continues

Table 6

Percentage Shares of Lowest 40% of Households for Major Components of Household Income in Simulted Predicted Base Distributions and Under Hypothetical Human Capital Distribution Changes for Central Metropolis, Other Urban, and Rural Areas

Simulations	Women's Earnings			Men's Earnings			Total Income		
	Central Metropolis	Other Urban	Rural Areas	Central Metropolis	Other Urban	Rural Areas	Central Metropolis	Other Urban	Rural Areas
Expected Distribution (Base)	17	14	14	25	34	31	17	24	29
Simulations of Hypothetical Human Capital Change									
1. Add 2 Years of Schooling for Men and Women	17	14	13	25	24	32	17	24	29
2. Bring Rural Schooling up to Urban Average	17	14	14	25	24	32	17	24	29
3. Bring Women's Schooling up to Men's Average	17	14	14	25	24	31	18	23	29
4. Cut Days Ill in Half for Men and Women	17	14	14	25	24	31	17	24	29
5. Bring Rural Men's Days Ill Down to Urban Average	17	14	14	25	24	31	17	24	29
6. Raise Nutrition by 15%	17	14	13	25	24	31	17	24	29
7. Bring Average Rural Nutrition up to Urban Average	17	14	16	25	24	31	17	24	29
8. Bring all With Nutrition Below International Standards to These Standards	17	14	14	25	24	32	17	24	29
9. All Rural Simulations (2) + (5) + (7)	17	14	14	25	24	32	17	24	29
10. All General Simulations (1) + (4) + (6) + (8)	18	15	15	25	24	32	17	24	29
Sample Size	1,099	479	287	962	593	349	1,099	479	287

Table Continues

Table 6 (Cont'd)

Simulations	Transfers			Other Income			Total Income			Combined Across Regions
	Central Metropolis	Other Urban	Rural Areas	Central Metropolis	Other Urban	Rural Areas	Central Metropolis	Rural Urban	Rural Areas	
Expected Distribution (Base)	12	10	7	12	18	17	19	23	27	18
Simulations of Hypothetical Human Capital Change										
1. Add 2 Years of Schooling for Men and Women	12	10	8	14	23	13	19	23	27	18
2. Bring Rural Schooling up to Urban Average	12	10	9	12	18	16	19	23	27	19
3. Bring Women's Schooling up to Men's Average	12	10	7	20	19	17	20	23	27	18
4. Cut Days Ill in Half for Men and Women	12	10	7	12	18	17	19	24	27	18
5. Bring Rural Men's Days Ill Down to Urban Average	12	10	7	12	18	17	19	23	27	18
6. Raise Nutrition by 15%	12	9	7	12	18	17	19	23	27	17
7. Bring Average Rural Nutrition up to Urban Average	12	10	7	12	18	17	19	23	27	18
8. Bring all With Nutrition Below International Standards to These Standards	12	10	7	12	18	17	19	23	28	17
9. All Rural Simulations (2) + (5) + (7)	12	10	9	12	18	12	19	23	27	19
10. All General Simulations (1) + (4) + (6) + (8)	12	10	8	14	18	13	19	24	27	17
Sample Size	1,099	479	287	1,099	479	287	1,099	479	287	1,865

values of all of these variables except for the human capital changes that are indicated explicitly. The statistics for the base or expected distributions are given in the first rows of Tables 5 and 6.

Before we turn to the simulations of human capital investments, however, it is of interest to ask how the statistics for our base simulation distributions compare with those for the actual distributions which are presented in Table 2. For all of our 12 income component-regional distributions, the Gini coefficients for the base simulations are lower (indicating more equality) than for the actual distributions. Similarly, for all 12 of these distributions, the base simulation shares of the poorest households are larger than are the actual shares.

How should we interpret these systematic differences? The answer depends upon what factors we believe underlie the disturbance terms in our estimated relations in Table 4 and in the appendix. To the extent that these disturbance terms represent transitory fluctuations in income components or in probabilities of receiving them which are random over time for each household, the base simulations reflect longer-run distributions than do the actual distributions.[30] Purging the actual distributions of the random transitory components, under this interpretation, leads to greater equality in the underlying systematic longer-run distributions than in the short-run actual distributions.

But, alternatively, the disturbance terms may be representing unobserved characteristics of households which change the probabilities of receiving income components and the magnitudes received, yet which are not likely to change much over time for individual households (i.e.,

"fixed household effects"). To the extent that this is the case, the base simulations understate inequality in the short run and in the longer run.[31] Nevertheless, as long as these unobserved characteristics are independent of the observed ones on the right-hand sides of our estimated relations (as is assumed in the estimation process), simulations of the impact of changes in the observed variables on the base simulations are suggestive of the impact on the actual distributions.

With panel data we could identify the relative importance of transitory versus household effects in the disturbance terms. Unfortunately we do not have such data and therefore are not able to explore the relative importance of these two possible sources. We believe, however, that transitory factors are significant, although probably not exclusively of importance. The more important are these transitory factors, the more our simulations relate to longer-run distributions than do the actual current distributions.

Some Critical Assumptions in Our Hypothetical Simulations

Before turning to our hypothetical simulations, we note three implications of our procedure which should be kept in mind in interpreting our results.

1. We assume that our coefficient estimates for our human capital variables discussed in Section 3 are not biased because of unobserved ability and motivation variables.[32] If this assumption is inappropriate, we probably overestimate the impact of the human capital changes on the income component distributions.

2. We assume that our estimated effects of human capital variables remain the same despite the hypothetical changes in the human capital distributions. This assumption probably results in an overstatement of the impact of our hypothetical increases in the human capital stock, since they might be expected to depress the returns per unit. However, the direction of this effect is not entirely clear since within a general equilibrium context an increase in the human capital stock might cause a shift in the composition of demand towards human-capital intensive goods and services.

3. We are making static comparisons that assume the same degree of market fragmentation as in the sample period and ignore the dynamics of migration and other factors, which may integrate markets as well as the time paths of adjustment.[33] The total effects of this assumption are not clear since better integration across regions or sexes might increase returns to some human capital investments (e.g., those in rural areas) and reduce others.

Because of the ambiguities which we note, we cannot be sure of the direction of biases which these assumptions may have on our simulations. But our suspicion is that they tend to lead us to overstate, if anything, the impact of human capital changes.

Simulated Impact of Hypothetical Human Capital Investments

We have conducted 10 simulations of hypothetical changes in human capital distributions. We now discuss them in the order that they are presented in Tables 5 and 6.

1. Add two years of schooling for all men and women. This change is to shift the distributions of schooling to the right by two years. It works through a myriad of channels which are discussed in Section 3. Since two years of schooling are added for everyone, the differences among individuals' schooling are maintained. Prima facie this might not seem to affect distributions much. But because of the nonlinear effects, particularly through the changing probabilities of receiving positive values of income components, the income distributions are altered.

The most striking changes are in the other income distributions. In the urban areas, the lowest 40% of the households increase their percentage shares from 12 to 14 and from 18 to 23 (with accompanying changes in the Gini coefficients from .46 to .45 and from .36 to .37).[34] In contrast to these basically progressive shifts, in the rural areas the share of the poorest falls from 17 to 13% and the Gini coefficient increases from .46 to .50.

Among the other three income components the changes are much smaller. Some are equalizing (e.g., women's earnings in urban areas and men's earnings and transfers in rural areas), but for women's earnings in rural areas the change is disequalizing. The overall effect is to leave the total income distributions for each of the three regions unchanged.

2. Raise rural schooling average up to the urban average. This change affects only the poorer and less schooled rural sector. In this simulation schooling is increased by 3.6 grades for each rural woman and by 5.0 grades for each rural man so that the sex-specific rural averages are raised to the sex-specific urban averages. Within the rural

sector the effects are mixed. The distributions for women's earnings and other income become more unequal (with a drop in the share of the poorest for the latter), but the distributions for men's earnings and transfers become more equal (with increases in the shares of the poorest in both cases). The unequalizing changes dominate slightly so that the distribution of total rural household income becomes slightly more unequal. However, since the rural sector is the poorest, the impact on the distribution of total income in our combined sample across regions is slightly equalizing, with a decrease in the Gini coefficient from .36 to .341.

3. Raise women's average schooling up to the averages for men. As we observed in Section 2, women in the central metropolis and in other urban areas have significantly less schooling than do men in the same areas, although the same is not the case in the rural areas. In this simulation we increase the schooling of each woman in the central metropolis by 0.8 grades and that of each woman in other urban areas by 1.3 grades so that within each region average women's schooling is raised to the level of average men's schooling.

This change, interestingly, does not induce any changes in the Gini coefficients or in the shares of the left-hand tails for the distributions of women's earnings, but merely shifts those distributions more or less uniformly to the right. The shift to the right in the distributions of women's earnings, however, causes a progressive change in the distribution of overall earnings for the central metropolis because the women who receive the additional earnings tend to come from relatively poorer

low-earnings households. For the central metropolis, the Gini coefficients for overall earnings drops from .35 to .34 and the share of the poorest households increases from 17 to 18%. However, the opposite tends to be the case in the other urban areas, with the share of the poorest falling from 24 to 23%.

These shifts in the distributions of women's earnings are supplemented by relatively large induced increases in the shares of the poorest households in other income (from 12 to 20 and from 18 to 19%, respectively), although the Gini coefficient rises from .36 to .37 in the other urban areas. The total impact for the central metropolis is progressive, with a small drop in the Gini coefficient from .32 to .31 and an increase in the share of the lowest 40% of the households from 19 to 20%. In contrast, the total impact in other urban areas is slightly unequalizing, with the Gini coefficient going from .36 to .37.

4. Health status improved so days ill halved for all women and men; 5. Rural men's days ill reduced to urban average. These two simulations examine the impact, respectively, of a general increase in health status in which days ill are halved for everyone and a more targeted improvement in health status in which the group with the poorest reported health, rural men (see Table 3), are brought down to urban levels of days ill on the average. The discussion of our weak estimated effects for health variables in Section 3 leads us not to expect very substantial changes in these simulations. In fact we find no changes as large as 1% in absolute value in any of the percentage shares of the lowest 40% of households and only two changes as large as .01 in

absolute value in the Gini coefficients (falls from .52 to .51 for transfers in other urban areas and in total income for the combined sample in simulation 4). Given that the hypothetical health improvements are fairly substantial, these simulations reinforce the conclusion that our estimates show almost no relation between this measure of health status and the distribution of income.

6. Improve every household's nutrition status by 15%; 7. Increase rural nutrition status to urban average; and 8. Increase all households below the international minimum standards to those standards. These three simulations explore three hypothetical improvements in nutrition. Simulation 6 is a general one for all households. Simulation 7 is targeted successfully towards the worse-off region (see Table 3), and simulation 8 is targeted successfully towards all of the households which do not meet international minimum nutrition standards.

Simulation 6 affects all households in urban areas and simulation 8 affects all of the households in urban areas with nutrition below the international minimums. And yet the simulated impact on distribution in urban areas is in these two cases very small, despite evidence of significant impact of nutrition on labor force participation and on earnings for women and men in urban areas (Section 3). There are no induced changes as large as 1% in absolute value in the percentage shares of the poorest households in urban areas in either of these simulations. The Gini coefficients change by as much as .01 only for women's earnings and for total income in the central metropolis (.39 to .38 and .32 to .33) and in other urban areas (.43 to .42) in simulation 6 and for total earnings

in the central metropolis (.35 to .34) in simulation 8. The lack of an urban impact in simulation 8 is due to the fact that by our nutrition measure most urban households already meet the international minimum standard. The very limited impact in urban areas in simulation 6, however, suggests that general nutritional improvements will not alter urban income distribution much because the widespread effects induce responses in households throughout the income distribution, most of which have sufficiently good nutrition so that diminishing returns have set in regarding productivity inducements of improved nutrition.

In rural areas the effects are somewhat more pervasive, but not much larger despite the lower average nutrition levels. Increasing all households' nutrition input by 15% (simulation 6) causes the share in the left-hand tail in the distribution of women's earnings to fall from 14 to 13% and the Gini coefficient for men's earnings to fall from .13 to .12. Increasing average rural nutrition levels to urban averages (simulation 7) causes equalizing changes in the distribution of women's earnings (the share of the poorest households increases from 14 to 16% and the Gini coefficient drops from .42 to .41), and in men's earnings (the Gini coefficient drops from .13 to .12). The statistics for the total rural income distributions are not changed perceptibly, but the Gini coefficient for the total income distribution combined across regions falls from .36 to .35. Bringing all with nutrition below international standards up to those standards (simulation 8) reduces inequalities for women's and men's earnings (Gini coefficients drop

from .42 to .40 and from .13 to .12) and increases the shares of the households in the left-hand tails of the distributions of men's earnings (from .31 to 32%) and of total income (27 to 28%). For the distribution of total income combined across the three regions, the Gini coefficient drops slightly (from .36 to .35), but so does the share of the poorest (from 18 to 17%).

Thus, in both urban and rural areas in our sample, improving the nutritional status of the households with the poorest nutrition is not the same as improving the nutrition for the poorest households. Nutrition status and income are positively correlated, but far from perfectly so.[35] Improving the nutrition of those with the lowest nutrition levels probably is desirable for other reasons, but for the purpose of equalizing the distribution of income it would be more efficient to target the poorest households in terms of income, not in terms of nutrition.

9. All rural targeted simulations (2 + 5 + 7). In this simulation we explore the impact of improving average rural schooling, health, and nutrition levels to the urban averages. Within the rural sector, as in simulations 2, 5, and 7 above, we assign each of the relevant entities equal increments of the changed total human capital stocks.

Given our discussion above, the mixed effects on the distributions of rural income components are not surprising. The distributions become somewhat more equal for women's and men's earnings and for transfers, and somewhat less equal for total earnings and for other income. For total rural income, the disequalizing tendencies dominate, so that the Gini coefficient increases from .19 to .20. The share of those in the left-hand tails of the distributions increases for men's earnings and for

transfers, falls for other income, and is unaffected for total rural income. It is worth noting that the equalizing effect of this combination of policies on the share of the rural poorest is less than that of bringing all with nutrition below international standards up to those standards (simulation 8).

For the combined samples across regions, the share of the lowest 40% households increases from 18 to 19% and the Gini coefficient falls from .36 to .33. From an overall equalitarian viewpoint these effects are at least as positive as are those from any of our other simulations.

10. All general simulations (1 + 4 + 6 + 8). We combine in this simulation an additional two years of schooling, cutting days ill in half, an additional 15% in nutrition status, and moving all of the most poorly nourished households up to the international minimum nutritional standards.

This combination of fairly substantial human capital changes has mixed effects on the regional distributions of the income components. These effects are progressive, with increases in the shares of the poorest and declines in the Gini coefficients, for women's earnings in all three areas, for men's earnings and transfers in rural areas, and for other income in the central metropolis. They are regressive for other income in rural areas and, somewhat less so, in other urban areas.

The net impact on the income aggregates is equalizing, but quite limited. The only perceptible changes are small declines in the Gini coefficients for total earnings in the central metropolis and for total income for the combined sample across the regions and a small increase

in the share of the lowest 40% of households in total income in other urban areas. In regard to the impact on the total combined income distribution, these general human capital changes are less effective from an equalitarian viewpoint than are the ones targeted for the rural sector in simulation 9.

SECTION 5. CONCLUSION

Subject to some qualifications which we discussed in Section 4, our simulations lead us to five major conclusions. First, the impact of changes in human capital variables on the distribution of regional income often is not transparent from the individual relations. This is so for several reasons.

A given increment in a human capital variable may shift some distributions more or less uniformly, and therefore will have no impact on the Gini coefficients or on the percentage share of the poorest. But the same increment may have a concentrated impact on other distributions and therefore alter the Gini coefficients and the percentage share of the poorest. All of this is further complicated by the combination of changing probabilities of receiving different components, in addition to changing magnitudes conditional on their being positive.

At times the effects on the distributions of some income components are progressive and the effects on others are regressive. Moreover, changes which are progressive for a distribution of a particular income component may be regressive (and vice versa) for the overall regional

household income distribution or for the overall distribution combined across regions. Furthermore, the effects of separate changes are not necessarily additive, and even may be partly conflicting. For all of these reasons the simulation approach is a very useful tool for investigating the phenomena of interest.

Second, simulated changes in the Gini coefficient towards greater (or lesser) equality are not always accompanied by gains (or losses) in the shares of the poorest. For example, bringing everyone up to minimum international nutrition standards reduces the Gini coefficient and the share of the poorest in the total income distribution combined across regions. Of course this is an obvious theoretical possibility, but its empirical occurrence reinforces the admonishment to be careful about what measure of the income distribution is used to reflect the degree of attainment of different possible distributional goals.

Third, among our hypothetical human capital variable simulations, those involving changes in schooling and in nutrition have about equally strong and pervasive effects. We do not have evidence of perceptible impacts of our health variables on the distributions. But even for our hypothetical changes in schooling and nutrition, the simulated effects are limited and are mixed in regard to their impact on the progressivity of various distributions of possible interest across regions and across income components, although they tend to be progressive more frequently than regressive. Given that our assumptions probably lead to an overstatement of the impact of these human capital variables on income

distributions, these results suggest some skepticism about how large a progressive impact human-capital-related policies are likely to have on income distributions in developing countries. This brings into question the advocacy of the World Bank and others (noted in the introduction) for using such human resource investments to improve income distribution. Of course to make an operational decision about the wisdom of pursuing such policies, estimates would need to be made of the costs of the alternatives and of impacts on non-distribution goals.

Fourth, in some cases distributional goals of more equality can be attained by general measures. For example, general improvements in schooling or in nutrition imply less inequality in the combined total income distribution. However, a more cost-effective procedure would be to direct policies specifically towards the target group. This particularly is the case for the country under study regarding policies directed toward improving human capital distributions in the rural areas to levels more comparable to those in urban areas.

Fifth, even in targeted human-capital-distribution changes for the pursuit of income distribution goals, care must be taken to direct changes towards those households low in the overall income distribution and not towards those low in the distribution of a particular component of income or of a particular human capital variable. We provide several illustrations in which policies directed towards a particular low-income group (e.g., schooling for women) or towards a shortage of a particular human capital variable (e.g., nutrition for malnourished households) do not have much

impact on overall income distribution. Of course, such policies may be desirable for other purposes. But for the purpose of improving the position of the poorest households, they should be targeted specifically towards the poorest households themselves.

APPENDIX

Estimated Probit and Ordinary Least Squares Regressions for Receiving Various Income Components and for Magnitude of These Components

Table A. 1

Probit Estimates for Labor Force Participation for Women and Men for Central Metropolis, Other Urban Areas, and Rural Areas[a]

Right-Hand-Side Variables	Women			Men		
	Central Metropolis	Other Urban	Rural Areas	Central Metropolis	Other Urban	Rural Areas
Family Situation and Child Care						
Other Income + 1000	-.196 (3.6)	-.041 (0.8)	.068 (1.0)	-.148 (0.8)	-.168 (1.4)	.248 (0.2)
Children under Five	-.250 (1.9)	-.043 (0.3)	.210 (1.1)	-.06 (0.2)	.24 (0.9)	.18 (0.1)
Home Child Care						
x Children under Five	.291 (2.4)	.012 (0.1)	-.202 (1.3)	.04 (0.1)	.16 (0.6)	.02 (0.1)
Single	2.18 (8.5)	2.84 (4.9)	5.70 (0.4)			
Previously Accompanied	.589 (5.7)	.577 (4.9)	.846 (4.6)			
Regional Variables						
North		.026 (0.1)	-.333 (1.6)		-.467 (1.1)	.346 (1.0)
Madriz		.321 (0.7)	.435 (1.1)		-1.36 (2.0)	2.99 (0.2)
Nueva Segovia		-.405 (1.1)	-.046 (0.1)		2.91 (0.1)	-.177 (0.4)
Pacific		.158 (0.8)	-.186 (1.0)		-.024 (0.1)	.635 (1.7)
Atlantic Coast		-.561 (1.4)			2.75 (0.1)	
Rural						
Constant	-1.69 (9.3)	-2.12 (7.3)	-1.92 (5.7)	1.01 (1.8)	0.69 (1.1)	2.13 (2.4)
-2 ln Likelihood Ratio	604	505	152	21	41	9
Sample Size	1,535	1,041	557	998	762	406
Number of Participants	787	504	134	984	737	394

[a] Asymptotic absolute values of t statistics are given in parentheses beneath the coefficient estimates. See parts 1 and 2 of Table 4 for the estimated coefficients of the human capital variables.

Table A.2

Regression Estimates for Women's Labor Force Experience for Central Metropolis, Other Urban Areas, and Rural Areas[a]

Right-Hand-Side Variables	Central Metropolis	Other Urban	Rural Areas
Family Situation and Child Care			
Children under Five	-1.41 (3.6)	.259 (0.5)	-.823 (1.1)
Number of Living Children	-.374 (3.5)	-.232 (1.6)	-.065 (0.4)
Household Member over 14	-.369 (1.1)	.937 (2.1)	-.184 (0.3)
Single	.601 (0.9)	1.48 (1.5)	2.34 (1.1)
Previously Accompanied	2.18 (5.3)	1.47 (2.7)	1.53 (1.8)
Years of Cohabitation	-.174 (3.2)	-.115 (1.7)	.053 (0.5)
Background Variables			
Both Raisers Present (in Childhood)	-.331 (0.3)	.209 (0.1)	-.281 (1.6)
Father Present	.099 (0.1)	-1.89 (1.4)	-.321 (0.2)
Mother Present	.783 (1.5)	.210 (0.2)	2.04 (1.47)
Mother Worked	1.11 (3.5)	1.45 (2.8)	.065 (0.1)
Father's Occupational Prestige	-.002 (0.2)	.018 (0.9)	.047 (1.5)
Never Migrated	-.640 (2.0)	.338 (0.8)	-.561 (0.9)
Age	.611 (10.6)	.577 (8.7)	.208 (2.3)
Regional Variables			
North		1.38 (1.5)	-1.68 (2.0)
Madriz		.68 (0.3)	-2.21 (1.4)
Nueva Segovia		-.05 (0.0)	.01 (0.0)
Pacific		1.03 (1.2)	.53 (0.6)
Atlantic Coast		.13 (0.1)	
Rural			
Constant	-7.46 (5.1)	-10.6 (5.0)	-1.69 (0.6)
$\bar{R}^2$	.30	.26	.19
Sample Size	1,535	1,041	557

[a]See note a to Table A.1. See part 1 of Table 4 for the estimated coefficients of the human capital variables.

Table A.3

Regression Estimates for Women's and Men's Log Earnings for Central Metropolis, Other Urban Areas, and Rural Areas[a]

Right-Hand-Side Variables	Central Metropolis	Other Urban	Rural Areas	Central Metropolis	Other Urban	Rural Areas
Women's Characteristic						
Never Migrated	.181 (3.0)	-.088 (1.2)	-.114 (0.6)			
Regional Variables						
North		-.020 (0.1)	-.434 (1.9)		.164 (1.4)	-.411 (4.4)
Madriz		-1.091 (3.5)	.094 (0.3)		-.859 (2.4)	-.494 (2.3)
Nueva Segovia		-.175 (0.4)	-.449 (1.3)		.200 (1.0)	.143 (1.0)
Pacific		.028 (0.2)	-.215 (1.0)		.130 (1.3)	-.188 (1.6)
Atlantic Coast		.007 (0.0)			.110 (0.0)	
Rural						
Labor Force Participation	.340 (3.9)	.129 (1.2)	.151 (0.7)	1.36 (1.9)	1.28 (1.7)	-2.79 (2.4)
Constant	3.95 (21.9)	3.77 (13.6)	4.29 (8.0)	4.65 (28.6)	4.55 (21.0)	5.56 (34.2)
Rural						
Labor Force Participation	.340 (3.9)	.129 (1.2)	.151 (0.8)	1.36 (1.9)	1.28 (1.7)	-2.79 (2.4)
Constant	3.95 (21.9)	3.77 (13.6)	4.29 (8.0)	4.65 (28.6)	4.55 (21.0)	5.56 (34.2)
$\bar{R}^2$	.30	.35	.08	.32	.34	.14
Sample Size	697	455	121	917	593	346

[a]See note a to Table A.1. See parts 1 and 2 of Table 4 for the estimated coefficients of the human capital variables.

Table A.4

Probit Estimates for Receive Transfers and Regression Estimates of Log of Amount of Transfers for Central Metropolis, Other Urban Areas, and Rural Areas[a]

Right-Hand-Side Variables	Probit Estimates for Receiving Transfers			Regressions Estimates for Log of Amount of Transfers		
	Central Metropolis	Other Urban	Rural Areas	Central Metropolis	Other Rural	Rural Areas
Household Characteristics and Family Status						
Number of Living Children	.071 (3.3)	.069 (2.9)	.001 (0.0)	.072 (1.4)	-.032 (0.6)	.134 (1.6)
Household Members over 14	.511 (6.5)	.250 (2.8)	.623 (4.6)	.403 (1.3)	.007 (0.0)	.789 (1.0)
Single	.289 (0.5)	.611 (1.2)	-.590 (0.3)	1.455 (1.6)	-1.587 (1.3)	-2.309 (0.7)
Previously Accompanied	1.158 (12.2)	1.241 (10.6)	.875 (4.7)	1.060 (1.8)	-.854 (1.3)	-.101 (0.1)
Religious Marriage	-.082 (0.9)	-.144 (1.4)	-.037 (0.2)	-.003 (0.0)	.222 (1.0)	-.703 (1.5)
Single x Age of Woman	.013 (0.5)	-.004 (0.2)	.036 (0.5)	-.052 (1.4)	.063 (1.1)	.083 (0.7)
Woman's Background						
Father Present (in Childhood)	.210 (1.6)	.178 (1.4)	-.212 (1.0)	-.307 (1.4)	-.380 (1.7)	-.390 (0.8)
Mother Present	-.110 (1.1)	-.317 (2.2)	-.227 (1.2)	-.043 (0.3)	.240 (0.8)	-1.321 (2.0)
Father's Occupational Prestige	-.005 (1.4)	-.001 (0.3)	.014 (1.8)	.008 (1.5)	.021 (3.1)	.006 (0.3)
Mother's Occupational Prestige	-.004 (1.0)	-.005 (1.2)	.010 (1.2)	.008 (1.2)	.021 (3.0)	.044 (2.4)
Number of Siblings	-.008 (0.7)	.003 (0.2)	.055 (2.5)	.003 (0.2)	-.017 (0.7)	-.071 (0.9)
Urban Origin	-.238 (2.0)	.144 (0.9)	.169 (1.1)			
Woman's Characteristics						
Age	-.015 (2.1)	-.011 (1.4)	.024 (2.1)	.019 (1.4)	.051 (3.9)	-.017 (0.4)
Never Migrated	.088 (1.2)	.007 (0.1)	.170 (1.0)	.150 (1.4)	-.138 (0.9)	.544 (1.5)
Regional Variables						
North		.037 (0.2)	.259 (1.3)		-.098 (0.3)	-.267 (0.4)
Madriz		.302 (0.8)	.265 (0.5)		-1.099 (2.2)	-.052 (0.0)

Table Continues

Table A.4 (Cont'd)

Right-Hand-Side Variables	Receiving Transfers			Regressions Estimates for Log of Amount of Transfers		
	Central Metropolis	Other Urban	Rural Areas	Central Metropolis	Other Rural	Rural Areas
Nueva Segovia		.497	.218		-1.083	.642
		(1.7)	(0.7)		(2.1)	(0.6)
Pacific		.339	.491		-.124	.639
		(2.0)	(2.5)		(0.4)	(0.8)
Atlantic Coast		.307			-.172	
		(1.0)			(0.3)	
Rural						
Selection for Positive Transfers				1.063	-1.524	.158
				(1.3)	(1.8)	(0.1)
Constant	-.533	-.923	-2.690	1.731	4.490	4.373
	(2.2)	(2.7)	(6.0)	(1.6)	(3.5)	(1.1)
-2 log Likelihood Ratio	262	206	105			
$\bar{R}^2$				.14	.24	.18
Sample Size	1,567	1,159	541	314	231	88
Number Receiving Transfers	530	406	162			

[a]See note a to Table A.1. See part 3 of Table 4 for the estimated coefficients of the human capital variables.

Table A.5

Probit Estimates for Receiving Other Income and Regression Estimates of Log of Amount of Other Income for Central Metropolis, Other Urban Areas, and Rural Areas[a]

Right-Hand-Side Variables	Probit Estimates for Receiving Transfers			Regressions Estimates for Log of Other Income		
	Central Metropolis	Other Urban	Rural Areas	Central Metropolis	Other Urban	Rural Areas
Woman's Family Background Variables						
Father Present	.031	-.131	.171	-.302	-.137	-.405
	(0.2)	(0.9)	(0.7)	(1.1)	(0.4)	(0.5)
Mother Present	.132	.056	-.339	-.072	-.059	-.034
	(1.0)	(0.3)	(1.6)	(0.3)	(0.2)	(0.0)
Father's Occupational Prestige	.003	.004	.015	.009	-.010	-.007
	(0.7)	(0.9)	(1.7)	(1.3)	(1.1)	(0.3)
Mother's Occupational Prestige	.002	-.002	.003	.002	.012	-.002
	(0.4)	(0.5)	(0.3)	(0.2)	(1.3)	(0.0)
Household Composition Variables						
Woman's Age	.013	.009	.003	-.016	.024	.005
	(2.1)	(1.3)	(0.3)	(1.2)	(1.6)	(0.2)
Companion Present	-.215	-.128	-.420	-.306	.042	-.200
	(2.1)	(1.2)	(2.4)	(1.5)	(0.2)	(0.4)
Other Household Members Over 14	.229	.105	.099	.434	.395	-.096
	(2.5)	(1.0)	(0.6)	(2.3)	(1.8)	(0.2)
Regional Variables						
North		-.305	-.258		-.190	-1.34
		(1.5)	(1.2)		(0.5)	(1.5)
Madriz		-3.51	-.255			-1.76
		(0.4)	(0.6)			(1.0)
Nueva Segovia		.013	.170		-.833	-1.64
		(0.0)	(0.5)		(1.5)	(1.6)
Pacific		-.204	.042		-.537	-1.05
		(1.2)	(0.2)		(1.6)	(1.6)
Atlantic Coast		.017			-1.28	
		(0.0)			(2.1)	
Rural						
Constant	-2.19	-1.28	-1.42	50.9	4.26	6.27
	(9.7)	(3.9)	(2.8)	(9.3)	(6.4)	(4.0)
-2 Log Likelihood Ratio	76	37	26			
$\bar{R}^2$				.11	.17	.05
Sample Size	1,534	1,188	590	210	140	46
Number of Recipients	240	197	66			

[a]See note a to Table A.1. See part of Table 4 for the estimated coefficients of human capital variables.

Notes

[1]Other major sets of policies include redistribution of ownership of physical capital and natural resources and direct redistribution of income through taxes and subsidies.

[2]We collected these data in 1977-78. This sample is not strictly speaking a random one of all households because not all households include at least one women in the required age range. However, it is much closer to a random sample of all households than would be the case for a similarly defined sample for more industrialized countries. Extended families are fairly common and a high proportion of the women in the country are 45 or under in age due to the relatively low life expectancy and the high population growth of recent decades (53). It is quite rare in Nicaragua that families with children do not have at least one woman in the eligible age range. Thus, it is almost a random sample of that very important set of households in which the next generation is being raised. For the purpose of the present study the advantage of having integrated socioeconomic, health and nutrition, and demographic data outweighs the disadvantage of possible nonrandomness. For more details concerning these data and our other analyses of them see (5-20, 40, 43-52, 54).

[3]We note that our simulations are partial in that we do not consider possible macroeconomic effects. Despite such a limitation, we think that our study gives some important insight about the extent to which human capital investments are likely to affect medium-run household distributions of income and its components.

[4]We do not use "full" income because of the difficulties in making these imputations and because the use of actual income assures greater comparability with other studies. Of course to the extent that households in a certain part of the distribution forego relatively certain types of income (e.g., from paid labor force participation) in order to engage in household production, the distribution of actual income may differ from the distribution of "full" income. For example, Butz (22) and his collaborators report that in Malaysia the distribution of full income is more equal than is that of nominal income because many households which are low in the latter distribution have relatively low labor force participation and high household production.

[5]See (34) for discussion of the alternative of constructing equivalency scales.

[6]This measure of inequality is widely used despite its lack of consistency with a social welfare function (see 3).

[7]The numbers in parentheses are from Table 1. We always give such numbers in order of decreasing urbanization (i.e., central metropolis, other urban, rural). Mean values of income components are in 1977-78 cordobas per biweekly period (7 cordobas = 1 U.S. dollar).

[8]This result suggests that a Beckerian (4) full income definition might indicate greater inequality than does the actual income distribution since richer households are more likely to have more of women's time devoted to household production. This contrasts with the result referred to in note 4.

[9]Since our respondents are women, there may be more measurement error in our data for men than for women. If this measurement error is

random, it may underlie part of the larger dispersion in the distribution of schooling for men than for women.

[10]Since the measurement error probably is larger for men than for women (see the previous note), the true dispersion of days ill probably is in fact less for men than for women in urban areas.

[11]We also have measures of standardized household nutrient intakes for calories, vitamin A, and iron. Those for calories are highly correlated with those for proteins, so it does not alter our estimated results significantly if we switch between these two most important nutrients. For more details concerning these nutrients, see (45).

[12]The calculation in the text is approximate since it assumes that women started school on the average when six years old and did not repeat any grades. Both of these assumptions probably cause an overestimate of their post-schooling years (and an underestimate of the proportion of those years in which they worked).

[13]The difference is not due to differences in age distributions. The age distributions for all three regions have means of 29 years and standard deviations of 8 years.

[14]But in rural areas the females are older by an average of a year.

[15]Selectivity bias may occur if the disturbance term in the relation that determines whether or not a household receives an income component is correlated with the disturbance term in the relation that determines the magnitude of the income component. Selectivity bias is most emphasized in the literature on women's earnings (8, 18, 28, 29, 31, 40, 41) but we also have found evidence of it in other contexts, such as whether or not

certain information is provided (7, 8, 18, 40). We control for selectivity bias in our estimates for the first three income components, but not for other income. In the last case the Heckman term from the probit estimate is merely a nonlinear transformation of the variables included in the OLS regression for the magnitude of other income. Therefore we cannot identify whether it is actually representing some selectivity phenomenon, or only nonlinearities in the true relation.

[16]On a more disaggregate level schooling may lead to selection into the formal sector and out of the informal and domestic sectors in the urban areas and into the formal sector in rural areas as we have found in other studies (8, 18). However, we do not try to divide work into different sectors in the present study because to do so would unduly complicate the analysis.

[17]Earlier results suggest that on a more disaggregate level there may be a simultaneity problem between nutrition and labor force participation for domestics (8, 18). If so this would bias primarily the estimate for the central metropolis, since the proportion of women who work as domestics is highest there (although still less than a fifth).

[18]In our simulations in Section 4 we focus on changes in days ill to represent changes in current health status. Therefore the simulations are not contaminated by the possible reverse causality for the disease category coefficient estimates.

[19]Earlier estimates suggest that on a more disaggregate level the returns to schooling in the urban areas are much higher for the formal than for the informal sector and not significantly nonzero for domestics (8).

[20]Disaggregated estimates imply that these returns are highest for the formal sector but, in the central metropolis, also significantly positive for domestics (8).

[21]We and others have found similar results in other studies (8, 27, 37, 38).

[22]On a more disaggregate level the returns are greatest in the informal sector, whose participants have the lowest nutrition level, and are not significantly positive for domestics, so there is not evidence of a simultaneity problem for the latter (8).

[23]On a national level for women we find a significantly negative coefficient for this variable, but not on more disaggregate levels (8).

[24]For men the variables related to home production, such as child care, are not significant. See the appendix and (8, 18).

[25]The estimates imply a maximum impact after almost three decades of experience in the central metropolis, which is longer than the periods for the maximums for women. For the other urban areas the maximum is often slightly more than two decades of experience, which is about the same as for women's earnings.

[26]The lesser importance of nutrition in male labor force participation than in female labor force participation may indicate that males tend to receive at least minimal nutrient inputs even if the household as a whole is below the minimum standards; therefore changing the household average does not affect the male's nutrition intake in the critical range as much as it affects the females. On the other hand, the trade-off between home production and labor force participation for males may so favor the latter

that marginal changes in their nutritional intakes (even if they are no better than the household averages) have little impact on their labor force participation.

[27]Since we are considering gross income, not the use of income, we do not concern ourselves with transfers from a household in our sample to other households. For this reason we work with gross transfers received (not net transfers), which are non-negative by definition.

[28]We find more evidence for the impact of demographic factors, such as number of children and marital status (44).

[29]If the probabilities of receiving a particular income component are ignored, the distributions are less skewed--in some cases substantially so. A striking illustration is the case of women's earnings in rural areas in which most of the inequality arises from differential probabilities of labor force participation and not from differential predicted magnitudes of earnings for workers. In this case the incorporation of the effect of the probabilities of participating in the labor force increases the Gini coefficient from 0.18 to 0.42 and reduces the share of the lowest 40% of households from 23 to 13%. Thus it is important to incorporate into the simulations the probabilities of receiving various income components in addition to the magnitudes that are received conditional on their being positive.

[30]Such an interpretation is common at least for earnings functions in many studies. For example, see (42).

[31]For evidence that unobserved family or household effects may be quite important in male earnings functions in the United States, see (5, 39). We are attempting a similar investigation for a subsample of sisters from the data set of the present study, but the results are not yet available (15).

[32]See the studies mentioned in note 31 for evidence to the contrary for the United States.

[33]We are undertaking in (11) a study of migration among the women in our sample.

[34]The second of these provides an empirical illustration for the proposition that the poorest can become relatively better off even if the Gini measure of inequality increases.

[35]For this reason our earlier study of nutrient demands in the central metropolis finds a very low income elasticity, with a number of other factors being more important (45).

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