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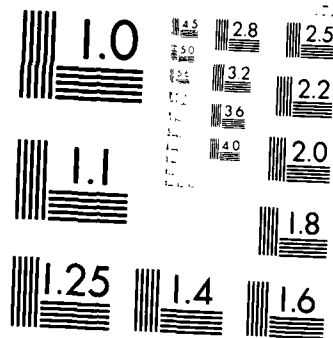NATIONAL BUREAU OF STANDARDS 1963 A

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ACCOUNTING FOR NONMARKET ACTIVITIES IN THE DISTRIBUTION OF INCOME:
AN EMPIRICAL INVESTIGATION

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ABSTRACT

It is frequently alleged that inequality is overstated when the nonmarket sector is ignored. This paper tests this proposition empirically, using detailed survey data from Malaysia. Indeed, we find that when the definition of income is broadened to include the value of nonmarket activities, income levels rise, especially among the poor, and inequality falls. In these data, it is the *average* number of hours of work considered to produce "income," and not their distribution, that affects income inequality. This underscores the need for great caution in interpreting intercountry or intertemporal comparisons of inequality.

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1. INTRODUCTION

Typically, as a country develops, specialized institutions arise that supply many of the goods and services previously produced by households. The households supply labor to these institutions and buy their products, both through markets. Consequently, households receive more income in the form of money wages, which are included in standard income figures, and less in the form of home-produced consumption, which often is not. Although intercountry .omparisons of income levels frequently acknowledge these "national accounts" problems, most studies of income distribution within a country ignore them. In both cases, measured income differences may overstate differences in well-being if the extent of market participation is not held constant. Although these issues have been raised before [e.g., Kravis (1960); Kuznets (1955)], there has been little empirical documentation using appropriate data.

This paper explores these issues with income data from Malaysia, using definitions of income that range from a narrow measure--market income--to broader measures that include the value of various nonmarket activities. By applying alternative definitions to the same sample, we can assess how measures of income levels and inequality change as the definition of income broadens. We find that traditional income measures that exclude household production underestimate the well-being of the poor and overstate inequality. For example, in moving from our narrowest definition of income to the broadest, both median household income and the income share of the poorest quintile of the population more than double.

2. DATA AND DEFINITIONS OF INCOME COMPOSITES
2.1 Data

The study uses 1976-77 data on a sample of 1,064 households in Peninsular Malaysia provided by the Malaysian Family Life Survey (MFLS) [see Butz and DaVanzo (1978)]. The MFLS consisted of 11 questionnaires administered one or more times during a three-round survey. It collected information on households' time allocation, earnings, assets, business and agricultural activities, and other income-earning activities. The MFLS sample is a random one of households with at least one ever-married

woman less than 50 years old.[1] Though not representative of the entire population of Peninsular Malaysia (it represents around three-quarters), this sample illustrates *what happens* to measures of the central tendency and inequality in the distribution of income when the definition of income is broadened.

2.2 Definitions of Income Composites

2.2.1. Unstandardized Income Composites.

We examine four successively broader income composites, each measuring households' annual before-tax income in 1976-77.[2] Details on their definitions can be found in Table 1 and in Kusnic and DaVanzo (1980, Secs. II and [Table 1] III). The first, and narrowest, income composite is **Market Income** (MI), the sum of a household's monetary receipts from formal market transactions. Next is **Total Observable Income** (TOI), the total of the household's monetary and nonmonetary receipts. It comprises MI plus four types of nonmoney income that are often not reported in income data, but clearly affect a household's well-being: in-kind income, transfer income, the value of the flow of services from owner-occupied housing, [3] and nonmonetary cottage industry income. **Total Actual Income I** (TAI-I) adds to TOI the value of time that adults (persons aged 15 or over) spend on such tasks as cleaning, laundry, and shopping. We include it because it is a productive use of time that could have been spent in other productive pursuits. **Total Actual Income II** (TAI-II), the broadest income composite, adds to TAI-I the value of time that adults spend on cooking and child care in the household.

We equate the value of what is produced with nonmarket time to the opportunity cost of that time, i.e., the value of the market goods implicitly forgone in order to spend that time in nonmarket activities. This opportunity cost, if correctly measured, serves as a lower-bound estimate of the value of that nonmarket time, independent of how the person chooses to spend it (i.e., in "productive" activities or simply in consuming leisure). We approximate the opportunity cost of a person's time by his or her wage rate (the observed wage if he or she works at a wage-paying job, an imputed wage if there is no observed wage).[4] With some rather restrictive assumptions (i.e., hours flexibility, zero marginal tax rate, no disutility of work), economic

Table 1

SUMMARY OF DEFINITIONS OF INCOME COMPOSITES IN MALAYSIA

Market Income = Wage Income + business income + capital and interest income

Total Observable Income = Market Income + in-kind income + transfer income + value of housing services + cottage-industry income

Total Actual Income I = Total Observable Income + value of housework

Total Actual Income II = Total Actual Income I + value of cooking and childcare

where the income components are defined as follows:

Income Component	Items Included in Definition
Wage	Cash earnings accruing to labor
Business	Net farm income Net business income (including income from partnerships) Monetary receipts from cottage industry
Capital and interest	Land and building rental income (cash) Dividend income Interest income Insurance and E.P.F. receipts*
In-kind	In-kind income received by employees Value of home consumption of own animals, animal produce, and crops Value of home consumption of own business products In-kind (share) receipts for land rentals
Transfer	Interhousehold transfer payments Income value of asset gifts received
Housing services	Net value of housing services from living in a house one owns
Cottage industry	Value of time spent producing cottage-industry products consumed in the home
Housework	Value of time spent cleaning house, shopping, washing clothes, and performing other housework tasks
Cooking and childcare	Value of time spent cooking meals and caring for own children

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*Employees Provident Fund, an insurance-cum-retirement program analogous to a cross between Social Security and Workman's Compensation in the United States.

theory implies that an individual's wage will exactly equal his or her
marginal value of time in terms of market goods. This implication,
coupled with the notion of diminishing marginal productivity of time in
household production (or diminishing marginal value of leisure), is
sufficient to ensure that the total value of what is produced at home is
worth at least the individual's wage rate multiplied by the amount of
time spent producing it.

We imputed a wage offer for people in the sample who were not in
the formal labor force and consequently did not have an observable wage
rate.[5] We estimated wage equations that relate natural logarithms of
wage rates to the economic and sociodemographic characteristics for the
sampie of people whose wages were reported. We then used the estimated
coefficients from those regressions to impute wages to nonparticipants.
Separate equations were estimated for males and females. Explanatory
variables in the wage regressions include age, education, marital
status, geographic location, ethnicity, and job characteristics. We
tested for selectivity bias using the procedure summarized in Heckman
(1976), and found no significant selectivity bias in our wage-imputing
procedure (the t-statistic on λ was -0.22). (The empirical analyses
used to test for selectivity bias are presented in Kusnic and DaVanzo
(1980, Appendix A).) To mitigate the problem of artificially lowering
variance through regression imputation, we added to the imputed wages an
error drawn from a normal distribution to preserve total wage
variance.[6]

Note that, even if one knew with certainty the potential wage offer
for a particular nonparticipant, one would not be able to infer that his
marginal value of time equaled that wage, because he chose not to work
for that wage rate; i.e., he placed a value on his time that exceeded
the wage offer. If hours of work were completely flexible, if there
were no time or money costs of labor-force participation, and if the
person received no disutility of work, then the wage rate would
understate the nonparticipant's marginal value of time; but it could
overstate it if any of these conditions failed to hold. In light of
these considerations, our results must be interpreted subject to the
maintained (and untestable) hypothesis that the wage imputed to

nonparticipants is a reasonable reflection of their marginal value of time (or at least a reasonable estimate of their *average* value of nonmarket time over the range of hours considered).[7]

2.2.2. Standardized Income Composites. This study also considers how accounting for the value of the consumption of leisure time (or the cost of forgoing leisure) in the definition of income affects measures of income inequality. By ignoring this component of welfare, most income-distribution studies implicitly assume that leisure time has zero value.[8] Furthermore, any measure of income that ignores leisure implicitly incorporates variation in tastes for leisure (vis-a-vis work) into the variation in the income distribution [Becker (1965)] and will lead to the conclusion that people with little taste for leisure are better off than those with more, other things equal. This is especially true if the value of other uses of nonmarket time is included, since people can do anything they wish with that time. If the interest is in the distribution of *consumption potential* in a population, the data should be purged to the extent possible of the effects of variation in preferences across the population.

To adjust for variations in leisure consumption, we constructed three standardized income composites for comparison with the last three unstandardized composites defined above. These new income composites are denoted as **Standardized Observable Income** (SOI), **Standardized Actual Income I** (SAI-I), and **Standardized Actual Income II.**[9] They adjust for the variation in hours of work (and hence hours of leisure consumption) implicit in each of the unstandardized income measures, by evaluating that income measure at the same number of hours for all adults in the sample--the mean of the observed distribution of work-hours for the corresponding unstandardized income composite. That is, we add to (or subtract from) each adult's income an estimate of the value of leisure consumed (or forgone) in the process of achieving the income previously attributed to him.[10]

3. FINDINGS

3.1. Central Tendency of Unstandardized Incomes

Table 2 presents mean levels of the nine components of income considered here, starting with those most commonly considered in other income distribution studies, and shows how the means of composite income measures change when we add components that are less typically considered.

The largest component of household income--the one considered in every income-distribution analysis--is wage income, followed by business income. The composite of wage, business, and capital and interest income--Market Income (MI)--is a measure similar to that used in many previous analyses of income distribution. Its mean of M$8,219 is equivalent to US$3,288 (using the 1976-77 exchange rate of M$2.5 = US$1). The mean household income in the United States in 1975, for a definition very close to MI, was US$13,186.

The next four components in Table 2--net transfer payments, the value of services provided by living in a home one owns, in-kind income from employment and from own farm and business products consumed rather than sold, and the imputed value of cottage industry production--are mentioned in most income-distribution studies, but few studies have been able to measure them with much accuracy. Adding these four components to MI, to form Total Observable Income (TOI), increases average annual household income by 17 percent. Another 17-percent increase occurs when we add the next income component, the value of housework, to TOI to form Total Actual Income I (TAI-I).

The final component, the value of cooking and childcare, exceeds the value of all other components except wage income and business income. Including it yields composite measure we call Total Actual Income II (TAI-II), whose mean exceeds the mean of the most narrowly defined composite, MI, by 56 percent, and that of the more commonly accepted income measure, TOI, by 33 percent.

Table 3 presents both medians and means of the various income composites. The medians are substantially smaller (less than 5 percent for MI) than the corresponding means, an indication of the high degree of positive skewness in each of the distributions. In addition, the

Table 2

MEANS OF COMPONENTS AND COMPOSITES
OF HOUSEHOLD INCOME

Income Component	Mean Level (M$/year)
Wage income	4,986
Business income	2,830
Capital and interest income	403
MARKET INCOME	8,219
Transfer income	131
Value of housing services	352
In-kind income	416
Cottage-industry income	499
TOTAL OBSERVABLE INCOME	9,617
Value of housework	1,410
TOTAL ACTUAL INCOME I	11,027
Value of cooking and childcare	1,754
TOTAL ACTUAL INCOME II	12,781

NOTE: M$ = Malaysian dollars

Table 3

MEANS AND MEDIANS OF UNSTANDARDIZED
INCOME COMPOSITES

Income Composite	Mean (HS)	Median (HS)	Mean/Median
Market Income	8,219	3,829	2.15
Total Observable Income	9,617	5,091	1.89
Total Actual Income I	11,027	6,443	1.71
Total Actual Income II	12,781	7,958	1.61
Total Actual Income II/ Market Income	1.56	2.08	

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the extent to which consumption by individuals or families passes
through formal markets becomes more equal as a country develops, much of
what has been described as increasing equality due to economic growth
may be spurious.

a broader definition increases the average number of hours of "work." Possibly, the levels of income inequality in developed countries are lower largely because the average number of hours considered to produce "income" is larger there than in less developed countries.

Our results can be interpreted as relating to the downward-sloping portion of the inverted U-shaped relationship frequently observed between income inequality and the level of economic development [Kuznets (1955, 1963); Kravis (1960); Adelman and Morris (1973); Ahluwalia (1976); and Paukert (1973)]. Our explanation of this part of the relationship relates to the increasing monetization of labor-income sources of welfare that occurs during the development process. To explain the other, positively sloped, segment of the relationship one could appeal to a similar kind of argument with respect to nonlabor sources of welfare (e.g., capital and interest income), which at the earliest stages of development, may be the first to be monetized. Given that the variance of the values of these sources of welfare across the population is, in general, considerably higher than that for labor incomes, it follows that during the stage of economic development for which nonlabor incomes are being increasingly monetized (and before labor incomes have begun to be monetized), one would observe higher and higher levels of measured income inequality.

Economists have traditionally assumed that there is a direct relationship (within a country over time or among countries at different stages of development at a point in time) between average income and the equality of its distribution, as though the development process itself carried implications for equality, or vice versa. But is this relationship between income inequality and economic development real? The belief that it is has guided recent development policy and stimulated much research into its causes.[20] We argue here, however, that much of the relationship could be illusory--owing to the use of measures of economic well-being that are biased toward formal market activities. Most studies focus on measures of income too narrow to yield useful inferences about relations between levels and dispersion in well-being. If the fraction of aggregate consumption that passes through formal markets increases as a country develops, the fraction of well-being measured as market income will increase. If, in addition,

substantial fraction of productive economic activity takes place in the nonmarket sector. We show that conclusions about income levels and income inequality are sensitive to how broadly income is defined and to how income levels and inequality are measured.

We have examined this sensitivity for a sample of households in Malaysia. When we compare our broadest household income composite, Total Actual Income II, with our narrowest, Market Income, mean income increases by 56 percent and median income by 108 percent. When we broaden the definition of income, income inequality unambiguously falls. This is true for all measures of inequality examined here--Gini ratios, Theil indexes, coefficients of variation, and income shares of the poorest and wealthiest quintiles of the sample.[19] Indeed, each successive broadening of the definition generates a distribution of income that *stochastically dominates* the preceding one. The falls in inequality when we contrast our broadest income composite with our narrowest range from 22 percent to 41 percent, and the income share of the poorest quintile of the population more than doubles. Although broadening the definition of income increases most sample members' measured income, the effect is greatest on the poorest members.

As intended, the procedure we use to remove variation across the population in leisure consumption has very little effect on income means or medians. Surprisingly, it has little effect on overall income inequality as well. However, standardization affects different portions of the income distribution differently. It tends to reduce the incomes of the poorest households, who work an above-average number of hours, and to raise the incomes of the wealthiest households. The poor in Malaysia appear to compensate for their low market incomes by forgoing leisure consumption and working long hours to produce many goods and services for their own consumption.

When incomes are standardized to eliminate variation in hours of leisure, measures of income inequality are sensitive to the number of hours on which one chooses to standardize. In particular, in these data, the larger the average number of work-hours on which we standardize, the lower the estimate of inequality. The fall in inequality in unstandardized measures of income when we broaden the definition of income appears to be almost entirely due to the fact that

the distribution of income.[18] We showed earlier that inequality falls
as the definition of income broadens. The results of this subsection
imply that that fall is primarily due to the fact that broadening the
definition increases the average number of hours of "work," rather than
to any effect it has on variation in those hours across the population.

This last point leads to an interesting speculation. Imagine an
economy "developing" in the sense that, over time, individuals are
observed substituting hours worked in the marketplace for hours spent
"working" in the nonmarket sector. Further imagine that this
substitution of hours represents a fully *quid pro quo* transaction; that
is, the return in terms of welfare to the additional hours spent working
for a wage is exactly equal to the reduction in welfare resulting from
the reduction in nonmarket production. If this were the case,
"development" would have no effect on anyone's welfare level. However,
this substitution would raise mean hours of measured (i.e., market) work
and, as we have just demonstrated, thereby reduce estimated income
inequality in a completely spurious manner.

We do not mean to suggest that the preceding thought-experiment
necessarily reflects what happens during development; rather, our intent
is to underscore the need for great caution in interpreting a comparison
of income inequality between countries, or for a given country at
different stages of development. To the extent that our results
generalize, they indicate that unless an inequality comparison holds
constant both the definition of income and the resulting mean hours of
"work," there is a great risk that apparent differences in income may
not represent true differences in the underlying distributions of
welfare.

4. SUMMARY AND CONCLUSIONS

The definitions of national income that were developed in the 1930s
and 1940s made the pragmatic decision to focus almost exclusively on the
value of activities that pass through formal markets, and to ignore the
value of nonmarket activities. We have shown here, and others have
demonstrated for other countries [e.g., King and Evenson (1983);
Hawrylshyn (1976); Sirageldin (1969); Nordhaus and Tobin (1973)], that a

Table 7

SENSITIVITY OF INEQUALITY IN STANDARDIZED INCOME
MEASURES TO CHOICE OF STANDARDIZING HOURS

Income Measure	Gini Ratio	Theil Index	Coefficient of Variation	Income Share of Lowest Quintile	Income Share of Highest Quintile
Standardized Observable Income (H = 1490)	0.569	0.712	2.04	3.1%	61.6%
U.S. Standardized Income (H = 2080)	0.527	0.587	1.87	3.9	58.0
Malaysian Standard- ized Income (H = 2288)	0.515	0.556	1.78	4.2	57.1
Maximal Standardized Income (H = 5840)	0.441	0.367	1.17	5.8	50.8

market income by producing many goods and services for their own
consumption. Ignoring that fact understates their relative income
position. However, those activities tend to draw the poor into working
above-average hours and hence forgoing leisure consumption. Ignoring
this implicit cost of household production tends to bias estimates of
their well-being upward.

3.4. Sensitivity of Inequality of Standardized Income to Choice of Standardizing Hours

The generation of the standardized income composites is equivalent
to a procedure that first constructs a budget constraint for each
household in the sample and then defines income as the dollar value of
that budget constraint evaluated at a prespecified, constant number of
hours of leisure consumption. However, the choice of the number of
hours at which to evaluate those budget constraints is ultimately
arbitrary. Nevertheless, statistics describing the extent of inequality
in the distribution of leisure-standardized income will, in general, be
a function of where those budget constraints are evaluated, i.e., the
number of hours at which we standardize.

The implication is that there can be no unique answer to a question
concerning the level of inequality in the distribution of "full" income.
Table 7 illustrates this by presenting inequality measures corresponding
to four levels of standardizing hours (H). Three are new, generated by
setting H equal to standard U.S. full-time-work hours (2,080/year)[14],
Malaysian standard full-time-work hours (44 hours/week or 2,288
hours/year), and, as a limiting choice, 16 hours/day 365 days a year, or
5,840 hours/year.[15] In Table 7, the level of measured income
inequality is critically dependent on the choice of H; inequality falls
considerably as H rises.[16] In fact, for plausible values of the
variances and covariances of wages and nonlabor income, the general
result is that **the larger is H, the lower will be the estimate of
inequality of full income.**[17]

One interpretation of these results is that measures of inequality
are highly sensitive to the relative share of labor income in total
income; the larger the share, on average, the lower the inequality in

Table 6

MEASURES OF INEQUALITY:
STANDARDIZED INCOME COMPOSITES

Income Measure	Gini Ratio	Theil Index	Coefficient of Variation	Income Share of Lowest Quintile	Income Share of Highest Quintile
Standardized Observable Income (H = 1490)	0.569 (0.567)	0.712 (0.709)	2.04 (2.05)	3.1% (3.3)	61.6% (61.9)
Standardized Actual Income I (H = 1934)	0.535 (0.518)	0.611 (0.591)	1.80 (1.81)	3.7 (4.5)	58.8 (58.0)
Standardized Actual Income II (H = 2481)	0.506 (0.480)	0.530 (0.501)	1.59 (1.60)	4.4 (5.2)	56.3 (54.7)

NOTE: The numbers in parentheses are the corresponding values for the unstandardized composites.

Table 5

MEANS AND MEDIANS OF STANDARDIZED
INCOME COMPOSITES

Income Measure	Mean	Median
Standardized Observable Income (H = 1496)	9429 (9617)	5030 (5791)
Standardized Actual Income I (H = 1934)	11069 (11027)	6248 (6443)
Standardized Actual Income II (H = 2481)	13107 (12781)	7643 (7958)

NOTES. The numbers in parentheses are the means and medians of the corresponding unstandardized measures.

H = number of standard hours of work at which each adult's income was calculated.

differences between the estimates of inequality decreases implied by the Gini ratio and by the Theil index are due to the fact that broadening the income concept primarily affects the lower end of the income distribution. The income share of the poorest quintile of the sample increases by more than 40 percent when the various in-kind forms of income are added to MI to form TOI. When we contrast MI with TAI-II, the income share of the poorest quintile more than doubles (from 2.3 percent to 5.2 percent). This explains why the Theil index, the measure most sensitive to changes at the lower end of the income distribution, shows the greatest fall when the definition of income is broadened.

3.3. Distribution of Standardized Incomes

We now turn to the measures of income that adjust for variation in leisure consumption across the population. Table 5 shows means and medians of these standardized income composites.

By design, standardizing on alternative values for leisure consumption has little effect on the means and medians.[13] Surprisingly, standardizing for the variation across the population in leisure consumption has little effect on income inequality as well (Table 6). Inequality in these standardized income distributions still falls with an increase in the scope of activities included in income; but the adjustment for leisure per se--eliminating variation in leisure consumption while holding mean work-hours constant--has no unambiguous effect on inequality. In fact, the most commonly used measures of inequality, the Gini ratio and the Theil index, are always larger for the standardized measures than for the corresponding unstandardized ones.

However, standardizing for leisure consumption substantially affects the income share of the poor. Whereas one of the important conclusions drawn earlier was that failure to consider nonmarket sources of income leads to a serious understatement of the well-being of the poorest 20 percent of the population, the results in Table 6 imply that failure to adjust for variation in leisure consumption leads to an overstatement. The reconciliation of these two points is worth noting: The poor (in terms of MI) in Malaysia appear to compensate for their low
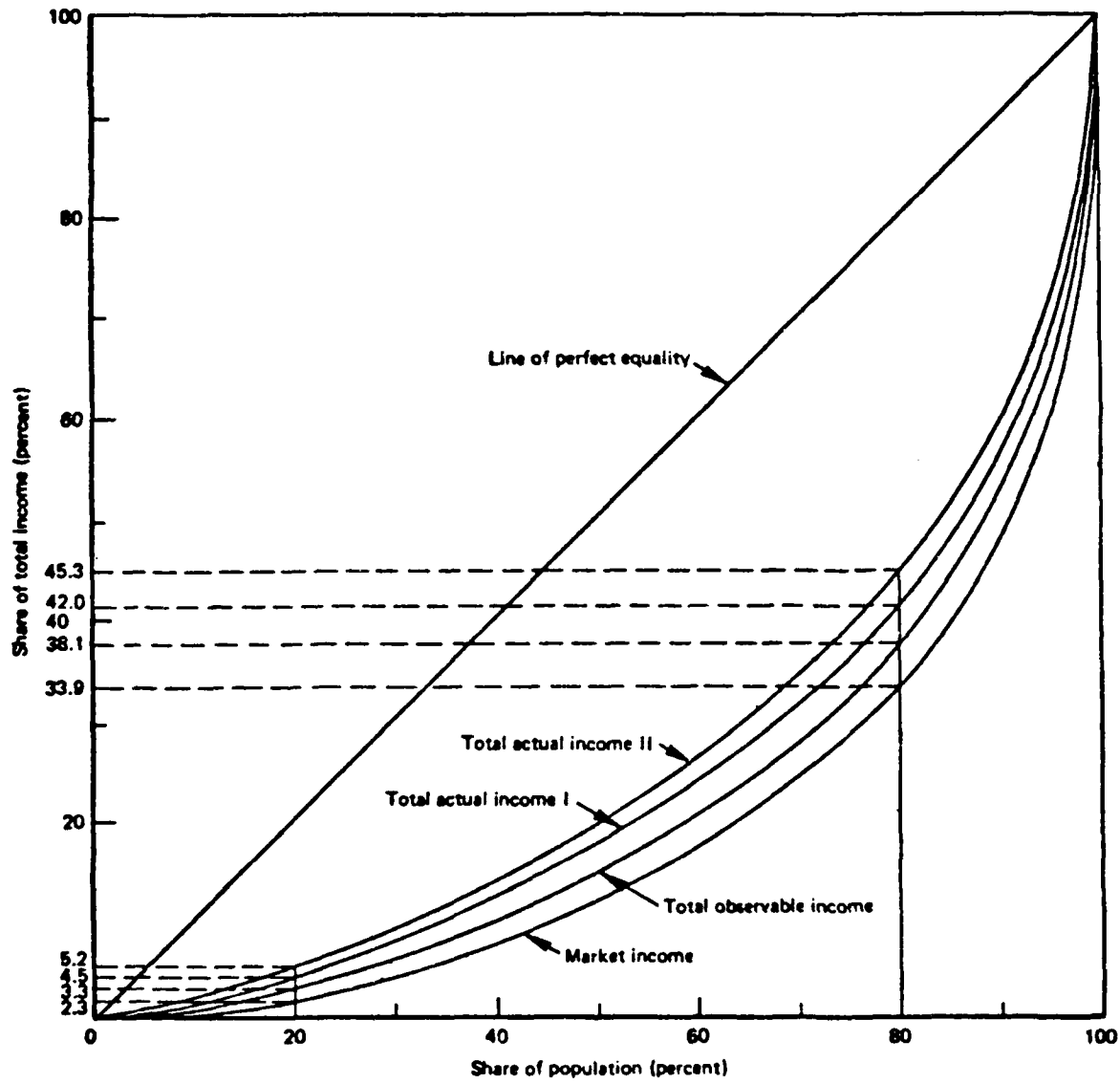
Fig. 1—Lorenz curves for the four household income composites

Table 4

MEASURES OF INEQUALITY:
UNSTANDARDIZED INCOME COMPOSITES

Income Composite	Gino Ratio	Theil Index	Coefficient of Variation	Income Share of Lowest Quintile	Income Share of Highest Quintile
Market Income (MI)	0.616	0.850	2.34	2.3%	66.1%
Total Observable Income (TOI)	0.567	0.709	2.05	3.3	61.9
Total Actual Income I (TAI-I)	0.518	0.591	1.81	4.5	58.0
Total Actual Income II (TAI-II)	0.480	0.501	1.60	5.2	54.7
Ratio of value for TAI-II to value for MI	0.78	0.59	0.68	2.3	0.83

ratio of mean to median falls as we broaden the definition of income, because such broadening has a larger relative effect on households in the lower end of the distribution. As a consequence, moving from the narrowest income composite to the broadest increases median household income considerably more than it does the comparable mean (108 percent vs. 56 percent).

3.2. Variation in the Distribution of Unstandardized Incomes

We now examine how broadening the definition of income affects measures of variation in income. We consider two measures of inequality--the Gini ratio and the Theil index [Theil (1967)]; one measure of general dispersion--the coefficient of variation; and two measures of income shares--the income shares of the poorest and of the wealthiest quintiles of the population. (For simplicity, we will refer to this set of measures as measures of inequality.) We use more than one measure of inequality (1) to increase the probability of detecting ambiguity in our comparisons, and (2) to assess how broadening the definition of income affects different portions of the distribution (since different measures have differing sensitivities to changes in particular parts of the distribution [Champernowne (1974)]).

Table 4 presents these five inequality measures for the four unstandardized income composites. The overwhelming conclusion here is that *as one broadens the definition of income, inequality unambiguously falls.* This result holds for all inequality measures examined. furthermore, each successive broadening of the income definition generates a distribution that *stochastically dominates* the preceding one.[11] This result is implicitly illustrated by the Lorenz curves in Fig. 1.[12]

The extent of the decrease in inequality depends on the inequality measure used. When the definition is broadened from MI to TOI, the Gini ratio decreases by 8 percent but the Theil index decreases 17 percent. Even more dramatic is the fall in inequality implied by a comparison of the distribution of MI with that of the broadest measure, TAI-II. The range of estimates for that comparison varies from a fall of 22 percent for the Gini ratio to a fall of 41 percent in the Theil index. The

FOOTNOTES

1. The MFLS sample excludes households that lack an ever-married woman or in which the ever-married women are all over age 50. These excluded households--approximately 24 percent of the households in Peninsular Malaysia--are mostly older households.

2. Household income is the sum of the incomes of all adult members of the "household." (In the MFLS, a *household* is defined as a "group of people who sleep under the same roof and eat from the same cooking pot" [Jones and Spoelstra (1978, p. 10)]. In this paper, no adjustment is made for household size and composition. The main conclusions remain the same when we consider distributions of households by per-adult or per capita income, or of individuals by per capita income [Kusnic and DaVanzo (1980)].

3. This value was imputed using a hedonic rent regression based on the sample of households renting their dwelling units [see Kusnic and DaVanzo (1980)].

4. The most common alternative approach uses the market price to directly "cost out" the values of the goods or services produced in the household. We use this procedure only when the goods so produced are identified in the data, and reasonable prices for them also exist. In the general case of unidentified goods and services produced in the home, this procedure is fraught with both conceptual and empirical difficulties (e.g., reasonable prices do not exist in the data), and so we opt for the wage imputation technique.

5. Substantial unemployment may nullify the meaning of the potential wage offer in terms of its relevance to individuals' actual market options: If labor markets fail to clear and market work is *not* available, is it correct to consider market work the alternative that could have been chosen? Although high unemployment may be a persistent problem in other less-developed countries, Malaysia's average unemployment rate in 1975 was a middling 6.9 percent. Furthermore, unemployment rates are highest in Malaysia for the high-wage, high-income subgroups in our sample (Chinese and urban residents). Thus, taking account of it would not likely affect our general results.

6. For unmarried individuals, this error had a mean of zero and variance equal to the error variance in the wage-imputing equation. (An identical procedure was employed in the construction of the component measuring the value of owner-occupied housing services.) For married individuals, we used information on the covariance structure of the distribution of husbands' and wives' residuals in calculating the error we added back. We computed the correlation coefficient (0.143) between husbands' and wives' estimated residuals for the sample of husband-wife pairs for whom both wages were observed. For households in which one spouse's wage was not observed, the error added to one spouse's imputed wage was conditioned on the value of the observed residual of the other. (The paired residuals were treated as being distributed bivariate normal.)

7. It is important to note a common misunderstanding concerning the implications of using an observed (or imputed) marginal wage to approximate the value of household time. It is sometimes alleged that this implicitly assumes that the individual could, in fact, work those additional hours without affecting his marginal wage offer, and, as a consequence, it is asserted that the elasticity of demand for labor has been assumed to be infinite. Neither assertion is correct. The potential effect on wage offers that would result from an individual (or all individuals) actually attempting to work those extra hours is irrelevant. The validity of our procedure simply requires that (1) the wage (imputed or observed) is a reasonable estimate of the value of the individual's marginal unit of nonmarket time; and (2) the marginal value of nonmarket time is a declining function of how much time is spent in nonmarket production.

8. A notable exception is Garfinkel and Haveman (1977), who look at the distribution of "earnings capacity" in the U.S.--the income the family would earn if the male and female heads worked 40 hours a week, 52 weeks a year.

9 We chose not to generate a standardized composite corresponding to Market Income because of the ambiguity involved in allocating hours between that composite and Total Observable Income. For example. if a person working as an employee gets paid both money wages and in-kind payments, his total working hours will show up in Market Income hours.

10. The estimated value of leisure consumed or forgone for each individual is the product of the individual's wage rate and the difference between the sample average number of hours of work for a particular definition of income and the individual's hours of work. Note that leisure time is treated symmetrically with other uses of nonmarket time, and, hence, priced out at the value of the individual's wage rate. We are assuming that an individual is free to allocate his time among nonmarket activities, including leisure. Therefore, all nonmarket uses of time must be equivalued on the margin.

11. If a distribution, A, stochastically dominates another distribution, B, any inequality measure based on a social welfare function that is increasing and concave in individual incomes will yield a conclusion that income in A is more equally distributed than in B [Atkinson (1970)].

12. Distribution A stochastically dominates distribution B if the Lorenz curve for A lies entirely above that for B (i.e., Lorenz dominance), and the mean of A exceeds the mean of B [Atkinson (1970)].

13. We standardized on mean observed hours of work for alternative definitions of work to isolate, as much as possible, the pure effect of the standardization process. As the definition of income broadens, standardized means tend to increase relatively more than the corresponding unstandardized values, while the opposite is generally true for medians. Standardization on hours reduces mean Observable Income compared with the corresponding unstandardized measure, while the opposite is generally true for the broader definitions. Although these net differences caused by standardizing on hours are small, they are the result of some interesting offsetting changes. In general, the distribution of the workload in the household depends on the definition of work. The narrower the definition, the more it appears that the men in the household work the most. When the variation in leisure consumption among household members is purged by estimating what the household's income would be if every adult worked the same number of hours, the higher-valued forgone leisure of male heads dominates the value of the extra leisure consumed by other adults, and mean household Observable Income falls. However, when all forms of housework

activities are included in "work" (i.e., TAI-II), female heads are the main workers in the household. In addition, this broadening of the definition of work increases the relative leisure consumption of other household adults, both male and female. On balance, the additional value of the leisure consumed by other adults dominates the value of the leisure forgone by female heads, so that in this case the hours-adjustment raises mean household income.

14. The U.S.-based distribution is included to allow a comparison between this study and a similar study using U.S. data by Garfinkel and Haveman (1977), who calculate a full income measure standardized at 2,080 hours per year, which they call "earnings capacity."

15. Becker's (1965) definition of full income involved an even more extreme choice of H--24 hours a day, 365 days a year.

16. It is interesting that broadening the definition of income has very similar effects on measured inequality in Malaysia and the U.S. If we compare Gini ratios for our MI composite and Garfinkel and Haveman's (1977) "pre-transfer income," a measure corresponding most closely to our MI composite, with those for "full income" or "earnings capacity" standardized at 2,080 annual hours, the relative falls in inequality between the unstandardized MI and earnings capacity standardized at U.S. full-time work hours are identical--17 percent in both cases. Since Garfinkel-Haveman's "families" are restricted to include only non-aged husband-wife pairs, our most comparable distributions are for per-adult measures (these are presented in Kusnic and DaVanzo [1980]). We estimate Gini ratios of 0.614 for unstandardized per adult MI (compared with their 0.540) and 0.508 for "full income," or "earnings capacity," standardized at 2,080 annual hours (compared with their 0.448).

Note, however, that Garfinkel and Haveman are making two adjustments at once when they move from unstandardized Market Income to standardized earnings capacity. They not only remove variation in hours of work but also increase the mean number of hours worked. Our results below show that adjusting for variation in hours of work, by itself, has practically no effect on inequality, but that increasing the number of hours at which we standardize reduces inequality. Thus the Garfinkel-Haveman finding appears to result from the fact that their earnings capacity measure assumes a considerable increase in average

. . . . removing variation in those hours

. . . . illustrated for the coefficient of variation (whose
. . . . manipulate algebraically). If the value of a
. . . . budget . . . . is

$$Y = WH + X, \tag{1}$$

. . . . sum of wages across adults in the family, H is the
standard number of hours of work, and X is the sum of the household's
nonlabor sources of income, then the coefficient of variation of Y is

$$CV_y = \frac{\sigma_y}{\bar{Y}} = \sqrt{\frac{H^2 \sigma_w^2 + \sigma_x^2 + 2H\sigma_{xw}}{\bar{W}H + \bar{X}}} \tag{2}$$

To examine how this statistic changes when H is increased, we take the
partial derivative of Eq. (2) with respect to H:

$$\frac{\partial(CV_y)}{\partial H} = \frac{K_x K_w}{H} \left[K_w CV_w^2 - K_x CV_x^2 + (K_x - K_w) CV_{xw} \right] , \tag{3}$$

where $K_x \equiv \frac{\bar{X}}{\bar{Y}}$, $K_w \equiv \frac{\bar{W}H}{\bar{Y}}$, $CV_w^2 = \frac{\sigma_w^2}{\bar{W}^2}$, $CV_x^2 = \frac{\sigma_x^2}{\bar{X}^2}$, $CV_{xw} = \frac{\sigma_{xw}}{\bar{X}\bar{W}}$

The value and sign of the expression in Eq. (3) depend on the
relative sizes of the squared coefficients of variation of wages (CV^2)
and of nonlabor income (CV^2), and on the coefficient of covariation
between wages and nonlabor income (CV_{xw}). In our sample these variables
have the following values: $CV^2 = 0.851$, $CV^2 = 11.3$, and $CV_{xw} = 0.492$.
These particular magnitudes imply that the derivative in Eq. (3) is
negative over the possible range of hours. In fact, this will follow
whenever $CV^2 > CV^2 = CV_{xw}$, which is generally the case. That is, the
larger is H, the lower is the estimate of inequality. Since
successively broader measures of standardized income stochastically

dominate narrower ones within the range of hours considered here, this same result applies to the other common measures of inequality, at least for these data.

18. Others [e.g., Kravis (1960)] have noted that increases in the share of labor income, which varies less than most other income components, will reduce overall inequality. Kravis speculates that labor shares increase with development and that this is why inequality typically falls as a country develops.

19. In related papers [DaVanzo and Kusnic (1983, 1984); Kusnic and DaVanzo (19840], we show that income differences among ethnic and urban/rural subgroups become smaller as successively broader definitions are used. For example, the ratio of Malay to Chinese median income increases from .48 for MI to .63 for TAI-II.

20. For example, Nugent (1983) has compiled a list of 10 alternative explanations that researchers have offered for the "inverted-U hypothesis."

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