INCOME INEQUALITY AND THE DEFINITION OF INCOME: THE CASE OF MALAYSIA

PREPARED FOR THE AGENCY FOR INTERNATIONAL DEVELOPMENT

MICHAEL W. KUSNIC, JULIE DA VANZO

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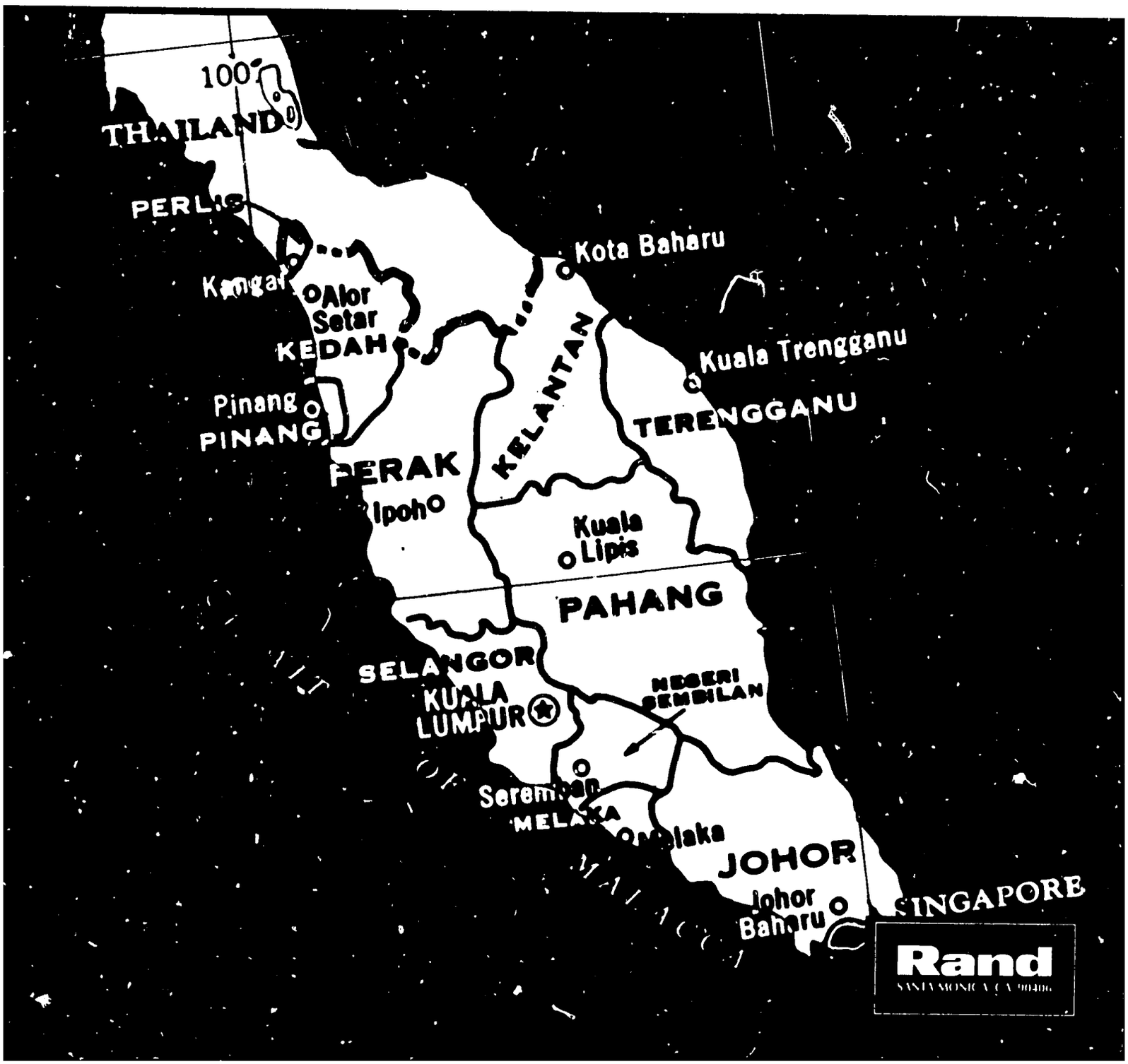

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PREFACE

The research reported herein has been performed under Contract AID/OTR-C-1432 from the Bureau for Program and Policy Coordination, U.S. Agency for International Development, as part of a Rand-centered program of research into the ties between human capital and income distribution in developing countries. The report should be useful to readers with a general interest in economic development or income distribution, as well as to those with a particular interest in the economic situation in Peninsular Malaysia.

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SUMMARY

This report characterizes the distribution of income in Peninsular Malaysia and explores the sensitivity of estimates of income levels, interethnic or urban/rural differences, and income inequality to five factors:

- How broadly income is defined.
- Whether means or medians are used to describe the central tendency of the distribution.
- Whether incomes are adjusted for household size or composition.
- Whether we standardize on hours of work to remove variation in leisure consumption.
- Whether we control for the influence of demographic characteristics of the recipient units.

We have examined the distribution of four measures of household income, using recent (1976-77) data from the Malaysian Family Life Survey on a sample of over 1,000 households in Peninsular Malaysia. These income measures are defined as:

- *Market income*—the sum of the household's money income receipts from formal market transactions.
- *Total observable income*—the total of the household's monetary and non-monetary receipts, including in-kind and cottage-industry income.
- *Total actual income I*—total observable income plus the value of the time adult household members spend in certain housework activities (such as cleaning house, washing clothes, and shopping).
- *Total actual income II*—total actual income I plus the value of the time adult household members spend cooking meals and caring for children in the household.

Values of time spent in cottage industry or housework activities are calculated by multiplying the amount of time spent in these activities by the wage rate the individual is paid in his or her outside employment, or by an estimate of what the individual would have received from outside employment.

The mean 1976-77 household market income in our sample is M$8,219 (M$ denotes Malaysian dollars), which is equivalent to $3,288 in 1976-77 U.S. dollars. Broadening the definition of income to include transfer income, the value of living in a home one owns, in-kind income, and cottage-industry income (i.e., considering total observable income) increases mean household income in our sample by 17 percent. Including the value of housework activities other than cooking and child-care (total actual income I) increases the mean by another 17 percent; and finally, including the value of time devoted to cooking and childcare as well (total actual income II) increases the mean another 16 percent, to M$12,781. Thus the broadest measure of household income has a mean 56 percent higher than the narrowest measure; *median* household total actual income II is over twice the size of median household market income; and the household total actual income II of the poorest

decile of the population is over 3.6 times the corresponding figure for market income. Indeed, broadening the definition has the greatest impact on the poorest segments of the population.

When the definition of income is broadened, inequality falls. This is true for all the inequality indicators examined in this study (Gini ratio, Theil index, coefficient of variation, income shares of the poorest and wealthiest quintiles of the population, variance of logarithms of income, ratio at deciles, and the Lorenz curve). Each successive broadening of the definition of income generates a distribution of income that stochastically dominates the preceding one.

Failure to consider nonmarket sources of income leads to a serious understatement of the relative income position of the poorest quintile of the population; when the definition of income is broadened from market income to total actual income II, the income share of the poorest 20 percent of the population more than doubles. This same broadening decreases the Gini ratio, Theil index, coefficient of variation, and variance of logarithms by from 20 to 65 percent.

Broadening the definition of income not only tightens the distribution of income, it also changes households' rankings in the distribution considerably.

Removing variation in the value of leisure consumption by estimating what each adult's income would be if he or she worked the sample mean number of hours for that definition of income has remarkably little effect on most measures of overall income inequality. However, when we remove this variation (i.e., when we standardize the income measures), the income share of the poor is smaller for each standardized income measure than for the corresponding unstandardized measure, particularly under the broadest definition of income. This suggests that failure to adjust for leisure consumption results in an overstatement of the relative income position of the poor. The poor in Malaysia appear to attempt to compensate for their relatively low market income by producing many goods and services for their own consumption (which explains the rise in their income share when the definition of income is broadened to include nonmarket activities). But the poor tend to work relatively long hours at these household production activities and hence forgo relatively large amounts of potential leisure consumption. Ignoring this implicit cost of household production tends to bias estimates of the relative welfare position of the poor upward. Standardizing for leisure consumption causes considerable changes in households' rankings in the income distribution.

The fall in inequality that results from broadening the definition of income appears to result almost entirely from an increase in the *average* number of hours of "work" (and the fact that income measures based on larger average number of hours of work are more equally distributed) rather than from any effect the broadened definition has on variation in those hours across the population. That is, inequality in our standardized measures is inversely related to the number of hours of work on which we standardize. This finding has important implications for international (or intertemporal) comparisons of measures of income inequality, for it suggests that if two countries have identical distributions of well-being, but the average number of hours *considered* to produce income (and hence the amount of well-being measured as income) is greater in the first than in the second, measured inequality will tend to be less in the first. The generally lower levels of income inequality in more developed countries than in less developed countries may be largely a reflection of the fact that the average number of hours considered to produce income is larger in the former group than in the latter.

Adjustments for household size and composition do not affect income inequality in an unambiguous way but do change households' rankings in the income distribution considerably.

Income distributions show dramatic differences among the three main ethnic groups in Peninsular Malaysia (Malays, Chinese, and Indians) and between the rural and urban subgroups. Chinese incomes are larger, on the average or median, and are more unequally distributed than those of Malays or Indians. However, because relatively more of Chinese income is received from market activities, broadening the definition of income reduces the relative difference between Chinese households and the other two ethnic groups. Since the distribution of Chinese income is more highly skewed than that of Malays or Indians, medians lead to considerably smaller Chinese/Malay or Chinese/Indian income ratios than do means. Adjusting for household size further improves the position of Malay households, which are the smallest of the three ethnic groups. Chinese households are primarily urban, while Malay households are primarily rural; thus similar conclusions are found for urban/rural income differences. In fact, the relative income difference between Chinese households and the other two ethnic groups is partly due to the fact that incomes in urban areas are higher than those in rural areas, regardless of ethnicity. The relative difference between Chinese and Malay or Indian incomes is smaller within urban or rural strata than when overall group means or medians are compared, although even within these strata, Chinese households' incomes considerably exceed those of Malays or Indians. Indian income superiority over Malay appears to be entirely due to the fact that relatively more Indians live in urban areas, since this superiority generally disappears when comparisons are made within urban or rural strata. Taking account of the value of forgone leisure time worsens the position of rural Malay households (who work an above-average number of hours) and improves that of urban Indian households (who work a below-average number of hours).

Within each ethnic and locational subgroup, broadening the definition of income reduces within-group inequality. The reductions are larger for the subgroups whose incomes were most equally distributed to begin with—Malays, Indians, and rural households; thus, relative differences among subgroups in the extent of within-group inequality become larger as the definition of income is broadened.

Despite the fact that mean income differences among ethnic or urban/rural subgroups are large (Chinese mean income is generally twice as large as Malay, and urban mean income is generally twice the rural level), the vast majority (around 80 to 90 percent) of overall income inequality in Peninsular Malaysia is due to differences *within* subgroups rather than among them.

A multivariate analysis of the relationship between our composite income measures and various demographic characteristics of the household recipient unit shows, among other things, that (1) educational levels of the male and female heads of household become less important as determinants of income variations among households as the income concept is broadened; (2) other adults (i.e., nonheads) contribute relatively more to households' market income than to their nonmarket income; (3) female-headed households have significantly lower levels of household market income, but on a per adult basis, their values of the housework-inclusive total actual income I and II are no lower than those of otherwise similar male-headed households; and (4) income differences between Chinese and Malays are

reduced considerably when the effects of other socioeconomic characteristics are held constant.

Our results show that conclusions about the extent of income inequality within Peninsular Malaysia or among its ethnic subgroups are very sensitive to how broadly income is defined as well as to the other factors examined. As an illustration, one measure—mean household market income—yields a conclusion that Chinese income is 177 percent higher than Malay income, while another very plausible measure—median urban per adult total actual income II—reduces this number to only 17 percent. Researchers and policymakers concerned with income distribution should be aware of this sensitivity and should exercise utmost care in processing and interpreting income data, especially when comparing statistics from different studies, different countries, or different time periods.

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I. INTRODUCTION

The distribution of a country's income has long been a topic of intense political and economic concern. Development policymakers are interested not only in economic growth *per se* but also in the distribution of the proceeds of that growth, especially to the poor. "Growth with equity" was in fact one of the catch phrases of development policy in the 1970s.

Available evidence (e.g., Kuznets, 1955; Adelman and Morris, 1973; Ahluwalia, 1974) suggests that incomes are less equally distributed in developing countries than in developed countries. This greater inequality appears to persist, and in many cases increase, over time, at least in the early stages of development. At later stages, it appears to decrease. A number of different explanations have been offered for these relationships.[1] In this report we offer an additional explanation for the decrease in income inequality with development: The observed relationship may be illusory, due to the use of income measures that are biased toward formal market activities.

Although there have been numerous studies of income distribution, few have considered whether the data they use provide appropriate measures of economic well-being. The income variables commonly used are mainly concerned with income received from products or services sold in markets; hence they tend to ignore (or greatly understate) the value of productive nonmarket activities, such as cottage industry and housework. Typically, as a country develops, specialized markets arise outside the household that produce many of the goods and services previously produced at home or in the nonmarket sector. With development, fewer people work in their homes or fields or in self-employment; more people work in the labor market for wages and salaries. Consequently, more income is received in the form of money wages, which are included in standard income figures, and less is received in the form of in-kind payments and home-produced consumption, which are often not included in standard measures of income. Although these "national accounts" problems are fairly well recognized by those who make *intercountry* comparisons of average incomes, they are often not considered in studies of the distribution of income *within* a country. Just as income differences among countries may overstate differences in well-being because the extent of market participation is not held constant, so may income differences within a country.

This report characterizes the distribution of income in a representative less-developed country, Malaysia, using alternative definitions of income that range from a rather narrow measure, market income, to broader measures that include the value of various nonmarket activities. Since the narrower definitions of income (e.g., money receipts) are highly sensitive to the extent of market participation, we anticipated that as the measures used incorporate more and more nonmarket components of income (in-kind income, value of housework, value of leisure, etc.), the measured income of persons and households in the traditional sector would rise relative to that of persons in the market sector, and thus overall inequality would decrease. And indeed, as we change the definition of income to encompass succes-

[1] See Nugent (1979) for a list of ten possible explanations.

sively broader sources of economic welfare, measures of inequality decline monotonically.

The study uses 1976-77 data on a sample of over 1,000 households in Peninsular Malaysia, provided by the Malaysian Family Life Survey (MFLS).[2] The sample includes only households with at least one ever-married woman less than 50 years of age,[3] so it is not representative of the entire population of Peninsular Malaysia, and our estimates of levels and inequality of income should be interpreted with care. Nonetheless, we feel that this sample (which represents around three-quarters of the population of Peninsular Malaysia) can still provide useful information on *what happens* to measures of the central tendency and inequality of the distribution of income when the definition of income is broadened.

Section II discusses the underlying theoretical framework for our approach and the income concepts we consider. Section III describes the data we use and the empirical procedures we employ to define the income components and composites. In Sec. IV we present various statistics describing the distributions of these alternative income measures for our entire sample. We examine the sensitivity of a number of measures of the level and inequality of income to (1) broadening the definition of income, (2) adjusting income for household size and composition, and (3) adjusting for variation in hours of work. In Sec. V we examine ethnic and rural/urban differences in the central tendencies and dispersion of the distribution of income. Section VI presents a descriptive regression analysis of the contributions of various household characteristics to variations in our alternative income measures. Finally, the conclusions of the study are presented in Sec. VII.

[2] The MFLS was funded by the U.S. Agency for International Development and was conducted by William P. Butz and Julie DaVanzo of The Rand Corporation in collaboration with, initially, personnel at the Department of Statistics of the Government of Malaysia, and subsequently, personnel at Survey Research Malaysia, Sdn. Bhd., who actually did the fieldwork. For more information about the survey, see Butz and DaVanzo (1978).

[3] The sample of such households is a random one.

II. CONCEPTUAL FOUNDATIONS

> "Our definition of economic welfare [is] the conventional one of potential real consumption per equivalent consumer unit over a specific period of time."
>
> Michael K. Taussig (1973)

The above quotation characterizes reasonably well what the economic analyst, as well as the layman, has in mind when he refers to "the distribution of *income.*" The problem is, of course, how to specify precisely, for both conceptual and operational purposes, what is meant by each of the rather ambiguous terms in the definition. Our attempt to address these issues provides the framework for the discussion that follows.

THE APPROPRIATE MEASURE OF WELFARE

Economic welfare can be thought of as being derived from at least five different kinds of income. First, and most commonly recognized, is generalized purchasing power, i.e., money income. Second, income may appear in the form of specific economic goods which are not readily exchangeable into other goods, e.g., in-kind payments and home consumption of farm products. The third source of economic welfare also involves consumption of specific goods, but the income takes a different form, and it is more difficult to measure. This type of income consists of the flows of economic services from consumer durables, e.g., owner-occupied housing. The last two sources of economic welfare are less often recognized conceptually and are rarely incorporated into empirical studies of income distribution:[1] the value of productive uses of nonmarket time (e.g., cottage industry, production for home consumption, housework, etc.) and the value of the consumption of leisure time.

While most income-distribution studies acknowledge or attempt to incorporate the first three kinds of income in their (often implicit) definition of economic welfare, the last two components are commonly neglected, even though variation in either of these may clearly affect the relative welfare positions of individuals and families. This study presents alternative definitions of income that explicitly allow for variation across individuals and households in the value of their nonmarket uses of time, and it assesses the sensitivity of conclusions about the distribution of income to how broadly income is defined.

Since there has been ample discussion in the literature concerning the appropriate handling of the various market-related components of income, we shall concentrate here solely on the measurement of the value of these nonmarket components.

Estimating the Value of Nonmarket Time: Why and How?

We are interested in incorporating the value of nonmarket time into a compre-

[1] Some notable exceptions are Sirageldin (1969), Smith and Morgan (1970), Nordhaus and Tobin (1972), Walker and Gauger (1973), Taussig (1973), Garfinkel and Haveman (1977), Gronau (1976), and Evenson and Quizon (1977).

hensive measure of economic welfare because that time does have value. This value derives from two (not always distinct) factors: (1) Much of the time that is not spent in activities that produce goods or services to be sold in the marketplace is devoted to the production of goods and services that are consumed directly in the home—for example, crops grown on a family farm—especially in less-developed countries, such as Malaysia; and (2) even time that is not spent producing any actual goods or services has value (as we shall explain in more detail below). We refer here to the "pure consumption value of leisure time."

The issue of whether nonmarket uses of time, especially "productive" uses such as housework, are important sources of economic welfare is no longer as controversial as it once may have been. The current thriving literature on estimating the economic value of the housewife attests to the general acceptability of the notion (see, for example, Walker and Gauger, 1973). In fact, the only issues that appear to generate serious scholarly debate are (1) the precise value that should be placed on nonmarket time, and (2) the specific uses of time that should be included in that valuation process.[2]

The value to be placed on nonmarket uses of time appears to depend on what is being "produced" with that time. If specific economic goods are being produced (e.g., rice being grown on a family plot for home consumption) and the quantities of output being generated are known, it makes sense to value that output directly (assuming, of course, that market prices for the commodities in question are available). If, however, what is being produced is a less tangible, less well-defined economic service (e.g., cleaning house or cooking meals), this direct-valuation procedure will, in general, not be satisfactory. First, reasonable market prices for these services may not even exist.[3] Second, there is the question of comparable quality: Is the service purchased through the market the same service being produced in the household?[4] And finally, are the market prices for those services (if they exist) at all relevant, since they have been explicitly rejected by the household?[5] For example, if the family chose not to hire a cook, should a cook's wage rate be used to value the time the wife spends preparing meals for the family?

Because the use of market-alternative prices for household services has these severe shortcomings, we have chosen not to use this procedure as a method of valuing nonmarket time. Moreover, another valuation procedure exists which suffers from none of these problems. This procedure is known in the literature as the opportunity-cost-of-time approach. In this approach, the value of what is produced with nonmarket time is approximated by the opportunity cost of that time, i.e., the quantity of market goods implicitly forgone in order to spend that time in nonmarket activities. This opportunity cost, if correctly measured, serves as a legitimate lower-bound estimate of the value of that nonmarket time, independent of how an individual chooses to spend it (i.e., in "productive" activities or simply in consuming leisure).[6]

[2] Of particular concern is the question of whether "leisure" time should be included.

[3] The less developed the formal market, the more likely this is to be the case.

[4] The same issue can arise even if the outputs are tangible goods rather than services. For example, homemade bread or homegrown crops may taste better than "comparable" store-bought items. However, the problem of differential qualities is not likely to be as serious for goods as it is for services.

[5] If the "services" produced are "leisure services," there can be no market-produced service that would serve as a reasonable substitute, i.e., whose price we could use.

[6] The opportunity cost is a lower-bound estimate of the value of time spent in nonmarket activities because we assume the person chose to spend that time in nonmarket activities because he or she felt his or her time has equal or higher value in these activities than in the forgone market alternatives.

The problem is in determining what value should be used as the opportunity cost of time. The value frequently used in practice is the individual's wage rate (the observed wage if he or she works at a wage-paying job, an imputed wage if there is no observed wage). With some rather restrictive assumptions,[7] economic theory implies that an individual's wage will exactly equal his marginal value of time in terms of market goods. This implication, coupled with a 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 is worth at least the individual's wage rate multiplied by the amount of time spent producing it.

Problems in Implementing the Opportunity-Cost-of-Time Approach

A number of practical problems arise when we try to estimate the marginal value of individuals' time by using their wage rates: (1) What value should be used for non-labor-force participants (individuals who do not have an observed wage)? (2) How should time spent in involuntary unemployment be handled? (3) How are the estimates affected if the assumptions of complete flexibility of hours, no taxes, and no disutility from work are not satisfied?

For those individuals in the sample who do not participate in the formal labor force and who consequently do not have an observable wage rate, it is necessary to impute a (hypothetical) wage that would be offered to them if they chose to seek work. In our empirical work, we estimate wage equations that relate wage rates to the economic and sociodemographic characteristics for the sample of individuals for whom we observe wages, and we then use the estimated coefficients from those regressions to impute wages to nonparticipants, based on their characteristics. However, this procedure may be unsatisfactory if the sample of labor-market participants used in estimating the parameters of the wage equation differs in some unobserved and systematic way from the sample of nonparticipants. In that case, we may impute wages that are biased and do not accurately measure nonparticipants' wage offers. This issue of "selectivity bias" has been the focus of much recent theoretical and empirical research (e.g., Gronau, 1976; Maddala, 1978; Heckman, 1976). That research has produced a procedure to test for the existence and extent of this kind of bias and a method for correcting it if it exists. As discussed more fully in Appendix A, we tested for the existence of selectivity bias in the sample of female heads of household (the individuals potentially most susceptible to it) and could not reject the null hypothesis that there was no selectivity bias. This increased our confidence in our ability to impute unbiased wage offers to nonparticipants, but an additional problem still remained: Even if we knew with certainty the potential wage offer for a particular nonparticipant, we would not be able to infer that his marginal value of time equaled that wage, simply because we also know that he rejected that alternative, i.e., chose not to work for that wage rate. 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 always be an underestimate of the nonparticipant's value of his time because his choice not to work indicates that he felt that the value of his time in nonmarket

[7] Complete flexibility over number of hours of work, positive hours of work, zero marginal tax rate, no disutility of work.

activities exceeded the value of that time spent in market activities, i.e., his wage rate. However, if any of these conditions fails to hold to a significant degree, then the wage could actually overstate the marginal value of time. 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.[8]

An additional problem arises in the presence of substantial unemployment, which may nullify the meaning of the potential wage offer in terms of its relevance to individuals' actual market options. That is, 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 levels of unemployment may be a persistent problem in other less-developed countries (LDCs), the reported average unemployment rate in 1975 in Peninsular Malaysia was not particularly high—6.9 percent.[9] In this study we assume that all unemployment in Malaysia is frictional.[10]

Finally, strictly speaking, the wage rate measures the marginal value of time only when certain theoretical assumptions are satisfied, i.e., no fixed time or money costs of working, flexible hours of work. (In this context, we shall discuss the problem only as it relates to market participants, since the issue of nonparticipants has already been discussed above.) Fixed time or money costs of working (e.g., for transportation) do not affect the conclusion that the worker's wage equals the marginal value of his time as long as hours of work are freely variable. However, even if a restriction were placed on the number of hours a person would have to work in order to receive the wage offer—whether it is a minimum restriction, a maximum restriction, or both—the wage defined in this wage-hours package still serves as a lower bound on the *average* value of that quantity of nonmarket time (Cogan, 1977). Thus, it still serves, in our opinion, as a useful measure of the value of nonmarket time.

[8] Or at least a reasonable estimate of their *average* value of nonmarket time over the range of hours considered.

[9] Government statistics reported in Asian Development Bank (1977). The information on unemployment collected in the MFLS that we use in this study is consistent with the government figures. See Table H.1 in Appendix H for the MFLS unemployment rates for male and female heads of household, by ethnic and geographic subgroupings.

The observation of low unemployment rates does not eliminate the attendant problems altogether. Disguised unemployment may still exist and serve to break the tie between wage offers and value of time. However, the relatively low unemployment rates in our sample suggest that unemployment effects are relatively unimportant.

[10] One possible way of handling the unemployment problem would have been to multiply each wage rate by an estimate of the probability that the person would gain employment at that wage. We rejected this approach because we did not have accurate unemployment information on various groups in the sample, because we did not feel that the observed unemployment rates were excessively high, and, most importantly, because we are interested in examining a distribution of steady-state income. The probability-of-wage approach is antithetical to this, for it implies that a 5 percent unemployment rate indicates that 95 percent of the person's time has a value equal to his wage rate but that 5 percent of his time has *no value*. We do not believe that individuals actually relate to the existence of unemployment in this way.

The fact that the entry of all nonparticipants into the labor market would drastically change prevailing wage rates is not pertinent to the question of whether the wage is a correct marginal value of nonmarket time. What is important is that nonparticipants perceive a tradeoff between working in the market sector and working in the household sector (or consuming leisure) in general, and that the wage offers they face provide a reasonable measure of their perceived rate of exchange, on the average and/or on the margin, between their time and market goods.

If we had made some sort of adjustment for unemployment, it would have tended to reduce the income difference between Chinese and Malays and between urban and rural households, since it would have impacted most on the relatively wealthier segments of Malaysian society—Chinese households and urban dwellers. (See Table II.1 for verification of this point.)

Including the Value of Leisure Consumption in the Definition of Income

In this study we also estimate the effect on income distribution of including the value of the consumption of leisure time (or the cost of forgoing leisure) in the definition of income.[11] As noted earlier, we do this because leisure time has value. By ignoring this component of welfare, most other income-distribution studies implicitly assume that leisure time has zero value.[12] The notion we are trying to incorporate into our income measures is illustrated by the following example: Suppose that on the basis of an income measure that excludes the value of leisure consumption we have two individuals who have the same measured income, but one individual works 16 hours a day while the other works only 8 hours a day. A definition of income that excludes the value of leisure time would indicate that these two individuals are equally well off, when in fact one enjoys 8 hours more of leisure each day than the other. What has not yet been specified is how to properly estimate the *value* of that relative difference in their consumption of leisure time. We will address that issue after we have introduced two additional arguments in favor of the inclusion of the value of leisure in income.

Assuming that inclusion of the value of the more narrowly defined productive uses of nonmarket time (e.g., housework) in income is considered valid, the additional inclusion of the value of leisure time avoids what appear to us to be two major drawbacks inherent in the narrower concept of income. First, the distinction between productive and consumptive uses of nonmarket time immediately becomes blurred when one starts considering such activities as childcare, cooking, or personal maintenance. It seems likely that any conceptual distinction among such activities would invariably end up being rather arbitrary when put into practice.

Another problem with ignoring leisure value is implicit in the example given above. *Any measure of income that ignores leisure implicitly incorporates variation in tastes for leisure (vis-à-vis work) into the variation in the income distribution.*[13] This is especially true if the value of other uses of nonmarket time is included, given that individuals are necessarily free to vary the allocation of nonmarket time in any way they wish.[14] If we are interested in the distribution of *consumption potential* in a population, we must attempt, as much as possible, to purge from the data the effects of any variation in preferences across the population. Inclusion of the value of leisure in the definition of well-being goes a long way toward that goal.[15]

The final point to make here concerns the appropriate value to place on an hour of leisure consumption. The logic of rational economic time allocation dictates that

[11] We also generate distributions of income which exclude the value of leisure time but explicitly include the value of specific uses of nonmarket time.

[12] A notable exception is Garfinkel and Haveman (1977), who look at the distribution of "earnings capacity"—the income the family would earn if the male and female heads had worked 40 hours a week, 52 weeks a year. This is closely related to the original concept of "full income" suggested by Becker (1965).

[13] That is, the inevitable conclusion is that individuals with a relatively low taste for leisure are better off than those with stronger preferences for leisure, other things being equal.

[14] The same problem arises with narrower definitions of income, e.g., money income, although to a somewhat lesser degree, depending on the restrictions placed by the labor market on the individual's freedom to vary his hours of market work.

[15] This leisure-inclusive view of income is not without its own problems, however. In particular, there is the issue of how many hours of leisure time should be included in income. This is discussed in some detail in Sec. IV.

leisure time must be treated symmetrically with other uses of nonmarket time, i.e., priced out at the value of the individual's wage rate.[16] This conclusion is implied by the fact that regardless of any restrictions placed on an individual's ability to allocate time between market and nonmarket uses, he still is free to allocate his time among nonmarket activities, including leisure. Therefore, all nonmarket uses of time must be equivalued on the margin—that is, whatever value is placed on "productive" uses of nonmarket time must also be applied to leisure time.

Income Taxes

Although a thorough study of income distribution should include an analysis of the redistributive effects of government, we have chosen not to deal with this issue for two reasons: First, we had no reliable information concerning the relative enforcement of the tax codes in Malaysia. An assumption of perfect enforcement appeared to be our only alternative and we were doubtful of the validity of such an assumption. Second, even if we could measure them correctly, taxes are only one side of the redistributive function of government; the other side, the goods and services provided by the Malaysian government, is something on which we had no direct information to incorporate into the study.[17]

Not adjusting for income taxes, which are progressive in Malaysia, will tend to bias our estimates of the *levels* of income inequality upward, while the estimates of the extent of inequality and of *changes* in inequality due to broadening the income definition will most likely be biased downward. When we broaden the definition of income, we include components that would not usually be subject to income taxation—in-kind income, income flows from consumer durables, goods and services produced in the home, and, finally, leisure. Hence the relative value of these components would be larger in a post-tax measure of income than in the corresponding pre-tax measure. Since the inclusion of these sources lowers inequality in the distribution of pre-tax income, that reduction should be even greater for post-tax income.

Strictly speaking, when we value nonmarket uses of time, we should adjust the wage rate for the marginal tax rate faced by the individual. Use of the gross wage would bias the estimate of the levels of the value of nonmarket time upward. However, since our emphasis is on the relative rather than the absolute bias implied by ignoring nonmarket uses of time, the incorporation of income taxes would only serve to strengthen our conclusions.[18] Furthermore, in Malaysia the impact of using an after-tax wage rate on estimates of the value of time would tend to be rather small. We estimate that 62 percent of the households in our sample would face a marginal tax rate of 0, an additional 19 percent would face a marginal tax rate of 9 percent or less, and less than 2 percent would face a marginal tax rate

[16] Assuming, of course, that the wage is the correct marginal value of "productive" nonleisure time.

[17] We are aware of the studies by McLure (1972) and Snodgrass (1974) on tax incidence in Malaysia and by Meerman (1979) on the estimated benefits of public expenditure in Malaysia, but we felt that adapting and incorporating their results into our analysis was beyond the scope of this study.

We would also like to have adjusted for regional differences in cost of living, but we could find no data whatsoever on regional price differences.

[18] This is so because the groups for whom household production is a relatively important component of income (e.g., the rural poor) are, in general, least subject to income taxation.

as high as 40 percent.[19] Given these magnitudes, we feel confident that ignoring income taxes does very little to alter our main conclusions.

THE UNITS OF OBSERVATION: INDIVIDUALS VERSUS HOUSEHOLDS

In all empirical income distribution studies, one of the first questions to arise is, What should be the basic unit of analysis? Of course, the answer to this question depends largely upon the particular focus of the research. In a purely descriptive study, one might want to examine distributions of both individual and household income to gain as full an idea as possible of the overall multidimensional structure of income distribution. However, if the focus is on the distribution of *consumption potential* over the population, as it is here, then it seems preferable to focus on households rather than individuals, especially given the jointness of the income-earning and consumption decisions made by the household unit, as well as the complex network of transfers going on continuously within the household. In addition, dealing with the household unit minimizes a problem present in all individual income-distribution studies, i.e., how to properly limit the sample, given the problem of interpretation involved when many people in the sample (such as young children) have measured incomes of zero. Most of the sample truncations ultimately used in examining the distribution of individuals' income are rather arbitrary, with the resulting distributions often bearing little relation to the underlying distribution of welfare in the population.

While the arguments for using the household as the basic unit of observation are strong, implementation of this concept is not at all straightforward, for there simply is no unambiguous definition of a "household": Is it the nuclear family or the extended family? Do the individuals have to be legally or genetically related to constitute a household? Is a two-person household with a certain income better off than an eight-person household with that same total household income? If not, in precisely what manner should the comparison be made? All of these questions need to be addressed before a meaningful interpretation can be placed on the various statistics generated by the estimation of the distribution of household income.

The lack of a well-defined concept of the household unit is particularly troublesome when we attempt to determine whether and how to adjust measured household income for differences in household size and/or composition. The standard practices in the literature have been to (1) make no adjustments at all, i.e., examine the distribution of household or family income employing some definition of the family unit, usually the nuclear structure; (2) divide household income by the number of household members and thereby generate a distribution of per-capita household income,[20] or (3) divide household income by some function of household size and composition.[21] In this third approach, the function used is typically spe-

[19] These estimates are for a two-adult, three-dependent family. Appendix B presents a more thorough explanation of Malaysian tax laws as well as the frequency distribution of families in our sample vis-à-vis their market income.

[20] This procedure was, to our knowledge, first used by Kuznets (1950).

[21] This third alternative contains the second as a special case, so there really are only two alternatives: to adjust in some way for differences in household size or composition or to make no adjustments at all.

cified either in an arbitrary manner (e.g., a child less than 10 years old counts as half an adult) or on the basis of household-expenditure data which generate the familiar household "equivalence" tables.

The question of whether or not to adjust household income for size and compositional differences depends upon one's view of the nature of the process generating observed size and composition differences among households. There is also the additional, often unaddressed, issue of whose welfare we are referring to when we speak of "family" welfare. It has long been the implicit tradition in economics to refer to a nuclear family unit and to view the family essentially from the standpoint of the heads of the household. We intend to adopt this viewpoint for two reasons. First, the development of a comprehensive theory of familial or household association that would be appropriate for our immediate purposes is simply beyond the scope of this study.[22] And second, since the earmark of economics is a choice-theoretic approach and because it is difficult to think of children, especially very young ones, as economic agents engaging in voluntary trade relationships, it would be extremely difficult to incorporate the behavior and welfare of every member (both actual and potential) of a household into our model. However, having explicitly excluded the welfare of children from consideration we still have the question of how to measure the impact of the existence of an additional child on the welfare of the parents. The answer of course depends upon how much control people can exercise over the number of children they have, and also on whether children are net assets or net liabilities.[23]

In addition to the problems implicit in the differences across households in their numbers of children, there is the problem of variation in the number of adult members of a household. We assume that adult members of a household comprise a voluntary association of individuals, and we thus feel that it is appropriate to make adjustments to household income to account for differences in the number of adult income earners, both actual and potential. In this study, we consider anyone 15 years of age or older to be an adult.[24]

We must also address the question of the appropriate weights to apply to various income units. Danziger and Taussig (1978) analyze this problem and conclude that "conventional size distributions[25] violate the requirements for individualistic social welfare functions because they implicitly weight the welfare of an individual inversely to the size of the unit in which he or she lives."

Although we recognize the complexity of the difficulties involved in the questions of whether and how to adjust for differences in household size and composition and how to weight income units, the solution of these problems is beyond the scope of this study. Our primary concern is with the proper definition of income,

[22] An interesting attempt to develop such a theory is reported in Ben-Porath (1978).

[23] For our purposes, the issue is even more complicated. Not only do we have to deal with the option of making these kinds of adjustments once we have a household income figure, we also face the problem of whether or not to attempt to impute a value to the time of children so as to include it as part of our household income estimate. This should, of course, be discussed within the context of the wider issue of how to handle the net return streams from durable goods and assets as a whole. Ideally, we would like to treat children like other consumer durables and include the magnitude of the net return stream, appropriately estimated, as part of current period income. We do this with owner-occupied housing. The question is, Should we attempt to do the same with "child services"? The lack of data, along with the conceptual difficulty involved in such a procedure, forces us to supplant estimation with assumptions.

[24] This cutoff is not entirely arbitrary; it has justification in Malaysian tax laws (see App. B).

[25] For example, distributions of households by total household income.

and therefore our main interest is in the issues of what the income unit should be. Whether we should adjust for household size or composition or weight to adjust for individuals' welfare depends on the extent to which the specific treatment of these issues affects our conclusions concerning the effect of income definition on inequality. Therefore, we consider three different distributions of household income, each representing a different size/composition adjustment and/or population-unit weighting scheme. We use these different distributions not only to examine the sensitivity of our results to these choices, but also for general descriptive and comparison purposes. Independent of any explicit welfare considerations, it is interesting to examine the impact of variation in household size on the distribution of household income. Furthermore, since these kinds of adjustments are common in the literature, considering all three types of size/composition adjustments will aid in comparing our results with other income-distribution studies.

The first specific household size/composition adjustment measure we consider in this report, *household income*, is the sum of the incomes of all adult members of the "household."[26] No adjustment is made for household size and composition; rather the household is treated as if it were a homogeneous unit, and we consider the distribution of the command over resources of the various household units in our sample. The second measure we consider is the *per adult income of households*, that is, household income divided by the number of adults in the household. This is a crude way to adjust for the fact that households with more adult income earners will appear in the first distribution as having higher incomes, when they *may* be no better off than smaller households with proportionately smaller household incomes.[27] When we look at per adult household income, we consider one observation on each household in our sample. The last measure we examine is *per capita income of individuals*, that is, household income divided by the total number of household members. For distributions of this measure, we consider one observation on each household member and hence give equal weight *to each individual* in our sample.[28] (The first two measures give equal weight *to each household* and hence give less weight to individuals in larger households.) If each of these measures reflects the same kinds of changes when the definition of income is broadened, our conclusions will be thereby strengthened.

THE CHOICE OF TIME PERIOD: INCOME VERSUS WEALTH

The period of time over which income flows are to be measured should be long

[26] 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). We have excluded income of children because we had no reliable way of estimating the value of their time. However, our household income measure does not totally exclude income derived from the work of children. To the extent that children have positive marginal products in their work on the family farm or business, income attributable to their efforts is unavoidably incorporated into our measures of business/farm income.

[27] This crude method of adjustment provides no possibility of incorporating into our measure of income any notion of gains from specialization within the household, returns to scale in household consumption, or increased efficiency in the allocation of time and effort within the household. That is, if a household with three adults earning 50 percent more than a household with two adults is actually better off than the smaller household, this is not captured in our adjustment.

[28] This procedure implicitly assumes that (1) a household's income is distributed equally among all of its members, (2) children are unambiguous net liabilities from the standpoint of the adult members of the household (because we ignore children's incomes), and (3) the welfare of each of the members of the household, including children, should be equally weighted. These assumptions are very different from those corresponding to the household-income measure.

enough so that the resulting income measures bear a close relation to some intuitive notion of economic well-being; the shorter the time frame, the harder it is to handle such problems as seasonality, life-cycle or business-cycle effects, or random events. If equilibrium or steady-state distributions of income are to be estimated, it is desirable to purge the data of these problems. Therefore, it would be helpful to have as long a reference period as possible; in fact, ideally, we would look at the distribution of *wealth* rather than income. However, the lack of available data constrains us to consider income only. Since we have continuous, detailed information on each household for only a 12-month period,[29] our income measure is that year's income. Nonetheless, we believe that this period is long enough to be meaningful for purposes of income measurement and to allow us to accommodate one of the most important features of our setting—the seasonality of economic activity, especially in agriculture. Of course, we will not be able to account for single-year effects, such as those due to position in the business cycle, droughts, or bumper crops.[30] To the extent that these problems are important and *affect some people more than others*, our results must be interpreted with caution. To our knowledge, no particularly unusual events occurred during our reference period.

[29] This information derives from three successive interviews spaced four months apart and each detailing the events of the previous four-month period. We have 20 months of data on some of the variables, since the first round of the survey elicited information for the previous 12 months on some of the household-level income and wealth variables. The handling of these variables is discussed in Sec. III.

[30] We briefly investigate variation due to life-cycle position in Sec. VI.

III. INCOME COMPONENTS AND COMPOSITES

THE DATA BASE

The MFLS data base used in this analysis provides an unusually rich set of recent data on households in Peninsular Malaysia. The MFLS consisted of 11 questionnaires administered one or more times during a three-round survey conducted over the period August 1976-August 1977. Although the MFLS was primarily designed to provide data for estimating the magnitude of key economic and biomedical relationships affecting birth spacing, contraceptive use, and breastfeeding patterns of families in Peninsular Malaysia, detailed information was also collected on families' time allocation, earnings, assets, business and agricultural activities, and other income-earning activities. Thus the data are well suited for a study of the level and distribution of income among sample members.

Because the initial purpose of the MFLS was to study fertility and closely related topics, the sample surveyed is not representative of the entire Malaysian population, but rather is composed of private households that each contained at least one ever-married woman less than 50 years of age at the time of the initial visit. Thus, households that do not contain a woman who has been married at least once, regardless of her present marital status, or in which the ever-married women are all over age 50 are not represented in the MFLS data. These excluded households—approximately 24 percent of the households in Peninsular Malaysia—are mostly older households.[1]

The sample households are located in 52 areas of Peninsular Malaysia called primary sampling units (PSUs). Forty-nine of the areas were selected by area probability sampling methods. Three areas were purposively selected to give additional representation to Indian households and to households living in fishing communities. The sample used in this report consists of the 1,064 households who live in the 49 randomly selected PSUs[2] and who responded in all three rounds of the survey.[3]

The research reported here uses data from seven of the MFLS questionnaires: Household Roster (MF1), Female Retrospective (MF2), Female and Male Time Budgets (MF4 and MF5), Income and Wealth (MF6), Networks of Support (MF9), and the Community Questionnaire (MF11).[4]

DEFINITIONS OF INCOME COMPONENTS AND COMPOSITES

Before describing how we translated each of the conceptual components used

[1] Initially, contacts were made with a random sample of *all* private households in Peninsular Malaysia. Of those contacted, 7.8 percent had no ever-married women and 16.3 percent had only an ever-married woman over 49 years of age.

[2] Households in the three purposively selected PSUs are included in the samples we used to estimate the wage and rent equations discussed in Apps. C and D, but they are not included in our analysis of incomes.

[3] We also excluded three cases with irresolvable inconsistencies in their records and a few cases where the household head was of a race other than Malay, Chinese, or Indian.

[4] These questionnaires are reproduced in Butz et al., 1978.

in this study into empirical constructs, we shall briefly define the components and their various composites.

Conceptual Definitions

Wage income includes monetary income earned by employees in wage-paying jobs.

Business income consists of earnings from farms or businesses owned by the household, net of variable costs, as well as money earnings from individually operated cottage industries.

Capital and interest income is the return on nonbusiness, nonfarm assets owned by household members.

Market income is a composite measure of the three components above, the sum of the household's monetary receipts derived from formal market transactions.

Four types of nonmoney income also clearly affect households' well-being but are often not reported in income data:

In-kind income consists of earned receipts that are not in monetary form, such as food or housing provided by employers or home consumption of home-produced products.

Transfer income is income received from or given to persons or institutions (e.g., the government) outside the household. This transfer comes in two forms: (1) net income flows resulting from interhousehold transfers of goods, money, and time, and (2) receipts of large assets (land and buildings) from both persons and institutions.[5] Transfer income may be negative (net outflow) or positive (net inflow).

Value of housing services includes the estimated income value of the stream of services flowing from owning and living in one's own home, net of the interest payments on the mortgage, if any.

Cottage-industry income is closely related to in-kind income. It represents the value of household members' time spent in producing goods consumed in the home for which neither a physical description nor an estimate of their value is provided.[6]

Total observable income is the composite of in-kind income, transfer income, the value of housing services, cottage-industry income, and market income. This composite represents the total of the household's monetary and nonmonetary receipts.

The last two components we consider are values of time spent in household service activities:

Value of housework is the value of the time spent by all adult members of the household in performing common housework tasks such as cleaning the house, washing clothes, and shopping. This component is added to total observable income to form the third income composite, *total actual income I.*

Value of cooking and childcare, analogous to the preceding component, is the value of the time spent by all adult household members either cooking meals or caring for children in the household. We have separated these two forms of time

[5] We include only *net* interhousehold transfers because we view the network of transfers as an informal sort of capital market which helps to rearrange consumption expenditures over the family's life cycle; we believe interhousehold transfers should be handled the same as net interest income. Only the *receipts* of large asset-type gifts are included, however, because these transfers are much less likely to be part of an *ongoing* exchange process.

[6] If a value of the product was reported in the MFLS, the item was included as business income.

use from the other types of household work for several reasons: (1) Amounts of time spent cooking meals and caring for children are subject to potential measurement error, for there is considerable ambiguity in the precise definition of these activities, both conceptually for the analyst and operationally for the interviewer and respondent. (2) P aps more than other household activities, cooking and childcare may be done jointly with other activities; for example, a woman may watch her children while she cleans her house. (3) Finally, there is a question of whether cooking and childcare are purely productive activities or joint productive-consumptive activities.

Total actual income II, our final unadjusted income composite, consists of the value of cooking and childcare added to total actual income I.

We also constructed three additional income composites for purposes of comparison with the last three composites defined above. The distinguishing feature of these three additional measures is that they do not differentiate between leisure time and nonmarket work time as do total observable income, total actual income I, and total actual income II. These new income composites are denoted as *standardized observable income*, *standardized actual income I*, and *standardized actual income II*.[7] These measures adjust for the variation in hours of work (and hence hours of leisure consumption) implicit in each of the unstandardized income measures by evaluating the corresponding income measure at a common number of hours for all adults in the sample.[8]

Making These Concepts Operational

The empirical construction of each of the income components discussed above is summarized in Table 1. Some variables required little more than summing the responses across all household members and survey rounds to arrive at an annual household total for that type of income, while others involved extensive imputation. All components are *annual* incomes.[9]

Wage income is defined as the sum of earnings across activities, survey rounds, and adults in the household (persons 15 years of age or older) for all activities that were coded as part-time or full-time wage-paying jobs. Information concerning all income-earning activities over the four months prior to the survey for all individuals in each household was recorded in each round of the survey in the Time

[7] 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; no attempt was made to allocate hours between the two composites in this type of situation.

[8] The common measure is the mean of the number of hours sample members spent performing those activities encompassed in the corresponding unstandardized measure.

[9] The 12-month reference period is not the same for everyone. The Time Budget Questionnaires, from which the wage income and housework data are derived, were administered three times during the survey, at 4-month intervals. In each round the respondent was asked about his activities over the previous 4 months, giving us a total of 12 months of information. However, the initial interviews were conducted over a 4-month period (e.g., Round I interviews were conducted between August 1976 and December 1976), as were Round II and III interviews. Thus the 12-month reference period is April 1976 through April 1977 for those interviewed first in each round, while it is August 1976 through August 1977 for those interviewed last.

Moreover, income and wealth variables derived from the Income and Wealth Questionnaire (MF6) have a 12-month reference period in Round I, but 4-month reference periods in Rounds II and III. For these variables, we summed the responses across rounds, giving us 20 months of information. We then scaled this sum down by 40 percent to make it comparable with the other variables.

Table 1

SUMMARY OF INCOME-COMPONENT DEFINITIONS

Income Component	Items Included in Definition
Wage	Employee earnings
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[a]
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

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

Budget Questionnaires, MF4 and MF5. For reasons discussed below, income-earning activities in which the person is not classified as an *employee* (i.e., activities in which he or she is self-employed, an employer, or a worker in a family business) are not included in wage income despite the fact that, conceptually, these activities include a labor component. These are included in business income.

Business income is defined as the sum of net farm income and net business income, including that derived from partnerships, and money income from individually operated cottage industries (reported in the Time Budget as time spent on "home products or services for sale"). All incomes are net of expenditures on variable inputs, which is the form in which they were reported in the MFLS. Since the farm and business variables were coded only for households as a whole—that is, not coded separately for each individual in the household—there was no reliable way of extracting from these totals a component reflecting the opportunity cost of the (household's) *labor* input into the farm or business. As a result, our business income variable does not correspond exactly to the theoretical notion of pure

business earnings, or accounting profit, and the magnitude of our wage income variable is correspondingly understated.[10]

When the form of business organization was reported to be a partnership, the net earnings reported in the data were those for the partnership as a whole, not the household's share of those earnings. For 69 percent of these cases, the family's fractional share was reported as an "observation" in the questionnaires; in these instances we multiplied this share by the partnership's net earnings to arrive at the family's net earnings. Where the family's ownership share was not reported, we assumed it to be one-third, the average of the reported shares.

Capital and interest income includes cash receipts for rental of land owned by household members, dividend income, and payments received from insurance companies and the Employee's Provident Fund (EPF)[11] (all of which were reported directly in the data), as well as net interest income. Net interest income was not reported directly in the data and therefore required some assumptions for its calculation. The data reported the total amounts of money borrowed or loaned out, the length of the repayment term, and the magnitude of payments. If the repayment was in a lump sum, we defined the implied interest income (outgo) as the difference between the repayment amount and the initial loan (borrowed) amount. If, however, the repayment was accomplished over a period of time, we assumed that the implicit interest income (outgo) was equal to 6 percent[12] of the loan (borrowed) amount.[13]

Transfer income includes two general types of income. The first is interhousehold net transfers of income, including the net value of monetary transfers as well as the imputed net value of transfers of goods and time. The data report directly the total values of monetary gifts, the monetary value of goods, and the total amounts of time transferred into and out of the household during the reference year. The only imputation necessary for this component involved associating a monetary value with the time so transferred. We multiplied each amount of time by a predicted wage based on the socioeconomic characteristics of the person performing the transfer activity.[14] This wage was calculated using the wage regressions discussed in App. C. In this manner, total values of transfers of money, goods, and time *into* and *out of* the household were estimated. The difference between these two totals is the value we denote as the interhousehold net transfers of income.

The other type of income included in transfer income is that from transfers of assets, land parcels, buildings, etc. Since we felt it would have been inappropriate to include the total value of those assets in the reference year's income, we infer

[10] In spite of the fact that the procedure we were forced to use to allocate earnings between these labor and business variables understates the correlation between these two empirical constructs, we still found a positive correlation in the data between wage income and business income. The full matrix of correlations among income components is given in Table H.2.

[11] See footnote to Table 1.

[12] This interest rate was chosen because it seemed reasonable and it fell in the range of rates on return obtainable on Malaysian government securities offered during the reference period.

[13] We chose to use this simplified procedure rather than solving for the internal rate of return of the loan (which could conceivably have been done, given the information provided in the data), both because of the expense of solving an nth degree polynomial for each observation and because of the likelihood that such a calculation would fail to provide a unique, positive, and believable root.

[14] The individual transferees were usually not identified in the data; when they were, they generally did not have an observable wage. For more details on the specific procedures used, as well as the rationales included in the estimation of this income component, see Butz (1979).

a permanent income stream that could be generated by the assets, again assuming a 6 percent rate of return, and include this as part of the reference year's income.

The *value of housing services*, a measure of the income value of the stream of services derived from living in a house one owns, has to be imputed because we do not know housing rental values for owners. To impute this flow, we first estimated a regression explaining variation in logarithms of monthly payments for housing (i.e., rents) for the sample of households renting their dwelling units. (These rent regressions are presented and discussed in App. D). We then used the resulting set of regression coefficients, which can be viewed as hedonic prices for various housing attributes, to derive predicted rental values for the sample of households who owned their places of residence. To use these regression coefficients to derive predictive rental values for homeowners, we made several adjustments. First we adjusted for the lower variance of predicted values relative to actual values. Since one of our main concerns in this study is the effect that broadening the definition of income has on the *dispersion* of the distribution of income, we were concerned with the problem of artificially lowering the variance of components constructed through regression imputation.[15] To minimize this problem, we added variance back into the predicted rents by giving each homeowner household its predicted value from the rent equation plus a random number drawn from a normal distribution with mean zero and variance equal to the error variance in the rent equation. This procedure preserves variance in the distribution of the variable we are imputing and hence avoids the problem of artificially generating a conclusion of low dispersion in the distribution of an income measure which includes a regression-imputed component. Next we took antilogarithms, since the adjusted imputed value was in logarithmic form. Finally, we netted out interest payments on the mortgage in a manner strictly analogous to our handling of interest income discussed earlier.

In-kind income is somewhat of a catch-all variable; it includes all income sources from which benefits are not in cash form (except the value of housing services, which was discussed separately above). In-kind income comprises all in-kind benefits received in wage-paying jobs by all household members aged 15 or older, the value of the home consumption of products produced in a family farm or business, and share payments received for the rental of land or buildings. The value of in-kind employee benefits and the value of share payments received for land and building rental are reported directly in the data. Values of home consumption of farm and business products have been calculated by multiplying quantities of those products, which are reported in the data, by own-sales prices for the items in question. In cases where the household sold none of the products, the value of home consumption is priced out using sample mean sales prices for the items produced.

Cottage-industry income, as discussed earlier, represents the value of goods and services produced and consumed by the household. Since the actual output of this activity was not reported in the data, we were constrained to estimate its value as the opportunity cost of the time input used to produce the output. We calculated this component by multiplying each adult's wage rate, or an estimate thereof, by the number of hours he reported as engaged in producing "goods and services for

[15] This problem arises because the variance of predicted values is less than that of actual values, i.e., R^2 is less than 1.

own use," and then summing these amounts across all adults in the household. The resulting total, subject to reservations concerning whether the wage rate is the "right" value of time (as discussed in Sec. II), then serves as a lower-bound estimate of the value of those goods and services produced in cottage industry.

For individuals without an observed wage, we use the predicted value generated by a wage regression. (We estimated separate wage equations for males and females; these are presented and discussed in App. C.) To this imputed wage we added an error drawn from a normal distribution to preserve variance, as we did for imputed rents. For individuals who were not married, this error had a mean of zero; for married individuals we attempted to utilize 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 (.143) between husbands' and wives' computed residuals for the sample of husband-wife pairs for which we observed the wages of both. Then, treating these two residuals as being distributed as bivariate normal, we used the information contained in the observed residual of one spouse to compute the residual of the other. For example, when we observed the husband's wage but not the wife's, we gave the wife an error equal to the estimated correlation coefficient times her husband's observed error, standardized by the ratio of the variances of the two marginal distributions. That is, we gave her an error with mean equal to the conditional mean of the assumed bivariate distribution, conditioned on his observed error. In the case of couples for which we had observations on neither the husband's nor the wife's wage, we randomly generated the husband's error and then proceeded as if that were his actual observed error.[16]

The *value of housework* and the *value of cooking and childcare* were constructed in exactly the same fashion as was cottage-industry income. The Time Budget Questionnaires report how much time each adult in the sample spent doing each of six activities—cleaning house, washing clothes, shopping, other housework activities, cooking meals, and childcare—during each of the three 4-month reference periods. The sum of hours across the first four activities, multiplied by the individual's wage rate (imputed or observed, as outlined above) and summed across adults in the household, is our estimate of the *value of housework* for the household. A strictly analogous procedure generated the value of cooking and childcare. Due to the obvious problems involved in determining the actual number of hours one spends in cooking meals or caring for children, we advise caution in the interpretation of results relating to the income composite generated by inclusion of this component.

The standardization procedure that generates the income composites denoted as *standardized observable income*, *standardized actual income I*, and *standardized actual income II* is closely related to the wage-imputation procedure discussed above. To adjust for variation in the amounts of leisure time consumed in the process of generating the various income amounts defined above, we standardize leisure consumption for all adults in the sample at the means of the observed distribution of leisure time for each of the unstandardized income composites. 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 we previously attrib-

[16] The dependent variable in each wage equation is the natural logarithm of the hourly wage. After we adjusted imputed values to preserve variance, we took antilogarithms.

uted to him. For example, an average of 1,490 hours are spent annually by adults in income-earning activities that contribute to total observable income. To compute standardized observable income, we calculate for each individual the difference between 1,490 and his reported hours of work in the activities that contribute to total observable income,[17] multiply this difference by his wage rate, sum these across adults in the household, and add the total to the household's total observable income. We are assuming that the individual who worked fewer than 1,490 hours implicitly chose to consume extra hours of leisure (an in-kind source of income) rather than work, and therefore his income should reflect that extra consumption. On the other hand, the individual who worked more than 1,490 hours chose to forgo those potential hours of leisure consumption, and his adjusted income total should reflect that extra cost. For the latter example, our procedure would subtract from the individual's income an amount equal to the value of the leisure consumption forgone relative to the sample average. The procedures for arriving at standardized actual incomes I and II[18] are identical, save for the difference in mean work hours at which we standardized. Those means were 1,943 and 2,481 hours for total actual income I and total actual income II, respectively.

[17] These hours were summed over activities that potentially generate total observable income for the household, irrespective of whether the *individual* actually recorded positive income in that activity. For example, if the individual recorded positive hours worked for the family business but reported that he received no income for that work, these hours were still counted. This was done because his work presumably generated income for the family business, which is accounted for elsewhere (in business income); to price that time out again would be to engage in double counting.

[18] The potential measurement error in total actual income II is not a problem when we examine the corresponding standardized income composite because for the standardized income composite, all households are evaluated at the same number of work hours.

These procedures are like those used by Garfinkel and Haveman (1977) to construct their measure of "earnings capacity." They estimate what each husband's and wife's earnings would be if they worked full-time (2,080 hours/year).

IV. RESULTS FOR THE ENTIRE SAMPLE

This section presents findings regarding the distribution of income for our entire sample of 1,064 households in Peninsular Malaysia. As we noted earlier, this is a random sample of households with at least one ever-married woman less than 50 years of age. For this sample, we examine the impact on the central tendency and dispersion in the income distribution of broadening the definition of income. We also consider the effect of alternative adjustments for household size and composition. Finally, we assess how standardizing income for number of hours of work (leisure) affects these results. We also consider how these various changes affect particular parts of the income distribution and how they affect households' rankings in the income distribution.

MEASURES OF CENTRAL TENDENCY OF UNSTANDARDIZED INCOMES

Means of Income Components and Composites

Table 2 and Fig. 1 present mean levels and relative shares for the nine components of income defined in Sec. III, starting with those most commonly considered in other income distribution studies, and shows the effect on the size of composite income measures of adding components that are less typically considered. All the data in Table 2 refer to annual household incomes. Later we explore the effects of adjusting income for household size and reweighting of population units.

The largest component of household income—the one considered in every income distribution analysis—is wage income, which has a mean of M$4,986 (M$ denotes Malaysian dollars). Business income has a mean of M$2,830, while capital and interest income is much smaller in absolute magnitude, with a mean of M$403. The composite of wage, business, and capital and interest income, which we call market income, 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).[1]. This compares to a mean household income in the United States in 1975, for a definition very close to our market income, of US$13,186.

The next three components in Table 2—net transfer payments,[2] the value of services provided by living in a home one owns, and in-kind income from employment and from own farm and business products consumed rather than sold—are mentioned in most income-distribution studies, but few studies have been able to measure them with much accuracy. Our data indicate that the inability to include

[1] This was the official rate of exchange during most of the period. It also fell in the range of private money market rates of exchange during the period.

[2] It is important to point out that transfer income, although it has the smallest mean of any of the components considered, is a very important source of income variation. It also has a strong equalizing impact on income distribution, being negatively correlated with most of the other components of income. For verification, see Table H.2, which reproduces the correlation matrices between the nine income components for the total sample as well as the various ethnic and geographic subgroups.

Table 2

COMPONENTS OF INCOME AND ALTERNATIVE DEFINITIONS OF HOUSEHOLD INCOME

Income Component	Mean Level (M$/year)
Wage income	4,986
Business income	2,330
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

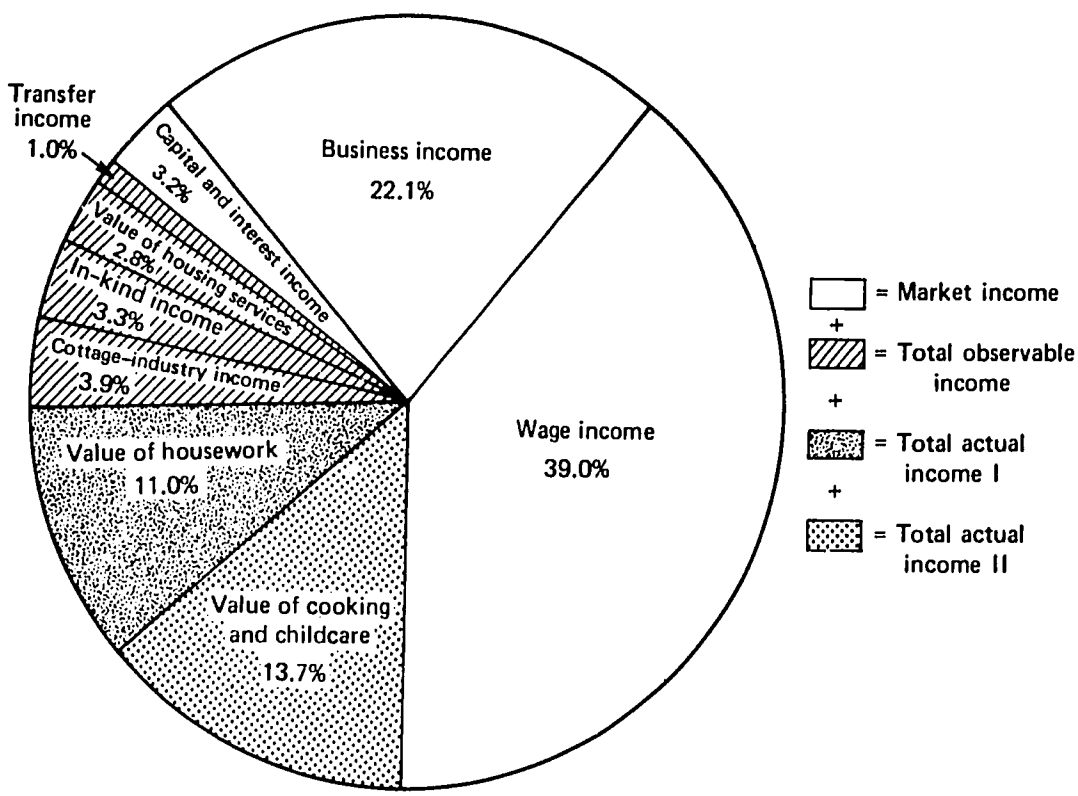

Fig. 1—Income components and alternative composite measures

observed transfer income, the value of owner-occupied housing, and in-kind payments would have resulted in an estimate of mean income for our sample which would be M$899/year, or 10 percent, too low.

Our in-kind income component includes the value of home consumption of *identified* goods and services. The value of home production and consumption of goods not specifically identified in the data is measured by the cottage-industry income component. The value of this "hidden" form of income, M$499/year, exceeds that of the observable component, in-kind income, suggesting that estimates of in-kind consumption based on reports of actual products consumed may dramatically understate the total value of this form of income.

Adding transfer income, the value of housing services, identified in-kind income, and cottage-industry income to market income increases average annual household income by M$1,398, or 17 percent. This broader income measure, the household's total observable income, averaged M$9,617 in Malaysia during 1976-77.[3]

Our next income component consists of the value of the economic services produced by such typical household activities as washing clothes, cleaning house, shopping, and other housework. This component, which is denoted here as the value of housework, has mean of M$1,410. When we add this component to total observable income, to form total actual income I, estimated mean Malaysian household income increases 17 percent.

The final income component we consider, the value of cooking and childcare, is an estimate of the value of the services derived from time devoted to those two household activities. Its mean value of M$1,475 exceeds the value of all other income components except wage income and business income. When this component is included along with all of the others, we obtain the composite measure we call total actual income II. The mean of this final unstandardized income composite, M$12,781, exceeds the mean of the most narrowly defined composite, market income, by 56 percent, and it exceeds the mean of the more commonly accepted income measure, total observable income, by a full 33 percent.

Overall, housework activities—value of housework and value of cooking and childcare—add M$3,164 to the average Malaysian household's income. This increment is 38.5 percent the size of market income and 33 percent the size of total observable income, and it accounts for about one-quarter of total actual income II.

[3] The two most recent studies concerning income distribution in Peninsular Malaysia are Anand (forthcoming), which uses data from the 1970 Post-Enumeration Survey (PES), and Meerman (1979), which uses data from the 1974 Distributive Effects of Public Expenditures Survey (DEPS). For the PES data, Anand found a mean annual household income of M$3,168, while for the more recent DEPS data, Meerman calculated a mean annual household income of M$5,662. The income concepts used in these studies were quite similar and correspond most closely to our total observable income composite, less the cottage-industry income component, for which we find a mean of M$9,118 per household. We make no attempt here to draw comparisons between our mean and theirs because of two basic problems involved in doing so. First, there is the problem of intertemporal comparability: What growth factor should be applied to their estimates to render them temporally comparable with our 1976-77 data? It makes a great difference in the resulting estimate whether one uses as a benchmark the historical rate of growth in consumer prices, personal income, GNP, or wages. Compounding this problem is the difference in the samples used. Both the Anand and the Meerman studies use data generated through random samples of the entire population of Peninsular Malaysia. The sample from the MFLS data used here excluded all households with no ever-married women under 50. Thus there is no accurate way of decomposing the difference between our estimates and Anand's and Meerman's estimates of mean income into that attributable to the differences in the sample versus that due to income growth over time.

However, as shown in App. E, these ratios of value of housework to total income are smaller than comparable figures for other countries.

Medians of Income Composites

Table 3 presents both medians and means of the various income composites (and adjusts household income for differences in household size and/or composition). The medians of the various income measures in Table 3 are substantially smaller (less than 50 percent for market income) than the corresponding means, an indication of the high degree of positive skewness in each of the distributions. In addition, regardless of how we adjust for household size, the ratio of mean to median falls as we broaden the definition of income. This occurs because broadening the definition of income has a larger relative impact on households in the lower end of the distribution. This point can be highlighted by noting the effect of broadening the income concept on the median, rather than mean, income levels. The movement from market income to total observable income increases *median* household income by 33 percent, whereas the corresponding relative change in *mean* household income is only half as large. Similarly, moving from the narrowest income composite to the broadest increases median household income by 107 percent--nearly twice the increase of the comparable means (56 percent). Thus changes in the definition of income dramatically affect estimates of general levels of economic welfare, especially when medians are used. (We shall consider below how broadening the definition of income affects the *inequality* of the overall distributions.)

Adjustments for Household Size and Composition

The means and medians of per adult household income shown in Table 3 are for the 1,064 households in the sample, the same units of analysis used for total

Table 3

MEANS AND MEDIANS OF INCOME COMPOSITES: ALTERNATIVE ADJUSTMENTS FOR HOUSEHOLD SIZE AND COMPOSITION

Income Composite	Household Income (n = 1,064)	Per Adult Income of Households (n = 1,064)	Per Capita Income of Individuals (n = 6,992)
Market income	8,219 (3,829)	2,620 (1,230)	1,251 (607)
Total observable income	9,617 (5,091)	3,064 (1,582)	1,464 (743)
Total actual income I	11,027 (6,443)	3,556 (2,051)	1,679 (947)
Total actual income II	12,781 (7,958)	4,174 (2,584)	1,946 (1,191)

[a]Medians are given in parentheses.

household income; all 6,992 individuals in the sampled households are the units of analysis for the per capita individual incomes shown. Adjusting for the number of adults or number of members in a household (which average 3.4 and 6.6, respectively, in our sample) of course reduces the sizes of all our income measures. However, for each income composite, adjustments for number of adults or household size have little effect on the ratios of mean to median or on the size of the relative increase in income when the definition of income is broadened.

The use of individual rather than household-level weights reduces means and medians of per capita income by about 9 percent (that is, for a given definition of income, the mean or median of the distribution of *individuals* by per capita household income is about 9 percent lower than the corresponding mean or median of the distribution of *households* by per capita household income (not reported here). This is so because larger households, whose members get more weight in the distribution of individuals, tend to have smaller per capita incomes (see Table 29, p. 81).

INEQUALITY IN THE DISTRIBUTION OF UNSTANDARDIZED INCOMES

In addition to measures of central tendency, estimates of the variation and inequality in the overall distribution are of crucial interest in the study of income distribution. Of particular interest here is the effect on income inequality of broadening the definition of income. Toward this end, we have selected two measures of inequality (the Gini ratio and the Theil index), one measure of general dispersion (the coefficient of variation), and two measures of income shares (the income shares of the poorest 20 percent and the wealthiest 20 percent of the population).[4] We have chosen to use more than one measure of inequality because of the inherent complexity of the notion of inequality. Comparisons of inequality based on alternative measures often fail to agree, implying a degree of ambiguity in the comparison. Since we would like our conclusions to be free of ambiguity, if possible, and since we want to increase the ease of comparison between this study and others like it, we have used all of the most popular measures of inequality. There is one additional advantage to using multiple measures of inequality: Different measures have differing sensitivities to changes in alternative locations in the income distribution. This is important because, beyond concluding that one distribution is more unequal than another, we would like to say something concerning *how much* more unequal it is. Since our various measures will, in general, give different answers to this question, we will be able to specify a range of magnitudes with more confidence than any single estimate of relative change would enable us to do.

Measures of Inequality Used in this Study[5]

The *Gini ratio* is defined as the ratio of the area between the Lorenz curve and the diagonal to the total area under the diagonal.[6] It ranges from 0 to 1, with 0

[4] Variance of logarithms of income, another commonly used measure of inequality, is used in Sec. VI.

[5] See App. F for algebraic definitions of the first two of these measures.

[6] The Lorenz curve is the set of points obtained by plotting the cumulative share of total sample income (along a vertical axis ranging from 0 to 1) against the cumulative share of population units (along a horizontal axis, also ranging from 0 to 1). The diagonal is the line connecting the points (0,0) and (1,1).

representing perfect equality, i.e., all incomes the same, and 1 representing perfect inequality, i.e., a single unit receiving all the income. The Gini ratio is relatively sensitive to inequality occurring in the middle of the income distribution.[7]

The *Theil index* is a measure of inequality based on information theory, developed by Henri Theil (1967). It varies from 0, perfect equality, to ln (N), perfect inequality, where N is the number of population units.[8] Two of the advantages of this measure are its ability to handle zero values of income (unlike the variance of logarithms of income, for instance) and the ease with which it can be decomposed to reveal the proportion of inequality due to within- and among-group differences. The Theil index is less sensitive than the Gini ratio to inequality in the middle of the income distribution, but it is more sensitive to very large relative incomes.

The *coefficient of variation* is defined as the standard deviation of income divided by the mean. It is a common measure of relative dispersion which, like the Gini ratio and the Theil index, is unaffected by a proportional expansion of all incomes. It has a lower bound of zero, but is unbounded from above. Of the three measures, the coefficient of variation is the most sensitive to variations in extreme wealth and the least sensitive to variations at the lowest end of the income distribution.

There is another, more general concept of inequality to which we will periodically refer, the concept of *stochastic dominance.*[9] The importance of this concept derives from the fact that all measures of income inequality are implicitly based on specific social welfare functions, i.e., alternative ways of translating different levels of individual or household incomes into a general level of social welfare. If one is interested in drawing a conclusion concerning the relative amounts of inequality present in two distributions, one would also be interested in whether alternative concepts of social welfare would yield the same ranking of the two distributions in terms of inequality. Presumably, the wider the class of social welfare functions that would yield the same ranking of two distributions, the more confidence one would have in the particular comparison made. In a seminal article on the measurement of income inequality, Atkinson (1970) shows that if a distribution, A, stochastically dominates another distribution, B, then *any* inequality measure based on a social welfare function which is increasing and concave in individual incomes[10] will yield a conclusion that income in A is more equally distributed than in B. Furthermore, Atkinson demonstrates that distribution A stochastically dominates distribution B if the Lorenz curve for A lies entirely above that for B *and* the mean of A is greater than the mean of B. This latter statement provides a relatively simple method of checking for the existence of stochastic dominance. Thus if the latter condition is satisfied, we know that any inequality measure (based on the

[7] All references to the relative sensitivities of the various inequality measures are based on an excellent article on the subject by Champernowne (1974).

[8] This characteristic of the Theil index, i.e., having its maximum value vary positively with the size of the population, is a drawback vis-à-vis attempts to draw comparisons between distributions of different sizes. One could make this measure vary from 0 to 1, like the Gini ratio, by dividing by Log (N), but this would destroy its decompositional feature.

[9] Formally, a distribution, F(y), stochastically dominates another distribution, G(y), if

$$\int^{z} [F(y) - G(y)]dy \leq 0 \quad \text{for } 0 \leq z \leq \bar{y} \quad \text{and} \quad F(y) \neq G(y) \text{ for some } y.$$

[10] This simply means that the measure of social welfare increases whenever any one individual's income is increased, holding others' incomes constant, and the poorer the individual who receives the income, the greater the increases. These are rather weak conditions, and therefore a rather wide class of social welfare functions will satisfy them.

type of social welfare function described) would yield the same conclusion.

Although the existence of stochastic dominance allows us to make relatively strong statements concerning the *ranking* of two distributions in terms of income inequality, it does not provide any information regarding the magnitude of the difference. For that, it is necessary to specify a particular social welfare function, i.e., to employ a specific measure of inequality.

Effects of Broadening the Definition of Income and Adjusting for Household Size on Inequality in the Unstandardized Measures of Income

Table 4 presents the results of the analysis of *inequality* in the various composites of income just discussed.[11] The overwhelming conclusion here is that *as one broadens the definition of income, inequality unambiguously falls.* This result holds for all inequality measures examined and within each of the alternative household size/weighting adjustments. We can also conclude that each successive broadening of the income definition generates a distribution of income that stochastically dominates the preceding one. This is illustrated by the Lorenz curves for household income in Fig. 2.[12] The magnitudes of the falls in inequality when the income definition is broadened depend, as suggested earlier, on the measures of inequality used. For the movement from household market income to total observable income, the estimated fall in inequality ranges from a low of 8 percent for the Gini ratio to a high of 17 percent for the Theil index. Even more dramatic is the fall in inequality implied by a comparison of the distribution of household market income with that of the broadest measure, total actual income II. The range of estimates for that comparison varies from a fall of 22 percent implied by the Gini ratio to a fall of 41 percent indicated by the Theil index.[13] The differences between the estimates implied by the Gini ratio and those implied by the Theil index are due primarily to the effects of broadening the income concept on the income share of poorest quintile. The income share of the poorest quintile of our sample increases by more than 40 percent when we add the various in-kind forms of income to market income to form total observable income. When we contrast market income with total actual income II, the income share of the poorest 20 percent of the sample *more than doubles* (from 2.3 percent to 5.2 percent). This explains why the Theil

[11] The most relevant comparison to our results is with Anand's (forthcoming) analysis of the Malaysian 1970 PES. Anand uses an income concept that appears to be almost identical to our household total observable income. Based on a sample of 25,000 households, he estimates a Gini ratio of .513, and income shares of the poorest and richest 20 percents of the population of 3.5 percent and 55.7 percent, respectively. Our corresponding statistics indicate more inequality—.616, 2.3 percent, and 66.1 percent, respectively. We cannot, however, attribute the differences between our results and his to differences in our respective samples. The major group left out of our sample is older families, a fact that would most likely tend to bias our estimates of inequality *downward* rather than upward, since older families tend to be represented disproportionately among the poor. Most likely, the difference in results is due to the fact that the PES data came in the form of frequencies within various income intervals. This causes a downward bias in estimated income inequality due to a resulting zero variance of income within the reported intervals. This bias is particularly strong when it comes to the handling of the highest income interval, since it is necessarily unbounded from above. In this situation, very large income outliers effectively get eliminated from the sample through the process of assigning all observations in this bracket an estimated mean value, as Anand did.

[12] Lorenz curve points for other income measures are given in Table II.3.

[13] The variance of logarithms, shown at the bottom of Table 27 (p. 79), exhibits an even greater fall, 65 percent.

Table 4

MEASURES OF INEQUALITY

Income Composite	Gini Ratio	Theil Index	Coefficient of Variation	Income Share of Lowest Quintile	Income Share of Highest Quintile
Distribution of Households by Household Income (n = 1064)					
Market income	.616	.850	2.34	2.3%	66.1%
Total observable income	.567	.709	2.05	3.3	61.9
Total actual income I	.518	.591	1.81	4.5	58.0
Total actual income II	.480	.501	1.60	5.2	54.7
Distribution of Households by Per Adult Household Income (n = 1064)					
Market income	.614	.916	2.99	2.6%	66.1%
Total observable income	.560	.758	2.59	3.9	61.8
Total actual income I	.512	.635	2.26	4.9	57.9
Total actual income II	.479	.544	1.97	5.4	54.9
Distribution of Individuals by Per Capita Household Income (n = 6992)					
Market income	.608	.856	2.57	2.6%	65.3%
Total observable income	.561	.714	2.23	3.6	61.2
Total actual income I	.516	.602	1.98	4.6	57.7
Total actual income II	.481	.516	1.75	5.3	54.6

index, the measure most sensitive to changes at the lower end of the income distribution, shows the greatest fall in inequality when the definition of income is broadened.

Essentially the same story is told by the per adult household and per capita individual distributions. The levels of inequality tend to be slightly higher for the per adult distributions, while those for the per capita distribution are about the same as those for household income. Our finding that the Gini ratio is slightly lower for the distribution of individuals by per capita household income than for the distribution of households by household income is consistent with that of Danziger and Taussig (1978), who also found that the distribution of individuals by per capita household income had a lower Gini ratio than the corresponding distribution of households by household income.[14] However, our other data yield ambiguous results on that issue, since the ranking of the two distributions depends both on which inequality measure is used and on which definition of income is employed.

The share of total income received by the poorest 20 percent of the population is uniformly higher for the per adult and per capita income distributions than for the corresponding distributions of household income because, in our sample,

[14] Danziger and Taussig's income measure is similar to our market income. However, for each income definition, the Gini ratio for our distribution of *households* by per capita household income (not presented here) is *greater* than that for the corresponding distribution of households by household income.

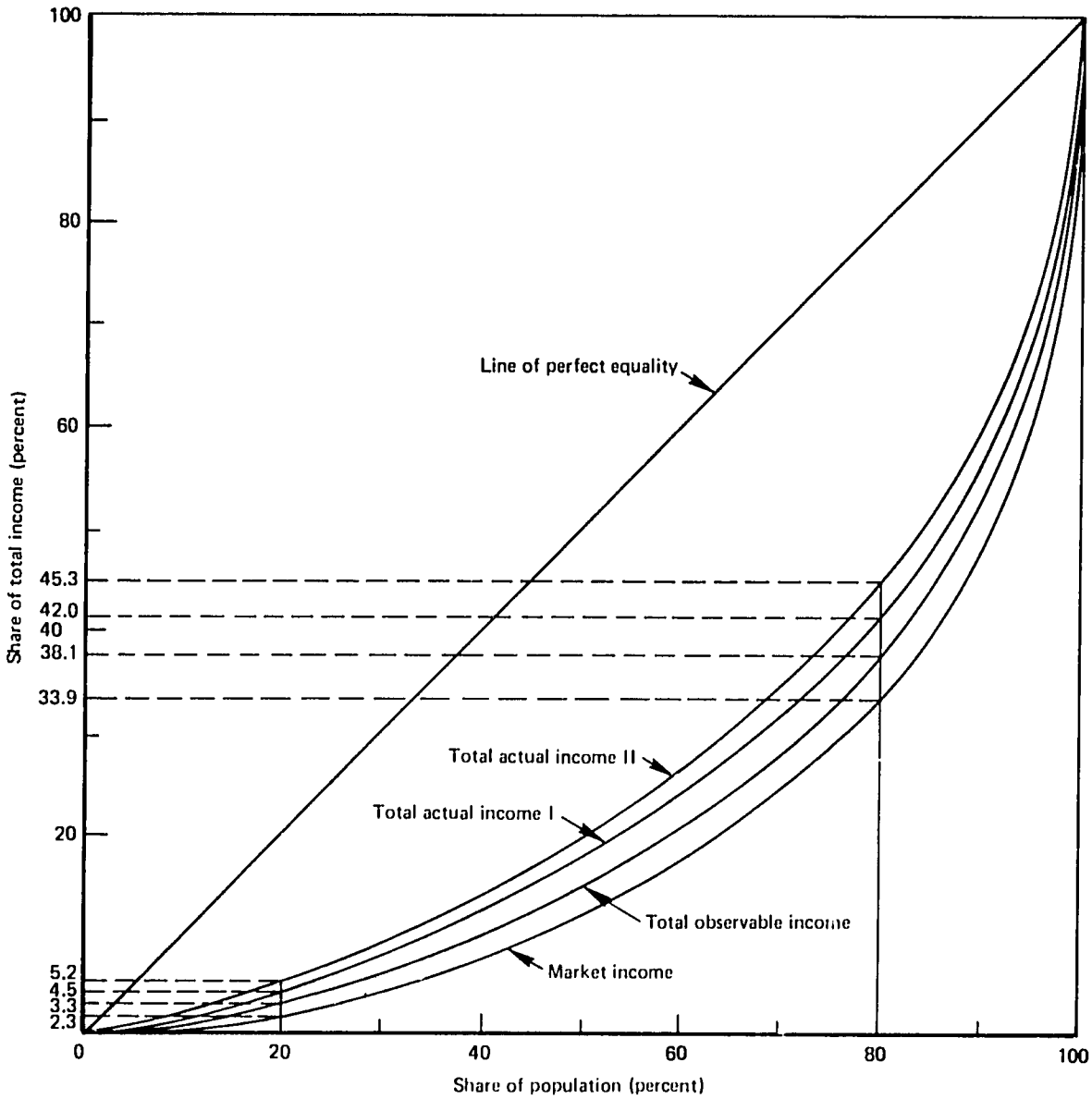

Fig. 2—Lorenz curves for the four household income composites

household income is positively correlated both with numbers of adults per family and with overall household size.

Our finding that broader definitions of income are less unequally distributed than narrower ones may have important implications for international comparisons of inequality. We find that for Malaysia, definitions of income that are biased toward including only income earned in formal market activities yield distributions of income that are more unequally distributed. Since the extent of economic development is highly correlated with the extent of the formal market, income definitions biased toward market activities tend to overstate the extent of inequality, especially in LDCs, where nonmarket activities contribute substantially to households' well-being. The common finding that "income" (based on a definition, say, like our market income) is more unequally distributed in LDCs than in MDCs (more-developed countries) may merely be a reflection of the fact that fewer families participate in formal market activities in the former than in the latter; it does not necessarily mean that well-being or consumption potential is less equally distributed in LDCs than in MDCs.

Effects of Broadening the Definition of Income on Different Portions of the Income Distribution

So far, all of the discussion relating to the alternative definitions of income has involved summary measures of the central tendency (means, medians) and dispersion (Gini ratio, Theil index, coefficient of variation, and income shares of poorest and richest quantiles) in the resulting distributions. In the following paragraphs we present and discuss the results of an alternative method of contrasting these distributions which does not suffer from the loss of information inherent in the use of summary measures.

The technique we use is known as the ratio-at-quantiles function. To our knowledge, it was first suggested by Wohlstetter and Coleman (1970) in a study of black/white income differentials in the United States and was later analyzed by Morris (1972) in a study of measures of alternative inequality. As its name implies, the ratio-at-quantiles function is the relation generated by plotting the ratios of incomes from two distributions at the same quantile (percentage share of the population). The interpretation of the results involves both the height and the slope of the function. The height of the function at various quantiles provides direct information on relative income differentials in the various segments of the two distributions. The slope of the function conveys information on relative dispersion in the various portions of the two distributions being compared. For example, if in comparing two distributions, A and B, one finds that the ratio of incomes in A relative to B increases (falls) between the second and third deciles, the implication is that the dispersion in A is becoming greater (smaller) than that in B over that range of the two distributions.[15] Furthermore, a finding that the slope of the function reverses sign *anywhere in its range* implies that it is impossible to make an unambiguous ranking of inequality in the two distributions.

Figure 3 presents the ratio-at-deciles functions based on a comparison of distributions of total observable income, total actual income I, and total actual income II with the distribution of market income. We see in Fig. 3 that at the first decile,

[15] For a proof of this conclusion, see Morris (1972).

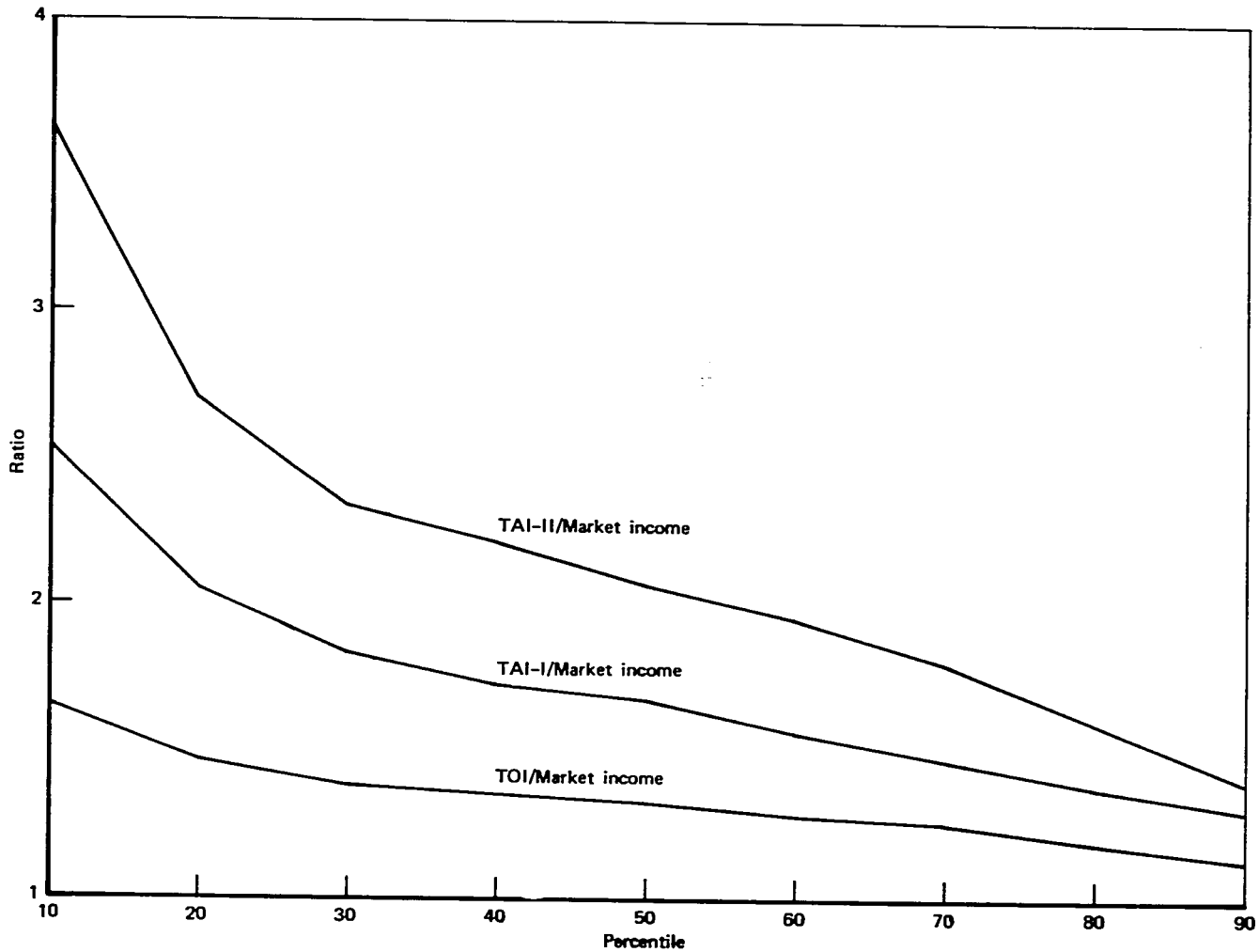

Fig. 3—Income ratios at deciles: effect of broadening the definition of income

total actual income II is 3.6 times the size of market income. This ratio falls to 1.4 at the 90th percentile. Comparable figures for total actual income I are 2.5 and 1.3, and for total observable income, 1.7 and 1.1. The positive relation between the height of the curves and the broadness of the income definition means only that incomes increase as we broaden the definition of income. The consistently negative slope of each curve and the fact that the function is steeper for broader definitions of income are consistent with our earlier results that inequality unambiguously falls as we broaden the definition of income. Also consistent with our earlier results, Fig. 3 shows that the impact of broadening the definition of income is greatest at the lowest end of the income distribution. The differences in the heights as well as the slopes of the three functions in Fig. 3 are greatest over the first two deciles. This indicates that the *increases* in income and the *decrease* in inequality produced by broadening the income definition are greatest in this portion of the income distribution.

Effects of Broadening the Definition of Income and Adjusting for Household Size on Households' Rankings in the Income Distribution

Table 4 and Figs. 2 and 3 have shown quite clearly that broadening the definition of income tightens the distribution of income. However, these data do not tell us whether it affects a household's relative position in the income distribution. Broadening the definition of income may indeed increase every household's income and may increase that of the poor relatively more than that of the rich, but is the household that was judged to be poorest (or richest) in terms of market income still the poorest (or richest) for total observable income or total actual income I or II? To answer this question we look at rank correlations among our four income composites. We also investigate whether adjustment for household size and composition affects households' rankings in the income distribution. This adjustment had no systematic effect on overall inequality.

Table 5, which presents rank correlations among our four unstandardized income composites, shows that when we broaden the definition of income, some households do change their rank in the income distribution. The more we broaden the definition of income, the greater the average change in ranking. Adding nonmonetary receipts to market income (to form total observable income) has a greater effect on rankings than adding the value of narrowly defined housework to total observable income (to form total actual income I); the effect of adding the value of cooking and childcare to total actual income I (to form total actual income II) is as large as or larger than that of adding the value of narrowly defined housework to total observable income. The average absolute change in percentile ranking when we move from market income to total observable income is 10.2 percent, while the average absolute change in percentile ranking due to broadening the income definition from total observable income to total actual income I is 6.7 percent and from total actual income I to total actual income II is 7.1 percent. The average absolute change in percentile ranking due to moving from the narrowest definition to the broadest, 14.5 percent, is less than the sum of these three changes (24 percent), implying that each successive broadening does not change each household's rank in the same way.

Table 5

RANK CORRELATION AMONG INCOME COMPOSITES: EFFECT OF BROADENING THE DEFINITION OF INCOME

Income Measure	Market Income	Total Observable Income	Total Actual Income I	Total Actual Income II
Distribution of Households by Household Income (n = 1064)				
Market income	1.000	.942 (.098)	.925 (.112)	.896 (.132)
Total observable income		1.000	.979 (.059)	.935 (.104)
Total actual income I			1.000	.970 (.071)
Total actual income II				1.000
Distribution of Households by Per Adult Household Income (n = 1064)				
Market income	1.000	.932 (.106)	.896 (.132)	.847 (.160)
Total observable income		1.000	.964 (.077)	.902 (.128)
Total actual income I			1.000	.964 (.077)
Total actual income II				1.000
Distribution of Households[b] by Per Capita Household Income (n = 1064)				
Market income	1.000	.937 (.102)	.911 (.122)	.877 (.143)
Total observable income		1.000	.975 (.065)	.931 (.107)
Total actual income I			1.000	.973 (.067)
Total actual income II				1.000

[a]The statistic presented in parentheses is the average absolute change in percentile ranking (see App. G for the derivation of this statistic).

[b]Households, not individuals, are the units of analysis for the per capita income data.

Table 6 shows how alternative adjustments for household size and composition affect a household's ranking in the income distribution. Simply dividing household income by the number of adults in the household can change a household's percentile ranking in the income distribution by nearly 20 percent. Dividing instead by total number of household members has a somewhat smaller effect. Adjusting for household size and composition causes a greater change in a household's ranking the more broadly income is defined.

Table 6

RANK CORRELATION AMONG HOUSEHOLD, PER ADULT, AND PER CAPITA INCOMES: EFFECT OF ADJUSTING FOR HOUSEHOLD SIZE AND COMPOSITION

Income Measure	Household Income	Per Adult Income of Households	Per Capita Income of Households[b]
	Market Income		
Household income	1.000	.889 (.136)	.917 (.118)
Per adult income of households		1.000	.918 (.117)
Per capita income of households			1.000
	Total Observable Income		
Household income	1.000	.855 (.155)	.893 (.134)
Per adult income of households		1.000	.895 (.132)
Per capita income of households			1.000
	Total Actual Income I		
Household income	1.000	.803 (.181)	.855 (.155)
Per adult income of households		1.000	.875 (.145)
Per capita income of households			1.000
	Total Actual Income II		
Household income	1.000	.772 (.195)	.833 (.167)
Per adult income of households		1.000	.839 (.164)
Per capita income of households			1.000

[a]The statistic presented in parentheses is the average absolute change in percentile ranking (see App. G for the derivation of this statisti

[b]Households, not individuals, are the units of analysis for the per capita income data.

MEASURES OF CENTRAL TENDENCY OF STANDARDIZED INCOMES

We now turn to the measures of income which adjust for variation in leisure consumption across the population. The means and medians of these standardized income composites are shown in Table 7. To facilitate comparisons, the means and medians of the corresponding unstandardized measures are shown in parentheses.

Table 7

MEANS AND MEDIANS OF STANDARDIZED INCOME COMPOSITES

	Household Income (n = 1064)		Per Adult Income of Households (n = 1064)		Per Capita Income of Individuals (n = 6992)	
Income Measure	Mean	Median	Mean	Median	Mean	Median
Standardized observable income (H = 1490)	9429 (9617)	5030 (5091)	2975 (3064)	1618 (1582)	1436 (1464)	783 (743)
Standardized actual income I (H = 1934)	11069 (11027)	6248 (6443)	3474 (3556)	2035 (2051)	1686 (1679)	986 (947)
Standardized actual income II	13107 (12781)	7843 (7958)	4095 (4174)	2511 (2584)	1996 (1946)	1238 (1191)

NOTES: The numbers in parentheses are the mean and medians of the corresponding unstandardized measures.
H = number of standard hours at which each adult's income was calculated (see p. 20).

In general, standardizing on alternative values for leisure consumption seems to have little effect on the various means and medians. As we broaden the definition of income, 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 standardized observable income compared with the corresponding unstandardized measure, while the opposite is generally true for the broader definitions.

Although the net differences caused by standardizing on hours are small, they are the result of some offsetting changes which are interesting in themselves. These can be disentangled by examining the time allocations of the various adults in our sample. Table 8 presents mean values of work hours corresponding to our alternative definitions of income, as well as wage rates and labor-force participation rates for the four groups of adults who generate household income: male heads of household, female heads of household, other adult males residing in the household, and other adult female household members. The wage means shown in Table 8 are averages over both observed and imputed wages. The corresponding labor-force participation rates are the percentages of those wages that were observed.

From Table 8, we see that the distribution of the workload in the household depends on the definition of work. The narrower the definition of work, the more it appears that the men in the household work the most. However, when the scope of the concept of work is expanded to include narrowly defined housework activities

Table 8

Hours and Wages of Adults

Item	All Adults (n = 3793)	Type of Household Member: Male Heads (n = 963)	Female Heads (n = 1064)	Other Adult Males (n = 865)	Other Adult Females (n = 901)
Market income hours	1306 (.87)	1982 (.49)	1151 (.99)	1216 (.89)	851 (1.20)
Total observable income I hours	1490 (.81)	2147 (.47)	1515 (.87)	1297 (.86)	942 (1.12)
Total actual income I hours	1934 (.71)	2276 (.46)	2754 (.52)	1352 (.82)	1159 (.94)
Total actual income II hours	2481 (.68)	2448 (.44)	4182 (.36)	1402 (.80)	1545 (.76)
Wage ($M/hr)	1.05 (1.18)	1.65 (1.04)	.91 (1.05)	.94 (1.05)	.67 (1.28)
Labor force participation rate (%)	36.6	57.8	28.8	33.8	26.0

NOTE: Numbers in parentheses are coefficients of variation.

(total actual income I), the relative position of male and female heads is reversed. When we include time engaged in cooking and childcare, then both groups of women dominate their respective male counterparts in terms of average amount of time spent working. The other side of the story is, of course, the relative variation in leisure consumption across the four groups of adults. For the observable income composite, male heads of household are, relatively speaking, the main workers in the household, i.e., are forgoing the most leisure, while other adults in the household are the primary consumers of leisure time, with average leisure time of female heads approximately equal to the overall mean. When this 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 ($\bar{H}$ = 1,490), the higher-valued forgone leisure of male heads dominates the value of the extra leisure consumed by other adults, and mean household income falls.

When all forms of housework activities are included in "work" (i.e., total actual income II), then it is female heads who are the main workers in the household, whereas the amount of leisure consumed by male heads is approximately equal to the mean for all adults. In addition, this broadening of the definition of work increases the relative leisure consumption of other adults, both males and females. On balance, the additional value of the leisure consumed by other adults dominates the value of the leisure f .rgone by females, so that the adjustment in this case raises mean household income.

INEQUALITY IN THE DISTRIBUTION OF STANDARDIZED INCOMES

Effects of Leisure Standardization Procedure on Measured Inequality

The effects of the leisure standardization procedure on measured inequality are summarized in Table 9. The values of the corresponding unstandardized composites are again included in parentheses to aid in making comparisons.

Table 9

MEASURES OF INEQUALITY: STANDARDIZED INCOME MEASURES

Income Measure	Gini Ratio	Theil Index	Coefficient of Variation	Income Share of Lowest Quintile	Income Share of Highest Quintile
Distribution of Households by Household Income (n = 1064)					
Standardized observable income (H = 1490)	.569 (.567)	.712 (.709)	2.04 (2.05)	3.1% (3.3)	61.6% (61.9)
Standardized actual income I (H = 1934)	.535 (.518)	.611 (.591)	1.80 (1.81)	3.7 (4.5)	58.8 (58.0)
Standardized actual income II (H = 2481)	.506 (.480)	.530 (.501)	1.59 (1.60)	4.4 (5.2)	56.3 (54.7)
Distribution of Households by Per Adult Household Income (n = 1064)					
Standardized observable income (H = 1490)	.557 (.560)	.761 (.758)	2.61 (2.59)	3.7% (3.9)	61.4% (61.8)
Standardized actual income I (H = 1934)	.518 (.512)	.653 (.635)	2.27 (2.26)	4.6 (4.9)	58.3 (57.9)
Standardized actual income II (H = 2481)	.483 (.479)	.564 (.544)	1.97 (1.97)	5.4 (5.4)	55.6 (54.9)
Distribution of Individuals by Per Capita Household Income (n = 6992)					
Standardized observable income (H = 1490)	.557 (.561)	.708 (.714)	2.22 (2.23)	3.5% (3.6)	60.7% (61.2)
Standardized actual income I (H = 1934)	.521 (.516)	.605 (.602)	1.95 (1.98)	4.2 (4.6)	57.6 (57.7)
Standardized actual income II (H = 2481)	.491 (.481)	.522 (.516)	1.71 (1.75)	4.8 (5.3)	55.1 (54.6)

NOTE: Numbers in parentheses are the corresponding unstandardized measures from Table 4.

There are basically three conclusions to be drawn from Table 9. First and most surprising is that *standardizing for the variation across the population in leisure consumption has surprisingly little effect on income inequality.* Inequality in these standardized income distributions still falls with an increase in the scope of activities included in income, but the pure effect of the adjustment for leisure, i.e., 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 usually larger for the standardized measures than for the corresponding unstandardized ones,[16] though the opposite is true for the share of the lowest quintile.

The second, somewhat weaker, conclusion indicated in Table 9 is that the fall in inequality implied by broadening the scope of income is somewhat less for the standardized composites than for the unstandardized measures.[17] This is because, as we saw in Table 8, the standardization procedure increases the relative share in total household income of income earned by adults other than the household heads. This is especially true when the definition of income is broadened to include the value of housework activities. This tends to lessen the magnitude of the decline in inequality, because for these two groups of adults, the variation in wages as well as hours of work is relatively large, implying a relatively large variation in the positive component of income which is attributable to them.

The last and most significant inference to be drawn from Table 9 has to do with the impact of the leisure adjustment on 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 relative position of the poorest 20 percent of the population, the implication of the results shown in Table 9 is that failure to adjust for variation in leisure consumption leads to an *overstatement* of the relative position of the poor. The reconciliation of these two points is worth noting: The poor (in terms of market income) in Malaysia appear to attempt to compensate for their relatively low market income by producing many goods and services for their own consumption. Ignoring this substitution among productive activities understates the relative income position of the poor. However, in the process of producing those goods and services in the household, the poor tend to work relatively long hours and hence forgo relatively large amounts of potential leisure consumption. Ignoring this implicit cost of household production tends to bias estimates of their relative welfare position upward.

Effects of Leisure Standardization Procedure on Different Portions of the Income Distribution

Figure 4 presents the ratio-at-deciles functions generated by comparison of the leisure-standardized distributions with their unstandardized analogues. The primary result here is the differential impact of the leisure-standardization procedure on the lower and upper parts of the distributions. In the lower part, for all three

[16] This is also true for the variance of logarithms of actual income II (see Tables 27–29).

[17] The rank correlations among successively broader standardized composites (not reported here) are larger than those among the corresponding unstandardized composites—the absolute changes in percentile rankings range from .026 (household standardized observable income and standardized actual income I) to .058 (per adult standardized observable income and standardized actual income II). The lower correlations for unstandardized measures are probably the result of changes in rank orderings of hours of "work" when the definition of income is broadened.

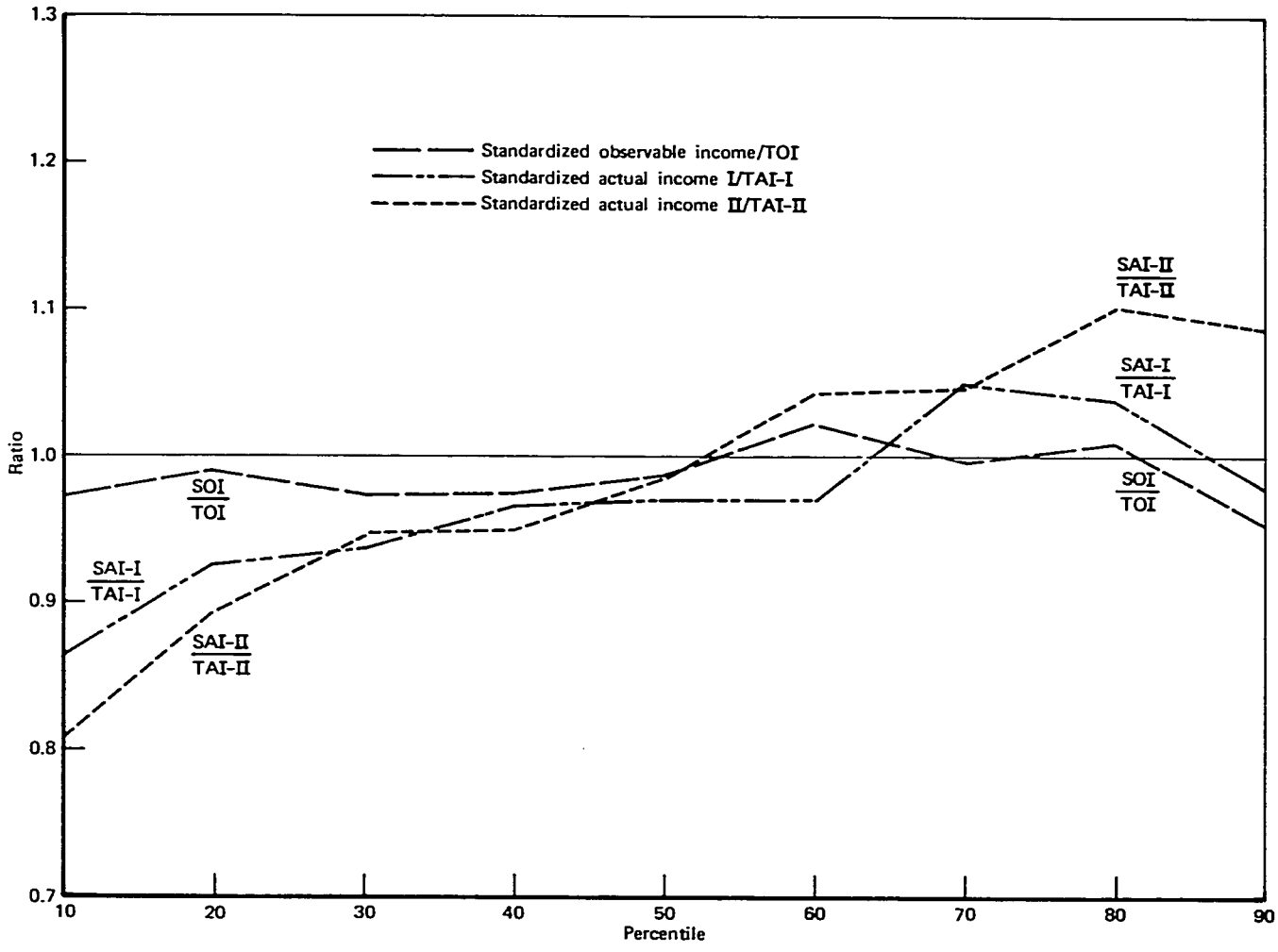

Fig. 4—Income ratios at deciles: effect of standardizing for leisure consumption

definitions of income, standardizing on leisure consumption reduces the incomes of the poorest members of Malaysian society, a result we have seen before. The ratios at deciles are less than 1.0 for the poorest half of the population. For the poorest 10 percent of the population, standardizing reduces actual income II by nearly 20 percent. Standardization increases the dispersion in incomes as levels of income increase in the lowest deciles of the distribution (i.e., the slopes of the curves are positive). Each of these effects is more pronounced the broader is the definition of income.

The reduction in income that results from standardizing on leisure consumption becomes progressively smaller for richer segments of the population. Standardization increases income slightly at the 60th and 80th percentiles for observable income, increases actual income I by around 5 percent at the 70th and 80th percentiles, and increases actual income II by 5 to 10 percent for all deciles after the 50th percentile. In the highest end of these income distributions, standardization tends to reduce the dispersion in income (i.e., the curves slope downward between the 80th and 90th percentiles). The lack of monotonicity in the slopes of the ratio-at-deciles functions in Fig. 4 means that it is not possible to make unambiguous rankings of inequality between the standardized and unstandardized distribution, which is consistent with our earlier results.

Effects of Leisure Standardization Procedure on Households' Rankings in the Income Distribution

Table 10 shows how standardizing for leisure consumption affects households' rank ordering in the income distribution. The sizes of the absolute changes in percentile rankings when we standardize for variations in leisure consumption are slightly greater on the average than the changes that result from broadening the definition of income or adjusting for household size. Standardizing for leisure consumption changes a household's percentile rank in the income distribution by from

Table 10

RANK CORRELATIONS BETWEEN STANDARDIZED AND UNSTANDARDIZED INCOMES: EFFECT OF STANDARDIZING FOR LEISURE CONSUMPTION

	Household Income	Per Adult Income of Households	Per Capita Income of Households[b]
Observable income	.835 (.166)	.784 (.190)	.816 (.175)
Actual income I	.842 (.162)	.789 (.188)	.824 (.171)
Actual income II	.845 (.161)	.794 (.185)	.827 (.170)

[a]The statistic presented in parentheses is the average absolute change in percentile ranking (see App. G for the derivation of this statistic).

[b]Households, not individuals, are the units of analysis for the per capita income data.

16 to 19 percent. For each definition of income, the changes are largest for per adult income and smallest for household income.

Sensitivity of Inequality of Standardized Income to Choice of Standardizing Hours

The generation of our standardized income composites is equivalent to a procedure which first constructs a budget constraint for each household in the sample and then defines income to be the dollar value of that budget constraint evaluated at a prespecified number of hours of leisure consumption, constrained to be the same for everyone in the sample. The problem is that the choice of the number of hours at which to evaluate those budget constraints is arbitrary.[18] Furthermore, the resulting statistics describing the level of inequality in the distribution of income defined in that fashion 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 of this is that there can be no unique answer, *even conceptually*, to a question concerning the level of inequality in the distribution of "full" income.

The nature of the issue becomes clear if we focus on a single measure of inequality. We use the coefficient of variation because of the algebraic ease of manipulating its formula. We can write the value of a household's budget constraint, evaluated at a given number of hours, H, as

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

where W is the sum of wages across adults in the family, and X is the sum of the household's nonlabor sources of income. In this context, the coefficient of variation of measured income, Y, is

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

In particular, we are interested in how this statistic changes when we increase H. After taking the partial derivative of Eq. (2) with respect to H and simplifying, we have

$$\frac{\partial(CV_y)}{\partial H} = \frac{K_x K_y}{H}(K_w CV_w^2 - K_x CV_x^2 + (K_x - K_w)CV_{xw}) \tag{3}$$

where

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

Depending on the relative sizes of the squared coefficient of variation of wages (CV_w^2), the squared coefficient of variation of nonlabor income (CV_x^2), and the squared coefficient of covariation between wages and nonlabor income (CV_{xw}), the

[18] We constructed the standardized income distributions above by standardizing on mean observed hours of work for the alternative definitions of work. We chose those values to isolate, as much as possible, the pure effect of the standardization process.

expression in Eq. (3) can take on any value or sign. In our sample we have the following values for these variables: $CV_w^2 = .851$, $CV_x^2 = 11.3$, and $CV_{xw} = .492$.[19] These particular magnitudes imply that the derivative in Eq. (3) is negative over the relevant range of hours.[20] That is, *the larger H is, the lower will be our estimate of inequality.*[21]

To further illustrate this, Table 11 presents inequality measures corresponding to four levels of hours on which we could standardize. Three are new, generated by setting H equal to standard U.S. full-time work hours (2,080/year),[22] Malaysian standard full-time work hours (44 hours/week or 2,288 hours/year), and, as a limiting choice of H, 16 hours/day 365 days a year, or 5,840 hours/year. As shown, the level of measured income inequality is critically dependent on the specific choice of H. Given this kind of sensitivity, how are we to interpret the inequality statistics generated by a study of the distribution of full income? In particular, how do we draw inferences vis-à-vis international comparisons of income inequality? It would appear that firm conclusions concerning, for instance, the relative levels of inequality in the United States and in Malaysia would have to be based on a comparison of the two economies' entire *inequality functions* (relationships between inequality and the levels of hours used to standardize on). That is, an unambiguous conclusion would be implied only if the relative ranking of inequality in the two countries was independent of the number of hours chosen in the standardization procedure. Short of a comparison of these entire inequality functions, a minimum requirement for any comparison would have to be standardizing at the same number of hours, whatever that value was chosen to be.

These results can also be interpreted to mean that the level of inequality is highly sensitive to the relative share of labor income, i.e., WH, in total income; the larger the share, on the average, the lower the inequality in the distribution of

[19] Y for this example is household observable income, and hence X is total observable income less wage income and cottage-industry income.

[20] For our sample, this derivative is negative at H = 0 and only becomes zero at a value of H defined by

$$H^* = [\bar{X}(CV_x^2 - CV_{xw})]/[\bar{W}(CV_w^2 - CV_{xw})]$$

i.e., a quantity of hours far in excess of 8,760, the total number of hours in a year.

[21] Note that this will be the case whenever $CV_x^2 > CV_w^2 \simeq CV_{xw}$, as it is with our data.

[22] We included the U.S.-based distribution to allow a comparison between this study and a similar study using U.S. data done by Garfinkel and Haveman (1977). Garfinkel and Haveman report a Gini ratio of .540 for "pre-transfer income," a measure corresponding most closely to our market income composite, and .448 for their full income measure standardized at 2,080 hours/year, which they call "earnings capacity." Both statistics are based on the non-aged population in the United States. Since their "families" are restricted to include only husband-wife pairs, our most comparable distributions are for the per adult measures. Contrasting our results with theirs, we estimate a Gini ratio of .614 for unstandardized per adult market income (compared with their .540). Our Gini ratio for "full income" or "earnings capacity" standardized at the same number of annual hours Haveman and Garfinkel use to standardize, 2,080, is .508 (compared with their .448). Although the levels of both of our Gini ratios are higher than the corresponding ones for the United States, the relative falls in inequality when we move from the unstandardized market income to earnings capacity standardized at U.S. full-time work hours are identical—17 percent in both cases.

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 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 amount of work, rather than from its removing variation in those hours among households.

Table 11

SENSITIVITY OF INEQUALITY IN STANDARDIZED INCOME MEASURES TO CHOICE OF HOURS

Income Measure	Gini Ratio	Theil Index	Coefficient of Variation	Income Share of Lowest Quintile	Income Share of Highest Quintile
Distribution of Households by Household Income (n = 1064)					
Standardized observable income (H = 1490)	.569	.712	2.04	3.1%	61.6
U.S. standardized income (H = 2080)	.527	.587	1.87	3.9	58.0
Malaysian standardized income (H = 2288)	.515	.556	1.78	4.2	57.1
Maximal standardized income (H = 5840)	.441	.367	1.17	5.8	50.8
Distribution of Households by Per Adult Household Income (n = 1064)					
Standardized observable income (H = 1490)	.557	.761	2.61	3.7%	61.4%
U.S. standardized income (H = 2080)	.508	.627	2.18	4.8	57.5
Malaysian standardized income (H = 2288)	.495	.592	2.07	5.1	56.5
Maximal standardized income (H = 5840)	.406	.388	1.25	7.3	49.2
Distribution of Individuals by Per Capita Household Income (n = 6992)					
Standardized observable income (H = 1490)	.557	.708	2.22	3.5%	60.7%
U.S. standardized income (H = 2080)	.512	.580	1.87	4.4	56.9
Malaysian standardized income (H = 2288)	.501	.548	1.78	4.6	55.9
Maximal standardized income (H = 5840)	.423	.356	1.17	6.2	49.4

income. We showed earlier that inequality falls as we broaden the definition of income. Now we show that that fall appears to be almost entirely due to the fact that broadening the definition increases the average number of hours of "work," rather than because of any effect it has on variation in those hours across the population. This underscores the point made earlier regarding the need for caution in international comparisons of measures of income inequality. To the extent that our results for Malaysia generalize, they suggest that if two countries M and L have identical distributions of well-being, but the average number of hours *considered* to produce income (and hence the amount of well-being measured as income) is greater in M than in L, measured inequality in the distribution of that income will be less for M than for L, even though the distributions of consumption potential are identical in both settings. Hence, we can speculate that the lower levels of income inequality in MDCs than in LDCs could be largely a reflection of the fact that the average number of hours considered to produce "income" is larger in the former than in the latter.

SUMMARY OF FINDINGS

In this section we have shown that conclusions about income levels and income inequality in Peninsular Malaysia are very sensitive to how broadly income is defined and to how income levels and inequality are measured. When we move from our narrowest household income composite, market income, to our broadest, total actual income II, mean income increases by 56 percent, median income by 10 percent, and the income of the poorest decile of the population by 264 percent. As these numbers suggest, broadening the definition of income has its greatest impact on the poorest segments of the population.

When the definition of income is broadened, income inequality unambiguously falls. This is true for all measures of inequality examined here—Gini ratios, Theil indexes, coefficients of variation, income shares of the poorest and wealthiest quintiles of the population, Lorenz curves, ratios at deciles, and variances of logarithms of income. Indeed, each successive broadening of the definition of income generates a distribution of income that *stochastically dominates* the preceding one. The falls in inequality when we contrast our narrowest income composite with our broadest measure of income range from 22 percent to 65 percent, and the income share of the poorest quintile of the population increases by 125 percent.

Broadening the definition of income not only tightens the distribution of income, it also changes the relative position of households in that distribution. Changing from household market income to total actual income II causes an average absolute change in percentile rankings of 14.5 percent.

Adjusting income for household size, of course, reduces household incomes. This is especially true when the units of observation are individuals, for then more weight is given to larger households, which have lower per capita incomes, on the average. Adjustments for household size do not have an unambiguous effect on income inequality, but they do change households' rankings in the income distribution considerably.

As intended, the procedure we use to standardize for 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 income of the wealthiest households in the sample. The poor in Malaysia appear to attempt to compensate for their relatively low market incomes by producing many goods and services for ther own consumption, but in the process, they work relatively long hours and forgo relatively large amounts of potential leisure consumption.

Standardizing for leisure consumption changes households' percentile rank in the income distribution an average of 16 to 19 percent.

We have shown that broadening the definition of income, adjusting for household size and composition, and standardizing for leisure consumption each change the percentile rankings of households in the income distribution by from 10 to 20 percent. The net effect of all these changes together is less than the sum of the individual effects (that is, making all three changes at once will not change a household s percentile ranking by 60 percent)[23] but it is nonetheless large. The smallest rank correlation we found among all the various measures of income considered here was .518 (household standardized actual income II and per adult total actual income II). The average absolute change in percentile ranking associated with this rank correlation is 28.3 percent. Thus we see that decisions regarding how to define income, whether and how to adjust for household size and composition, and whether to standardize for leisure can simultaneously have a sizable effect on a household's relative position in the income distribution.

An interesting result of our standardization exercise is that measures of income inequality are sensitive to the number of hours on which one chooses to standardize. In particular, in our data, the larger the average number of hours of work on which we standardize, the lower our estimate of inequality. The fall in inequality we find in unstandardized measures of income when we broaden the definition of income appears to be almost entirely due to the fact that broadening the definition of income increases the average number of hours of "work." Possibly, the lower levels of income inequality in MDCs are largely a reflection of the fact that the average number of hours considered to produce "income" is larger in MDCs than in LDCs.

[23] In fact, the maximum value of our statistic measuring average absolute change in percentile rankings is 57.7 percent, corresponding to a rank correlation of −1. The value of corresponding to a rank correlation of zero is 40.8 percent.

V. ETHNIC AND GEOGRAPHIC DIFFERENCES IN INCOMES

In this section we analyze the relative effects of broadening the definition of income on the main ethnic subgroups of the Malaysian population—Malays, Chinese, and Indians—and on the rural and urban subpopulations. Malay households comprise just over half (50.7 percent) of our sample; 38.0 percent of sample households are Chinese; and 11.3 percent are Indian. (These percentages are very close to Malaysian census figures on the ethnic composition of the population of Peninsular Malaysia.) Over two-fifths (41.7 percent) of the households in our sample live in urban areas,[1] and the remainder reside in rural areas.

VARIATION OF INCOME COMPONENTS AND COMPOSITES BY ETHNIC GROUP AND LOCATION OF RESIDENCE

Table 12 presents means, medians, and coefficients of variation of the nine income components for each of the main subgroups in Peninsular Malaysia, showing that there is considerable variation in the relative importance of different components of income for the different subgroups.

The average value of our broadest income measure, total actual income II (which we shall designate TAI-II for expositional convenience), is nearly twice as large for Chinese households as it is for Malay and Indian households. Similarly, the urban average TAI-II is nearly twice the rural average. These differences arise because the average value of nearly every component of total observable income is greater for Chinese households than for Malays and Indians, and for urban households than for rural ones.[2] The only exceptions are rather small components, such as transfer income, where the rural average exceeds the urban average, and cottage-industry income, where the averages are highest for Malay and rural households. However, when we move beyond total observable income to the two housework components included in TAI-II, we see that average values for the Chinese are not the highest of the ethnic groups for either of these components. Indians have the highest average value of housework and value of cooking and childcare. (However, even for these components, urban averages exceed the corresponding rural values.) The average value of TAI-II is larger for Indians than for Malays because the former have higher wage income and higher values of

[1] Urban areas are defined as cities, towns, or villages whose population was over 10,000 in 1967, or where it is estimated that at least half of the work force is engaged in nonagricultural activities.

[2] As a general rule of thumb, one can draw inferences about urban/rural differences based on the corresponding differences between Chinese and Malay households. Most Chinese households (64 percent of the Chinese households in our sample) reside in urban areas, and hence they are very similar to urban families as a group, whereas over three-quarters of the Malays in our sample reside in rural areas, and hence are very similar as a group to rural families as a whole. These considerations will tend to simplify the discussion of the rest of our results, because once we have drawn comparisons between Chinese and Malays, we will tend not to refer independently to urban/rural differences unless they tell a substantially different story.

Table 12

MEANS, MEDIANS, AND COEFFICIENTS OF VARIATION FOR COMPONENTS OF HOUSEHOLD INCOME, BY ETHNIC AND GEOGRAPHIC SUBGROUPS

Income Component	Ethnic Subgroup			Geographic Subgroup	
	Malay (n = 539)	Chinese (n = 405)	Indian (n = 120)	Rural (n = 620)	Urban (n = 444)
Wage income	3332 (2328) [1.29]	7149 (4830) [1.21]	5111 (3383) [1.31]	3141 (2359) [1.12]	7562 (4818) [1.20]
Business income	1175 (198) [4.38]	5764 (146) [3.92]	357 (0) [6.00]	1637 (239) [4.50]	4495 (0) [4.62]
Capital and interest income	358 (0) [7.45]	549 (0) [6.05]	114 (0) [5.19]	390 (0) [8.34]	422 (0) [4.78]
Transfer income	68 (0) [7.26]	254 (0) [7.30]	3.3 (0) [12580.]	151 (0) [5.72]	103 (-.2) [15.2]
Value of housing services	222 (146) [1.33]	545 (0) [2.09]	284 (0) [3.12]	221 (134) [1.43]	534 (0) [2.19]
In-kind income	421 (99) [3.84]	481 (111) [2.64]	169 (59) [1.92]	386 (111) [2.69]	457 (78) [3.90]
Cottage industry income	773 (457) [1.32]	226 (95) [1.99]	188 (1) [2.00]	680 (338) [1.44]	245 (75) [1.91]
Value of housework	1371 (1007) [1.03]	1366 (962) [1.09]	1734 (1255) [0.93]	1299 (996) [0.89]	1564 (1082) [1.14]
Value of cooking and childcare	1428 (1033) [1.04]	2058 (1470) [1.16]	2193 (1545) [0.96]	1431 (1088) [0.95]	2204 (1560) [1.15]
Total actual income II	9149 (6815) [1.02]	18392 (10785) [1.64]	10160 (7008) [1.01]	9338 (6824) [1.24]	17588 (10301) [1.59]

NOTE: Cell entries are, in order, means, medians (in parentheses), and coefficients of variation (in brackets). Means and medians are in $Malaysian/year.

housework and of cooking and childcare. Malay averages exceed Indian for every other component except housing.

Just as for the total sample, wage income is the largest component of income for every subgroup considered in Table 12. For Indians, over 50 percent of TAI-II is wage income; the corresponding figures for the other subgroups are Malays, 36 percent; Chinese, 39 percent; rural households, 34 percent; and urban households, 43 percent. Average business income ranges from 7 percent of the value of average wage income for Indians to 81 percent for Chinese. Average business income is over 50 percent of the value of wage income for both rural and urban households. The share of average TAI-II that derives from business income ranges from 3.5 percent for Indians to 31 percent for Chinese. No other component of total observable income accounts for more than 5 percent of average TAI-II for any subgroup, with the exception of cottage-industry income for Malays and rural households (8 percent and 7 percent, respectively). The two housework components of income are significant shares of TAI-II for all subgroups, but especially for Indians (where these components account for 39 percent of TAI-II), Malays (31 percent), and rural households (29 percent).

Although the relative mean and median values for wage income in Table 12 each give approximately the same picture of interethnic differences, for some of the income components a comparison of *means* across ethnic groups can be misleading. For example, mean Chinese business income is almost five times as large as mean Malay business income, but *median* business income for Malay households *exceeds* median Chinese business income. Obviously, there are some rather large outliers pulling up the mean in the distribution of Chinese business income. A similar reversal occurs in the rural/urban comparison, where the rural mean of business income is only 36 percent the size of the urban mean, but the rural median is M$239, while the urban median is zero. This implies that over 50 percent of the rural population has some (small amount of) business income, while less than 50 percent of the urban population derive positive income from business ventures. We also observe zero medians for capital and interest income and transfer income for all subgroups. The former implies that less than half of the households in any of our subgroups receive any capital or interest income, while the latter implies that the typical (median) household for each subgroup is neither a net donor nor a net recipient of interhousehold transfers. Value of housing services has a median value of zero for Chinese, Indian, and urban households, because relatively few of these households own their homes.

As is true in most income-distribution studies, the coefficients of variation for both business income and capital and interest income exceed those for wage income for every subgroup. For each subgroup, coefficients of variation are lowest for the two housework-related components of household income, because there is relatively little variation in the amounts of time spent in those activities and in the value placed on that time, i.e, wage rates, compared with the amounts of variation in the other components. The large coefficients of variation for capital and interest income and transfer income are due both to their relatively small means and to some large outliers.

As before, we construct our income composites by summing across these components. Table 13 shows how broadening the definition of income to include the components just discussed affects estimates of the sizes of ethnic and geographic income differences in Malaysia. If income is measured solely in terms of money

Table 13

MEANS AND MEDIANS OF INCOME COMPOSITES, BY ETHNIC AND GEOGRAPHIC SUBGROUP

Income Composite	Ethnic Subgroup			Geographic Subgroup	
	Malay (n = 539)	Chinese (n = 405)	Indian (n = 120)	Rural (n = 620)	Urban (n = 444)
Distribution of Households by Household Income (n = 1064)					
Market income	4866 (3017)	13462 (6260)	5582 (3599)	5168 (3019)	12479 (5841)
Total observable income	6350 (4288)	14968 (7472)	6233 (3980)	6608 (4239)	13819 (6872)
Total actual income I	7721 (5506)	16334 (8788)	7967 (5479)	7907 (5479)	15384 (8151)
Total actual income II	9149 (6815)	18392 (10785)	10160 (7008)	9338 (6824)	17588 (10301)
Distribution of Households by Per Adult Household Income (n = 1064)					
Market income	1612 (1034)	4224 (1782)	1736 (1008)	1623 (984)	4013 (1709)
Total observable income	2122 (1429)	4654 (2123)	1929 (1116)	2101 (1396)	4408 (2056)
Total actual income I	2606 (1867)	5124 (2535)	2531 (1589)	2572 (1822)	4930 (2494)
Total actual income II	3139 (2353)	5811 (3056)	3302 (2288)	3088 (2296)	5692 (3154)
Distribution of Individuals by Per Capita Household Income (n = 6992)					
Market income	782 (458)	1942 (913)	807 (481)	798 (471)	1864 (859)
Total observable income	1021 (676)	2160 (1067)	901 (538)	1021 (650)	2064 (1018)
Total actual income I	1241 (840)	2357 (1257)	1152 (723)	1221 (826)	2298 (1218)
Total actual income II	1471 (1047)	2654 (1535)	1469 (905)	1443 (1042)	2627 (1540)

NOTE: Medians are in parentheses.

receipts, i.e., market income, Chinese households have mean household incomes 2.77 times those of Malay households, while Indian households have incomes 15 percent higher than Malays. When we broaden the definition of income, these relative differences fall dramatically. Simply including the tangible, observable forms of in-kind income to form total observable income reduces the Chinese/Malay ratio of mean household incomes by 15 percent, to 2.36/1. Equally noteworthy is the change in the relative positions of Malay and Indian households. When we compare them on the basis of average household total observable income, the Indian income superiority disappears completely.[3] Broadening the definition of income still further to TAI-I and TAI-II tends to further reduce the Chinese/Malay income ratio. Nonetheless, even for our broadest definition (TAI-II), Chinese average household income is twice as large as Malay. Broadening the definition of income to TAI-I and then to TAI-II tends to improve the position of Indian households relative to Malay households (the ratios being 1.03/1 and 1.11/1, respectively).

These conclusions are based on a comparison of *mean household* incomes. If we instead compare *median* income levels and/or look at the distributions of income adjusted for differences in household size, the relative position of Malay households improves considerably.

Looking first at median household incomes, we find that the advantage enjoyed by the median Chinese household relative to the median Malay household is 2.07/1 for market income, but only 1.58/1 for TAI-II. A comparison of median incomes for Indian and Malay households implies an Indian advantage of 19 percent for market income, but little difference for all broader income definitions.

Before discussing the adjustments for household size and composition shown in Table 13, let us examine the variation of household size and composition across our population subgroups (shown in Table 14). Malay households average significantly fewer potential income earners (i.e., adults) than either Chinese or Indians. Chinese households, on the average, contain slightly more potential income earners than Indian households. Malay households also tend to have fewer nonadult members than the other two ethnic groups. However, the differential is greater for adults than for nonadults, so the ratio of income earners to total household members tends to be smaller for Malay than for Chinese or Indian households. Rural households are even worse off in terms of the ratio of potential earners to consumers; they have both more children and fewer adults, on the average, than do urban families. As we will see next, these considerations make a difference for interethnic and rural/urban comparisons when one contrasts the income distributions that adjust for household size characteristics with those that do not.

Adjusting for household size and composition further improves the relative position of Malay households. This is due, of course, to the fact that Malay families tend to be smaller than either Chinese or Indian families, both in number of adults and in total household size. The ratio of Chinese to Malay median incomes varies from 1.72/1 for per adult market income to 1.29/1 for per adult TAI-II, while the comparable ratios for median per capita incomes are 1.99/1 and 1.46/1.[4] The range of Indian to Malay income ratios, on the other hand, changes to a high of 1.08/1

[3] For total observable income, mean Malay household income actually exceeds mean Indian household income by 2 percent.

[4] The comparable figures for ratios of means are 2.62/1, 1.85/1, 2.48/1, and 1.80/1.

Table 14

MEAN HOUSEHOLD SIZE AND COMPOSITION, BY ETHNIC AND GEOGRAPHIC SUBGROUP

Item	Total Sample	Ethnic Subgroup			Geographic Subgroup	
		Malay	Chinese	Indian	Rural	Urban
Number of adults (age $\geq$ 15)	3.39	3.13	3.68	3.53	3.25	3.57
Number of non-adults (age $<$ 15)	3.18	3.10	3.23	3.38	3.22	3.13
Total household size	6.57	6.23	6.91	6.91	6.47	6.70

for mean per adult market income to a low of 0.80/1 for median per capita total observable income.

These statistics demonstrate how sensitive estimates of the extent of differences among ethnic groups are to the researcher's or survey designer's decisions regarding (1) how to define income, (2) whether to use means or medians, and (3) whether to adjust for household size or composition. For example, if we were to use mean household market income, we would conclude that Chinese incomes are 177 percent larger than Malay. However, consideration of median per adult TAI-II leads to the conclusion that Chinese incomes exceed Malay by only 29 percent. This dramatic difference arises from three sources: (1) Because relatively more of the Chinese income is derived from market activities, the ratio of Chinese to Malay income falls when the definition of income is broadened to encompass nonmarket activities; (2) because the distribution of Chinese income is more highly skewed than the corresponding distribution of Malay income, the Chinese/Malay income ratio is always smaller for medians than for the corresponding means; and (3) because Malay households are smaller than Chinese households, adjustments for household size reduce the Chinese/Malay income ratio.

Similar conclusions follow in general for urban/rural ratios[5] and for Chinese/Indian and Indian/Malay ratios, although relative differences for the last two are not nearly as large as for the Chinese/Malay ratio.[6]

INCOME INEQUALITY WITHIN ETHNIC AND GEOGRAPHIC SUBGROUPS

Table 15 shows the impact of broadening the definition of income on measures of income inequality within the major subgroups of Malaysian society. For every

[5] For example, the urban/rural income ratio varies from a high of 2.47/1 for mean per adult market income to a low of 1.37/1 for median per adult TAI-II.

[6] Changing from means to medians always improves the position of rural residents relative to urban, Malays relative to Indians, and Indians relative to Chinese. Adjusting for household size slightly improves the position of Malays relative to Indians but has little effect on the urban/rural or Indian/Chinese ratios. Broadening the definition of income leads to a monotonic decrease in the urban/rural ratio, but not the Indian/Malay ratio, as noted above. The decline in the Chinese/Indian ratio when the definition of income is broadened is monotonic except in the case of medians, where the ratio is largest for total observable income.

Table 15

Measures of Inequality, by Ethnic and Geographic Subgroup

Income Composite	Ethnic Subgroup			Geographic Subgroup	
	Malay (n = 539)	Chinese (n = 405)	Indian (n = 120)	Rural (n = 620)	Urban (n = 444)
Distribution of Households by Household Income (n = 1064)					
Market income	.537 (.600) [1.64]	.612 (.814) [2.13]	.504 (.537) [1.47]	.562 (.703) [1.98]	.601 (.785) [2.13]
Total observable income	.469 (.438) [1.30]	.585 (.733) [1.96]	.493 (.498) [1.37]	.500 (.548) [1.66]	.575 (.704) [1.96]
Total actual income I	.426 (.358) [1.13]	.550 (.647) [1.82]	.431 (.379) [1.16]	.446 (.436) [1.42]	.536 (.609) [1.78]
Total actual income II	.396 (.306) [1.02]	.510 (.555) [1.64]	.400 (.313) [1.01]	.411 (.363) [1.24]	.495 (.516) [1.59]
Distribution of Households by Per Adult Household Income (n = 1064)					
Market income	.521 (.546) [1.50]	.633 (.978) [2.88]	.511 (.526) [1.37]	.535 (.610) [1.73]	.620 (.939) [2.87]
Total observable income	.453 (.402) [1.21]	.600 (.869) [2.64]	.494 (.478) [1.27]	.470 (.460) [1.42]	.591 (.842) [2.64]
Total actual income I	.411 (.324) [1.04]	.564 (.763) [2.42]	.444 (.373) [1.08]	.422 (.365) [1.20]	.551 (.726) [2.39]
Total actual income II	.392 (.285) [.94]	.526 (.657) [2.17]	.427 (.337) [1.01]	.394 (.310) [1.06]	.515 (.620) [2.10]
Distribution of Individuals by Per Capita Household Income (n = 6992)					
Market income	.534 (.597) [1.74]	.606 (.845) [2.42]	.538 (.651) [1.75]	.544 (.675) [2.19]	.605 (.822) [2.37]
Total observable income	.471 (.449) [1.40]	.576 (.751) [2.21]	.528 (.606) [1.63]	.489 (.531) [1.80]	.577 (.734) [2.16]
Total actual income I	.431 (.369) [1.21]	.544 (.670) [2.05]	.475 (.487) [1.41]	.439 (.427) [1.54]	.543 (.643) [1.97]
Total actual income II	.408 (.322) [1.08]	.507 (.580) [1.85]	.450 (.424) [1.26]	.406 (.357) [1.34]	.508 (.557) [1.77]

NOTE: Cell entries are, in order: the Gini ratio, the Theil index (in parentheses), and the coefficient of variation (in brackets).

definition of income or adjustment for household size, income is always more unequally distributed among Chinese households than among Malay or Indian households, and urban incomes are always more unequally distributed than the corresponding rural measures.[7] This is especially true for Theil indices for per adult incomes. In comparisons between Malays and Indians, the only time Malay inequality exceeds that of Indian households is in market income in the household and per adult distributions. For all other distributions, the Indian incomes are more unequally distributed than the Malay.

Broadening the definition of income leads to an unambiguous reduction in income inequality for every subgroup in Peninsular Malaysia; and within every subgroup, the conditions for stochastic dominance are satisfied for each successive broadening of the income concept. This conclusion holds for all three of the inequality measures in Table 15 and for all of the household size/composition adjustments we have tried.

Table 16 summarizes the extent of the decrease in inequality for our subgroups when the income definition is broadened, in terms of the percentage decreases in the Gini ratio and Theil index for our narrowest definition, market income, versus our broadest, TAI-II. All incomes are household incomes.

Table 16

DECREASES IN MEASURED INCOME INEQUALITY WHEN THE INCOME DEFINITION IS BROADENED FROM MARKET INCOME TO TOTAL ANNUAL INCOME II

	Decrease (percent)	
Subgroup	Gini Ratio	Theil Index
Malays	26	49
Chinese	17	32
Indians	21	38
Rural	27	48
Urban	18	34
Total sample	22	41

[7] If we compare our results for ethnic subgroups with Anand's (forthcoming), we find general agreement for Malays and Indians, but not for Chinese. The following table compares his Gini ratios with ours for household total observable income (our composite that corresponds most closely to his).

	Household Income		Per Capita Income of Individuals	
	Anand	Kusnic/DaVanzo	Anand	Kusnic/DaVanzo
Malays	.466	.469	.455	.471
Chinese	.466	.585	.454	.576
Indians	.472	.493	.500	.528

The fact that his estimates of Chinese inequality are lower than ours is consistent with our earlier explanation concerning the truncation in his study of large outliers. All the large outlying observations in our data involve Chinese households.

When the definition of income is broadened, decreases in inequality are smallest for the groups whose incomes were the least equally distributed even for the narrowest definition of income—Chinese and urban households. This means that the relative differences among ethnic and locational subgroups in the extent of inequality become even greater when the definition of income is broadened.

Adjusting for household size and composition has no unambiguous effect on inequality within subgroups.

Decomposition of Inequality Into Within- and Among-Subgroup Differences

How important are these interethnic and urban/rural income differences relative to overall income inequality in Malaysia? That is, what fraction of total income inequality in Malaysia is accounted for by ethnic or geographic differences in income? Moreover, how sensitive is the magnitude of these ethnic or geographic contributions to total inequality to the alternative ways of measuring income? We have seen that broadening the definition of income (1) reduces estimates of inequality in the total population, (2) reduces relative differences in mean income among subgroups, and (3) reduces inequality within subgroups. The question is, Which effect is strongest? As one expands the definition of income, does the relative contribution of within-group differences rise or fall? The answers to all of these questions can be found in Table 17, which presents the results of a decomposition of inequality into within-group and between-group components of the Theil index.

The inequality decompositions in Table 17 show clearly that most of the income inequality in Malaysia is attributable to income variation *within* the various subgroups. The contribution of interethnic differences ranges from 8.1 percent to 14.2 percent, while the contribution of urban/rural differences ranges from 8.0 percent to 11.1 percent. Although the 8 to 14 percent contribution of between-ethnic-group inequality may seem rather small, it is remarkably large in comparison with the situation in the United States. Smith and Welch (1979) report that between-race inequality accounts for only 5.9 percent[8] of total income inequality in the United States.

When we broaden the definition of income, the relative contribution of interethnic inequality to overall inequality becomes smaller. Thus for the unstandardized income composites, ethnic differences tend to converge faster than within-group inequality declines. For urban/rural differences, the change is not monotonic: The relative between-group contribution falls at first but then increases when we get to TAI-II.

Adjustments for household size and composition reduce the share of inequality due to between-group differences, which is higher for household income distributions than for either the per adult or per capita distributions, holding the definition of income constant.

[8] This number was calculated on the assumption that the number of whites and blacks in the population was the same. Without this assumption, the between-race contribution would have been much lower, about 2 percent. The number used in our study was chosen because the ethnic subgroup in Malaysia whose incomes are markedly different from others, i.e., the Chinese, is much closer to being equally represented than are blacks in the United States.

Table 17

THEIL DECOMPOSITION OF INEQUALITY

Income Composite	Overall Index	Ethnic Decomposition		Geographic Decomposition	
		Within	Between	Within	Between
Distribution of Households by Household Income (n = 1064)					
Market income	.850	.729 (85.8)	.121 (14.2)	.756 (88.9)	.094 (11.1)
Total observable income	.709	.618 (87.1)	.091 (12.9)	.642 (90.5)	.067 (9.5)
Total actual income I	.591	.522 (88.4)	.069 (11.6)	.536 (90.7)	.055 (9.3)
Total actual income II	.501	.443 (88.5)	.058 (11.5)	.451 (90.1)	.050 (9.9)
Distribution of Households by Per Adult Household Income (n = 1064)					
Market income	.916	.805 (87.9)	.111 (12.1)	.816 (89.1)	.100 (10.9)
Total observable income	.758	.678 (89.4)	.080 (10.6)	.690 (91.0)	.068 (9.0)
Total actual income I	.635	.577 (90.9)	.058 (9.1)	.583 (91.8)	.052 (8.2)
Total actual income II	.544	.498 (91.5)	.046 (8.5)	.498 (91.5)	.046 (8.5)
Distribution of Individuals by Per Capita Household Income (n = 6992)					
Market income	.856	.756 (88.3)	.100 (11.7)	.768 (89.7)	.088 (10.3)
Total observable income	.714	.639 (89.5)	.075 (10.5)	.653 (91.5)	.061 (8.5)
Total actual income I	.602	.548 (91.0)	.054 (9.0)	.552 (91.7)	.050 (8.3)
Total actual income II	.516	.473 (91.7)	.043 (8.3)	.471 (91.3)	.045 (8.7)

NOTE: Numbers in parentheses are percentages of the corresponding overall index.

INTERGROUP DIFFERENCES WHEN WE STANDARDIZE FOR LEISURE CONSUMPTION

As we have argued earlier, the failure to count the value of forgone leisure consumption as a cost of earning income is a potential source of considerable error in the process of income measurement and can result in distorted comparisons of economic well-being. We now assess the relative impact of our leisure standardization procedure on the ethnic and geographic subpopulations in Malaysia, beginning with an examination of changes in measures of central tendency for the various subgroups.

Measures of Central Tendency

Table 18 presents means and medians of our leisure-standardized distributions. Again, for purposes of comparison, we have included in parentheses means and medians for the corresponding unstandardized measures.

The general conclusion to be drawn from Table 18 is that inclusion of forgone leisure time worsens the positions of Malay and rural households and improves the relative status of Chinese, Indian, and urban households.[9] These conclusions generally hold regardless of whether we compare on the basis of mean or median incomes, or whether we adjust for household size or composition.[10]

Thus, the Malay/Chinese and the rural/urban income gaps widen when we standardize for leisure. These results are, of course, entirely consistent with our substitution hypothesis. That is, the poorer segments of Malaysian society, Malays and rural households, make up for their lower market incomes by substituting into longer hours of household production. The resulting improvement in their relative welfare positions is registered by our successively broader measures of income, unadjusted for leisure consumption. However, when we take account of the cost of that household production, i.e., the forgone leisure time, the unstandardized income measures overstate the extent of the improvement in the relative status of the poor in Malaysia that occurs when the definition of income is broadened.

We can add concreteness to the points just made by comparing intergroup mean and median income ratios for market income with those for broader measures of income, both unstandardized and standardized. As noted earlier, the ratio of Chinese to Malay mean household income is 2.77/1 for market income; it falls to 2.36/1, 2.12/1, and 2.01/1 when we broaden the income definition but do not standardize. When we standardize on mean hours of work, the standardized measures that correspond to the last three ratios above are 2.53/1, 2.41/1, and 2.31/1, respectively. Thus, the improvement of Malay relative to Chinese household incomes that occurs when we broaden the definition of income is not nearly as dramatic when we standardize on hours of work.[11]

[9] The improvement in the absolute position of Chinese households is across the board except for mean household observable income, where the standardized mean is about 0.4 percent lower than the corresponding unstandardized mean.

[10] If we make the contrast on the basis of mean incomes, Indians register an unambiguous improvement when we standardize. However, if medians are used, the conclusion depends on how we adjust for household composition: The household income medians increase when we standardize, the per adult distributions yield an ambiguous result, and the per capita distributions show essentially no change.

[11] The story is the same for the per adult household and per capita individual distributions. That is, although the levels of the ratio of Chinese to Malay mean income are successively lower for these two sets of distributions, the relative change in the ratio of means when the income concept is expanded is virtually the same as for the household income distributions.

Table 18

Means and Medians: Standardized Income Composites

Income Composite	Ethnic Subgroup						Geographic Subgroup			
	Malays		Chinese		Indians		Rural		Urban	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Distribution of Households by Household Income										
Standardized observable income ($\bar{H}$ = 1490)	5883 (6350)	3795 (4288)	14912 (14968)	8088 (7472)	6851 (6233)	4230 (3980)	6205 (6608)	3870 (4239)	13932 (13819)	7331 (6872)
Standardized actual income I ($\bar{H}$ = 1934)	7079 (7721)	4872 (5506)	17091 (16334)	9894 (8788)	8666 (7967)	5759 (5479)	7417 (7907)	4921 (5479)	16168 (15384)	9356 (8151)
Standardized actual income II ($\bar{H}$ = 2481)	8573 (9149)	6126 (6815)	19793 (18392)	12154 (10785)	10900 (10160)	7482 (7008)	8939 (9338)	6174 (6824)	18926 (17588)	11414 (10301)
Distribution of Households by Per Adult Household Income										
Standardized observable income ($\bar{H}$ = 1490)	1920 (2122)	1335 (1429)	4640 (4654)	2232 (2123)	2100 (1929)	1212 (1116)	1924 (2101)	1327 (1396)	4444 (4408)	2173 (2056)
Standardized actual income I ($\bar{H}$ = 1934)	2130 (2606)	1675 (1867)	5264 (5124)	2745 (2535)	2660 (2531)	1617 (1589)	2302 (2572)	1670 (1822)	5111 (4930)	2671 (2494)
Standardized actual income II ($\bar{H}$ = 2481)	2800 (3139)	2083 (2353)	6039 (5811)	3419 (3056)	3351 (3302)	2152 (2288)	2779 (3088)	2072 (2296)	5932 (5692)	3321 (3154)
Distribution of Individuals by Per Capita Household Income										
Standardized observable income ($\bar{H}$ = 1490)	946 (1021)	615 (676)	2152 (2160)	1174 (1067)	991 (901)	533 (538)	959 (1021)	612 (650)	2081 (2064)	1106 (1018)
Standardized actual income I ($\bar{H}$ = 1934)	1138 (1241)	769 (840)	2467 (2357)	1414 (1257)	1253 (1152)	727 (723)	1147 (1221)	763 (826)	2415 (2298)	1378 (1218)
Standardized actual income II ($\bar{H}$ = 2481)	1378 (1471)	973 (1047)	2858 (2654)	1753 (1535)	1576 (1469)	935 (905)	1382 (1443)	973 (1042)	2827 (2627)	1724 (1540)

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

The conclusions are even less favorable for Malay households if the comparison with Chinese households is based on median incomes. In fact, the ratio of median Chinese to median Malay standardized observable income, 2.13/1, is even higher than the corresponding ratio of medians of market income, 2.08/1. For the two broader standardized income composites, the ratio of medians does fall to 2.03/1 and 1.98/1, but these are small changes indeed.[12]

If Indian to Malay income comparisons are made on the basis of ratios of standardized incomes, the Indian income superiority *increases* monotonically as the income concept is expanded from standardized observable income to standardized actual income II, regardless of how income is adjusted for household size or whether means or medians are used.

It is clear, then, that the value of leisure time consumed directly, or forgone, in the process of creating other forms of income is an important determinant of the relative well-being of the various ethnic and geographic subgroups in Peninsular Malaysia. But exactly what is generating this leisure effect? That is, which group of adults, heads or nonheads, males or females, is responsible for these differential effects across ethnic and geographic subpopulations? To help in addressing this question, Table 19 presents the relevant wage and time allocation information for the groups in question.

The relative importance of variation in wage and variation in work hours in determining the impact of the leisure adjustment on rural versus urban households depends solely on the sex of the adults in the household. Urban and rural adult male heads of household have almost identical patterns of time allocation, as do urban and rural male nonheads. For them, it is the higher values of time in urban areas that make the difference.[13] For females, however, variation in hours of work is the more important influence. Rural women in general, and rural female heads of household in particular, work much longer hours, i.e., forgo much more leisure, than their urban counterparts. In addition, the marginal values of time of urban women exceed those of rural women by about 50 percent.[14]

The interethnic differences shown in Table 19 are much more complex than the urban/rural differences. The ethnic ranking for either hours or value of time depends, in general, both on the sex of the adult and on whether he or she is a head of household. Because these patterns are so complicated, and because the effects of the leisure-adjustment procedure for each group of adults depend not only upon the means of hours and wages but also upon the entire variance-covariance matrix for those variables, we shall not attempt a detailed discussion of the interethnic differences. We shall simply note the general patterns observed in the data, beginning with male heads of household.

Of the four adult groups, male heads of household exhibit the most regular ethnic patterns of hours and wages. For the narrowest definition of work, market income hours, there tends to be a positive association between mean hours of work and mean wage across ethnic groups: Malay male heads have the lowest wages and

[12] This is especially true when these latter ratios are contrasted to the corresponding ratios generated by the unstandardized distributions, which show a Chinese to Malay ratio of median incomes of 1.75/1 for total observable income, and 1.59/1 for both TAI-I and TAI-II.

[13] Average wages of urban male heads of household exceed those of their rural counterparts by over 100 percent. For other males, the urban/rural mean wage differential is 45 percent.

[14] More precisely, the mean urban/rural wage differentials are 53 percent for female heads and 45 percent for other females.

Table 19

Hours and Wages, by Ethnic and Geographic Subgroup

Item	*Male Heads of Household*					*Female Heads of Household*				
	Malays	Chinese	Indian	Rural	Urban	Malays	Chinese	Indian	Rural	Urban
Market income hours	1917	2044	2077	1860	2144	1184	1115	1119	1374	844
	(.47)	(.54)	(.38)	(.49)	(.47)	(.96)	(1.08)	(.89)	(.82)	(1.30)
Total observable income hours	2202	2064	2175	2118	2186	1770	1258	1221	1887	1004
	(.44)	(.53)	(.34)	(.47)	(.46)	(.78)	(.97)	(.85)	(.70)	(1.10)
Total actual income I hours	2387	2116	2300	2288	2259	3157	2289	2495	3204	2136
	(.43)	(.53)	(.33)	(.45)	(.46)	(.46)	(.57)	(.50)	(.45)	(.56)
Total actual income II hours	2578	2252	2503	2470	2418	4582	3701	3993	4601	3605
	(.42)	(.51)	(.30)	(.44)	(.45)	(.33)	(.39)	(.32)	(.33)	(.37)
Wages (M$/hr)	1.25	2.18	1.70	1.15	2.31	.76	1.04	1.10	.74	1.13
	(1.05)	(.92)	(1.11)	(.89)	(.94)	(1.16)	(.90)	(1.04)	(.86)	(1.08)
Labor force participation rate (%)	59.3	47.8	84.1	52.3	65.1	21.8	30.6	53.2	30.5	26.3
	Other Adult Males					*Other Adult Females*				
Market income hours	1052	1462	976	1169	1274	723	947	894	839	863
	(.97)	(.77)	(1.01)	(.86)	(.92)	(1.30)	(1.14)	(1.14)	(1.18)	(1.22)
Total observable income hours	1221	1471	1000	1297	1297	875	1002	918	982	989
	(.90)	(.77)	(1.00)	(.82)	(.90)	(1.18)	(1.08)	(1.10)	(1.07)	(1.17)
Total actual income I hours	1300	1500	1062	1363	1338	1152	1158	1188	1241	1071
	(.86)	(.75)	(.94)	(.79)	(.86)	(.95)	(.95)	(.89)	(.89)	(.99)
Total actual income II hours	1338	1553	1141	1409	1393	1579	1498	1621	1666	1413
	(.85)	(.72)	(.87)	(.78)	(.83)	(.79)	(.77)	(.63)	(.75)	(.76)
Wages (M$/hr)	.75	1.16	.84	.78	1.13	.51	.81	.66	.55	.80
	(.73)	(1.08)	(1.15)	(.95)	(1.05)	(.61)	(1.43)	(.72)	(.65)	(1.46)
Labor force participation rate (%)	26.5	39.4	40.5	30.9	37.6	18.1	29.4	39.1	22.1	30.1

NOTE: Coefficients of variation are in parentheses.

work the fewest hours, while Indian and Chinese male heads work about the same numbers of hours and have wages that exceed those of Malay heads, on the average, by 36 percent and 74 percent, respectively. For all of the broader definitions of work, there is a perfect negative rank correlation between mean hours and mean wages across the three ethnic groups: Malay male heads work the most and have the lowest values of time, while Chinese male heads work the least and have the highest values of time. Overall, wage variation has a larger impact than hours variation for this group of adults.

For female heads of household, the ranking of ethnic groups in terms of hours of work is similar to that of male heads, while the ranking in terms of mean wages differs somewhat. In general, Malay female heads work most, with Indians second, while Chinese female heads work least.[15] For wages, on the other hand, Indian female heads have the highest mean, with their Chinese counterparts placing a close second, and Malays a distant third. Wage variation still appears to have a greater impact than hours variation, although the impact of hours variation is much more important for female heads than for male heads.

Finally, Table 19 shows that other males and other females have the same rankings in terms of mean wages, i.e., Chinese first, Indians a rather distant second, and Malays a relatively close third. In terms of hours, on the other hand, the two groups differ considerably. Chinese adult males work the most, with Malays second and Indians last. Further, for all but the narrowest definition of work, the hours differentials between the three ordered groups are relatively constant at about 200 hours each. Other Indian female adults work more than their Malay counterparts for all definitions of work. However, the rank of other Chinese females relative to the other two groups depends on the definition of "work": If work is defined to exclude all household activities, Chinese females work most; as successive housework activities are included in work, their ranking falls successively to second and then to third. Wage variation appears to be more important than hours variation for both groups of nonheads, although hours variation is still an important influence for other adult males.

The Effect of the Leisure Adjustment on Income Inequality Within and Among Ethnic and Geographic Subgroups

We shall now analyze the impact of our leisure standardization procedure on income inequality within the major population subgroups in Malaysia, along with its effect on the decomposition of inequality into within- and between-group components.

Table 20 presents measures of inequality for our leisure-standardized measures of income for each of our subgroups. Within each cell in Table 20, the Gini ratio appears first, then the Theil index in parentheses, and finally, the coefficient of variation, in brackets. Although the levels of the inequality measures for each subgroup/income-definition cell are, in general, different from the corresponding levels for the unstandardized income measures, the leisure standardization procedure does not overturn the general result that within every subgroup income inequality falls monotonically and unambiguously as we broaden the definition of

[15] For the two narrowest definitions of work, mean hours of work of the Chinese exceed those of the Indians very slightly.

Table 20

Measures of Inequality for Standardized Income Composites, by Ethnic and Geographic Subgroup

Income Composite	Ethnic Subgroup			Geographic Subgroup	
	Malays	Chinese	Indians	Rural	Urban
Distribution of Households by Household Income					
Standardized observable income ($\bar{H}$ = 1490)	.497 (.492) [1.38]	.563 (.690) [1.91]	.492 (.484) [1.33]	.523 (.600) [1.73]	.549 (.651) [1.89]
Standardized actual income I ($\bar{H}$ = 1934)	.461 (.415) [1.22]	.529 (.596) [1.71]	.466 (.426) [1.22]	.483 (.500) [1.51]	.516 (.560) [1.67]
Standardized actual income II ($\bar{H}$ = 2181)	.432 (.355) [1.09]	.500 (.516) [1.52]	.448 (.387) [1.14]	.449 (.420) [1.32]	.489 (.487) [1.48]
Distribution of Households by Per Adult Household Income					
Standardized observable income ($\bar{H}$ = 1490)	.464 (.436) [1.28]	.573 (.820) [2.59]	.496 (.485) [1.28]	.477 (.489) [1.48]	.565 (.788) [2.56]
Standardized actual income I ($\bar{H}$ = 1934)	.426 (.361) [1.13]	.534 (.702) [2.30]	.468 (.432) [1.20]	.432 (.394) [1.28]	.528 (.673) [2.26]
Standardized actual income II (H = 2481)	.393 (.304) [1.01]	.498 (.598) [2.03]	.448 (.397) [1.14]	.392 (.319) [1.11]	.496 (.576) [1.98]
Distribution of Individuals by Per Capita Household Income					
Standardized observable income ($\bar{H}$ = 1490)	.491 (.491) [1.47]	.550 (.704) [2.15]	.511 (.582) [1.60]	.500 (.561) [1.85]	.551 (.681) [2.09]
Standardized actual income I ($\bar{H}$ = 1934)	.454 (.410) [1.29]	.516 (.605) [1.91]	.484 (.518) [1.48]	.456 (.457) [1.59]	.519 (.589) [1.85]
Standardized actual income II ($\bar{H}$ = 2481)	.423 (.369) [1.14]	.486 (.522) [1.69]	.465 (.475) [1.39]	.419 (.375) [1.37]	.493 (.514) [1.63]

NOTE: Cell entries are, in order, Gini ratio, Theil index (in parentheses), and coefficients of variation (in brackets).

income. Within each population subgroup, each successively broader income measure produces a distribution which stochastically dominates the preceding one. In fact, the proportionate fall in inequality recorded by each measure is approximately the same for the leisure-standardized income definitions as for the unstandardized measures.

Within each subgroup, there is a negative relation between the direction of the change in inequality and the direction of the corresponding change in mean income levels that occur when we standardize at average leisure consumption in the entire sample. That is, when the leisure adjustment increases mean income for a particular population subgroup, it reduces income inequality for that same subgroup. Thus income inequality increases for Malay and rural households and decreases for Chinese and urban households when we standardize.[16] This pattern is consistent with our earlier results on the sensitivity of inequality measures to the number of hours of "work." For example, the increase in mean income in Chinese income when we standardize implies a larger weight applied to the wage-related fraction of total income, i.e., the component of income possessing the lowest variation; this tends to result in lower overall inequality.

Next we examine the effect on the between-group contribution to overall inequality of the changes in within-group income means and inequality that occur when we standardize on hours of "work." As before, we address this issue via a decomposition of the Theil index, the results of which are displayed in Table 21.

Contrasting the results in Table 21 to the decomposition based on the unstandardized measures shown in Table 17, we can make two strong conclusions: First, as expected, given the relative changes in subgroup mean incomes, the shares of overall inequality due to between-group differences are higher for the leisure-standardized measures than for the unstandardized ones. Second, the direction of changes in this between-group contribution when we broaden the definition of income is just the reverse of that generated by the unstandardized composites. That is, as the scope of leisure-standardized income is expanded, the relative contribution to total inequality due to the income differentials between the ethnic and geographic subpopulations in Malaysia *grows* rather than declines (except for ethnic differences in the per adult distribution). In addition, the urban/rural, as opposed to ethnic, differences are the more persistent, registering the greater increase in the between-group relative contribution.

The results in Table 21 are consistent with our hypothesis that the relatively poorer segments of Malaysian society work harder in nonmarket production to compensate for their lower market earnings. When the implicit cost of that household production, i.e., the forgone leisure, is taken into account, we find that intergroup inequality becomes more pronounced relative to overall inequality.

THE RELATIONSHIP BETWEEN ETHNIC AND GEOGRAPHIC INCOME DIFFERENTIALS

Although we have found that Malays tend to be significantly poorer than Chinese and that rural residents are poorer than urban ones, we cannot yet determine whether the difference is due to the fact that Malays tend to reside predomi-

[16] The results for Indian households depend on the measure of income used.

Table 21

THEIL DECOMPOSITION: STANDARDIZED INCOME MEASURES

Income Composite	Overall Index	Ethnic Decomposition		Geographic Decomposition	
		Witnin	Between	Within	Between
Distribution of Households by Household Income (n = 1064)					
Standardized observable income ($\bar{H}$ = 1490)	.712	.612 (85.9)	.100 (14.1)	.632 (88.7)	.080 (11.3)
Standardized actual income I ($\bar{H}$ = 1934)	.611	.522 (85.5)	.089 (14.5)	.536 (87.8)	.075 (12.2)
Standardized actual income II ($\bar{H}$ = 2481)	.530	.451 (85.1)	.079 (14.9)	.461 (86.9)	.069 (13.1)
Distribution of Households by Per Adult Household Income (n = 1064)					
Standardized observable income ($\bar{H}$ = 1490)	.761	.668 (87.8)	.093 (12.2)	.675 (88.7)	.086 (11.3)
Standardized actual income I ($\bar{H}$ = 1934)	.653	.574 (87.9)	.079 (12.1)	.575 (88.1)	.078 (11.9)
Standardized actual income II (H = 2481)	.564	.496 (87.9)	.068 (12.1)	.493 (87.4)	.071 (12.6)
Distribution of Individuals by Per Capita Household Income (n = 6992)					
Standardized observable income ($\bar{H}$ = 1490)	.708	.627 (88.6)	.081 (11.4)	.635 (89.7)	.073 (10.3)
Standardized actual income I ($\bar{H}$ = 1934)	.605	.535 (88.4)	.070 (11.6)	.537 (88.8)	.068 (11.2)
Standardized actual income II ($\bar{H}$ = 2481)	.522	.460 (88.1)	.062 (11.9)	.459 (87.9)	.063 (12.1)

NOTE: Numbers in parentheses are percentages of the corresponding overall index.

nantly in rural areas, while Chinese tend to be largely urban dwellers, or whether the Chinese income superiority is independent of urban/rural differentials. Alternatively, the apparent geographic differences may be due merely to the different ethnic compositions of rural and urban areas.

Up to this point we have examined the differences in income levels and income inequality among ethnic and geographic subgroups as if the two ways of subdividing the sample were independent of each other. We shall now investigate the extent to which these two ways of disaggregating the population are in fact interrelated, focusing on the interaction between the ethnic and geographic contributions to income inequality in Peninsular Malaysia. First, we shall examine variation in the means and medians of the nine components and the four unstandardized composites of income, centering on urban/rural differences within ethnic groups and ethnic differences within the urban and rural subgroups. We shall then perform a two-way decomposition of income inequality in the unstandardized composites into within- and among-group variation based on a simultaneous ethnic-geographic stratification of the population. Finally, we shall repeat the analysis of variation in income levels, as well as the decomposition of inequality, using the leisure-standardized income composites.

Income Components and Unstandardized Composites

Table 22 presents means and medians for the nine components of income for each of the six geographic/ethnic subpopulations. There is considerable urban/rural variation in the levels of the various components within each of the three ethnic groups. This is especially true of the earlier, more traditional components of income.

In particular, while wage income is the largest component for each of the six subgroups, it is always much larger for urban than for rural subgroups. The ratio of mean urban to mean rural wage income ranges from a low of 1.76/1 for Chinese households to a high of 2.40/1 for Indian households. The urban/rural distribution of business income, on the other hand, varies considerably across ethnic groups. There is very little difference between urban and rural Malay households in average business income; urban households enjoy only a 13 percent advantage over their rural counterparts. In contrast, mean business income for urban Chinese and Indian households considerably exceeds the corresponding values for their rural counterparts, the urban/rural ratios being 1.92/1 and 3.71/1, respectively. Indian business income is relatively low overall and is particularly small for rural households. Finally, although urban *mean* business income is larger than the rural mean for all three ethnic groups, rural *median* business income is greater than the corresponding urban median value for both Malays and Chinese.

Mean capital and interest income is larger for rural than urban Malay households, is about the same for rural and urban Chinese households, and is virtually nonexistent for rural Indian households. However, there were few households in any of the subgroups with positive amounts of capital and interest income, as is suggested by the zero medians for all subgroups.

In contrast, mean transfer income is consistently larger for rural households, regardless of their ethnicity. This suggests that net transfers are from urban

Table 22

MEANS, MEDIANS, AND COEFFICIENTS OF VARIATION FOR INCOME COMPONENTS: ETHNIC AND GEOGRAPHIC SUBGROUPS SIMULTANEOUSLY

Income Component	Malays		Chinese		Indians	
	Rural (n=414)	Urban (n=125)	Rural (n=147)	Urban (n=258)	Rural (n=59)	Urban (n=61)
Wage income	2569 (1890) [0.99]	5860 (3676) [1.21]	4812 (3025) [1.10]	8480 (5485) [1.16]	2988 (2700) [0.79]	7164 (4388) [1.21]
Business income	1142 (354) [4.57]	1286 (0) [3.82]	3628 (199) [3.35]	6981 (67) [3.83]	150 (0) [3.41]	557 (0) [5.31]
Capital and interest income	409 (0) [7.03]	190 (0) [9.53]	491 (0) [9.40]	582 (0) [3.93]	3 (0) [4.73]	222 (0) [3.69]
Transfer income	86 (0) [5.26]	6 (-.2) [10363]	373 (0) [4.22]	186 (-.3) [10.7]	55 (0) [6.24]	-47 (0) [-9.81]
Value of housing services	227 (179) [1.09]	205 (0) [2.04]	279 (0) [1.71]	696 (0) [1.96]	37 (0) [4.12]	523 (0) [2.28]
In-kind income	337 (115) [2.14]	699 (75) [4.40]	615 (141) [2.80]	405 (84) [2.26]	161 (74) [2.18]	177 (58) [1.69]
Cottage industry income	880 (533) [1.25]	419 (213) [1.29]	280 (138) [1.62]	195 (72) [2.29]	281 (108) [1.63]	98 (0) [2.51]
Value of housework	1272 (978) [0.90]	1697 (1186) [1.16]	1331 (956) [0.97]	1386 (970) [1.15]	1412 (1258) [0.58]	2045 (1251) [1.02]
Value of cooking and childcare	1222 (952) [0.90]	2109 (1492) [1.05]	1990 (1459) [0.93]	2097 (1478) [1.27]	1508 (1251) [0.76]	2855 (2354) [0.90]

NOTE: Cell entries are, in order, means, medians (in parentheses), and coefficients of variation (in brackets).

households to rural ones. Furthermore, median transfer income is effectively zero for all subgroups, an expected result, given the net nature of the variable.[17]

Overall, the last five income components (i.e., those involving the greatest degrees of imputation) display less urban/rural variation within each of the three ethnic groups than did the first four components, because there is relatively little urban/rural variation in the prices used in these imputations (wages, rents, and commodity prices).

The value of housing services is considerably higher in urban areas than in rural areas for Chinese and Indian households, whereas for Malays there is a slight rural advantage. Somewhat surprisingly, in-kind income has a higher mean in urban than in rural areas for Indians and Malays. (This is due to higher urban consumption of own business products.) However, the rural medians always exceed the corresponding urban medians. Cottage-industry income is uniformly a rural phenomenon, in both means and medians. And finally, housework and cooking and childcare have consistently higher values in urban strata, primarily because of higher urban values of time.

As shown in Table 22, interethnic differences are, in general, greatly reduced when the population is stratified on the basis of household location. A comparison of rural (urban) Malay with rural (urban) Indian or Chinese households yields less pronounced ethnic differences than does a comparison of overall ethnic means. This is partly due to the fact that although there is no consistent pattern of urban or rural superiority across income components, when a particular component displays a rural (urban) advantage for one ethnic group, it tends to be repeated for the other two ethnic groups; e.g., wage income is always much larger in urban areas, while cottage-industry income is always larger in rural areas.

As before, summing across these nine components of income produces our four successively broader unstandardized income composites. Table 23 presents the mean and median values for each of these composites for all six of the ethnic/geographic subgroups.

When we control for geographic location, rural Malay households are better off than rural Indian households regardless of the definition of income or how income is adjusted for household size and/or composition, except in the case of median market incomes. Furthermore, the differences between *urban* Malay and Indian households appear to be very small. The first implication of these two results is that the Indian income superiority that we observed earlier is largely due to the fact that Indian households are much more likely to be located in urban areas than Malay households. That is, the higher urban mean receives relatively more weight for Indian households than for Malay households (51 percent of the Indian households in our sample live in urban areas, compared with 23 percent of the Malay households).

The second conclusion to be drawn from Table 23 is that the Chinese/Malay income superiority is largely independent of geographic distribution. Holding constant the definition of income and the method of household size/composition income adjustments, we find that *rural* Chinese income exceeds *rural* Malay income by virtually the same proportion as *urban* Chinese income exceeds that of *urban* Malays. For example, the ratio of Chinese to Malay household market income is 2.17/1 for rural areas and 2.19/1 for urban areas. However, as this example illus-

[17] Note that had outflows of assets-type gifts been subtracted from income, analogous to the inclusion of those inflows, we would have expected transfer income *means* to also be close to zero.

Table 23

MEANS AND MEDIANS OF INCOME COMPOSITES, BY ETHNIC AND GEOGRAPHIC SUBGROUPS SIMULTANEOUSLY

Income Composite	Malays		Chinese		Indians	
	Rural	Urban	Rural	Urban	Rural	Urban
Distribution of Households by Household Income						
Market income	4121 (2633)	7336 (4061)	8932 (4471)	16043 (7518)	3141 (2795)	7943 (4640)
Total observable income	5651 (4083)	8665 (5101)	10479 (5946)	17525 (8755)	3676 (2962)	8706 (5241)
Total actual income I	6923 (5202)	10363 (6690)	11810 (7045)	18911 (10179)	5088 (4683)	10751 (6631)
Total actual income II	8145 (6452)	12472 (8343)	13799 (8966)	21008 (12598)	6596 (5590)	13606 (8973)
Distribution of Households by Per Adult Household Income						
Market income	1390 (862)	2348 (1380)	2504 (1442)	5204 (2300)	1059 (793)	2392 (1434)
Total observable income	1929 (1321)	2760 (1691)	2934 (1695)	5633 (2480)	1230 (886)	2606 (1434)
Total actual income I	2393 (1761)	3311 (2209)	3415 (2188)	6097 (2800)	1727 (1371)	3308 (2060)
Total actual income II	2853 (2222)	4086 (2873)	4094 (2752)	6790 (3357)	2232 (1874)	4337 (3003)
Distribution of Individuals by Per Capita Household Income						
Market income	675 (399)	1112 (670)	1224 (695)	2388 (1134)	447 (383)	1168 (575)
Total observable income	925 (638)	1313 (801)	1437 (850)	2609 (1274)	523 (438)	1280 (643)
Total actual income I	1134 (808)	1571 (1076)	1619 (1036)	2815 (1461)	723 (631)	1580 (803)
Total actual income II	1334 (1007)	1891 (1372)	1892 (1294)	3128 (1753)	938 (800)	2000 (1113)

NOTE: Medians are given in parentheses.

trates, Chinese to Malay ratios of mean income are lower when the comparisons are made within the urban or rural strata than when overall ethnic means are compared (the corresponding ratio of overall means is 2.77/1).[18] Again, as with the Indian/Malay comparison, this follows from the fact that Chinese households are much more likely to be located in higher-income urban areas than are Malay households (64 percent of Chinese households in our sample reside in urban areas).

The ratio of Chinese to Malay income is always smaller for medians than for means, and in rural areas it is further reduced by adjusting for household size: Chinese median per adult TAI-II in urban areas is only 17 percent higher than the corresponding figure for Malays; the comparable figure for rural areas is 27 percent. Thus we see that controlling for geographic location, like broadening the definition of income, adjusting for household size, and using medians rather than means, reduces the ratio of Chinese to Malay income even further.

Turning next to the urban/rural income differences within each of the ethnic groups, we see from Table 23 that urban values are always considerably higher than the corresponding rural values. The urban/rural differentials are greatest for market income, where they range from a low of 65 percent income superiority for Malay individually weighted per capita income to a high of 161 percent for Indians using the same distribution. The urban/rural ratio for each ethnic group generally falls as the definition of income is broadened. However, despite the fact that there is a great deal of variation in urban/rural income across ethnic groups, there is surprisingly little variation in the *relative change* in those differentials as the definition of income is expanded. The fall in the ratio of urban to rural mean incomes that occurs when the definition of income is broadened from market income to TAI-II is never more than 20 percent and never less than 14 percent. Clearly, within ethnic groups, urban/rural income differentials are fairly insensitive to changes in the scope of income definition.

The last feature of Table 23 we wish to emphasize is the ranking of the three ethnic groups in terms of urban/rural income differentials. In general, Indians display the greatest urban/rural income difference,[19] with Chinese a distant second, and Malays third. Averaging the urban/rural differential across all income definitions and household size/composition adjusted distributions, we find that the mean urban superiority is 122 percent for Indians, 77 percent for Chinese, and 55 percent for Malays.

The Simultaneous Contributions of Geography and Ethnicity to Income Inequality

In order to properly address the relative importance of ethnic or geographic effects on inequality in Peninsular Malaysia, we must allow for the possibility of interaction between the two effects. The total joint contribution of both effects must be established before the individual contribution of either can be ascertained, because significant interaction between them introduces ambiguity into the estimation of the magnitude of either taken separately.

[18] Our regression results in Sec. VI and Hirschman's (1975) study show that a large portion of this remaining difference between Chinese and Malay incomes results from socioeconomic differences between the groups.

[19] This is consistent with the fact that urban Indians are largely civil servants, while rural Indians mainly work on rubber plantations.

Table 24 presents our results concerning these issues based on a two-level decomposition of income inequality utilizing the Theil index. The overall index, the portion of the index due to inequality within each of the six ethnic/geographic subgroups, and the portion due to the inequality among these six subgroups, respectively, are shown in the first three lines of each section of the table. The percentage contributions of within- and among-group variation to the overall index are given in parentheses in the second and third lines of each section.

Ethnic and geographic income differences taken jointly account for less than one-fifth of all income inequality in Peninsular Malaysia. That is, the overwhelming majority of income inequality in Malaysia is not due to ethnic and urban/rural income differentials but to inequality within those subgroups. Further, as we showed earlier when we examined ethnic and geographic subgroups separately, this among-group relative contribution tends to diminish as the scope of income is expanded. (This pattern is universal, except for the movement from household TAI-I to household TAI-II, where a slight increase is registered.) Two other relatively minor conclusions implicit in Table 24 concern variation in the levels of and changes in among-group relative contribution to inequality across the three methods of household composition adjustments. Holding the breadth of the income definition constant, we find that the unadjusted household income constructs generate the highest levels of the among-group contribution; i.e., ethnic and geographic differences are most pronounced for the distribution of households by household income. The among-group contribution displays the greatest sensitivity to broadening the income concept for the per adult household income distributions: The relative among-group contribution falls more than 25 percent when we compare per adult market income with per adult TAI-II.

To explore the interaction between ethnic and geographic income inequalities in Malaysia, we decompose the among-group contribution shown on the third line of each panel of Table 24. The first number in each of the last three cells in each panel represents the *unconditional* contribution of the ethnic, geographic, or interaction effect, respectively, taken from Table 17. The second entry (in parentheses) in lines 4 and 5 is the contribution of the ethnic (geographic) effect to overall inequality, holding constant the other effect. That is, the numbers in parentheses represent the among-group portion that remains after the effect of the other characteristic has been netted out.

Two conclusions can be drawn from this decomposition of total among-group income inequality: First, and most important, inequality due to ethnic differences is greater than inequality due to urban/rural differences for the narrower definitions of income. However, the magnitudes of these two effects are nearly equal for the broadest measure of unstandardized income, TAI-II, which implies that an overly narrow definition of income tends to overstate the importance of ethnic relative to geographic income differentials in Malaysia.

Second, the effects of ethnicity and geography are not independent in Peninsular Malaysia. The sum of the separate contributions of the two effects is greater than their combined effect. Hence the interaction between the two is negative. The relative size of this interaction effect remains constant, at about 30 percent the size of the total among-group portion of the index, when the definition of income is broadened. The difference between the conditional and unconditional magnitudes for each effect shows that, in general, the contribution to inequality of either ethnicity or location is reduced by approximately 50 percent when the effect of the

Table 24

THEIL DECOMPOSITION: ETHNIC AND GEOGRAPHIC EFFECTS TREATED SIMULTANEOUSLY (UNSTANDARDIZED INCOME COMPOSITES)

Item	Market Income	Total Observable Income	Total Actual Income I	Total Actual Income II
Distribution of Households by Household Income				
Overall index	.850	.709	.591	.501
Within ethnic and geographic cells portion of index[a]	.690 (81.2)	.589 (83.1)	.498 (84.3)	.421 (84.0)
Among ethnic and geographic cells portion of index[a]	.160 (18.8)	.120 (16.9)	.093 (15.7)	.080 (16.0)
Portion of index due to ethnic differences[b]	.121 (.066)	.091 (.053)	.069 (.038)	.058 (.030)
Portion of index due to geographic differences[b]	.094 (.039)	.067 (.029)	.055 (.024)	.050 (.022)
Interaction between ethnic and geographic effects	-.055	-.038	-.031	-.028
Distribution of Households by Per Adult Household Income				
Overall index	.916	.758	.635	.544
Within ethnic and geographic cells portion of index[a]	.759 (82.9)	.645 (85.1)	.551 (86.8)	.475 (87.3)
Among ethnic and geographic cells portion of index[a]	.157 (17.1)	.113 (14.9)	.084 (13.2)	.069 (12.7)
Portion of index due to ethnic differences[b]	.111 (.067)	.080 (.045)	.058 (.032)	.046 (.023)
Portion of index due to geographic differences[b]	.100 (.046)	.068 (.033)	.052 (.026)	.046 (.023)
Interaction among ethnic and geographic effects	-.054	-.035	-.026	-.023
Distribution of Individuals by Per Capita Household Income				
Overall index	.856	.714	.602	.516
Within ethnic and geographic cells portion of index[a]	.712 (83.2)	.607 (85.0)	.521 (86.5)	.447 (86.6)
Among ethnic and geographic cells portion of index[a]	.144 (16.8)	.107 (15.0)	.081 (13.5)	.069 (13.4)
Portion of index due to ethnic differences[b]	.100 (.056)	.075 (.046)	.054 (.031)	.043 (.024)
Portion of index due to geographic differences[b]	.088 (.044)	.061 (.032)	.050 (.027)	.045 (.026)
Interaction among ethnic and geographic effects	-.044	-.029	-.023	-.019

[a]Numbers in parentheses are percentages of the corresponding overall index.

[b]Numbers in parentheses are the contribution to inequality of that characteristic, holding constant the effect of the other characteristic.

other characteristic is held constant. These results are consistent with the fact that ethnicity and rural/urban population distribution are strongly correlated in Peninsular Malaysia. The two overlap considerably in their effects on overall income inequality.

Ethnic and Geographic Differentials in Leisure-Standardized Income

As we have seen in earlier results, adjusting measured income for variation in leisure consumption tends to affect the various ethnic and geographic subgroups of the population in Malaysia differently. We shall now examine this issue in more detail for subgroups stratified by ethnicity and geographic location simultaneously.

Table 25 presents the means and medians of the three leisure-standardized income composites for each of the six main ethnogeographic subgroups in Peninsular Malaysia. Since our primary concern here is with the effect of including the value of leisure in income, most of the comments will implicitly refer to the corresponding means and medians of the unstandardized composites shown in Table 23.

Only two of the six population subgroups are affected by the leisure adjustment in an unambiguous way. Rural Malays are clearly worse off and urban Indians are better off when we include the value of leisure in income, because for all definitions of "work," hours of work by adults are on average greatest in rural Malay households and smallest in urban Indian households.

The results for the other four subgroups tend to be mixed. Only Chinese households display a reasonably consistent pattern of change when we standardize at the total sample mean hours of "work." For nearly every measure of income considered in Table 25, both rural and urban Chinese households benefit from the inclusion of leisure. The most reasonable conclusion for the other two subgroups, urban Malays and rural Indians, is that standardizing everyone at the same number of hours of work has very little effect on mean or median levels of income.

In terms of urban/rural income ratios within ethnic groups, the difference due to standardizing on hours of work is greatest for Indians, the group that had the greatest rural/urban income difference for the unstandardized composites. Including leisure in income widens this gap even more. If we average across income definitions and alternative household composition adjustments, urban Indians have mean standardized incomes over two and one-half times those of their rural counterparts. The corresponding ratio of median incomes is also greater for standardized measures than for unstandardized, though the extent of the differences is smaller than for means.

Urban/rural differentials for Malays tend to become larger when we standardize to eliminate variation in hours, while urban/rural differences for Chinese households remain pretty much unchanged. The net result of these two changes is to make urban/rural ratios nearly the same for Malay and Chinese households. For example, Chinese urban superiority for mean standardized incomes is 73 percent, on the average, whereas the corresponding Malay urban advantage is 65 percent. For ratios of median incomes, the ranking is reversed. The average median standardized incomes of Malay households are 54 percent higher in urban areas, while the corresponding figure for Chinese households is 42 percent.

Turning now to interethnic differentials, holding constant urban/rural status, we find that the two big gainers from standardizing for hours are rural Chinese

Table 25

Means and Medians of Standardized Income Composites, by Ethnic and Geographic Subgroups Simultaneously

Income Composite	Malays		Chinese		Indians	
	Rural	Urban	Rural	Urban	Rural	Urban
Distribution of Households by Household Income						
Standardized observable income ($\bar{H}$ = 1490)	5035 (3393)	8693 (5679)	10587 (6230)	17411 (9594)	3646 (3370)	9952 (5770)
Standardized actual income I ($\bar{H}$ =1934)	6050 (4375)	10485 (7334)	12281 (7800)	19832 (12077)	4892 (4162)	12315 (7372)
Standardized actual income II ($\bar{H}$ = 2481)	7328 (5555)	12697 (9398)	14486 (9836)	22818 (15224)	6423 (5695)	15231 (9389)
Distribution of Households by Per Adult Household Income						
Standardized observable income ($\bar{H}$ =1490)	1677 (1249)	2723 (1664)	2944 (1855)	5606 (2459)	1113 (939)	3054 (1836)
Standardized actual income I ($\bar{H}$ = 1934)	2014 (1552)	3290 (2150)	3439 (2329)	6304 (3057)	1488 (1247)	3793 (2332)
Standardized actual income II ($\bar{H}$ = 2481)	2441 (1941)	3988 (2682)	4064 (2911)	7164 (3776)	1951 (1616)	4706 (2932)
Distribution of Individuals by Per Capita Household Income						
Standardized observable income ($\bar{H}$ = 1490)	824 (537)	1318 (830)	1445 (953)	2592 (1321)	518 (462)	1463 (696)
Standardized actual income I ($\bar{H}$ = 1934)	991 (688)	1589 (1079)	1686 (1191)	2952 (1700)	695 (615)	1810 (922)
Standardized actual income II ($\bar{H}$ = 2481)	1200 (877)	1924 (1364)	1990 (1505)	3397 (2019)	913 (820)	2239 (1212)

NOTE: Medians are given in parentheses.

relative to rural Malays and urban Indians relative to urban Malays. When standardized measures are used, the extent of Chinese income superiority over Malays is virtually identical in urban and rural areas: The Chinese advantage over Malays in terms of mean standardized income measures averages 82 percent in rural areas and 90 percent in urban areas. The corresponding figures for median incomes are 68 percent in rural areas and 55 percent in urban areas.

Comparing Malays with Indians, Malays have an average mean standardized income advantage of 26 percent in rural areas, but Indians have a 15 percent advantage in urban areas. If we use median rather than mean income, there appears to be nearly complete parity between the two groups in urban areas, but an 11 percent Malay advantage in rural areas.

Again, standardizing on alternative amounts of leisure consumption tends to reduce significantly, or eliminate entirely, the previously noted tendency for these interethnic and urban/rural differentials to increase with expansion of the income concept.

Decomposing Inequality in Leisure-Standardized Income

We conclude our analysis of the relationship between interethnic and urban/rural income inequality with a two-way decomposition of the Theil index of inequality in standardized income composites, shown in Table 26. The major conclusions are essentially the same as those obtained by comparing the decomposition in inequality for unstandardized and standardized measures for ethnic and geographic subgroups separately (Tables 17 and 21).

As in that comparison, including the value of leisure in income unambiguously increases the among-group contribution to overall inequality. When the percentage contributions to overall inequality of these among-group differentials are averaged across each of the income definitions and household size adjustment schemes, the mean among-group contribution is 18.5 percent for the standardized measures, but only 14.6 percent for the unstandardized ones. However, the relative portions of among-group inequality due to ethnic differences, geographic differences, and their interaction remain virtually the same when we standardize (compare Tables 26 and 24).

Also, accounting for variation in leisure consumption reverses the trend observed with the unstandardized composites when we broaden the definition of income. As before, broadening the scope of income increases the relative contribution of among-group inequality in standardized income composites.

SUMMARY OF FINDINGS

For every ethnic and urban/rural comparison, the income of Chinese exceeds that of Malays and Indians, and the income of households or individuals residing in urban areas exceeds that of their rural counterparts. However, the extent of the difference and whether Malays' income is greater or smaller than Indians' depend on five factors:

1. *How broadly income is defined.* In general, the more broadly income is defined, the lower the ratios of Chinese to Malay income, Chinese to Indian income, and urban to rural income. This is because the lower-income groups derive rela-

Table 26

THEIL DECOMPOSITION: ETHNIC AND GEOGRAPHIC EFFECTS TREATED SIMULTANEOUSLY (STANDARDIZED INCOME MEASURES)

Item	Standardized Observable Income	Standardized Actual Income I	Standardized Actual Income II
Distribution of Households by Household Income			
Overall index	.712	.611	.530
Within ethnic and geographic cells portion of index[a]	.577 (81.0)	.489 (80.0)	.420 (79.2)
Among ethnic and geographic cells portion of index[a]	.135 (19.0)	.122 (20.0)	.110 (20.8)
Portion of index due to ethnic differences[b]	.100 (.055)	.089 (.047)	.079 (.041)
Portion of index due to geographic differences[b]	.080 (.035)	.075 (.033)	.069 (.031)
Interaction among ethnic and geographic effects	-.045	-.042	-.038
Distribution of Households by Per Adult Household Income			
Overall index	.761	.6[illegible]	.564
Within ethnic and geographic cells portion of index[a]	.627 (82.4)	.[illegible]36 (82.1)	.461 (81.7)
Among ethnic and geographic cells portion of index[a]	.134 (17.6)	.117 (17.9)	.103 (18.3)
Portion of index due to ethnic differences[b]	.093 (.048)	.079 (.039)	.068 (.032)
Portion of index due to geographic differences[b]	.086 (.041)	.078 (.038)	.071 (.035)
Interaction among ethnic and geographic effects	-.045	-.040	-.036
Distribution of Individuals by Per Capita Household Income			
Overall index	.708	.605	.522
Within ethnic and geographic cells portion of index[a]	.588 (83.1)	.498 (82.3)	.427 (81.8)
Among ethnic and geographic cells portion of index[a]	.120 (16.9)	.107 (17.7)	.095 (18.2)
Portion of index due to ethnic differences[b]	.081 (.047)	.070 (.039)	.062 (.032)
Portion of index due to geographic differences[b]	.073 (.039)	.068 (.037)	.063 (.033)
Interaction among ethnic and geographic effects	-.034	-.031	-.030

[a]Numbers in parentheses are percentages of the corresponding overall index.

[b]Numbers in parentheses are the contribution to inequality of that characteristic, holding constant the effect of the other characteristic.

tively less of their income from the market activities covered in the narrower definitions of income and relatively more from the nonmarket activities included in the broader definitions. Broadening the definition of income does not have an unambiguous effect on the Indian/Malay ratio.

2. *Whether means or medians are used to describe the central tendency of the income distribution.* When medians are used, the Chinese/Malay, Chinese/Indian, Malay/Indian, and urban/rural ratios are all lower than when means are used. This is because the distribution of Chinese incomes is more highly skewed than the distribution of Indian incomes, which in turn is more highly skewed than the distribution of Malay incomes, and because the urban income distribution is more highly skewed than the rural distribution.

3. *Whether adjustments are made for household size or composition.* The relative position of Malays is improved when we adjust for household size, because Malay households are the smallest, on average, of the three ethnic groups. Adjusting for household size has little effect on Chinese/Indian or urban/rural income ratios.

4. *Whether we standardize for hours of "leisure."* Evaluating everyone's income at the sample mean hours of work improves the relative position of Chinese, Indian, and urban households. Hence, Chinese/Malay, Indian/Malay, and urban/rural ratios are larger when we standardize. This is because Malays and rural households work longer hours than other subgroups in Malaysia. Standardizing does not have an unambiguous effect on the Chinese/Indian ratio.

5. *In ethnic comparisons, whether we control for urban/rural location; in urban/rural comparisons, whether we control for ethnicity.* The relative difference between Chinese and Malay incomes is smaller within urban or rural strata than when overall group means or medians are compared. Indian income superiority over Malay generally disappears entirely when comparisons are made within urban or rural strata. Urban/rural ratios are often smaller when ethnicity is controlled (except for Indians).

Estimates of the size of ethnic and urban/rural differences in incomes are very sensitive to these factors. For example, the extent by which Chinese incomes exceed Malay can range from 17 percent (median urban per adult TAI-II) to 177 percent[20] (mean household market income). The extent by which urban incomes exceed rural ones ranges from 37 percent (median per adult TAI-I) to 147 percent (mean household market income)[21] for the total sample and from 22 percent (median Chinese per adult TAI-II) to 182 percent (mean Indian per capita standardized observable income) when ethnicity is controlled.[22]

For every measure of inequality we examine, Chinese income is the most unequally distributed of the ethnic groups and urban incomes are always more unequally distributed than rural incomes. The extent of inequality in Malay and Indian incomes is quite similar, though the former exhibit less inequality than the latter (except for household and per adult market income).

[20] This number would undoubtedly be even greater if we had calculated a standardized equivalent of market income. Standardization raises the Chinese/Malay mean household income ratio for the next broader measure of income, total observable income, by 7 percent.

[21] This number would also undoubtedly be even greater if we had calculated a standardized equivalent of market income. Standardization raises the urban/rural mean household income ratio for the next broader measure of income, total observable income, by 17 percent.

[22] As discussed in Sec. II, adjustments for income taxes or for unemployment would reduce the Chinese/Malay and urban/rural ratios even further.

Within each ethnic and locational subgroup, broadening the definition of income reduces (within-group) income inequality. The reductions are largest for the subgroups whose incomes were most equally distributed to begin with—Malays, Indians, and rural households. Thus the relative differences in the extent of within-group inequality among subgroups become larger as we broaden the definition of income.

Standardizing at total sample mean hours of work increases inequality for Malay and rural households and reduces it for Chinese and urban households; hence this standardizing reduces the extent of ethnic and locational differences in income inequality.

Although for many measures of income, Chinese incomes are more than twice the size of Malay and Indian incomes, and urban incomes exceed rural incomes by a similar margin, most of the total income inequality in Peninsular Malaysia is due to differences *within* subgroups rather than among them. Differences among ethnic groups or between urban and rural strata account for only 8 to 14 percent of overall income inequality, and when we stratify by ethnicity and location simultaneously, differences among these six subgroups never account for more than 21 percent of overall inequality. The among-group contribution to inequality in unstandardized income measures becomes somewhat smaller as we broaden the definition of income. However, the opposite pattern is true for standardized income measures. The contributions to overall income inequality of ethnic differences and rural/urban differences are not independent, but rather have a negative interaction around 30 percent the size of the total contribution of differences among the six ethnogeographic subgroups.

VI. A DESCRIPTIVE REGRESSION ANALYSIS OF INCOME DIFFERENTIALS

We conclude our empirical analysis with a multivariate analysis of the relationships between our composite income measures and various demographic characteristics of the household recipient units. Our intent is to measure, in a regression context, the relative explanatory power of a small set of variables describing the salient characteristics of the sample households. We are not specifying an empirical theory of income generation;[1] we are merely attempting to provide a compact and useful way of describing some rather complex relationships that exist in the data. Hence the results presented in this section should be viewed as exploratory rather than conclusive.

CHOICE OF FUNCTIONAL FORM AND VARIABLES

In our regressions below, the dependent variable is the natural logarithm of income.[2] We have chosen to use a semi-log functional form for the income regressions for several reasons. First, we assume here that income is log-normally distributed. This is a rather common assumption in the literature, frequently justified by the fact that income is usually defined so that there are no negative values for it, which precludes an assumption of normality in the distribution of the arithmetic levels of income. Second, the variance of the dependent variable we are explaining, i.e., the "log variance" of income, is often itself used as a measure of income inequality. Third, employing a semi-log functional form facilitates comparisons across income measures. In a semi-log regression, one can interpret a particular coefficient as the percentage change in the dependent variable associated with a small increase in the independent variable in question.[3] This is a particularly attractive feature for our purposes, since it facilitates comparisons of coefficients across regression equations involving different income variables with very different means.[4]

Since our purpose in estimating income regressions is purely descriptive, we have opted for a reasonably small set of regressors. The variables included fall into three general categories: First, there are some characteristics of the heads of household, including a quadratic in "household age" (the average of the ages of the

[1] That is, we are in no way defending any particular notion of causality running between the set of explanatory variables we use and the dependent variables.

[2] Zero values of income have been set equal to $1 so that their logarithm is defined.

[3] Strictly speaking, this interpretation applies only to continuous independent variables. If the explanatory variable is a dummy variable, i.e., one that takes only the values 0 or 1, then the statement made in the text is incorrect because there is no such thing as a small increment in a dummy variable. If β is the estimated coefficient of a dummy variable D in a regression whose dependent variable is in logarithmic form, i.e., $\ln Y = \alpha + \beta D + \ldots$, then the associated percentage change in the dependent variable Y when the characteristic represented by that dummy variable is present is $e^{\beta} - 1$ (Halvorsen and Palmquist, forthcoming). In our regression results, we report both the coefficient and the calculated percentage changes for the four dummy variables.

[4] We experimented with alternative functional forms and found that the semi-log form provides the best fit in an R^2 sense.

male and female heads of household), the education of the male head of household, the education of the female head of household, and an interaction term between these two education variables. The second group of variables reflects aspects of household size and composition. Included in this group are variables measuring the number of other adults (i.e., nonheads of household) and the number of nonadults (persons 14 years of age or younger) residing in the household and a dummy variable indicating that there is no male head of household. The last group of explanatory variables encompasses the ethnic and geographic characteristics of the households in our sample. By including dummy variables for urban, Chinese, and Indian households, we can examine the size of the ethnogeographic differentials in income when the other economic and demographic characteristics of the household are held constant.

Tables 27 through 29 report over regressions on income measures for each of the three household size/composition adjustments used in this study.[5] The first four regressions in each table are on our four unstandardized composite income measures—market income, total observable income, TAI-I, and TAI-II. The fifth regression in each table is on the standardized income measure corresponding to TAI-II, i.e., standardized actual income II. These two corresponding measures allow us to isolate the pure effect of the standardization procedure. The last income measure used as a dependent variable is maximal standardized income, which evaluates what each adult's income would be if he or she worked 16 hours a day, 365 days a year. The coefficients in this regression, in some sense, provide limiting values for the effects of the various explanatory variables in a standardized income framework.

RESULTS OF THE REGRESSION ANALYSIS

The entries in each cell of Tables 27 through 29 represent the estimated coefficient and the corresponding t-statistic (in parentheses). For the dummy variables, the percentage change in the dependent variable associated with the presence of the characteristic measured by the dummy variable is shown in brackets. This last value bears the same interpretation as the coefficients on the nondummy variables.

We shall now examine the effect of each of the explanatory variables in order, noting differences in magnitude of the effect of a variable due to changes in the dependent income variable.

The first two variables in each regression comprise a quadratic in the average age of the household heads. Many previous studies have found that there is an inverted U-shaped relationship between age and income for the household, and we also find such a relationship in our regressions on household and per adult income measures. In Tables 27 and 28, the linear age coefficient is positive and significant, while the coefficient on the age-squared variable is negative and significant either at the 5 percent level or close to it. The peak of this age quadratic is also rather

[5] In the regressions reported in Tables 27 and 28 on household and per adult incomes, the units of observation are households. However, in Table 29, where the dependent variable is per capita income, there is an observation for each individual in each sampled household. All of the observations of individuals in a given household are identical and hence their error terms will be perfectly correlated. This will cause a downward bias in estimated standard errors for this equation, but the coefficient estimates will *not* be biased.

Table 27

Descriptive Income Regressions, I: Distribution of Households by Household Income

Variable	Market Income	Total Observable Income	Total Actual Income I	Total Actual Income II	Standardized Actual Income II	Maximal Standardized Income
Characteristics of Household Heads						
Household age	.0681 (2.11)	.0722 (2.71)	.0640 (3.23)	.0504 (2.80)	.0541 (2 59)	.0584 (4.23)
Household age squared	-.000660 (-1.53)	-.000644 (-1.81)	-.000585 (-2.21)	-.000471 (-1.96)	-.000449 (-1.60)	-.0005 (-2.84)
Education of male head	.0573 (3.41)	.0531 (3.83)	.0383 (3.71)	.0360 (3.85)	.0326 (3.00)	.0443 (6.16)
Education of female head	.0619 (3.12)	.0565 (3.46)	.0471 (3.87)	.0516 (4.68)	.05[illegible]3 (3.92)	.0305 (4.67)
Education interaction	.000454 (0.22)	-.0000972 (-0.06)	.00194 (1.52)	.00177 (1.53)	.00260 (1.93)	.002 (2.49)
Household Size and Composition						
Number of other adults (⩾ age 15)	.234 (10.5)	.201 (10.9)	.156 (11.4)	.136 (10.9)	.209 • (14.4)	.206 (21.6)
Number of persons ⩽ age 14	.0200 (1.07)	.00736 (0.48)	.0149 (1.30)	.0241 (2.31)	.0219 (1.80)	.0108 (1.34)
Husband not present dummy	-.872 (-6.44) [-.582]	-.613 (-5.49) [-.458]	-.441 (-5.30) [-.357]	-.359 (-4.78) [-.302]	-.248 (-2.85) [-.220]	-.261 (-4.51) [-.230]
Geographic Location and Ethnicity						
Urban dummy	.254 (3.11) [.289]	.122 (1.81) [.130]	.0935 (1.86) [.097]	.0884 (1.95) [.097]	.208 (3.93) [.231]	.161 (4.61) [.175]
Chinese dummy	.389 (4.78) [.476]	.299 (4.46) [.349]	.273 (5.47) [.314]	.283 (6.26) [.327]	.396 (7.51) [.486]	.338 (9.71) [.402]
Indian dummy	-.0842 (-0.73) [-.081]	-.291 (-3.04) [-.252]	-.151 (-2.12) [-.140]	-.0637 (-0.99) [-.062]	-.0142 (-0.19) [-.014]	.0396 (0.80) [.041]
Intercept	5.572 (9.47)	5.968 (12.3)	6.547 (18.1)	7.088 (21.7)	6.675 (17.5)	7.492 (29.8)
R^2	.314	.314	.379	.395	.434	.613
Mean of dep. var.	8.229	8.545	8.841	9.061	9.021	9.829
Var. of dep. var.	1.821	1.236	0.759	0.638	0.925	0.589

NOTE: Means and standard deviations of explanatory variables are presented in appendix Table H.4. Numbers in parentheses are t-statistics. Numbers in brackets are the percentage changes in the dependent variable associated with the presence of the characteristic measured by the dummy variable.

Table 28

Descriptive Income Regressions, II: Distribution of Households by Per Adult Household Income

Variable	Market Income	Total Observable Income	Total Actual Income I	Total Actual Income II	Standardized Actual Income II	Maximal Standardized Income
			Characteristics of Household Heads			
Household age	.0643 (2.02)	.0666 (2.54)	.0593 (2.96)	.0457 (2.51)	.0494 (2.44)	.0537 (3.92)
Household age squared	-.000643 (-1.51)	-.000605 (-1.73)	-.000557 (-2.08)	-.000443 (-1.82)	-.000419 (-1.55)	-.000496 (-2.71)
Education of male head	.0556 (3.35)	.0513 (3.75)	.0370 (3.54)	.0347 (3.66)	.0329 (3.13)	.0429 (6.02)
Education of female head	.0626 (3.20)	.0565 (3.51)	.0481 (3.91)	.0526 (4.70)	.0511 (4.12)	.0405 (4.82)
Education interaction	.000426 (0.21)	-.0000235 (-0.01)	.00189 (1.46)	.00171 (1.46)	.00243 (1.87)	.00215 (2.44)
			Household Size and Composition			
Number of other adults (≥ age 15)	-.0229 (-1.04)	-.0563 (-3.11)	-.100 (-7.26)	-.121 (-9.61)	-.0483 (-3.47)	-.0507 (-5.37)
Number of persons ≤ age 14	.0251 (1.35)	.0122 (0.80)	.0203 (1.74)	.0295 (2.78)	.0264 (2.24)	.0161 (2.02)
Husband not present dummy	-.536 (-4.02) [-.415]	-.275 (-2.50) [-.240]	-.102 (-1.22) [-.097]	-.0208 (-0.27) [-.021]	.0936 (1.10) [.098]	.0779 (1.36) [.081]
			Geographic Location and Ethnicity			
Urban dummy	.246 (3.00) [.279]	.116 (1.75) [.123]	.0857 (1.69) [.090]	.0806 (1.75) [.084]	.201 (3.93) [.223]	.153 (4.42) [.165]
Chinese dummy	.429 (5.34) [.536]	.337 (5.10) [.401]	.311 (6.15) [.365]	.320 (6.98) [.377]	.433 (8.50) [.542]	.376 (10.9) [.456]
Indian dummy	-.0749 (-0.65) [-.072]	-.283 (-3.00) [-.246]	-.148 (-2.06) [-.138]	-.0607 (-0.93) [-.059]	-.0132 (-0.18) [-.013]	.0426 (0.87) [.044]
Intercept	4.905 (8.45)	5.353 (11.2)	5.890 (16.1)	6.431 (19.4)	6.007 (16.3)	6.835 (27.4)
R^2	.224	.213	.294	.341	.325	.473
Mean of dep. var.	7.116	7.452	7.727	7.947	7.908	8.715
Var. of dep. var.	1.566	1.048	0.680	0.602	0.724	0.425

NOTE: Means and standard deviations of explanatory variables are presented in appendix Table H.4. Numbers in parentheses are t-statistics. Numbers in brackets are the percentage changes in the dependent variables associated with the presence of the characteristic measured by the dummy variable.

Table 29

Descriptive Income Regressions, III: Distribution of Individuals by Per Capita Household Income

Variable	Market Income	Total Observable Income	Total Actual Income I	Total Actual Income II	Standardized Actual Income II	Maximal Standardized Income
Characteristics of Household Heads						
Household age	.0308	.0346	.0296	.0172	.0189	.0248
	(2.70)	(3.63)	(3.82)	(2.45)	(2.54)	(4.63)
Household age squared	-.000228	-.000224	-.000191	-.0000866	-.0000155	-.000108
	(-1.50)	(-1.78)	(-1.86)	(-0.93)	(-0.16)	(-1.53)
Education of male head	.0443	.0441	.0343	.0317	.0359	.0429
	(7.74)	(9.24)	(8.86)	(9.01)	(9.66)	(16.0)
Education of female head	.0597	.0527	.0473	.0509	.0535	.0427
	(8.51)	(9.01)	(10.0)	(11.8)	(11.7)	(13.0)
Education interaction	.00130	.000845	.00218	.00205	.00220	.00218
	(1.77)	(1.38)	(4.38)	(4.54)	(4.61)	(6.33)
Household Size and Composition						
Number of other adults (≥ age 15)	.100	.078	.0420	.0224	.0828	.0769
	(15.3)	(14.3)	(9.46)	(5.56)	(19.4)	(25.1)
Number of persons ≤ age 14	-.105	-.115	-.107	-.0980	-.103	-.112
	(-17.7)	(-23.3)	(-26.6)	(-26.8)	(-26.6)	(-40.5)
Husband not present dummy	-.678	-.474	-.298	-.203	-.0463	-.0522
	(-13.8)	(-11.6)	(-8.94)	(-6.70)	(-1.45)	(-2.27)
	[-.492]	[-.377]	[-.258]	[-.184]	[-.045]	[-.051]
Geographic Location and Ethnicity						
Urban dummy	.223	.121	.0813	.0769	.177	.124
	(8.03)	(5.21)	(4.32)	(4.50)	(9.83)	(9.56)
	[.250]	[.129]	[.084]	[.080]	[.194]	[.132]
Chinese dummy	.439	.328	.289	.303	.393	.339
	(15.6)	(14.0)	(15.2)	(17.5)	(21.5)	(25.8)
	[.551]	[.388]	[.335]	[.354]	[.484]	[.404]
Indian dummy	-.118	-.326	-.210	-.119	-.0545	.0147
	(-2.97)	(-9.86)	(-7.80)	(-4.86)	(-2.12)	(0.79)
	[-.111]	[-.278]	[-.189]	[-.112]	[-.053]	[.015]
Intercept	5.141	5.52	5.984	6.489	6.087	6.892
	(24.3)	(31.2)	(41.7)	(49.8)	(44.2)	(69.6)
R^2	.303	.319	.356	.376	.430	.566
Mean of dep. var.	6.407	6.716	6.969	7.183	7.179	7.977
Var. of dep. var.	1.436	1.022	0.713	0.608	0.744	0.506

NOTE: Means and standard deviations of explanatory variables are presented in appendix Table H.4. Numbers in parentheses are t-statistics. Numbers in brackets are the percentage changes in the dependent variable associated with the presence of the characteristic measured by the dummy variable.

stable in these two sets of regressions, ranging between 49 and 65 years and averaging around 58 years. The curvature of this quadratic relationship tends to be less for the broader income measures, because very young and very old households tend to specialize relatively more in household production than in market work. Since the broader measures of income are much more reflective of nonmarket income sources, broadening the definition of income reduces the size of the variation of measured income due to age.

The age/income relationships are different in the regressions on per capita income presented in Table 29. First, the estimated quadratic does not reach a peak in the range of the data. And second, the magnitude of the linear age coefficient, although still positive and significant, is only half the size of those found in the first two sets of regressions. The explanation of both of these facts is rather straightforward. Households at both ends of the age distribution, i.e., the young and the old, tend to contain fewer members, so when household income is divided by the number of individuals in the household, the higher-income households in the middle of the age distribution show the greatest reduction in income. Further, generating a distribution of *individuals* by this per capita household income measure results in weighting those observations in the tails of the age distribution less, again because they have fewer members. Both of these effects flatten out the previously observed inverted U-shaped age/income relationship.

Including this age quadratic in the income regressions enables us to investigate the importance of life-cycle differences in income in generating overall income inequality. To do this, we have removed the effects of age variation from the income distribution by evaluating what each household's income would be if the average age of heads of household were 37, the sample average.[6] We expected that this age standardization procedure would reduce income inequality, but it had surprisingly little effect—never more than 2 percent—and, more significantly, the direction of change was not consistent. In some cases income inequality increased rather than decreased as a result of standardizing on age.

We can discern three general patterns in the household education variables. First, the return to education tends to be higher for female than male heads of household. This is consistent with results reported in Apps. A and C on the relationships between education and wages, and between education and labor-force participation. The returns to education in terms of wages are much higher for females than for males, and further, the probability of participation in market earning activities is much more sensitive to educational attainment for females than for males.

The second general result, seen in the first four regressions in each table, is that there appears to be a decline in the returns to education for females and especially for males as the income concept is expanded.[7] This also can be explained in terms of the positive association between education and the probability of market participation. As the income definition is expanded, market earnings become less important in income and therefore the impact of variation in market participation rates decreases.

[6] That is, we subtract from each household's income the term

$$[\beta_{Age}(Age_i - \overline{Age}) + \beta_{Age^2}(Age_i^2 - \overline{Age^2})],$$

where Age_i is the household's age and $\overline{Age}$ is the sample average value.

[7] This result holds only for the first three regressions for females.

The last point concerning the education variables relates to the interaction term. For the two narrow, traditional measures, market income and total observable income, the interaction between the returns to education of one head and the level of education of his or her spouse is usually small and not statistically significant. However, for the broader measures of income, both actual and standardized, the coefficient of the interaction is consistently positive and always statistically significant at the 10 percent level or considerably above. For example, for these income measures, the increase in income due an extra year of education for the female head of household is around two percentage points higher if her husband has ten years of schooling than if he has none. This suggests that husbands' and wives' education are complementary in increasing the household's income.

Turning to the two household size variables, number of other adults and number of persons 14 years of age or less, we see the most dramatic differences in effects across the three sets of distributions. This is, of course, not surprising, since the difference in the dependent variables across the three sets of regressions is explicitly a function of these household size and composition variables.[8]

The regressions on household income in Table 27 show that an additional adult member of the household increases household income by 14 to 23 percent. Further, we see that the percentage increase in household income due to that additional adult becomes smaller as the definition of unstandardized income is broadened. The implication is that these other adults tend to contribute relatively more to the household's market income than to its nonmarket income. (Table 8 confirms that this is the case for other male adults.)

Comparison of these results with those based on the per adult and per capita income distributions shows the effect on income of an additional adult in the household, net of the increase in the household's consumption requirements. The regressions in Table 28 on the per adult incomes of households imply that an additional (nonhead) adult member *reduces* per adult income by 2 to 12 percent.[9] In contrast, the regressions in Table 29, based on the distribution of individuals by per capita household income, indicate that an additional adult household member *improves* the household's net income position by from 2 to 10 percent.[10] The reconciliation of these two estimates lies in the difference between the last two sets of distributions in the assumptions concerning the nature of the household's consumption behavior. For example, consider the increase in consumption requirements implied by increasing household size from 3 adults and 3 children to 4 adults and 3 children. The assumptions underlying the per adult distributions imply an increase in household consumption requirements of 33 percent (the percentage increase in the number of adults), whereas the per capita income composites would imply only a 17 percent increase (the percentage increase in total number of household members). These two estimates probably bracket the true difference in consumption requirements between the two hypothetical households in the exam-

[8] In fact, the results for these two explanatory variables may be partly due to spurious correlation, since the dependent variables in Tables 28 and 29 are a direct function of one or both of the independent variables in question.

[9] This is consistent with the information presented in Table 8, which shows that nonhead adult members of a household work fewer hours and have lower wage rates than a head of household of the same sex.

[10] For all three household size/composition adjustments, standardization increases (in an algebraic sense) the contribution of an additional adult, since it includes the positive value of that additional adult's leisure time.

ple. The first estimate would be too large to the extent that (1) children are, in fact, net consumption liabilities for the household, or (2) there are returns to scale in household consumption. The second estimate would be too low to the extent that the consumption requirements of an adult exceed those of a child.

The other determinant of differences in household size is variation across households in the number of nonadult members. Although this variable enters the regressions in exactly the same manner as the "other adult" variable just discussed, its interpretation is different. Since the reported income-earning activities of children were explicitly excluded from consideration in this study, the regression coefficient on this number-of-children variable should be interpreted as the difference in the income-earning behavior of the adult members of the household associated with the existence of additional children. Tables 27 and 28 show that, holding constant the number of adults, the existence of an additional child in the household raises household income by 0.7 to 3.0 percent. Although these effects are not always statistically significant, they are consistently positive for each of the income measures considered in Tables 27 and 28. These results do not necessarily imply that the existence of an extra child in the household causes the adults to work harder; it may simply be that households with higher incomes choose to have more children.[11] As pointed out earlier, a regression analysis such as this can provide no information concerning the direction of causation between numbers of children and the income-earning efforts of adults in a household.

The increase in income due to the presence of an extra household member under age 15 is about twice as large for TAI-I as it is for total observable income. Since the difference between these two income measures is the inclusion of the value of housework activities other than cooking and childcare, the implication is that households with more children spend more time performing all types of housework, not just those performed for children directly.[12] When the values of cooking and childcare are included (TAI-II), the effect of an additional child on income becomes even larger.

The problem of spurious correlation between the household size/composition explanatory variables and the dependent income variables is most evident in the regressions on per capita income shown in Table 29. Since by the construction of these income composites an additional nonadult member of a household adds nothing directly[13] to income (the numerator of the dependent variable) but directly increases the size of the denominator of the dependent variable, it is not surprising that the effect of an additional child is persistently strong, negative, and highly significant in these regressions.

An issue currently of considerable empirical and policy interest is the relative income position of female-headed households. In order to investigate the situation of such households in Peninsular Malaysia, we include the dummy variable "husband not present" in our income regressions. The interpretation of its coefficients, as with the three other dummy variables, is the partial effect on income of the

[11] Alternatively, the relationship may be due to the fact that contributions of children as unpaid workers in a family business are included in our business income component.

[12] This is consistent with DaVanzo and Lee's (1978) general findings regarding the effects of numbers of children on numbers of hours household members spend in various housework activities.

[13] And an additional nonadult only indirectly generates a slight increase in income by increasing the earning effort of adults in the household or by contributing to a family business.

permanent absence of a male head of household, holding constant the effects of all the other variables.

Table 27 shows that the estimated income disadvantage suffered by female-headed households depends crucially on the definition of income. If the estimates are based on the narrow market income measure, the absence of the male head appears to reduce the household's income by 58 percent, other things being the same. However, the broader measures of income yield much more conservative estimates. The disadvantage is reduced to 46 percent for total observable income, to 36 percent for TAI-I, and to 30 percent for TAI-II. Interestingly, the biggest reduction in the estimated effect of the absence of the male head results from the leisure standardization procedure. For standardized TAI-II, the estimated income differential between male- and female-headed households is only 22 percent. The corresponding differential is only slightly higher (23 percent) for the limiting maximal standardized income, i.e., one-half the size of the estimated effect for the more commonly used income measure, total observable income. Clearly, the relative status of female-headed households is very sensitive to the scope of the income concept used.

It is important to note that the question answered by these regression results is, How much does household income fall when there is no male head of the household *and* the number of other adults is held constant (i.e., he is not replaced)? This may not be the most appropriate question to ask for welfare purposes. Absence of the male head will generally reduce the total number of adults residing in the household and will thereby reduce the household's consumption requirements. Thus it would appear to be much more reasonable to assess the differential between male- and female-headed households on the basis of per adult income composites. With this procedure, the estimated income disadvantage of female-headed households is reduced for each successively broader definition of income. Comparing the results in Table 28 with those just described, we see that for the two traditional measures of income, market income and total observable income, the income differentials between male- and female-headed households are 42 percent and 24 percent, respectively. The results for the broader and standardized measures of per adult income are even more dramatic. For TAI-I and TAI-II and the two standardized measures, we find that female-headed households have no statistically significant income disadvantage. In fact, for the two leisure-standardized measures of per adult income, female-headed households register a sizable (though not statistically significant) income *advantage* over male-headed households.

Thus the apparently considerably lower unstandardized household incomes of female-headed households in Table 27 are caused by two factors: (1) Holding constant the number of other (nonhead) adults, the absence of a male head reduces the household's consumption requirements; hence, when we adjust for this fact, by looking at per adult rather than household income, the relative position of female-headed households improves; (2) unmarried females who head households apparently work less than the sample mean number of hours, especially in market activities; when our income measure includes the value of their nonmarket production and of the extra leisure they consume, the relative income position of female-headed households again improves.

The regressions on per capita incomes in Table 29 indicate a pattern that is very similar to those in Tables 27 and 28, the magnitudes of the "no-husband" effects being intermediate to the first two sets of estimates. For the regressions based on

the distribution of individuals by per capita household income, the estimated relative status of female-headed households ranges from a 49 percent disadvantage for market income to virtual equality for the standardized measures, again a rather dramatic difference by any criterion.

We shall now examine the estimated income differentials between the various geographic and ethnic groups in Peninsular Malaysia. The difference between this analysis and the earlier one is that a regression analysis allows us to hold constant the influences of other determinants of income that are correlated with ethnicity or location and focus solely on the pure effect of ethnicity or location.

Before we consider the actual results from these regressions, one comment is in order concerning the form in which the ethnic and geographic dummy variables enter the regressions. No interaction between geography and ethnicity is explicitly investigated here; we explored possible interaction effects in earlier regressions but never found a significant interaction between ethnicity and geography in the regression context. This appears at first to contradict our earlier results on this issue. However, the earlier analysis was made solely on the basis of comparisons of simple group means or medians for the six joint ethnogeographic subgroups. The current regression analysis, on the other hand, essentially nets out the effects of the other socioeconomic variables prior to making the ethnic and geographic comparisons. Therefore, the interaction between ethnicity and geography found earlier is apparently due to simultaneous covariation of income determinants such as age, education, and household size with these ethnic and geographic variables. Once the effects of these variables are accounted for, no significant interaction remains.

Because there is no significant interaction between them, the effects of ethnicity and geography on income are additive and can be discussed separately. We shall address urban/rural income differentials first. The urban income advantage is much lower in a regression context, ranging from 8 percent to 29 percent at most, than the advantage we observed when we compared simple group averages, where differentials often exceeded 100 percent. The urban income advantage also becomes smaller when the income definition is expanded and leisure is ignored; simply broadening the income concept from market income to total observable income cuts the urban advantage in half. Accounting for rural/urban differences in leisure consumption raises the urban advantage back near the levels observed for the narrowest income measures. And finally, when we hold constant the definition of income, the various adjustments to income due to household size and compositional differences have no appreciable effect on the urban/rural differential.

When the effects of the other determinants of income are controlled, the superiority of Chinese to Malay income, observed earlier to be often in excess of 100 percent, is reduced dramatically to an average of about 43 percent. For example, when overall means were compared, Chinese household market income exceeds Malay by 177 percent. When age, education household size and composition, and urban location are controlled through regression analysis, this difference is reduced by nearly three-quarters, to 48 percent.[14] As with overall means and medians, the Chinese income advantage over Malays falls as we expand in unstandardized income from market income to TAI-I and increases when we standardize for leisure.

[14] This is very similar to Hirschman's (1975) finding that almost two-thirds of the gross difference in his data between the monthly incomes of Malays and Chinese was due to differences in socioeconomic background, urban/rural location, and other socioeconomic factors.

The range of estimates of the Chinese/Malay income differential extends from a high of 55 percent for per capita market income to a low of 31 percent for household TAI-I. For each income definition, the magnitude of this differential tends to be larger for per adult and per capita income measures than for household incomes. Earlier, when we did not control for the influence of other variables, adjustments for household size and composition *reduced* the income differences between Malays and Chinese.

Whatever advantage was observed earlier for Indians relative to Malays when overall means or medians were considered is completely eliminated and in some cases strongly reversed when other socioeconomic characteristics are controlled.

The Indian/Malay income differential appears to depend both on the definition of income and on whether we standardize on leisure consumption. For the unstandardized income measures, the biggest Indian/Malay differentials occur for total observable income, where the Indian income *disadvantage* vis-à-vis Malays ranges from 25 percent to 38 percent. The relative position of Indians improves as we broaden the definition of income beyond total observable income. The differences between Indians and Malays are statistically insignificant for household and per adult TAI-II, though the difference is significant for the corresponding per capita measure.[15] Standardizing on leisure consumption reduces the size of the Indian disadvantage even further, and for maximal standardized income, when other explanatory variables are held constant, Indian incomes actually exceed Malay for all three household size/composition adjustments, though the differences are never statistically significant.

The regressions presented in Tables 27 through 29 explain from 21 percent to 61 percent of the variance in the logarithms of income. Explanatory power is highest for household and per capita income measures, though much of that power may be due to spurious correlation of the dependent variables with the household size variables.

Broadening the definition of income in general increases R^2. We are always able to explain more of the variation in TAI-I or TAI-II than in market or total observable income. However, this may be due to the fact that as we broaden the definition of income, there is less variance to explain. (The variance of the dependent variable, shown in the last line of each table, becomes smaller as we broaden the definition of income. Since the "log variance" is itself a measure of income inequality, this is consistent with our earlier finding that more broadly defined income measures are more equally distributed.)

Except in the case of per adult income, we are able to explain relatively more of the variation in standardized actual income II than in the corresponding unstandardized measure, TAI-II. And in all three tables, we can explain nearly twice as much of the variation in maximal earnings capacity (maximal standardized income) as we can the variation in actual market income. This is because the broadest income concept exhibits much less variance than the other concepts we consider.

[15] However, as stated earlier, the fact that all individuals in the same household have the same values of all variables biases our t-statistics upward.

VII. CONCLUSIONS

In this report, we have shown that the magnitudes of measures of income levels, interethnic or urban/rural differences, and income inequality depend on how broadly income is defined. In Peninsular Malaysia, incomes become more equally distributed and differences among ethnic and locational subgroups become smaller as successively broader definitions of income are used. Narrow income measures, which primarily register income received from formal market activities, overstate the amount of inequality in the overall distribution of well-being.

Furthermore, conclusions about overall or subgroup distributions of income are also sensitive to (1) whether means or medians are used to describe the central tendency of the distribution, (2) whether we adjust for household size or composition, (3) whether we standardize to remove variations in leisure consumption (i.e., assume that all adults work the same number of hours), and (4) whether we control for the influence of any demographic characteristics of the recipient units. The main findings are the following:

- Medians are always considerably smaller than the corresponding means and exhibit less relative variation among ethnic and urban/rural subgroups.
- Adjusting for household size and composition affects households' rankings in the income distribution and reduces the relative difference between Chinese and Malay income levels but has little effect on other subgroup differences or on inequality measures.
- Standardizing to remove variation in leisure consumption increases mean or median incomes for some subgroups (especially urban Indians) and reduces them for others (especially rural Malays) but has remarkably little effect on overall inequality. Variation in hours of work does not appear to be an important determinant of overall income inequality. However, the standardization procedure does change households' rankings in the income distribution and reduces incomes of the poor, who work an above-average number of hours. Furthermore, measured inequality in the standardized measures is sensitive to the composition of the consumption bundle (i.e., the number of hours of leisure) on which we standardize, being inversely related to the average number of hours of work.
- Life-cycle variation also does not appear to be an important determinant of income inequality.
- Despite the fact that mean income differences among ethnic and urban/rural subgroups are large (Chinese mean income is usually at least two times as large as Malay, and urban mean income is usually two times as large as rural), the vast majority (80 to 90 percent) of overall income inequality in Peninsular Malaysia is due to differences *within* subgroups rather than among them.

The distribution of income, especially among ethnic groups, is a topic of great political concern in Malaysia, and our results show that conclusions about income differences among ethnic groups are very sensitive to the factors discussed above.

The use of mean household market income as the measure of income can yield a conclusion that Chinese income is 177 percent higher than Malay, while another very plausible choice, median urban per adult total actual income II, can reduce this difference to only 17 percent. Researchers and policymakers concerned with income distribution should be aware of this sensitivity and should exercise utmost care in processing and interpreting income data, especially when comparing statistics from different studies. This is particularly crucial for international or intertemporal comparisons, since the extent of market development may differ among the countries or time periods being compared. Researchers doing comparative studies should take special care to ensure that a conclusion that two income distributions are different is due to true differences in the underlying distributions of economic well-being, and not merely to differences in the income measures or statistics used.

Economists have traditionally made the assumption 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. Our results challenge this conventional wisdom: They imply that most available studies focus on measures of income that are simply too narrow to yield useful inferences about relations between levels and dispersion in well-being. If economic development is synonymous with increasing fractions of aggregate consumption passing through formal markets (and hence the fraction of well-being measured as market income) and if development is coincident with increasing equality in the degree to which consumption by individuals or families passes through formal markets, much of what has been described as increasing equality due to economic growth may be spurious.

Appendix A

TESTING FOR SELECTIVITY BIAS IN THE WAGE REGRESSIONS

Selectivity bias can seriously affect the estimation of wage equations for a sample of individuals with observed wages. If there is a systematic relationship between the explanatory variables in the wage equation and the probability of an observation being included in the sample, i.e., the probability of observing a wage for an individual, simple ordinary-least-squares estimating techniques may yield biased and inconsistent estimates of the parameters of that equation; as a result, the wage equation will not yield unbiased estimates of what nonparticipants would earn if they worked. A relatively simple method, summarized in Heckman (1976), has been developed for testing and/or correcting for the existence of this type of bias.

The procedure for testing for the existence of selectivity bias in a wage equation involves two steps. First, we must estimate a probit equation explaining the probability of an observation being included in the wage equation, i.e., the probability the person participates in the labor force. This probability function is estimated using the entire sample. The results from this first stage of the estimation technique are presented in Table A.1, where the sample consists of female heads of household whose husband is present. (The statistics on the independent variables used in Table A.1 are shown in Table A.2.) The equation includes variables that affect a woman's wage offer as well as those that affect the value of her nonmarket time. (In the underlying model, a woman compares the wage she thinks she would be offered if she worked to the value of her time in nonmarket activities; she chooses to participate in the labor force if she perceives the former to exceed the latter.)

The second stage involves constructing a variable, λ, based on the probit function for each observation and including this variable along with the other regressors in the wage equation. The λ variable will eliminate the source of the selectivity bias, if any. The significance of the coefficient of λ is the test for the presence of selectivity bias. The results of this wage regression with and without the inclusion of λ are presented in Table A.3, which shows that there is *no evidence of selectivity bias in our sample*—the "t" statistic on λ in the wage regression is very close to zero, implying that λ has a statistically insignificant effect on observed wages. Therefore, we have chosen to ignore the issue of selectivity bias in the analysis in the text.

Table A.1

Reduced-Form Probit Participation Equation

Variable[a]	Maximum Likelihood Coefficient Estimate	t-value	Derivative of Probability Function Evaluated at Mean of Independent Variable
Age	.146	3.12	.0474
Age^2	-.00239	-3.43	-.000778
Work experience	.164	9.65	.0534
Work experience^2	-.00308	-4.65	-.00100
Education	-.0723	-1.63	-.0235
Education^2	.00690	2.60	.00224
Educated in English (D)	.377	1.90	.123
Attended private school (D)	-.191	-1.40	-.0622
Total number of household members	.0356	1.48	.0116
Number of household members <10 years of age	-.0815	-1.92	-.0265
Female head literate (D)	-.284	-1.94	-.0924
Husband's age	-.00922	-2.80	-.00300
Husband's education	-.000748	-0.14	-.000243
Total value of property owned at time of survey (in $1000's)	-.000105	-0.10	-.0000342
Full income (in $1000's)	-.0295	-1.49	-.00968
Urban (D)	-.260	-2.47	-.0846
Chinese (D)	.0248	0.22	.00807
Indian (D)	.582	3.94	.189
Intercept	-2.38	-3.15	-.775

log of likelihood function: - 514.1
- 2.0 times log likelihood ratio: 330.8
Proportion of observations where dependent variable >0: .2927
Estimated mean probability that dependent variable >0: .2923
Estimated probability of participation at sample means: .2615
D = dummy variable.

[a]Explanatory variables whose definitions are not obvious are defined below or in Table C.2.

Work experience = number of years of labor-force participation.
Literate = a dummy variable that equals 1 if the woman reports that she can read.
Value of property = value of all assets owned by the family.
Full income = per capita Malaysian standardized income (i.e., per capita standardized income evaluated at H = 2288).

Table A.2
STATISTICS OF INDEPENDENT VARIABLES USED IN TABLE A.1

Variable	Dep. Var. = 0 (n = 795)		Dep. Var. = 1 (n = 329)		Full Sample (n = 1124)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Age	33.9	8.65	34.3	7.81	34.0	8.41
Age^2	1225.8	594.7	1235.9	535.6	1228.7	577.8
Work experience	1.44	3.94	7.92	9.05	3.33	6.60
Work experience^2	17.5	90.6	144.4	254.8	54.6	167.7
Education	3.61	3.49	3.43	4.21	3.56	3.72
Education^2	25.2	42.3	29.5	58.8	26.5	47.7
Education in English (D)	.054	.226	.092	.288	.065	.247
Attended private school (D)	.499	.500	.523	.500	.506	.500
Total number of household members	6.39	2.74	6.24	2.39	6.34	2.64
Number of household members <10 years of age	2.03	1.55	1.90	1.47	1.99	1.53
Female head literate (D)	.620	.486	.517	.500	.590	.492
Husband's age	37.0	14.1	33.0	17.3	35.9	15.2
Husband's education	5.90	9.63	5.29	8.53	5.72	9.32
Total value of property owned at time of survey (in $1000's)	13790	34333	11895	56836	13235	42163
Full income (in $1000's)	1432.6	2785.1	1168.0	2733.9	1355.1	2771.6
Urban (D)	.440	.497	.353	.479	.415	.493
Chinese (D)	.397	.490	.395	.490	.397	.489
Indian (D)	.072	.258	.231	.422	.118	.323

Table A.3

SELECTIVITY-BIAS TEST WAGE REGRESSIONS

Variable	Coefficient	t-value	Coefficient	t-value
Age	.0534	0.74	.0591	0.87
Age^2	-.000618	-0.59	-.000715	-0.75
Work experience	-.0292	-0.75	-.0217	-1.21
Work experience^2	.00132	1.49	.00118	2.01
Age x education	.000918	0.39	.000872	0.37
Education	.0169	0.19	.0151	0.17
Education^2	.00299	1.12	.00322	1.30
Little education (0-2 years) but literate (D)	-.150	-0.67	-.163	-0.76
Educated in English (D)	.923	3.17	.947	3.53
Attended private school (D)	.0271	0.13	.0260	0.14
Distance (D)	.141	1.07	.140	1.13
Farm (D)	.0313	0.23	.0341	0.25
Work full-time (D)	.0860	0.57	.0856	0.57
Receive in-kind income (D)	.190	1.31	.188	1.30
Metropolitan (D)	-.421	-1.82	-.434	-2.07
Chinese (D)	.0749	0.48	.0705	0.45
Indian (D)	-.133	-0.68	-.111	-0.67
Lambda (λ)	-.0737	-0.22	—	—
Intercept	-1.71	-1.15	-1.89	-1.52
R^2	.2739		.2738	
F ratio	4.72		4.93	

Appendix B

INCOME TAXES IN MALAYSIA

The computation of income taxes in Malaysia involves three steps: defining gross income, calculating the applicable deductions to arrive at taxable income, and applying the appropriate tax-rate schedule to taxable income.

In the Malaysian tax code, *gross income* is the sum of wage, business, capital and interest, and in-kind incomes, exclusive of the home consumption of own business and farm products.

Deductions derive from three sources: lump-sum deductions for family heads, earned-income deductions, and deductions for children. The amount of the lump-sum deduction depends on marital status. For the tax laws in force in 1976-77, the lump-sum deduction for a single person was M$2,000 plus a tax rebate of M$60; a married couple was entitled to an additional M$1,000 and, if the wife was not employed, an additional M$30 tax rebate. The earned-income deduction was 10 percent of the earned income[1] of the husband and wife, up to a maximum of M$1000 for each spouse. The deductions for children (household members 14 years of age or younger) are as follows:

First child—M$750
Second child—M$500
Third child—M$500
Fourth child—M$300
Fifth child—M$300

No deductions are allowed for additional children.

Taxable income is calculated by subtracting total deductions, as described above, from gross income. The total tax liability of the family can then be calculated using the following tax-rate schedule:

Taxable Income Increments	Applicable Tax Rate
On the first M$ 2,500	6 percent
On the next M$ 2,500	9 percent
On the next M$ 2,500	12 percent
On the next M$ 2,500	15 percent
On the next M$ 5,000	20 percent
On the next M$ 5,000	25 percent
On the next M$ 5,000	30 percent
On the next M$10,000	35 percent
On the next M$14,000	40 percent
On the next M$25,000	50 percent
All income in excess of M$75,000	55 percent

[1] Earned income is essentially gross income less capital and interest income.

The total tax liability is then subtracted from gross income to arrive at after-tax income.

Using this information on Malaysian tax law, we need to make some assumptions concerning appropriate deductions for the average family. These assumptions, along with the empirical frequency distribution of gross income, will allow us to determine the approximate proportion of households in our sample that would be subject to the various degrees of income taxation.

If we assume that the representative household for our example is a two-adult, three-child family, we would calculate a minimum allowable deduction of M$4,750, plus a M$60 tax credit. This family may also be entitled to an additional M$2,000 in deductions, due to the earned-income deduction, which we ignore for the purposes of this illustration. Given the tax credit, our representative household would have to earn more than M$5,000 to have positive taxable income and thereby incur any tax liability.

The frequency distribution for household market income in our sample is as follows:

Income Bracket (M$)	Number of Households
0 - 999	105
1,000 - 1,999	136
2,000 - 2,999	167
3,000 - 3,999	142
4,000 - 4,999	109
5,000 - 9,999	207
10,000 - 14,999	70
15,000 - 19,999	39
20,000 - 24,999	32
25,000 - 29,999	14
30,000 - 34,999	7
35,000 - 39,999	7
40,000 - 44,999	5
45,000 - 49,999	3
50,000 and over	21

As we can see, 659 households, or 62 percent of the sample. have market incomes of less than M$5,000 and hence would pay no taxes. An additional 207 households, 19 percent of the sample, would have *taxable* incomes of less than M$5,000 and would face marginal tax rates of 9 percent or less.

Appendix C

WAGE-IMPUTING REGRESSIONS

Table C.1 presents the wage regressions that have been used to impute values of time to all adults for whom wage rates are not reported in the survey. The samples for these wage equations, which are estimated separately for males and females, consist of all full-time and part-time job observations for which positive money wages are reported.[1] Observations from all three survey rounds have been pooled. More than one observation may be included for an individual in a particular survey round if the individual had more than one wage-paying job.[2]

The dependent variables for the wage regressions are natural logarithms of hourly wage rates. Independent variables include characteristics of the individual (including age, education, marital status, ethnic group, and location of residence), characteristics of the job, and dummies indicating the survey round in which the observation was recorded. Together, these explain 46 percent of the variance in observed male wages and 41 percent of the variance in observed female wages.[3]

The positive coefficient of age and the negative coefficient of age-squared indicate that the age-earnings profile is concave. The age-earnings profile for males who have not attended school peaks at 39 years of age; the corresponding profile for females peaks at 35 years. The profile is considerably steeper for males than for females, and for each sex the steepness increases with education. For persons with 6 years of schooling (approximately the sample average), the age-earnings profile peaks at age 47 for males and does not peak in the range of the data for females.

In our calculations, we have entered years of schooling alone, squared, and in interaction with the person's age and with a dummy indicating whether he or she attended private or religious school.[4] This allows the effect of years of schooling on wages to be nonlinear and to vary with the person's age (to pick up a cohort or appreciation/depreciation effect) and type of schooling. We also include dummies indicating whether (1) the last school attended was private or religious, (2) the person was educated in English, and (3) the person has little or no education (two years or less) but reports that he or she can read. Except for very low levels of education for relatively young people, each additional year of education is associated with a higher wage rate; the higher the level of education, the larger the effect of an additional year of education on wage rates (i.e., the coefficient of the quadratic term is positive). For men 14 years of age, each additional year of public education has a positive effect except the first two years. For men 25 or older, even the first

[1] Observations with wage rates exceeding M$20/hour have been excluded from the estimating sample.

[2] Since there may be several wage observations for a given individual, the t-statistics reported in Table C.1, which have been estimated by ordinary least squares, are biased upwards. However, the coefficient estimates are unbiased.

[3] The unexplained variances are 0.430 for males and 0.464 for females. In adding error variances to the imputed log wages, we drew from normal distributions with these variances (and means of zero). See p. 19 for a description of the technique we used.

[4] We initially considered private and religious schools separately, but their effects were not significantly different.

Table C.1

WAGE REGRESSIONS

Explanatory Variables	Males (n = 3785) Coefficient	t	Females (n = 1912) Coefficient	t
Age, education, and marital status				
Age	.0663	(8.11)	.0215	(2.17)
Age^2	-.000855	(-8.75)	-.000307	(-2.39)
Education	-.0553	(-3.70)	-.126	(-6.01)
Education^2	.00468	(8.04)	.00755	(8.79)
Age x education	.00226	(7.34)	.00411	(7.64)
Private or religious school	.204	(2.76)	.421	(4.15)
Private or religious school x education	-.0118	(-1.24)	-.102	(-7.29)
Educated in English	.178	(4.95)	.237	(3.98)
Little education but literate	.221	(3.95)	-.00428	(-0.06)
Married	.214	(4.80)	.225	(5.31)
Location and ethnic group				
North	-.168	(-4.52)	-.236	(-4.72)
East	-.0499	(-0.88)	-.502	(-5.37)
Central	-.100	(-1.75)	-.0232	(-0.32)
South	-.0812	(-1.57)	-.306	(-4.36)
Metropolitan x Chinese	.346	(6.97)	.0776	(1.24)
Metropolitan x Indian	.182	(2.85)	-.244	(-2.60)
Metropolitan x Malay	.134	(2.34)	-.00446	(-0.05)
Nonmetropolitan x Chinese	.248	(7.21)	.226	(5.14)
Nonmetropolitan x Indian	.00522	(0.12)	.111	(2.05)
Distance to nearest town	.00410	(2.93)	.00385	(1.90)
Characteristics of job				
Distance to work	.204	(8.17)	.252	(6.84)
Received payment in kind	.0494	(1.93)	.115	(3.19)
Full-time employee	.216	(5.76)	.149	(3.35)
Farm	-.148	(-4.24)	-.0990	(-2.09)
Survey Round				
Round 2	-.0303	(-1.02)	-.0708	(-1.74)
Round 3	.0394	(1.30)	-.0641	(-1.56)
Intercept	-2.08	(-12.52)	-1.30	(-6.54)
R^2 (F)	.459	(99.8)	.408	(49.9)

NOTES: Dependent variable is natural logarithm of hourly wage rate. Sample = all full-time and part-time job observations with wages that are positive but less than $20 Malaysian per hour, all three survey rounds pooled. The variables are defined in Table C.2; their means are given in Table C.3.

Table C.2

DEFINITIONS OF VARIABLES IN WAGE REGRESSIONS

LN WAGE	Natural logarithm of the average hourly wage, in Malaysian dollars, received over the 4 months prior to the survey in question for the particular job in question
Age, Education, and Maritel Status	
AGE	Age in years
EDUCATION	Number of years of schooling completed 0 = None 1 = Standard 1 (or equivalent) 2 = Standard 2 . . . 6 = Standard 6 7 = Remove 8 = Form One . . . 12 = Form Five 13 = Lower Form Six 14 = Upper Form Six 15 = University or college—1st year . . . 22 = University or college—8th year
PRIVATE OR RELIGIOUS SCHOOL	Dummy = 1 if last school attended was a private or religious school; 0 otherwise
EDUCATED IN ENGLISH	Dummy = 1 if medium of instruction at last school attended was English
LITTLE EDUCATION BUT LITERATE	Dummy = 1 if the individual reports that he (she) can read and his (her) EDUCATION $\leqslant 2$
MARRIED	Dummy = 1 if individual is currently married
Location and Ethnic Group	
NORTH	Dummy = 1 if individual's state of residence is Perak, Kedah, Perlis, or Penang.

Table C.2—continued

Location and Ethnic Group (continued)	
EAST	Dummy = 1 if individual's state of residence is Kelantan or Trengganu
CENTRAL	Dummy = 1 if individual's state of residence is Pahang or Negri Sembilan
SOUTH	Dummy = 1 if individual's state of residence is Johore or Malacca
METROPOLITAN	Dummy = 1 if individual resides in the Kuala Lumpur (national capital) metropolitan area, the Ipoh metropolitan area, or in the Georgetown (Penang) metropolitan area
CHINESE	Dummy = 1 if the individual is Chinese
INDIAN	Dummy = 1 if the individual is Indian
MALAY	Dummy = 1 if the individual is Malay
DISTANCE TO NEAREST TOWN	Distance (in miles) to the nearest town of population 10,000 or more
Characteristics of Job	
DISTANCE TO WORK	Dummy = 1 if individual's place of work is more than 3 miles from his or her home; 0 otherwise
RECEIVED PAYMENT IN KIND	Dummy = 1 if individual received some wage payments in kind (food, housing, or other) in the 4-month reference period
FULL-TIME EMPLOYEE	Dummy = 1 if individual reports that his or her employment status in the job in question is full-time employee
FARM	Dummy = 1 if the individual's occupation for the job under consideration is farmer, farm worker, or forestry worker
Round	
ROUND 2	Dummy = 1 if the wage observation was reported in the second survey round, which lasted from January 1977 to April 1977
ROUND 3	Dummy = 1 if the wage observation was reported in the third survey round, which lasted from May 1977 to August 1977

two years of public schooling have positive effects. For women 15 years of age, each additional year of public education has a positive effect except the first four years. For women 31 or older, even the first four years of public schooling have positive effects on wages.

Men and women who attended private or religious school receive a considerable wage premium, although their return on additional years of schooling is smaller than that of persons who attended public school. Women receive a premium for attending private or religious school only for the first four years of schooling.

Both men and women receive higher wage rates if they were educated in English. Other things being the same, men (women) educated in English receive wages 19 percent (27 percent) higher than those educated in other languages.

Men with little or no education who are literate receive wages 25 percent higher than those of otherwise similar men who cannot read. However, literacy has no effect on females' wages.

People who were married at the time of the survey received significantly higher wages than people who were single or previously married. This may be because married people have unobservable characteristics that make them more productive workers than otherwise similar individuals who are not currently married or because employers believe that they have such characteristics (i.e., marital status acts as a signal to employers).

For both men and women, wages exhibit considerable geographic variation. Male and female wage rates are higher in the state of Selangor (the omitted category) than in other states. Female wages are lowest in the eastern states of Kelantan and Trengganu. Interestingly, male wages in these eastern states are not significantly lower than those in Selangor.

For each of the three main ethnic groups in Peninsular Malaysia, male wages are higher in metropolitan than in nonmetropolitan areas. However, the opposite is true for women: Female wages for each ethnic group are higher in nonmetropolitan than in metropolitan areas. For men, this metropolitan/nonmetropolitan difference is mitigated, and for women it is exacerbated, by the fact that wages are higher at greater distances from a large town.

Wage rates also vary among the three main ethnic groups of Peninsular Malaysia. Other things being the same, Chinese men and women receive the highest wage rates of the three ethnic groups. Malay men receive the lowest wage rates of the three ethnic groups in both metropolitan and nonmetropolitan areas, although their wage rates are not significantly lower than those of Indian men. Indian women receive the lowest wages of the three ethnic groups in metropolitan areas, while Malay women receive the lowest wages in nonmetropolitan areas.

The farther a person travels to his or her job, the higher the wage he or she receives. It appears that people require a wage premium to compensate for the (time and money) costs of commuting.

Apparently, the types of jobs that offer in-kind benefits also offer higher cash wages, for we find that individuals, especially women, who receive payment in kind earn higher wages in cash than those who do not receive in-kind pay.

Full-time employees receive higher wages than part-timers (24 percent higher for men and 16 percent for women), while persons with farm occupations receive less than otherwise similar nonfarmers.

The coefficients of the round variables indicate that wages were usually slightly

lower in the second and third rounds than in the first. This may be due to seasonality. However, in only one case is a round coefficient significantly different from zero.

For both sexes, the average log wage imputed to the sample of non-wage-earners is significantly lower than the average log wage for job observations reporting wage rates (see Table C.3). For men this is somewhat surprising, since the men to whom we impute wages are quite similar to those whose wages we observe (compare columns 1 and 3 of Table C.3). Non-wage-earning men are only ½ year older, on the average, than wage-earning men, and the two groups are nearly identical in educational attainment. The main difference between the two groups is that non-wage-earners are more likely to be young or to be old (i.e., they exhibit more age variation) and are less likely than wage-earners to be currently married.

The females to whom we impute wage rates are, on the average, older, exhibit more age variation, have slightly less education, are more likely to have attended private or religious school, are less likely to have been educated in English, and are more likely to be married at the time of the survey than women with wage-earning jobs. Also, non-wage-earners are less likely to live in the central region of the country or to be Indians living in a nonmetropolitan area; they are more likely to live in the less modernized eastern part of the country. The educational and locational differences between the two groups appear to be the main reasons for the difference in their average (log) wage rates.

Table C.3

Means and Standard Deviations of Variables in Wage Regressions

Variable Name	Males				Females			
	Job Observations Reporting Wage Rates (Sample for Wage Regression) (n = 3085)[a]		Non-Wage-Earners (Subsample to Whom Wage Rates Imputed) (n = 1510)[b]		Job Observations Reporting Wage Rates (n = 1910)[a]		Non-Wage-Earners (n = 1955)[b]	
Ln wage	-0.0499	(0.888)	-0.236	(0.862)[c]	-0.530	(0.879)	-0.638	(0.819)[c]
Age, education and marital status								
Age	32.8	(11.6)	33.3	(16.4)	29.3	(10.8)	33.4	(15.7)
Age^2	1212.	(833.)	1379.	(1335.)	977.	(732.)	1363.	(1341.)
Education	6.41	(3.98)	6.53	(4.08)	4.80	(4.34)	4.51	(4.16)
Education^2	56.9	(63.7)	60.6	(57.9)	41.9	(58.7)	37.8	(48.2)
Age x education	196.	(137.)	177.	(123.)	119.	(117.)	110.	(104.)
Private or religious school	0.136	(0.343)	0.181	(0.380)	0.089	(0.285)	0.114	(0.317)
Private or religious school x education	0.894	(2.61)	1.22	(2.98)	0.527	(2.12)	0.643	(2.13)
Educated in English	0.236	(0.424)	0.223	(0.411)	0.181	(0.335)	0.134	(0.341)
Little education but literate	0.0622	(0.242)	0.0476	(0.210)	0.0623	(0.242)	0.0353	(0.185)
Married	0.707	(0.455)	0.558	(0.491)	0.546	(0.498)	0.612	(0.487)
Location and ethnic group								
North	0.529	(0.499)	0.564	(0.496)	0.567	(0.496)	0.555	(0.497)
East	0.115	(0.319)	0.116	(0.320)	0.0555	(0.229)	0.125	(0.331)
Central	0.0836	(0.277)	0.0603	(0.238)	0.107	(0.309)	0.0599	(0.237)
South	0.119	(0.324)	0.128	(0.335)	0.127	(0.333)	0.119	(0.324)
Metropolitan x Chinese	0.106	(0.308)	0.126	(0.327)	0.138	(0.345)	0.128	(0.334)
Metropolitan x Indian	0.0470	(0.212)	0.0295	(0.166)	0.0377	(0.191)	0.0333	(0.179)
Metropolitan x Malay	0.0645	(0.245)	0.023	(0.163)	0.0466	(0.211)	0.0445	(0.206)
Nonmetropolitan x Chinese	0.275	(0.447)	0.302	(0.453)	0.337	(0.473)	0.306	(0.461)
Nonmetropolitan x Indian	0.127	(0.333)	0.0767	(0.262)	0.166	(0.373)	0.059	(0.235)
Distance to nearest town	9.12	(10.6)	9.40	(10.3)	8.54	(9.86)	9.01	(10.4)
Characteristics of Job[d]								
Distance to work	0.379	(0.485)	0.354	(0.472)	0.274	(0.446)	0.260	(0.439)
Received Payment In-Kind	0.410	(0.492)	0.382	(0.479)	0.298	(0.458)	0.283	(0.451)
Full-time employee	0.878	(0.327)	0.855	(0.348)	0.828	(0.378)	0.782	(0.413)
Farm	0.165	(0.371)	0.163	(0.365)	0.176	(0.381)	0.177	(0.382)
Round								
Round 2	0.350	(0.477)	0.323[c]	(0.468)	0.347	(0.476)	.329[c]	(0.470)
Round 3	0.329	(0.470)	0.338[c]	(0.473)	0.323	(0.468)	.337[c]	(0.473)

NOTE: Standard deviations are given in parentheses.

[a]This sample includes all observations on wage-paying jobs for all three survey rounds. Multiple observations sometimes occur for a given individual in a given round, as well as observations for different rounds for the same person.

[b]Except for the wage and round variables, the observations here are individuals for whom a wage rate is not reported in any of the three rounds. There is only one observation for each individual.

[c]Here the ...ations are person/round observations for which a wage rate was not reported. The imputed wage rates include the error component added to preser... ...iances.

[d]Since job characteristics are not known for non-wage-earners, we randomly assigned values of these explanatory variables when imputing wages to non-wage-earners. For each variable, we randomly generated 0's and 1's from a Bernoulli distribution with a mean equal to the sex-specific mean for the sample of wage observations reporting wage rates.

Appendix D

RENT REGRESSIONS

Table D.1 presents the rent regression we used to impute to the sample of homeowners the value of living in their own house. The sample consists of all observations on monthly rents paid by renters over the three survey rounds. (The total of 602 observations is fairly evenly spread across the three rounds.[1]) On the average, the renters in the sample are more urbanized and live in higher-quality housing than do the sample of nonrenters to whom housing values are imputed (see the means in Table D.2). Although the nonrenters' dwelling units average 1/3 room more than the renters', the nonrenters' units are considerably less likely to have sturdy outer walls, inside piped water, a flush toilet, a bath and shower, or electricity. Therefore, it is not surprising that the average log rent imputed to nonrenters is significantly smaller than the average log rent paid by renters.

Since the distribution of monthly rents in our data appears to be approximately log normal, we use the natural *logarithm* of the monthly rent payment as our dependent variable in the rent regression.

The explanatory variables consist of characteristics of the dwelling units, indicators of their location, and dummies indicating the survey round in which the observation was recorded. Together, they explain 65 percent of the variance in observed monthly rents.[2]

All of the dwelling unit characteristics considered in Table D.1 add significantly to the rental value of the unit. The rental value is positively related to the number of rooms in the unit—the most statistically significant variable in explaining variation in rents. Rents are 31 percent higher for dwelling units with outer walls of brick, concrete, or stucco than for those with outer walls of less sturdy materials. Modern plumbing also increases rental value; having water piped inside increases a unit's rental value by 20 percent, a bath or shower increases the rental value by 16 percent, and a flush toilet increases the value by 71 percent. Dwelling units with electricity rent for nearly 50 percent more than those without electricity.

For a given set of dwelling unit characteristics, rental values vary considerably by location. Rents in the metropolitan areas of Kuala Lumpur (Selangor), Ipoh (Perak), and Georgetown (Penang) are 71 percent higher than those for similar units in nonmetropolitan areas of those states. Rental values also vary considerably across areas of the country. Nonmetropolitan rents are highest in the northern states of Perlis and Kedah and in the southern states of Malacca and Johore.[3] Rents in these states are around 65 percent higher than those in the eastern states of

[1] Often there are multiple observations (for different rounds) for the same dwelling unit. Since we do not use a generalized least-squares procedure, the t-ratios in Table D.1 are biased upward, but the coefficients are unbiased.

[2] The unexplained variance is 0.388. In adding error variance to imputed log rents, we drew from a normal distribution with mean 0 and variance 0.388.

[3] The omitted category is the state of Penang and Province Wellesley. Since much of this state is metropolitan (which is already controlled for through the metropolitan dummy), the state coefficients show how rental values in nonmetropolitan areas of those states compare with the relatively few observations for nonmetropolitan areas of Penang and Province Wellesley.

Table D.1

RENT REGRESSIONS

Explanatory Variable	Coefficient	t-ratio
Characteristics of dwelling unit		
Number of rooms	.286	(11.3)
Brick or concrete walls	.272	(3.71)
Inside piped water	.179	(1.72)
Toilet	.535	(7.12)
Bath or shower	.152	(1.93)
Electricity	.389	(4.83)
Location		
Metropolitan	.534	(6.68)
State:		
Perlis or Kedah	.831	(7.25)
Kelantan, Trengganu, or Pahang	.279	(1.83)
Perak, Selangor, or Negri Sembilan	.380	(4.42)
Malacca or Johore	.833	(6.02)
Distance to nearest town (miles)	.016	(-4.49)
Round		
Round 2	-.113	(-1.22)
Round 3	-.159	(-1.46)
Intercept	1.73	(14.0)
R^2 (F)	.650	(78.0)

NOTES: Dependent variable = natural logarithm of monthly rent payment. Sample = rents paid by renters, all three survey rounds pooled.

Table D.2 defines the variables and presents their means and standard deviations.

Kelantan, Trengganu, and Pahang or in Negri Sembilan or nonmetropolitan areas of Perak or Selangor.[4]

The last location variable controls for distance to the nearest town with a population of 10,000 or more. Each mile of distance from such a town is associated with a 1.6 percent reduction in rental values. A dwelling unit 6½ miles from a town (the mean distance for the sample of renters) rents for 16 percent less than a similar unit in a town. A unit 35 miles from a town (the sample maximum) rents for 56 percent less than a similar unit in a town.

The last two variables control for the survey round in which the rental value was reported. The negative signs of the round coefficients are puzzling (although we also estimated negative round coefficients in the wage equations), though neither is significantly different from zero.

[4] To compare rental values on dwelling units in Kuala Lumpur and Ipoh with those in rural Penang, we add the metropolitan coefficient to the Selangor and Perak coefficient. We find that rents in these cities are around 2½ times higher than rents for comparable units in rural Penang. This number is a lower bound, since units in Kuala Lumpur and Ipoh are in large cities, while those in rural Penang must be adjusted downward to account for the negative effect of distance to the nearest town.

Table D.2

Definitions, Means, and Standard Deviations of Variables in Rent Regressions

Variable Name	Definition	Mean: Renters (n = 602)[a]	Mean: Nonrenters (n = 1754)
Rent	Natural logarithm of the monthly rent (in M$) of the dwelling unit	3.72 (1.04)	3.36 (1.17)[b]
Characteristics of dwelling unit			
Number of rooms	Number of rooms in the dwelling unit	2.71 (1.11)	3.05 (1.36)
Brick or concrete walls	Dummy = 1 if dwelling unit has outer walls of brick, concrete, or stucco	0.56 (0.50)	0.30 (0.46)
Inside piped water	Dummy = 1 if water is piped into the dwelling unit	0.52 (0.48)	0.36 (0.48)
Toilet	Dummy = 1 if dwelling unit has a flush toilet	0.42 (0.49)	0.19 (0.39)
Bath or shower	Dummy = 1 if dwelling unit contains a long bath or shower	0.17 (0.38)	0.095 (0.29)
Electricity	Dummy = 1 if dwelling unit has electricity	0.84 (0.37)	0.54 (0.50)
Location			
Metropolitan	Dummy = 1 if dwelling unit is in the Kuala Lumpur (national capital), Ipoh, or Penang metropolitan area	0.32 (0.47)	0.15 (0.36)
State:			
Perlis or Kedah		0.13 (0.34)	0.19 (0.40)
Kelantan, Trengganu, or Pahang		0.051 (0.22)	0.17 (0.37)
Perak, Selangor, or Negri Sembilan		0.59 (0.49)	0.36 (0.48)
Malacca or Johore		0.078 (0.27)	0.15 (0.36)
Distance to nearest town	Distance (in miles) to nearest town of population 10,000 or more	6.49 (8.92)	10.59 (10.28)
Round			
Round 2		0.33 (0.47)	0.33 (0.47)
Round 3		0.32 (0.47)	0.31 (0.46)

NOTE: Standard deviations are given in parentheses.

[a]The sample used to estimate the rent regression presented in Table D.1.

[b]The imputed log rents include the error component added to preserve variance.

Appendix E

THE RELATIVE VALUE OF HOUSEWORK: A COMPARISON OF OUR RESULTS WITH EARLIER STUDIES

Numerous attempts have been made to estimate the value of the services produced in the home. Since the pioneering work of Nordhaus and Tobin (1972), the literature concerning what has become known as "the economic value of a housewife"[1] has expanded rapidly, and a variety of estimation methodologies have been suggested and debated. In this appendix, we consider only those studies that employ procedures similar to our own, i.e., studies that use the *opportunity-cost-of-time approach* to value time spent in housework activities. Four recent studies (Adler and Hawrylyshyn (1976), Murphy (1978), Gronau (1976), Evenson and Quizon (1977)) and three earlier studies (Sirageldin (1964), Nordhaus and Tobin (1972), and Weinrobe (1973))[2] serve as benchmarks for comparison with our results.

The first eight entries in Table E.1 are taken from studies that report their results in terms of the aggregate value of household work as a fraction of GNP, whereas the last three entries refer to the ratio of value of housework to market income. To render the first eight estimates comparable with the last three, we have assumed that (1) our market income composite is a reasonable empirical approximation to the national accountant's definition of personal income,[3] and (2) the ratio of personal income to GNP for the countries covered by these other studies is .83.[4] Using these two assumptions, we have adjusted the results of the studies represented by the first eight entries in Table E.1 so that the estimates presented are for the ratio of household work to personal income.

Table E.1 compares the results of other studies with our own. Our estimate of the relative value of household work in Malaysia (38.5 percent) falls considerably short of the estimates for the United States and Canada (45.5 percent).[5] If one takes Canada and the United States as representative of the more developed, wealthier nations in the world and Malaysia as a representative LDC, these results suggest that international comparisons of levels of household work-inclusive income would

[1] This label is somewhat misleading, because many of the studies do not restrict their valuation of housework activities to those performed by the wife, but also consider the contributions of other household members.

[2] These last three studies were analyzed in an excellent review article by Hawrylyshyn (1976), who made adjustments to the original results which allow comparability to the results of this study.

[3] If anything, market income understates personal income (because personal income includes some types of transfer and in-kind income), so that the ratio of household work to market income is an upper-bound estimate of the ratio of household work to personal income.

[4] This fraction is the ratio of personal income to GNP for the United States for 1970 *(Survey of Current Business)*.

[5] However, if we had included the value of cottage-industry income, a component of negligible importance in developed countries, in our household work figure, our ratio of household work to market income would be very close to the average for the U.S. and Canadian studies—44.6 percent.

The fact that our estimate of the value of household work is no larger relative to market or personal income than ratios for other countries suggests that our estimates of time devoted to cooking and childcare are probably not seriously biased upward.

Table E.1

COMPARISON OF ESTIMATES OF THE VALUE OF HOUSEHOLD WORK RELATIVE TO PERSONAL INCOME

Date to Which Data Refer	Author(s)	Country	Estimated Value of HW/PI (%)
1929	Nordhaus-Tobin	United States	43.4[a]
1960	Murphy	United States	45.3
1961	Adler-Hawrylyshyn	Canada	48.2
1964	Sirageldin	United States	38.6[a]
1965	Nordhaus-Tobin	United States	41.0[a]
1970	Murphy	United States	44.7
1971	Adler-Hawrylyshyn	Canada	52.5
1973	Weinrobe	United States	47.0[a]
1974	Gronau	United States	48.6[b,c]
1975	Evenson-Quizon	Philippines	104.0[b,d]
1976-77	Kusnic-DaVanzo	Malaysia	38.5[b]

[a]Entries are based on adjusted estimates reported in Hawrylyshyn (1976)..

[b]The denominator is Market Income rather than Personal Income, which for the first eight studies listed is defined as 0.83 x GNP.

[c]Gronau counts only housework activities performed by the wife.

[d]Evenson-Quizon include housework activities performed by children also; 34.3 percent of their total value of housework is due to children, but we cannot determine how much of this is due to those under age 15.

generate greater differentials between MDCs and LDCs than would comparisons based on the more traditional personal income measure of welfare. Of course, the comparisons represented in Table E.1 are based on some rather crude approximations, so any conclusions derived from them should be considered tentative at best.

Studies by Gronau (1976) and Evenson and Quizon (1977) use a somewhat different procedure to estimate the value of household work. The opportunity-cost-of-time approach used in all but these two studies estimates the value of household work by estimating the marginal value of time and multiplying that value by the total number of hours spent in household work activities. The procedure used by Gronau and Evenson and Quizon explicitly acknowledges that the estimate resulting from the opportunity-cost-of-time approach, if done correctly, will understate the total value of household work to the extent that there is diminishing marginal productivity of time spent in household work activities. Their procedure, suggested by Gronau, attempts to correct for this understatement.[6] Obviously, to the extent that this is successful, their estimates of household work and the ratio of household work to personal income should be higher than ours. In fact, this is exactly what

[6] This involves estimating a demand function for home time, interpreting it as a marginal productivity function, and then deriving total product by integrating this function.

we find: Gronau estimates a ratio of 48.6 percent using U.S. data, and Evenson and Quizon estimate 104 percent using Philippine data.[7] Two tentative conclusions can be drawn from the comparison of their results with ours: (1) The opportunity-cost-of-time procedure may significantly understate the value of household work, and (2) the degree of understatement may be greater for LDCs than for MDCs. This latter point could prove to be important for international comparisons of welfare, potentially reversing the conclusion we drew from the other studies listed in Table E.1. In any event, firmer conclusions concerning these issues must await further theoretical and empirical investigation into the nature of the household's economic activity.

[7] However, as noted in the notes to Table E.1, the Evenson and Quizon estimate includes housework activities of all the households' children, whereas our estimate includes activities only of household members 15 years of age or older.

Appendix F

THE GINI RATIO AND THE THEIL INDEX

This Appendix provides additional information on two of the measures of inequality used in the text, the Gini ratio and the Theil index.

THE GINI RATIO

The Gini ratio is a measure closely related to the Lorenz curve. It can be defined in terms of the Lorenz curve or in terms of the relative mean difference. In terms of the former, the definition is as follows, assuming the Lorenz curve is linear between two adjacent observations:

$$G_L = 1 - \sum_{i=1}^{K-1} (f_{i+1} - f_i)(y_i + y_{i+1}) \tag{1}$$

where f_i is the relative cumulative frequency of occurrence of the ith group, y_i is the relative income share of the ith group, and K is the number of groups.

In terms of the relative mean difference, we define it as follows:

$$G_L = \frac{1}{2} \text{ (relative mean difference)}$$

$$= \left(\frac{1}{2n^2\mu}\right) \sum_{i=1}^{n} \sum_{j=1}^{n} (y_i - y_j)$$

$$= 1 - \left(\frac{1}{n^2\mu}\right) \sum_{i=1}^{n} \sum_{j=1}^{n} \min (y_i, y_j) \tag{2}$$

$$= 1 + \frac{1}{n} - \left(\frac{2}{n^2\mu}\right) (y_1 + 2y_2 + \ldots + ny_n)$$

$$y_1 \geqslant y_2 \geqslant \ldots \geqslant y_n$$

This last expression was used for the actual calculation of the Gini ratios in the text.

THEIL'S ENTROPY INDEX OF INEQUALITY

The Theil index is defined as

$$T(y) = \sum_{i=1}^{N} y_i \ln(N \cdot y_i) \tag{3}$$

where $0 \leq T(y) \leq \ln(N)$ and y_i is the income share of the ith population unit. One can easily transform T(y) into a measure that varies between 0 and 1, like the Gini ratio, by dividing by ln(N), but by doing so, one loses the decompositional properties discussed below.

One of the advantages of the Theil index is the fact that it can be decomposed into within-group and between-group components. This is very useful if one is trying to characterize a population that is known to be rather heterogeneous with respect to social and demographic characteristics, as is the case in Malaysia.

Two forms of disaggregation were used in the calculation of the results presented in the text. The first estimates the contribution to between-group inequality of each characteristic separately and an implied interaction between the two characteristics. The second nets the effect of one characteristic and estimates the residual contribution to between-group inequality due to the second characteristic. We shall clarify these statements via an algebraic decomposition based on the two characteristics of interest in the text. Let the following convention for subscripting hold:

i = ith household
j = jth ethnic group
k = kth geographic group

Further, let X be the population share of the subgroup, as a fraction of total population, and Y be the income share of the subgroup. In addition, for the income and population share variables, lower-case letters will refer to household-level groups, and upper-case letters will refer to larger population subgroups.

We can now write total between-group inequality for the joint ethnic and geographic subsetting of the population as

$$I_{jk} = \sum_j Y_j \ell n \left(\frac{Y_j}{X_j}\right) + \sum_k Y_k \ell n \left(\frac{Y_k}{X_k}\right) + \left[\sum_j \sum_k Y_{jk} \ell n \left(\frac{Y_{jk}}{X_{jk}}\right) - \sum Y_j \ell n \left(\frac{Y_j}{X_j}\right) - \sum_k Y_k \ell n \left(\frac{Y_k}{X_k}\right)\right] \tag{4}$$

The first two terms in Expression (4) represent the separate contributions of ethnic (j) and geographic (k) differentials to overall between-group inequality. The third term, in parentheses, measures the interaction between the ethnic and geographic effects.

The alternative way to decompose this between-group contribution can be seen by writing total inequality as follows:

$$I_{ijk} = \sum_j Y_j \ln\left(\frac{Y_j}{X_j}\right) + \sum_j Y_j \left[\sum_k \frac{Y_{jk}}{Y_j} \ln\left(\frac{Y_{jk}/Y_j}{X_{jk}/X_j}\right)\right] + \sum_j \sum_k \frac{Y_{jk}}{Y_j} \left[\sum_i \frac{Y_{ijk}}{Y_{jk}} \ln \frac{Y_{ijk}/Y_{jk}}{X_{ijk}/X_{jk}}\right] \quad (5)$$

The first term in Expression (5) represents the total contribution to between-group inequality resulting from ethnic income differentials. The second term is the residual contribution to between-group inequality due to geographic differentials *after* the contribution of ethnic inequality has been netted out. The sum of the first two terms in Expression (5) is equal to total between-group inequality, i.e., I_{jk} in Expression (4). Finally, the last term in (5), i.e., the difference between (5) and (4), represents the contribution to overall inequality due to within-group income differentials.

Appendix G

AN INTERPRETIVE STATISTIC ASSOCIATED WITH THE RANK CORRELATION COEFFICIENT

The Spearman rank correlation coefficient is the Pearson simple correlation coefficient with the observations constrained to be integers (ranks) running from 1 to N. The simple correlation, ρ_{12}, between variables X_1 and X_2 is defined as

$$P_{12} = \sigma_{12}/\sigma_1\sigma_2 \tag{G.1}$$

$$= \frac{E((X_{1i} - \bar{X}_1)(X_{2i} - \bar{X}_2))}{\sqrt{E(X_{1i} - \bar{X}_1)^2 E(X_{2i} - \bar{X}_2)^2}}$$

Taking account of the integer restriction, this translates into the rank correlation coefficient:

$$r_{12} = 1 - \left(\frac{6 \sum_{i=1}^{n} (X_{1i} - X_{2i})^2}{n(n^2 - 1)} \right) \tag{G.2}$$

If we normalize the ranks to the unit interval, i.e., substitute auxiliary variables $Z_{1i} = (X_{1i}/n)$ and $Z_{2i} = (X_{2i}/n)$, we can rewrite Eq. (G.2) as

$$r_{12} = 1 - \left(\frac{n^2}{n^2 - 1} \right) \left(\frac{6 \sum_{i=1}^{n} (Z_{1i} - Z_{2i})^2}{n} \right) \tag{G.3}$$

Rearranging and solving for the mean squared percentile change in rank, ϕ^2, and noting that the factor $(n^2/(n^2-1))$ is an inessential correction, we have

$$\phi^2 = \frac{1}{n} \sum_{i=1}^{n} (Z_{1i} - Z_{2i})^2 \tag{G.4}$$

$$\simeq \frac{1}{6} (1 - r_{12})$$

It is the square root of ϕ^2 to which we refer in the body of the text as the average absolute percentile change in ranking.

Appendix H

ADDITIONAL TABLES

Table H.1

Unemployment Rates for Sex, Ethnic, and Rural/Urban Subgroups

Item	Total	Malay	Chinese	Indian
Male Heads of Household				
Total	5.6 (n = 963)	3.6 (n = 498)	9.3 (n = 350)	3.5 (n = 115)
Rural	4.5 (n = 553)	2.7 (n = 374)	9.5 (n = 123)	4.7 (n = 56)
Urban	7.2 (n = 410)	6.0 (n = 124)	9.1 (n = 227)	2.4 (n = 59)
Female Heads of Household				
Total	1.4 (n = 1064)	0.9 (n = 539)	1.9 (n = 405)	2.5 (n = 120)
Rural	0.6 (n = 620)	0.5 (n = 414)	1.4 (n = 147)	0.0 (n = 59)
Urban	2.6 (n = 444)	2.4 (n = 125)	2.5 (n = 258)	4.9 (n = 61)

NOTE: Calculations are from time budget information in the Malaysian Family Life Survey.

Table H.2

Correlations Among Income Components

	Labor	Business	Capital	Transfer	Home	In-kind	Cottage	Housework	Childcare and Cooking
				Total Sample (n= 1064)					
Labor	1.000	.462	.128	- .039	.322	.104	- .065	.327	.281
Business		1.000	.076	.002	.209	.073	- .047	.051	.078
Capital			1.000	.004	.106	.227	.018	.119	.114
Transfer				1.000	.003	.143	- .033	- .106	- .097
Home					1.000	.040	- .017	.024	.038
In-kind						1.000	.001	.047	.017
Cottage							1.000	.170	.010
Housework								1.000	.559
Childcare and cooking									1.000
				Malay Households (n = 539)					
Labor	1.000	.184	.076	- .166	.116	.040	.023	.421	.372
Business		1.000	.049	.005	.113	.032	- .032	.055	.012
Capital			1.000	- .048	.013	.031	- .019	.011	.095
Transfer				1.000	.195	- .033	- .043	- .291	- .259
Home					1.000	.057	- .006	- .008	- .066
In-kind						1.000	- .018	- .001	- .017
Cottage							1.000	.244	.104
Housework								1.000	.626
Childcare and cooking									1.000
				Chinese Households (n = 405)					
Labor	1.000	.526	.159	- .029	.294	.176	.047	.318	.201
Business	.526	1.000	.087	- .010	.201	.109	- .009	.073	.079
Capital	.159	.087	1.000	.017	.154	.505	.138	.234	.117
Transfer				1.000	- .025	.277	- .031	- .054	- .070
Home					1.000	.029	.141	.010	- .005
In-kind						1.000	.068	.145	.061
Cottage							1.000	.165	.100
Housework								1.000	.502
Childcare and cooking									1.000
				Indian Households (n = 120)					
Labor	1.000	.535	.213	- .362	.476	.268	- .092	.330	.283
Business		1.000	.019	- .397	.287	.291	- .051	.136	.178
Capital			1.000	- .249	- .030	- .038	.088	.358	.563
Transfer				1.000	- .133	- .052	.284	- .317	- .381
Home					1.000	.264	- .069	.164	.193
In-kind						1.000	- .062	.037	.017
Cottage							1.000	.034	- .134
Housework								1.000	.678
Childcare and cooking									1.000

Table H.2--continued

Rural Households (n = 620)								
Labor	1.000	.435	.086	.034	.123	.289	.012	.326	.349
Business		1.000	.053	.128	.181	.286	- .043	.030	.038
Capital			1.000	.022	.035	.442	- .009	.086	.006
Transfer				1.000	.124	.281	- .055	- .076	- .060
Home					1.000	.093	- .015	- .009	- .037
In-kind						1.000	.020	.124	.042
Cottage							1.000	.293	.073
Housework								1.000	.583
Childcare and cooking									1.000
Urban Households (n = 444)								
Labor	1.000	.462	.239	- .055	.305	.044	.045	.324	.205
Business		1.000	.135	- .030	.197	.010	- .021	.048	.068
Capital			1.000	- .017	.221	.012	.160	.198	.286
Transfer				1.000	- .017	.082	- .034	- .119	- .110
Home					1.000	.025	.106	.011	.221
In-kind						1.000	- .007	.004	- .001
Cottage							1.000	.122	.085
Housework								1.000	.543
Childcare and cooking									1.000

Table H.3

Lorenz Curve Points for Income Composites (Total Sample)

Composite	10%	20%	30%	40%	50%	60%	70%	80%	90%
Points for Household Income Composites									
Market income	.583	2.28	4.86	8.25	12.4	17.7	24.4	33.9	49.2
Total observable income	1.10	3.34	6.37	10.3	15.1	20.9	28.3	38.1	53.5
Total actual income I	1.64	4.48	8.09	12.6	17.9	24.2	32.0	42.0	57.1
Total actual income II	1.98	5.24	9.26	14.2	20.0	26.7	34.9	45.3	60.3
Standardized observable income	.861	3.06	6.10	10.0	14.8	20.8	28.3	38.4	53.6
Standardized actual income I	1.23	3.74	7.08	11.3	16.5	22.8	30.8	41.2	56.9
Standardized actual income II	1.56	4.35	7.95	12.5	18.0	24.7	33.0	43.7	59.6
Income standardized at U.S. full-time hours	1.31	3.90	7.32	11.7	16.9	23.4	31.4	42.0	57.7
Income standardized at Malaysian full-time hours	1.44	4.14	7.65	12.1	17.5	24.1	32.3	42.9	58.8
Maximal standardized income	2.18	5.57	9.83	15.1	21.3	28.7	37.8	49.2	65.4
Points for Per Adult Incomes of Households									
Market income	.705	2.56	5.20	8.67	13.0	18.2	24.9	33.9	48.6
Total observable income	1.35	3.88	7.10	11.1	15.8	21.5	28.8	38.2	53.3
Total actual income I	1.90	4.90	8.66	13.2	18.5	24.7	32.4	42.1	57.3
Total actual income II	2.10	5.40	9.48	14.5	20.2	26.9	35.0	45.1	60.4
Standardized observable income	1.07	3.66	7.08	11.3	16.4	22.3	29.4	38.6	53.1
Standardized actual income I	1.55	4.55	8.38	13.0	18.4	24.7	32.2	41.7	56.4
Standardized actual income II	2.04	5.41	9.56	14.5	20.2	26.8	34.7	44.4	59.3
Income standardized at U.S. full-time hours	1.67	4.77	8.69	13.4	18.9	25.3	32.9	42.5	57.3
Income standardized at Malaysian full-time hours	1.86	5.11	9.15	14.0	19.6	26.1	33.9	43.5	58.4
Maximal standardized income	3.05	7.27	12.2	17.9	24.3	31.7	40.3	50.8	65.5
Points for Per Capita Incomes of Individuals									
Market income	0.8	2.6	5.2	8.6	12.9	18.2	25.1	34.7	49.7
Total observable income	1.2	3.6	6.7	10.6	15.4	21.1	28.6	38.8	54.0
Total actual income I	1.8	4.6	8.3	12.7	17.9	24.2	32.0	42.3	57.3
Total actual income II	2.2	5.3	9.3	14.2	19.8	26.6	34.8	45.4	60.1
Standardized observable income	1.1	3.5	6.6	10.6	15.5	21.6	29.3	39.3	54.3
Standardized actual income I	1.5	4.2	7.7	12.1	17.4	23.9	31.9	42.4	57.4
Standardized actual income II	1.8	4.8	8.7	13.4	19.1	25.8	34.2	44.9	60.1
Income standardized at U.S. full-time hours	1.6	4.4	8.0	12.5	17.9	24.5	32.6	43.1	58.2
Income standardized at Malaysian full-time hours	1.7	4.6	8.4	13.0	18.5	25.2	33.5	44.1	59.3
Maximal standardized income	2.5	6.2	10.8	16.3	22.7	30.3	39.3	50.6	65.7

Table H.4

Means and Standard Deviations of Explanatory Variables in Income Regressions in Sec. VI

Variable	Household-Level Regression		Individual-Level Regression	
	Mean	Std. Dev.	Mean	Std. Dev.
Household age	36.8	8.79	37.3	8.63
Household age^2	1430.5	660.6	1468.0	652.8
Education of male head	4.99	3.97	4.90	3.85
Education of female head	3.62	3.61	3.44	3.52
Education interaction	26.9	43.5	24.9	41.4
Number of other adults ($\geq$ age 15)	1.48	1.67	1.93	2.00
Number of persons $\leq$ age 14	3.18	1.95	3.79	2.13
Husband not present dummy	.095	.293	.083	.276
Urban dummy	.417	.493	.425	.494
Chinese dummy	.381	.486	.402	.490
Indian dummy	.113	.316	.119	.323

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