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# A Welfare Economic Approach to Growth and Distribution in the Dual Economy

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# A Welfare Economic Approach to Growth and Distribution in the Dual Economy

## Abstract

Excerpt] This paper presents a welfare economic analysis of the distributional consequences of growth, a problem that has attracted much attention from development economists of late. We shall explore the similarities and differences between the absolute income and poverty and relative inequality approaches for a general dualistic development model and for three stylized special cases. It will be shown that these approaches are not always in agreement and, more disturbingly, that the most notable discrepancy is found in the most relevant stylized model—growth via the transfer of population from a backward to an enlarging advanced sector. The fact of these discrepancies raises the important question of how to measure changing income distribution in a manner consistent with the judgments we wish to make about the alleviation of absolute poverty and changes in relative income inequality. A general welfare function is formulated to address these issues. Recent controversies over who received the benefits of growth in two less developed countries—Brazil and India—are examined in these terms.

## Keywords

dual economy, income growth, income distribution, welfare economic analysis, poverty

## Disciplines

Growth and Development | Income Distribution | Labor Economics | Labor Relations

## Comments

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A Welfare Economic Approach to Growth and  
Distribution in the Dual Economy

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## I. Introduction

This paper presents a welfare economic analysis of the distributional consequences of growth, a problem that has attracted much attention from development economists of late. We shall explore the similarities and differences between the absolute income and poverty and relative inequality approaches for a general dualistic development model and for three stylized special cases. It will be shown that these approaches are not always in agreement and, more disturbingly, that the most notable discrepancy is found in the most relevant stylized model—growth via the transfer of population from a backward to an enlarging advanced sector. The fact of these discrepancies raises the important question of how to measure changing income distribution in a manner consistent with the judgments we wish to make about the alleviation of absolute poverty and changes in relative income inequality. A general welfare function is formulated to address these issues. Recent controversies over who received the benefits of growth in two less developed countries—Brazil and India—are examined in these terms.

A review of the literature reveals that the poor in less developed countries are generally at least as well off in absolute income terms; in many countries, their absolute economic position is demonstrably improved.<sup>1</sup> Still the pace of improvement in economic position of the poor is

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<sup>1</sup> In some countries economic growth has been accompanied by declining relative income inequality, and hence alleviation of absolute poverty; see the studies by Fei, Ranis, and Kuo [1978] for Taiwan, and Ayub [1976] for Pakistan. In other countries relative income inequality did not improve, but the overall income growth was large enough to raise the position of the poor as well; this may be inferred from data contained in the studies of Argentina, Mexico, and Puerto Rico by Weisskoff [1970]; of Brazil by Fishlow [1972]; and of Colombia by Berry and Urrutia [1976]. Bardhan's [1974] country study of India is the one case I have seen where absolute poverty has been shown to increase in severity over time; undoubtedly other "fourth world countries" share a similar plight.

disappointingly slow, even in the rapidly growing countries.<sup>2</sup> This may be because the rules of distribution channel development resources to the middle and upper income groups. Nearly everywhere, the wages received by upper level workers (the skilled, government employees, etc.) have risen in real terms. These wage increases are larger in absolute terms than those received by lower level workers (the unskilled, self-employed, etc.).<sup>3</sup>

How are we to evaluate these various events? We turn now to an analysis of some of the approaches that have been suggested.

## II. Absolute and Relative Approaches for Evaluating Growth and Distribution

Economists are used to regarding social welfare as a positive function of the income levels of the  $n$  individuals or families in society before and after development takes place. In empirical studies the general social welfare function,

$$W = W(Y_1, Y_2, \dots, Y_n), \quad W_1, W_2, \dots, W_n > 0,$$

is too general to be useful, and the Pareto criterion,

$$W^A(Y_1^A, Y_2^A, \dots, Y_n^A) > W^B(Y_1^B, Y_2^B, \dots, Y_n^B)$$

if  $Y_i^A \geq Y_i^B$  for all  $i$  and  $Y_i^A > Y_i^B$  for some  $i$  is too stringent.

For analytical ease the information contained in the income vector  $(Y_1, Y_2, \dots, Y_n)$  is usually collapsed into one or more aggregative measures. The three classes of measures in most common

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<sup>2</sup> For instance, Fishlow [1972] demonstrates that given the existing pattern of income distribution in Brazil, the economy would have to grow at a rate of 5 percent per year for twenty years before the poor would attain incomes of \$100 per capita.

<sup>3</sup> These conclusions are drawn from Berg [1969]. He also presents evidence that while skilled-unskilled wage differences widened, skilled-unskilled wage ratios have generally narrowed.

use are total income ( $Y$ ) or its per capita equivalent, indices of relative inequality ( $I$ ), and measures of absolute poverty ( $P$ ).

The customary approach to studies of distribution and development is to posit (explicitly or implicitly) a social welfare function containing an index of relative inequality as one of its arguments:

$$W = f(Y, I), \quad f_1 > 0, \quad f_2 < 0,$$

where  $Y$  is total income and  $I$  is an indicator of inequality in its distribution. In what follows, this type of welfare judgment will be termed the “relative inequality approach.” Theoretical support for this approach may be found in the welfare economics literature in the writings of Sheshinski [1972] and Sen [1976B]. In the study of distribution and development, the relative inequality approach is best exemplified in the Nobel Prize winning work of Professor Kuznets [1955, 1963]. Income distribution is said to have “improved” or “worsened” according to Lorenz domination (i.e., whether one Lorenz curve lies wholly above or below a previous one ( $L$ )) or according to one or more measures of relative inequality, such as the income share of the poorest 40 percent ( $S$ ) or the Gini coefficient ( $G$ ). Thus, relative inequality studies typically make one or more of the following judgments:

$$(a) \quad W = f(Y, L), \quad f_1 > 0, \quad f_2 > 0,$$

$$(b) \quad W = f(Y, S), \quad f_1 > 0, \quad f_2 > 0,$$

$$(c) \quad W = f(Y, G), \quad f_1 > 0, \quad f_2 < 0.$$

A great many studies have made use of this framework. Some of the most influential recent contributions, which include extensive surveys and bibliographies of prior research studies, are those of Cline [1975], Chenery *et al.* [1974], and Adelman and Morris [1973].

As an alternative to the relative inequality approach, some writers have examined the income distribution itself, assigning a lower social welfare weight to income gains of the relatively well-off as compared with those of the poor. With no loss of generality we may order the  $n$  income recipient units from lowest to highest. The general class of studies that treats social welfare in the form,

$$W = g(Y_1, Y_2, \dots, Y_n), \quad g_i > g_j \forall i < j,$$

shall be termed the “absolute income approach.” In the development literature, the studies of Little and Mirrlees [1969], Atkinson [1970], and Stern [1972] are notable examples. As an extreme version of (5), Rawls [1971] has proposed the maximin principle, i.e., maximizing the income of the worst-off person in the economy:

$$W = g(Y_1), \quad g' > 0.$$

Finally, for some purposes, we may wish to define a poverty line  $P^*$  and concentrate our attention on the group in poverty to the exclusion of the rest of the income distribution. This practice, termed the “absolute poverty approach,” is common in studies of growth in the United States; see, for example, Bowman [1973] or Perlman [1976]. Denoting the extent of poverty by  $P$ , absolute poverty studies hold that

$$W = h(P), \quad h' > 0.$$

Usual measures of poverty are the number of individuals or families whose incomes are below that line or the gap between the poverty line and the average among the poor. In a recent paper Sen [1976A] combines these and argues elegantly for the use of an index  $\pi = H[\bar{I} + (1 - \bar{I})G_P]$ , where  $H$  is the head-count of the poor,  $\bar{I}$  is the average income shortfall of the poor, and  $G_P$  is the Gini coefficient of income inequality among the poor. Thus, alternative forms of the absolute poverty approach are given by

$$\begin{aligned}
 \text{(a) } W &= h(H), & h' &> 0, \\
 \text{(b) } W &= h(\bar{I}), & h' &> 0, \\
 \text{(c) } W &= h(\pi) = h[H[\bar{I} + (1 - \bar{I})G_P]] & h' &> 0.
 \end{aligned}$$

It is not necessary that the relative and absolute approaches be regarded as mutually exclusive. In the following section we formulate a more general welfare function combining these various approaches.

### III. A General Welfare Approach for Assessing Dualistic Development

The various welfare approaches of Section II were originated largely in a static context. However, since the distribution of benefits in the course of economic development refers to a phenomenon that takes place over time, it is appropriately measured by a dynamic index. It is important, therefore, to establish a suitably dynamic measure. We now posit a dualistic development model, a general welfare function, and a number of properties of this welfare function that are desirable for the purpose of evaluating economic development in the dual economy.

At the forefront of studies of modern economic growth are the dualistic development models of Lewis [1954], Fei and Ranis [1964], and Jorgenson [1961]. While these models differ one from another in a number of important respects, they have in common the division of the economy into a relatively advanced sector and a relatively backward sector, which we shall call “modern” and “traditional,” respectively. As with all dualistic models the working assumption is that the members of each sector are relatively similar to others in that sector and relatively different from those in the other sector. We shall regard the modern sector as synonymous with

high wages and the traditional sector as synonymous with low wages. “Wage” and “income” will be used interchangeably.<sup>4</sup>

In the two sectors workers receive wage rates  $W^m$  and  $W^t$  respectively.<sup>5</sup>  $W^m > P^* > W^t$ , where  $P^*$  is an agreed-upon absolute poverty line that is constant over time (except for allowing for price changes). The shares of the labor force in the two sectors are  $f^m$  and  $f^t$ , respectively; the total economically active population  $f^m + f^t$  is normalized at 1. Economic development consists of changes in  $W^t$ ,  $f^m$ , and  $f^t$ .

Suppose that we now want to implement a welfare function of the form,

$$W = W(Y, I, P),$$

which includes both absolute and relative considerations in the dualistic development model.

Total income ( $Y$ ) is given by

$$Y = Y^m + Y^t = W^m f^m + W^t f^t.$$

Whichever measure of relative inequality ( $I$ ) one chooses is functionally related to the distribution of the labor force between the two sectors and to the intersectoral wage structure:

$$I = I(W^m, f^m, W^t, f^t).$$

The poverty index ( $P$ ) depends on the wage in the traditional sector and the share of the population in that sector:

$$P = P(W^t, f^t)$$

Substituting (9)-(11) into (8), we have

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<sup>4</sup> This is not to downplay the importance of capital and other sources of income and wealth in determining economic position. Rather, since most people in less developed countries receive most or all of their income from the work they do, and since variation in labor income is the most important source of overall income inequality, a high-wage-sector-low-wage-sector dichotomy would appear more relevant than any other dualistic classification.

<sup>5</sup> The assumption of identical wages for all workers within a given sector is simply for algebraic and diagrammatic convenience and is not necessary for any of the results above. Intrasectoral wage diversity is allowed for in a model in an Appendix that is available from the author upon request.

$$W = W(W^m f^m + W^t f^t, I(W^m, f^m, W^t, f^t), P(W^t, f^t)),$$

which we term the “general welfare approach.”

We must now specify the relationship between  $W$  and its various arguments. In line with the considerations discussed in Section II, it is desirable to posit

$$\frac{\partial W}{\partial Y} > 0,$$

$$\frac{\partial W}{\partial I} < 0,$$

$$\frac{\partial W}{\partial P} < 0.$$

Condition (A) relies for its validity on the assumption that the basic goal of an economic system is to maximize the output of goods and services received by each of its members. We should be clear that acceptance of the judgment  $\partial W/\partial Y > 0$  does *not* require us to accept the stronger quasi-Pareto conditions  $\partial W/\partial Y_i > 0 \forall i$ , which in our dualistic development models becomes  $\partial W/\partial Y_k > 0, k = m, t$ . (This is quasi because it is formulated in terms of incomes rather than utilities). The judgment  $\partial W/\partial Y_m > 0$  is one that many observers would not want to make, since it implies that even if the richest were the sole beneficiaries of economic growth, society would be deemed better off. No such judgment is imposed in what follows.

Condition (B) requires us first to define what we mean by a more equal relative distribution of income. A generally accepted (although incomplete) criterion is that one distribution  $A$  is more equal than another  $B$  if  $A$  Lorenz-dominates  $B$ , i.e., if  $A$ 's Lorenz curve lies above  $B$ 's at at least one point and never lies below it. If  $A$  Lorenz-dominates  $B$  for the same level of income, it means distribution  $A$  can be obtained from distribution  $B$  by transferring

positive amounts of income from the relatively rich to the relatively poor.<sup>6</sup> The judgment that such transfers improve social welfare dates back at least to Dalton [1920]. One possible justification for this principle is diminishing marginal utility of income, coupled with independent and homothetic individual utility functions and an additively separable social welfare function.<sup>7</sup> But these assumptions are not necessary for the affirmation of the axiomatic judgment  $\partial W / \partial I < 0$ .

The difficulty with Lorenz-domination as a defining criterion for judgments concerning relative inequality is its incompleteness. When Lorenz curves cross, there is nothing to say. We therefore require a more complete relative inequality measure in order to rank various income distributions when Lorenz curves intersect. For this purpose, many indices of relative income inequality that provide complete orderings have been constructed.

The properties of various inequality indices have been examined by a number of writers (e.g., Champernowne, 1974; Kondor, 1975; Szal and Robinson, 1977; and Fields and Fei, 1978). It is agreed that a “good” inequality index should have the following properties: *scale irrelevance* (if one distribution is a scalar multiple of another, then they have the same relative inequality), *symmetry* (if one distribution is a permutation of another, then relative inequality in the two cases is the same), and the *Daltonian condition* (if one distribution is obtained from another by one or more income transfers from a relatively rich person to a relatively poor one, then the first distribution is more equal than the second).

Three other properties of relative inequality measures are desirable for analyzing the growth of a dualistic economy. These are

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<sup>6</sup> See Rothschild and Stiglitz [1973] and Fields and Fei [1978].

<sup>7</sup> See Atkinson [1970].

$$\frac{\partial I}{\partial W^t} < 0,$$

$$\frac{\partial I}{\partial W^m} > 0.$$

These accord with our intuitive notions about relative inequality (in terms of  $W^m - W^t$  or  $W^m/W^t$ ) and will probably not strike the reader as unusual. Then, we have

$$\frac{\partial I}{\partial f^t} = -\frac{\partial I}{\partial f^m} \geq 0.$$

This condition holds that when an increasing fraction of the economically active population is drawn into an enlarged modern sector, then other things being equal, relative inequality should be no greater than before. Since the wage differential between modern and traditional sector workers is being held constant, this is hardly an unreasonable property. Many would wish to go one step further and replace (F) by

$$\frac{\partial I}{\partial f^t} = -\frac{\partial I}{\partial f^m} = 0.$$

which I myself prefer. The choice between (F) and (F') has no bearing on any of the results that follow; what is important is the exclusion of  $\partial I/\partial f^t = -\partial I/\partial f^m < 0$ . Note that conditions (F) and (F') describe how *the inequality index itself* varies with the level of development. This does not mean that our *feelings* about inequality are invariant to income level. For a perceptive analysis of changing tolerance for inequality in the course of economic development, see Hirschman and Rothschild [1973].

Finally, we turn to condition (C), which holds that social welfare ( $W$ ) is increased the less absolute poverty ( $P$ ) there is. Whatever poverty measure(s) we employ should satisfy the properties,

$$\frac{\partial P}{\partial f^t} > 0,$$

and

$$\frac{\partial P}{\partial W^t} < 0.$$

These conditions state that absolute poverty  $P$  is reduced if there are fewer people in the low-income traditional sector or if the wage received by those in the traditional sector is increased, i.e., they become less poor. These concepts are equivalent to the “poverty population” and “poverty gap” notions used in studies of the United States and the “head-count” and “income shortfall” components of the poverty measure proposed by Sen [1976A]. The appeal of these properties is intuitive and requires no further elaboration.

Function (12) and conditions (A)-(H) constitute the “general welfare approach.”

Condition (B) may be modified to

$$\frac{\partial W}{\partial I} = 0$$

for observers interested only in absolute poverty, while (C) might be replaced by

$$\frac{\partial W}{\partial P} = 0$$

for those concerned only about relative inequality. The various approaches for analyzing growth and distribution in the dual economy are summarized in Table I.

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Insert Table I

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As they stand, the welfare functions, (4), (5), (7), and (12), are purely static. They are, however, easily made dynamic by differentiating (or differencing) them with respect to time or

to their underlying arguments. Changes in  $W^m$ ,  $W^t$ ,  $f^m$ , and  $f^t$ , and enter directly into (12), indirectly into the others.

The questions that then arise are how the various approaches evaluate distributional change in dualistic economic development and under what circumstances the judgments agree or differ. We address these questions in Sections IV and V.

#### IV. Welfare Economic Analysis of Dualistic Development: The General Case

The overall growth of the dualistic economy is the sum of growth in the two sectors as given by (9). In turn, each sector's growth (or lack thereof) may be partitioned into two components: one attributable to the *enlargement* (or contraction) of the sector to include a greater (or lesser) percentage of the economically active population, the other attributable to the *enrichment* of persons engaged in that sector. If a dualistic economy is growing successfully, one or more of the following must be happening: (i) the fraction of workers in the modern sector is increasing; (ii) those in the modern sector receive higher average incomes than before; or (iii) the incomes of those who remain in the traditional sector may rise. While every successfully developing country experiences some or all of these phenomena to varying degrees, some pursue more broadly based or more egalitarian courses than do others.

A useful way of examining how different groups benefit from economic growth is to take the first difference of (9), year 1 being the base year and year 2 the terminal year, and to decompose the change in income in the following way:

$$\begin{aligned}
 (13) \quad \Delta Y = & \underbrace{(f_2^m - f_1^m)(W_1^m - W_1^l)}_{\substack{\text{Modern sector} \\ \text{enlargement effect} \\ (\alpha)}} + \underbrace{(W_2^m - W_1^m)f_1^m}_{\substack{\text{Modern sector} \\ \text{enrichment effect} \\ (\beta)}} \\
 & + \underbrace{(W_2^m - W_1^m)(f_2^m - f_1^m)}_{\substack{\text{Interaction between mod-} \\ \text{ern sector enlargement} \\ \text{and enrichment effects} \\ (\gamma)}} + \underbrace{(W_2^l - W_1^l)f_2^l}_{\substack{\text{Traditional sector} \\ \text{enrichment effect} \\ (\delta)}}
 \end{aligned}$$

where

- $\alpha$  = enlargement of the high-income sector,  
= change in the number of persons in the high-income sector, multiplied by the income differential between the high-income and low-income sectors in the base year;
- $\beta$  = enrichment of the high-income sector,  
= change in income within the high-income sector, multiplied by the number of persons who were originally in that sector in the base year;
- $\gamma$  = interaction between enlargement and enrichment of the high-income sector,  
= change in income within the high-income sector, multiplied by the change in the number of persons in that sector;
- $\delta$  = enrichment of the low-income sector,  
= change in income within the low-income sector, multiplied by the number of persons who remained in that sector in the terminal year.

In the general case, a comparative static analysis of (1 ) reveals the following:

(a) *The modern sector enlargement effect* ( $\alpha$ ) is greater: (i) The greater the increase in modern sector employment; and (ii) the greater the difference between modern sector and traditional sector wage rates.

(b) *The modern sector enrichment effect* ( $\beta$ ) is greater: (i) The greater the rate of increase of modern sector wages; and (ii) the more important the modern sector in total employment.

(c) *The traditional sector enrichment effect* ( $\delta$ ) is greater: (i) The greater the rate of increase of traditional sector wages; and (ii) the more important the traditional sector in total employment.

Note that negative enlargement and enrichment effects are both possible. Negative enlargement would occur when a sector shrinks in size, while negative enrichment would result when real incomes in that sector fall.

Total income growth can be positive, while either of these effects is negative. For example, a 10 percent growth rate in a sector might result from either (i) a 20 percent rise in the size of the sector, coupled with a 10 percent fall in average wages, or (ii) a 20 percent rise in average wages, accompanied by a 10 percent decline in the number of persons in that sector. This example should make clear that *our qualitative judgments about the desirability of any particular sector growth rate depend crucially on the enlargement and enrichment components of that growth*; examination of the sector growth rate is not enough.<sup>8</sup>

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<sup>8</sup> Consider statements of the form “Income of the richest  $X$  percent grew by  $A$  percent but income of the poorest  $Y$  percent grew by only  $B$  percent (less than  $A$ ); therefore, income growth was disproportionately concentrated in the upper income groups.” This interpretation is correct if average income among those who were originally the richest  $X$  percent of the people rose much faster than among those who were originally the poorest  $Y$  percent. However, the interpretation is incorrect if what mainly happened was that the high-income sector expanded to include more people. From cross-sectional data on income growth of the richest  $X$  percent and poorest  $Y$  percent, we cannot tell which.

One immediate application of the decomposition in (13) is to poverty gap analysis. The poverty gap is the total income shortfall of the poor, i.e., the sum of the differences between each poor person's (or family's) income and the poverty line, which may be denoted by  $IS$ . The poor may benefit from economic growth in two ways: by more of them ( $\Delta f^m$ ) being drawn into an enlarged modern sector ( $\alpha$ ) or by those remaining receiving higher incomes ( $\Delta W^t$ ) within the traditional sector ( $\delta$ ). The sum  $\alpha + \delta$  is then the ex post income gain of the poor and  $(\alpha + \delta)/IS$  is an index of an economy's progress toward alleviating absolute poverty. This is one way in which the welfare judgments in (6) and (7) might be implemented. In addition, if the  $\beta$  component is also taken into account, we are able to gauge success in raising incomes more generally, which is what the absolute income approach (5) requires.

Relative inequality judgments may also be made using the decomposition in (13). It would seem natural to compare the share of income growth accruing to the poor ( $\alpha + \delta$ ) and to the nonpoor ( $\beta$ ), but I would be wary of such calculations, because  $\alpha + \delta$  will almost inevitably be less than  $\beta$ , for much the same reason that the income share of the poorest  $X$  percent must always be less than the income share of the richest  $Y$  percent.<sup>9</sup> A more meaningful measure, one that is more sensitive to relative income differentials to begin with, is one that normalizes for the amount of initial income. Then, the percentage gains in the two sectors may be calculated as  $\beta/Y_1^m$  and  $(\alpha + \delta)/Y_1^t$  or the equivalent per capita form.

Finally, the general welfare function (12) may be related to the enrichment and enlargement components of growth as follows:

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<sup>9</sup> This statement applies only to studies based on data from comparable cross sections such as are available for many countries. The statement does not apply to longitudinal data, which as of now are rare.

$$\frac{\partial W}{\partial \alpha} > 0;$$

$$\frac{\partial W}{\partial \beta} < 0;$$

$$\frac{\partial W}{\partial \delta} > 0.$$

The ambiguity in (14b) reflects the fact that by itself greater modern sector enrichment increases both total income and income inequality. These changes receive positive and negative weights, respectively, in welfare judgments according to conditions (A) and (B) of Section III, at least among observers who wish to take account of relative inequality changes. Observers interested only in absolute incomes and absolute poverty face no such difficulty.

It would be most interesting in future research to analyze different countries' growth experiences from these alternative welfare approaches. At present, suitable data are scarce.

## V. Welfare Economic Analysis of Dualistic Development: Special Cases

It is of interest to examine the three limiting cases of dualistic development. We might distinguish between three stylized development typologies. In the *Modern Sector Enlargement Growth* model, an economy develops by enlarging the size of its modern sector, the wages in the two sectors remaining the same. *Modern Sector Enrichment Growth* occurs when the growth accrues only to a fixed number of persons in the modern sector, the number in the traditional sector and their wages remaining unchanged. Finally, we have *Traditional Sector Enrichment Growth* when all of the proceeds of growth are divided evenly among those in the traditional sector.

In relation to existing literature the modern sector enlargement growth model most closely reflects the essential nature of economic development as conceived by a number of writers. Fei and Ranis [1964], for example, have written: "...the heart of the development problem may be said to lie in the gradual shifting of the center of gravity of the economy from the agricultural to the industrial sector...gauged in terms of the reallocation of the population between the two sectors in order to promote a gradual expansion of industrial employment and output," and this is echoed by Kuznets [1966]. Empirical studies of many countries have quantified the absorption of an increasing share of the population into the modern sector; see, for instance, Turnham [1971]. Thus, modern sector enlargement comprises a large and perhaps even predominant component of the growth of currently developing countries.

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Insert Figure I

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Let us now analyze the growth and distributional patterns that arise in each of the three stylized models of dualistic development according to the various welfare economic approaches previously discussed. The principal results are summarized in Table II.

#### *A. Traditional Sector Enrichment Growth*

In the traditional sector enrichment growth model, incomes in the traditional sector are assumed to rise; incomes in the modern sector remain the same; and the allocation of the labor force between the two sectors also remains the same. The following proposition is easily established:

PROPOSITION 1. Traditional sector enrichment growth results in higher income, a more equal relative distribution of income, and less poverty.

The increase in income and the alleviation of poverty (since each of the poor becomes less poor) are evident. Regarding the relative income distribution, we need observe only that traditional sector enrichment growth has the effect of shifting the kink point on the Lorenz curve vertically as in Figure I, which establishes Lorenz domination. By inspection, it is apparent that the income share of the poorest 40 percent ( $S$ ) increases and the Gini coefficient ( $G$ ) (the ratio of the area above the Lorenz curve to the entire triangle) decreases. Hence, relative income inequality declines, as was to be shown. By all of the social welfare criteria presented above, this type of growth therefore results in an unambiguous welfare improvement.

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Insert Figure II

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### *B. Modern Sector Enrichment Growth*

In modern sector enrichment growth, incomes in the modern sector rise, while incomes in the traditional sector and the allocation of the labor force between the modern sector and the traditional sector remain the same. In this case we have the following proposition:

PROPOSITION 2. Modern sector enrichment growth results in higher income, a less equal relative distribution of income, and no change in poverty.

Adherents of the more general form of the absolute income approach would regard this type of growth as an unambiguous improvement, although they would have preferred a pattern where less of the benefit accrued to the well-to-do. However, Rawlsians and persons who adopt the absolute poverty criterion would be indifferent to this type of growth, since no poverty is being alleviated.

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Insert Table II

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With respect to relative inequality the gap between the modern sector wage and the traditional sector wage increases. The kink point on the Lorenz curve shifts vertically downward, which is shown in Figure II. In Figure II we see clearly the Lorenz-inferiority of the new situation compared with the old. The Gini coefficient rises, and the share of the poorest 40 percent falls. Those concerned with relative inequality would give positive weight to the growth in income but negative weight to the rising relative inequality. Thus, the judgments rendered by the various welfare economic approaches are in disagreement. The observed discrepancy is not entirely undesirable. It is quite plausible that some observers may wish to regard the rising gap between the rich and poor unfavorably, not because the poor have lower incomes, but rather because the growing income differential might make the poor *feel* worse off. Some might even wish to allow envy of the rich by the poor to more than offset the gain in utility of the income recipients themselves. This is a defensible position—that income growth concentrated exclusively in the hands of the rich might be interpreted as a socially inferior situation as compared with the rich having less and the poor the same amount—but certainly an extreme one based on the primacy of relative income considerations. In the case of modern sector enrichment

growth, therefore, the differing judgments according to the welfare functions, (4), (5), (7), and (12), reflect a true difference of opinion.

This is not so in the case of modern sector enlargement growth, to which we now turn.

### *C. Modern Sector Enlargement Growth*

As observed earlier, many leading writers in the field hold that countries develop principally by absorbing an increasing share of their labor forces into an ever-enlarging modern sector. As a stylized version of this, in the modern sector enlargement growth model, incomes in both the modern and the traditional sectors remain the same but the modern sector gets bigger. In this case we may derive the following results:

**PROPOSITION 3.** In modern sector enlargement growth: (a) Absolute incomes rise, and absolute poverty is reduced, (b) The Rawlsian criterion shows no change, (c) Lorenz curves always cross, so relative inequality effects are ambiguous, (d) Relative inequality indices first increase and subsequently decline.

*Proofs.* a. The proofs of the absolute income and absolute poverty effects are immediate. Clearly, absolute incomes are higher, and since there are fewer poor, poverty is alleviated.

b. In modern sector enlargement growth there are fewer poor, but those who remain poor continue to be just as poor as before. Until poverty is totally eliminated, the Rawlsian criterion is completely insensitive to modern sector enlargement growth.

c. The crossing of Lorenz curves is demonstrated in Figure III. The explanation is the following: (i) Those among the poor who are left behind due to the incapacity of the modern sector to absorb everyone have the same incomes, but these incomes are now a smaller fraction of a larger total, so the new Lorenz curve lies below the old Lorenz curve at the lower end of the income distribution; (ii) each person in the modern sector receives the same absolute income as before, but the share going to the richest  $f_1^m$  percent is now smaller, and hence the new Lorenz curve lies above the old one at the upper end of the income distribution; (iii) therefore, the two curves necessarily cross somewhere in the middle. Of course, when Lorenz curves cross, welfare judgments based on relative inequality considerations are ambiguous.

d. We shall now demonstrate the inevitability of an initial increase in relative inequality in the early stages of development followed by a subsequent decline for the income share of the poorest 40 percent ( $S$ ) and the Gini coefficient ( $G$ ). This is the inverted-U pattern made famous by Kuznets.

Considering  $S$  first, it is evident that in the early stages of modern sector enlargement growth, the poorest 40 percent receive the same absolute amount from a larger whole, and therefore their share falls. However, in the later stages (i.e., for  $f^t < 40$  percent), they receive all of the income growth, and hence their share rises. This result may be generalized as follows: If our measure of inequality is the share of income accruing to the poorest  $X$  percent, that share falls continuously in modern sector enlargement growth until the modern sector has grown to include  $(1 - X)$  percent of the population.

Turning now to the Gini coefficient, the proof is given in note 10.<sup>10</sup>

While both measures exhibit the inverted-U pattern in modern sector enlargement growth, the turning points do not coincide. There are three phases: (1) Initially, both  $G$  and  $S$  show rising relative inequality; (2) Then,  $G$  turns down while  $S$  continues to fall; (3) Finally,  $S$  rises while  $G$  continues to fall. To indicate the importance of this discrepancy for just these two measures, it is thought that in real terms the modern-sector-traditional-sector wage gap is something like 3:1. This implies that Phase 2 ranges from 37 percent to 60 percent of the population in the traditional sector. This range is substantial and may well include many LDC's.

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10

The formula for the Gini coefficient in our dualistic model is

$$G = 1 - \frac{[W^t + (W^m - W^t)(f^m)^2]}{[W^t + (W^m - W^t)f^m]}$$

This is a quadratic function. By inspection,  $G = 0$  when  $f^m = 0$  and  $f^m = 1$ , and  $G > 0$  if  $0 < f^m < 1$ . Thus, the Gini coefficient follows an inverted-U path. To determine the location of the maximum, find

$$\frac{\partial G}{\partial f^m} = \left\{ \frac{[W^m - W^t]}{[W^t + (W^m - W^t)f^m]^2} \right\} \left\{ \frac{-2f^m W^t + W^t}{-(f^m)^2(W^m - W^t)} \right\},$$

and equate the result to zero. Since the first term in brackets is strictly positive, we need work only with the second term. Setting it equal to zero and applying the quadratic formula to solve for  $f^m$ , we find that

$$f^m_C = \frac{-W^t \pm \sqrt{W^m W^t}}{W^m - W^t}.$$

It is evident that one of the roots,

$$(f^m)_C = (-W^t - \sqrt{W^m W^t}) / (W^m - W^t),$$

is negative, so must be rejected. Considering now the other root,

$$(f^m)_C = \sqrt{W^m W^t - W^t} / (W^m - W^t),$$

the fact that  $W^m > W^t$  implies both numerator and denominator are positive and therefore  $(f^m)_C > 0$ . Likewise,  $W^m > W^t$  implies that  $\sqrt{W^m W^t} < W^m$ , and therefore  $(f^m)_C < 1$ . Thus,  $G$  achieves an economically meaningful critical value at

$$f^m = \sqrt{W^m W^t - W^t} / (W^m - W^t)$$

and that root is strictly between zero and one.

Kuznets [1955] demonstrated this pattern in the historical experiences of a number of then developed economies. Kuznets' explanation was that the inverted-U pattern was caused by the transfer of workers from the rural sector, where incomes were relatively equally distributed at low levels, to the urban sector, where there was greater income dispersion, owing to the presence of a skilled professional class at the top and poor recent migrants at the bottom. In terms of the development typologies analyzed above, Kuznets' model is basically one of *modern sector enlargement growth with within-sector inequality*.

In an unpublished Appendix, I extend the dualistic models of this paper to allow for within-sector inequality. There, I prove that the inverted-U pattern *always* arises in modern sector enlargement growth, even if the *traditional sector has a more unequal distribution of income within it*. This result has been observed by previous researchers, although not for the Gini coefficient.<sup>11</sup> Where I differ from the others is over the welfare interpretation of these patterns.

PROPOSITION 4. The various welfare approaches give different evaluations of the desirability of modern sector enlargement growth, (a) The absolute income and absolute poverty approaches rate this type of growth as an unambiguous welfare improvement, (b) Rawlsians would be indifferent to this type of growth, (c) The relative inequality approach regards this type of growth ambiguously in the early stages but once the turning point is reached, it is a good thing, (d) The general welfare approach (12) considers

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<sup>11</sup> In his original study [1955] Kuznets produced a number of numerical examples consistent with the inverted-U pattern in modern sector enlargement growth, using as his measure of relative inequality the difference in percentage shares between the first and fifth quintiles. He did not, however, establish its inevitability (under the same maintained assumptions as those employed here). After the first draft of this paper was completed, I learned that the result in Proposition 3.d had been proved earlier by Swamy [1967] using the coefficient of variation. The result has since been reconfirmed independently by Robinson [1976] using the log variance.

modern sector enlargement growth as an unambiguous improvement regardless of the stage of development.

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Insert Figure III

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The proofs of (a)-(c) are immediate given the respective welfare functions and the patterns established in Proposition 3. Point (d) follows from (12) and conditions (A), (C), (F), and (G). The lack of correspondence between (c) and (d) warrants further attention.

Kuznets [1955, 1963, 1966], Swamy [1962], Robinson [1976], and many others have interpreted the inverted-U pattern as signifying that in a true economic sense “the distribution of income must get worse before it gets better.” It would seem at first that a falling share going to the poor ( $S$ ) or a rising Gini coefficient ( $G$ ) *should* receive negative weight in a social welfare judgment, possibly negative enough to outweigh the rising level of income. But why? There are at least two possible answers.

Implicitly, we may have in mind that a falling  $S$  or rising  $G$  implies that the poor are getting *absolutely* poorer while the rich are getting absolutely richer, and many of us would regard this as a bad thing indeed. The problem with this notion is that it confuses cause and effect, that is to say, absolute emiseration of the poor would definitely imply falling  $S$  and rising  $G$ , but as we have just seen,  $G$  rises and  $S$  falls in the early stages of modern sector enlargement growth without the poor becoming worse off in absolute terms.

Ruling out the necessity of absolute emiseration of the poor as a reason for reacting adversely to a falling  $S$  or rising  $G$  in modern sector enlargement growth, we may instead have in mind *relative* income comparisons—that a growing income differential between rich and poor

reduces poor people's utilities. Yet, in the early stages of modern sector enlargement growth, despite the rising Gini coefficient and the falling share of the poorest 40 percent, *the income differential between rich and poor is not changing*. Hence:

PROPOSITION 5. For modern sector enlargement growth the conventional relative inequality measures do not "correctly" measure relative inequality, if the "correct" definition of relative inequality in dualistic development is the intersectoral wage difference or ratio (or a monotonic transformation thereof).

In the early stages of modern sector enlargement growth, we may be misled into thinking that relative inequality is "worsening" when in fact the wage structure is not changing. This same point holds in reverse for relative inequality "improvements" in the later stages of modern sector enlargement growth. This is because condition (F) is violated.

Proposition 5 implies that rising relative inequality *as measured by conventional indices* may be a perfectly *natural*, and even highly *desirable*, outcome for this type of development. Put differently, the falling share of the lowest 40 percent and rising Gini coefficient that arise in this case are *statistical artifacts without social welfare content*. For this type of growth, the specification of social welfare functions like (4) *conflicts* with our ideas of social well-being as given by (12). This conflict is particularly acute for persons who wish to give heavy weight to relative income considerations. If relative-inequality-averse persons compare Gini coefficients or income shares of the poorest 40 percent at two points in time when modern sector enlargement growth is taking place, they will be led to social welfare judgments which *they themselves would not wish to make*. Unfortunately, functions like (4) based on  $G$  or  $S$  are being used with

increasing frequency in current empirical studies of economic development. The use of functions like (12), based on the enlargement and enrichment components of various sectors' growth experiences, would avoid such difficulties.

## VI. Extensions of the Methodology

### A. Extension to $n$ Sectors

In practical applications the strict division of an economy into a modern sector and a traditional sector may be unsatisfactory, and a finer breakdown may be more desirable, for instance, into a modern urban sector, a traditional urban sector, and a traditional agricultural sector. In general, with  $n$  sectors national income ( $Y$ ) is

$$Y = \sum_{i=1}^n W^i f^i.$$

The change in national income is

$$\Delta Y = Y_2 - Y_1 = \sum_{i=1}^n W_2^i f_2^i - \sum_{i=1}^n W_1^i f_1^i,$$

which, when rewritten as

$$\Delta Y = \sum_{i=1}^n (W_2^i f_2^i - W_1^i f_1^i),$$

enables us to measure the contribution of the  $i$ th sector to total growth. To distinguish each sector's enlargement and enrichment effects and the interaction between them, (17) may be manipulated to yield

$$(18) \quad \Delta Y = \sum_{i=1}^n \left[ \underbrace{W_1^i(f_2^i - f_1^i)}_{\text{Sector } i \text{ enlargement effect}} + \underbrace{(W_2^i - W_1^i)f_1^i}_{\text{Sector } i \text{ enrichment effect}} + \underbrace{(W_2^i - W_1^i)(f_2^i - f_1^i)}_{\text{Interaction of sector } i \text{ enlargement and enrichment effects}} \right]$$

The results of the comparative static analysis of the two-sector case carry over to the  $n$ -sector case in an analogous manner.

Besides extensions to more than two *sectors*, the methodology may be carried over as well to more than two *income sources*, or to a hybrid classification of *sectors and sources*. For example, it might be useful to measure income growth in the following six groups:

- (i) Labor income among modern sector workers in urban areas
- (ii) Labor income among traditional sector workers in urban areas
- (iii) Labor income among traditional sector workers in agriculture
- (iv) Capital income in urban areas
- (v) Capital income in rural areas
- (vi) Other income.

With such an extended methodology we are limited only by restrictions of our data and our own ingenuity.

*B. Explicit Allowance for Population Growth*

It is a straightforward matter to give explicit recognition to population growth. Total income growth ( $\Delta Y$ ) may be thought to have two components: (i) A *population growth effect* ( $P$ ), defined as the expansion of the economy to absorb a growing population at the initial occupational and wage structure, and (ii) A *net growth effect* ( $N$ ), which results from higher wages and a higher proportion of the population employed in high paying activities. Let  $f^i$  be the *number* of persons in sector  $i$  and  $p$  the rate of growth of population between years 1 and 2. Then *net growth* (income growth net of population) is given by

$$N = \Delta Y - P$$

$$= \sum_{i=1}^n (W_2^i f_2^i - W_1^i f_1^i) - \sum_{i=1}^n W_1^i f_1^i p.$$

This can be decomposed into the various *net* effects as

$$(20) \quad N = \sum_{i=1}^n [W_2^i f_2^i - W_1^i f_1^i (1 + p)]$$

$$= \sum_{i=1}^n \underbrace{[W_1^i [f_2^i - f_1^i (1 + p)]]}_{\text{Sector } i \text{ net enlargement effect}} + \sum_{i=1}^n \underbrace{[(W_2^i - W_1^i) f_1^i (1 + p)]}_{\text{Sector } i \text{ net enrichment effect}}$$

$$+ \sum_{i=1}^n \underbrace{[(W_2^i - W_1^i) [f_2^i - f_1^i (1 + p)]]}_{\text{Interaction of sector } i \text{ net enlargement and enrichment effects}}.$$

## VII. Conclusions and Implications

This paper has examined the welfare implications of different types of dualistic economic development. Several alternative approaches for assessing the welfare implications of growth were set forth (Sections II and III). In Section IV dualistic development was analyzed from the various perspectives. Section V set out three stylized development typologies. For each the changes in relative inequality and absolute incomes and poverty and the welfare effects of these changes were derived according to the various welfare criteria and contrasts among them were noted. Then, some extensions of the methodology were set forth (Section VI).

A number of conclusions and implications may be drawn:

1. *The extent to which different groups participate in economic growth may be readily conceptualized and quantified using the formulas developed in this paper.* The procedure is easily implementable, subject to availability of straightforward cross tabulations of employment distributions and wage and income structures.
2. *The time paths of relative inequality and absolute poverty depend on the type of economic development as well as its level.* In terms of the three stylized development typologies formulated above, absolute poverty is diminished in traditional sector enrichment growth and modern sector enlargement growth, but is not alleviated in modern sector enrichment growth. Relative inequality declines in traditional sector enrichment growth and rises in modern sector enrichment growth. The usual relative inequality measures show an inverted-U pattern in modern sector enlargement growth. In short, contrary to the beliefs of some, income distribution need not get worse before it gets better, provided a suitable development strategy is followed.

3. *The absolute income and poverty and relative inequality approaches often do not give the same welfare judgments about the desirability of different patterns of growth.* Only for traditional sector enrichment growth and for the later stages of modern sector enlargement growth do these approaches concur in indicating an unambiguous welfare improvement. In the case of modern sector enrichment growth, there is a real substantive disagreement about whether or not growth of that sort is a good thing. However, in the early stages of modern sector enlargement growth, there arises a discrepancy between the various approaches, but it has no apparent welfare economic basis. This is because

4. *Conventional relative inequality measures show an inverted-U pattern in modern sector enlargement growth despite a constant intersectoral wage structure.* This implies that the “worsening” inequality (as ordinarily measured) should not be interpreted as a bad thing, nor should the subsequent “improvement” be regarded as an economically meaningful reduction in relative inequality either. Thus, social welfare functions, whether explicitly stated or implicitly assumed, of the form  $W = W(Y, I)$ ,  $f_1 > 0$ ,  $f_2 < 0$ , where  $I$  is any of the Lorenz curve-based relative inequality measures in common use, are invalid for this type of growth. In cases of modern sector enlargement growth, it is far better to look only at the rate at which the growth is taking place.

As a corollary of the above:

5. *Before we can legitimately interpret a rising relative inequality coefficient in a country as an economically meaningful worsening of the income distribution rather than a statistical artifact, we must know which of the three types of economic development patterns that country has been following.* We have shown that a falling share of income received by the poorest 40 percent and rising Gini coefficient can be the result of

(a) *Traditional Sector Impoverishment*, which is clearly *bad* in social welfare terms; or

(b) *Modern Sector Enrichment*, which is *good* in absolute income terms, *indifferent* in absolute poverty terms, and *ambiguous* in relative income terms; or

(c) *Modern Sector Enlargement* in the early phases, which is *good* according to widely accepted axiomatic judgments. Simple calculations of relative inequality patterns cannot distinguish among these causes. This implies the following:

6. *Regardless of whether one favors an absolute or relative approach or some combination of them, social welfare judgments about the desirability of a given course of economic development should be made on the basis of the enlargement and enrichment components of that growth.* Equation (12) makes clear that the way we feel about a country's growth pattern depends on changes in its wage structure and occupational structure over the development period. Data on rates of growth of total incomes in various sectors of an economy are insufficient for coming to a welfare judgment. We must also know how many are sharing in each sector's income at each point in time.

7. *To evaluate the participation of the poor in economic development, poverty indices have a number of desirable properties.* They avoid the problems associated with possible ambiguities that arise in interpreting relative inequality measures. They are sensitive to changes in the number of poor (the enlargement effect) and in the severity of their poverty (the enrichment effect). They are easily calculable from the microeconomic data or sufficiently disaggregated tabulations. The Sen Index shares these advantages, plus it reflects the degree of income inequality among the poor and its axiomatic justification is clearly delineated so that users and nonusers alike will know what welfare judgments underlie the measure. Absolute poverty

measures in general and the Sen Index in particular warrant further use, especially in the study of less developed countries where this type of approach has not received much attention.

### VIII. Empirical Significance

The preceding analysis has shown that under certain circumstances the absolute poverty and relative inequality approaches may give very different results concerning the distributional effects of growth in the dual economy. In light of these differences, the choice between the two types of measures should be based on the type of welfare judgments we wish to make. The empirical significance of the choice may be illustrated with reference to two actual cases of particular interest, India and Brazil.

The Brazilian economy achieved a growth in per capita income of 32 percent over the decade of the 1960's, a substantial accomplishment by the standards of less developed countries. Fishlow [1972], Langoni [1972], and others have examined the distributional question of who received the benefits of this growth, found greater relative income inequality, and concluded that the poor benefited very little, if at all. Yet when the distributional question is reexamined from an absolute poverty perspective by looking at the number of very poor and the levels of income they receive, it is found that the average real incomes among persons defined as poor by Brazilian standards increased by as much as 60 percent, while the comparable figure for nonpoor persons was around 25 percent (Fields, 1977). At the same time, the percentage of persons below the poverty line fell somewhat. It would thus appear that by assigning heavy weight to changes in the usual indices of relative income inequality and interpreting these increases as offsets to the

well-being brought about by growth, previous investigators may have inadvertently overlooked important tendencies toward the alleviation of poverty.

In the India case, the problem is just the opposite. Bardhan [1974] reports that relative inequality in India (as measured by the Gini coefficient) exhibited a small but perceptible decline, which some might see as an improvement in income distribution. Yet, due to the lack of growth of the Indian economy, the percentage of people living in absolute poverty increased in both the urban and rural sectors of the economy.

These examples indicate that the choice of an evaluative criterion *does* make a very real qualitative difference. It comes down to a choice between welfare judgments which emphasize the alleviation of absolute poverty or those focusing on the narrowing of relative income inequality. Personally, I am most concerned about the alleviation of economic misery among the very poorest, especially in low-income countries, and therefore give greatest weight to absolute poverty changes. Others with different value judgments who may be more concerned than I with relative income comparisons or with the middle or upper end of the income distribution may wish to rely more on one of the other approaches. The inconsistency between the professed concern of many researchers for the alleviation of absolute poverty and their use of relative inequality measures in empirical research is striking. I hope this will be less prevalent in the future.

Figure I

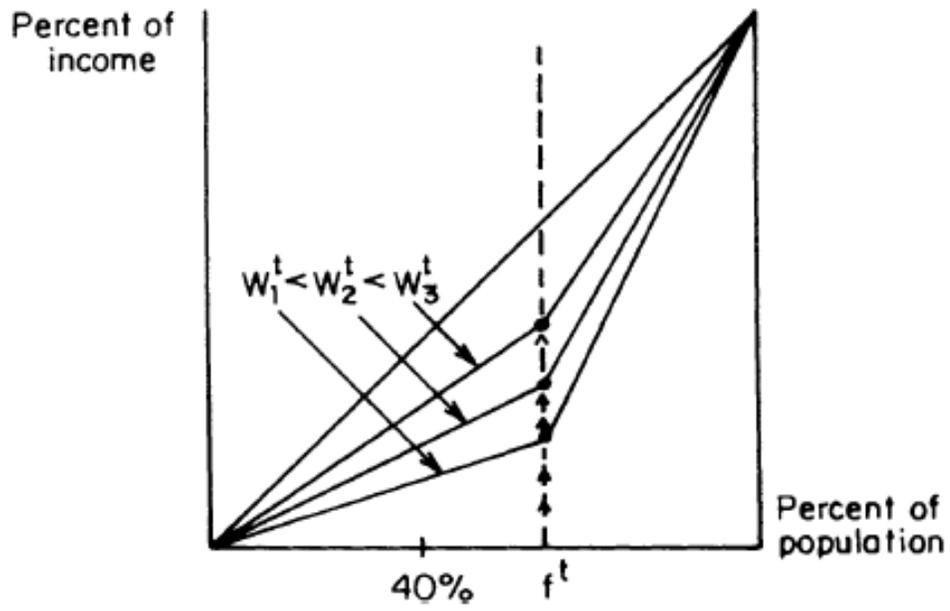


FIGURE I

Figure II

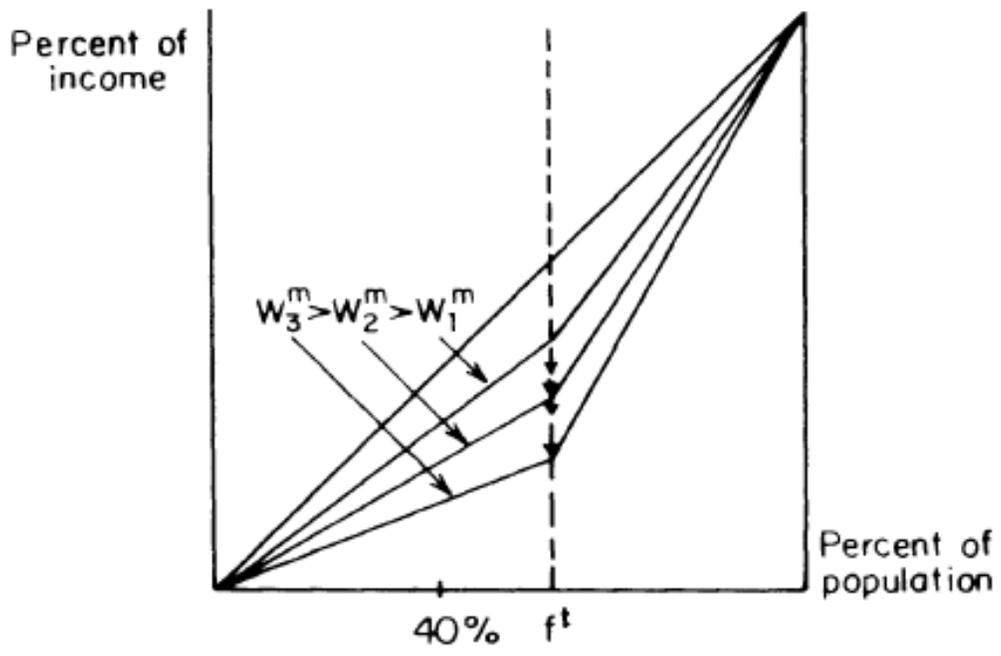


FIGURE II

Figure III

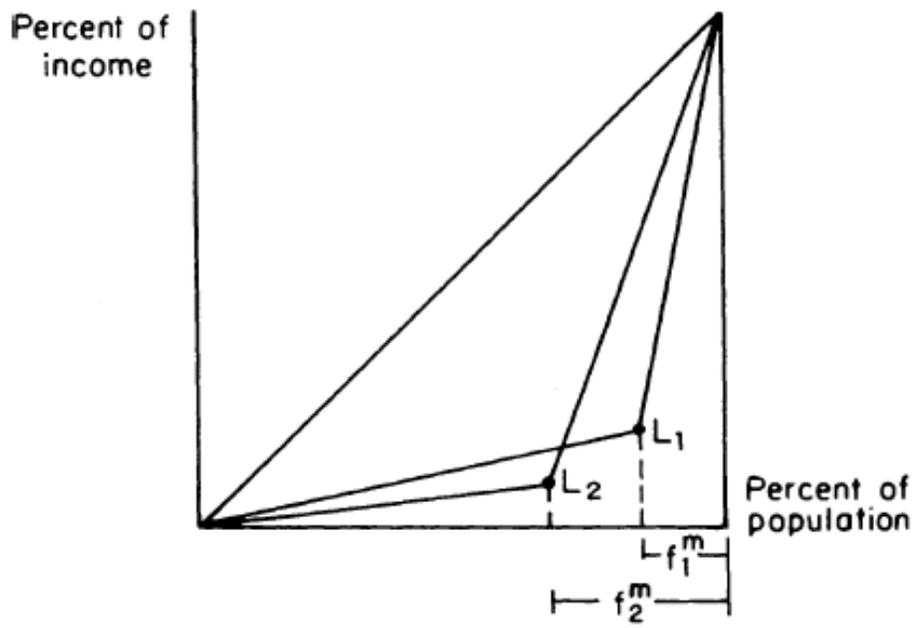


FIGURE III

Table I

TABLE I  
VARIOUS WELFARE ECONOMIC APPROACHES FOR ANALYZING DUALISTIC  
ECONOMIC DEVELOPMENT

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Relative inequality approach

General form:

(3)  $W = f(Y, I), f_1 > 0, f_2 < 0$  ... Inequality index

Specific applications:

(4) (a)  $W = f(Y, L), f_1 > 0, f_2 > 0$  ... Lorenz criterion  
 (b)  $W = f(Y, S), f_1 > 0, f_2 > 0$  ... Income share of poorest  
 (c)  $W = f(Y, G), f_i > 0, f_2 < 0$  ... Gini coefficient

Absolute income approach

General form:

(5)  $W = g(Y_1, Y_2, \dots, Y_n), g_i > g_j \forall i < j$  ... Absolute income

Specific application:

(5')  $W = g(Y_1), g' > 0$  ... Rawlsian maximum criterion

Absolute poverty approach

General form:

(6)  $W = h(P), h' < 0$  ... Poverty index

Specific applications:

(7) (a)  $W = h(H), h' < 0$  ... Head count of poor  
 (b)  $W = h(I), h' < 0$  ... Income shortfall  
 (c)  $W = h(\pi), h' < 0,$   
 $\pi = H[\bar{I} + (1 - \bar{I})G_p]$  ... Sen index

General social welfare approach

General form:

(8)  $W = W(Y, I, P), \frac{\partial W}{\partial Y} > 0,$   
 $\frac{\partial W}{\partial I} < 0, \frac{\partial W}{\partial P} < 0$  ... General welfare

Specific application:

(12)  $W = W(W^m f^m + W^t f^t, I(W^m, W^t, f^m, f^t), P(W^t, f^t)),$   
 $\frac{\partial W}{\partial Y} > 0, \frac{\partial W}{\partial I} < 0, \frac{\partial W}{\partial P} < 0,$  ... General welfare, dualistic  
 $\frac{\partial Y}{\partial W^m}, \frac{\partial Y}{\partial W^t}, \frac{\partial Y}{\partial f^m}, \frac{\partial Y}{\partial f^t} > 0,$   
 $\frac{\partial I}{\partial W^m} > 0, \frac{\partial I}{\partial W^t} < 0, \frac{\partial I}{\partial f^m} = -\frac{\partial I}{\partial f^t} \leq 0,$   
 $\frac{\partial P}{\partial W^t} < 0, \frac{\partial P}{\partial f^t} > 0.$

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Table II

TABLE II  
SUMMARY OF DISTRIBUTION AND WELFARE EFFECTS IN THREE MODELS OF DUALISTIC DEVELOPMENT

	Traditional sector enrichment growth	Modern sector enrichment growth	Modern sector enlargement growth		
			Phase 1 $0 \leq f^m < \sqrt{W^m W^t} - W^t$	Phase 2 $\sqrt{W^m W^t} - W^t \leq f^m \leq 60 \text{ percent}$	Phase 3 $f^m > 60 \text{ percent}$
<u>Growth and distributional effects</u>					
$f^m$	Unchanged	Unchanged	Rises	Rises	Rises
$f^t$	Unchanged	Unchanged	Falls	Falls	Falls
$W^m$	Unchanged	Rises	Unchanged	Unchanged	Unchanged
$W^t$	Rises	Unchanged	Unchanged	Unchanged	Unchanged
$Y$	Rises	Rises	Rises	Rises	Rises
$\pi$	Falls	Unchanged	Falls	Falls	Falls
$L$	Lorenz-superior	Lorenz-inferior	Lorenz-crossing	Lorenz-crossing	Lorenz-crossing
$G$	Falls	Rises	Rises	Falls	Falls
$S$	Rises	Falls	Falls	Falls	Rises
$Y_{\min}$	Rises	Unchanged	Unchanged	Unchanged	Unchanged
<u>Welfare effects according to:</u>					
Absolute income approach	Unambiguous improvement	Unambiguous improvement	Unambiguous improvement	Unambiguous improvement	Unambiguous improvement
Rawlsian maximin approach	Unambiguous improvement	Unchanged	Unchanged	Unchanged	Unchanged
Absolute poverty approach	Unambiguous improvement	Unchanged	Unambiguous improvement	Unambiguous improvement	Unambiguous improvement
Relative inequality approach:					
$L$	Unambiguous improvement	Lorenz-inferior	Lorenz-crossing	Lorenz-crossing	Lorenz-crossing
$G$	Unambiguous improvement	Ambiguous	Ambiguous	Unambiguous improvement	Unambiguous improvement
$S$	Unambiguous improvement	Ambiguous	Ambiguous	Ambiguous	Unambiguous improvement
Eq. (12) and condition (C')	Unambiguous improvement	Ambiguous	Unambiguous improvement	Unambiguous improvement	Unambiguous improvement
General welfare approach (12)	Unambiguous improvement	Ambiguous	Unambiguous improvement	Unambiguous improvement	Unambiguous improvement

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