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# The Potential Effect of Income Redistribution on Economic Growth in Six Latin American Countries

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## 1. Introduction

Both in the theoretical literature and at the level of practical planning the two goals of "economic growth" and "equity" are often considered to be in conflict. The purpose of this paper is to examine whether, and to what degree, economic growth must in fact be sacrificed for alternative desired increases in equity. Section 2 considers the theory relating income distribution to economic growth. Section 3 examines the available income distribution data for Argentina, Brazil, Chile, Colombia, Mexico, and Venezuela. Section 4 contains estimates of consumption functions and simulation exercises calculating the effect which income redistribution would have on savings and growth rates in Argentina, Brazil, Mexico, and Venezuela. Section 5 presents calculations of the effect on imports which income redistribution would have, for Brazil and Mexico, and discusses probable "economies of scale" and "factor opportunity cost" effects for the two countries. Finally, section 6 discusses the relative merits of alternative policy instruments available for redistributing income.

## 2. Income Distribution's Effect on Economic Growth: Theory

### 2.1 Changes in Income Distribution as a Result of Growth

The central concern of this study is the effect which income redistribution would have on economic growth. But first it is useful to consider the question in reverse, and ask whether there are systematic forces changing income distribution as economic growth proceeds. On a basis of neoclassical analysis, one would expect that in the long run rising per capita income would be associated with greater equality in distribution. The payment of labor is the main source of lower incomes; as the capital stock rises relative to the labor force the marginal product of labor rises and that of capital falls (unless rescued by technological change). If the elasticity of substitution between capital and labor is less than unity, as one expects, then capital's share in national product falls and that of labor rises. This shift in factoral shares would cause equalization in the distribution of income, given the original assumption that capital income goes to high income recipients and labor earnings to low income recipients.

On the other hand, Kuznets[1] has suggested two reasons why the secular trend in income distribution would be toward greater inequality. The first is, to the extent that the savings ratio is higher for higher income groups, upper income recipients will accumulate assets proportionately more rapidly than lower income recipients and the total asset and non-asset income will grow more rapidly for the former than for the latter. The second reason applies more strictly to countries in the early stages of development: as growth occurs, labor shifts from the rural to the urban

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1. Simon Kuznets, "Economic Growth and Income Inequality", American Economic Review, 45 (March 1955), pp. 1-28.

sector. But the distribution of income is more skewed in urban than rural sectors.[1] Under certain assumptions a shift of labor toward the urban sector implies an increase in the inequality of income distribution.[2] Finally, Kuznets implies that growing political influence of low income groups is the main countervailing influence offsetting the other two forces and giving a net result of increasing equality of income distribution as the economy matures -- after a phase of increasing inequality at the early stage of growth.

Empirically, the case seems to be that the advanced industrial countries experienced increasing equality of income distribution as their per capita income grew.[3] However, it is unclear whether this equalization resulted from increased capital per worker,[4] as implied in a neo-classical interpretation, or from other influences such as intentional social measures.

In the short run the effect of economic growth on income distribution is more uncertain. The short run behavior of income

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1. According tc Kuznets. However, this difference does not appear to characterize most of the countries of the present study (see Section 3.7.2). Presumably the explanation is that rural income in Latin America is much more unequally distributed than was the case historically in presently advanced countries or recently in India, which Kuznets mentions specifically.

2. Yet the absolute levels of all workers could and probably would increase in the process of this shift. Note the implicit assumption that the probability distribution of income levels for new urban migrants is identical to the frequency distribution of income levels in the urban sector in the past. This assumption is questionable since the migrants would presumably move into the low income jobs. So long as the wage for these jobs exceeded the wage of the rural jobs the migrants had held previously, the migration would equalize income distribution.

3. Kuznets, ibid., p. 4.

4. Note that capital and labor shares have remained relatively constant historically in the United States and England. See, for example, Tibor Skitovsky, "A Survey of Some Theories of Income Distribution," in The Behavior of Income Shares, National Bureau of Economic Research, Studies in Income and Wealth, V. 27. (Princeton: Princeton University Press, 1964), p. 21. A logical explanation would be that the declining capital share expected on a basis of a rising capital-labor ratio (assuming elasticity of substitution below unity) is offset by technical change which raises capital's marginal product relatively more than that of labor.

distribution depends much more on specific policy choices[1] than on automatic forces. However, some automatic forces do exist which may cause greater inequality as development proceeds, in the short run. One such force is Myrdal's "backwash" effect: externalities of infrastructure cause capital to continue pouring into the more advanced "development poles" of a country, rather than away from them ("spread effect") as neoclassical analysis would predict.

In sum, in the long run economic growth should cause equalization in income distribution, although in the short run the reverse may occur.

## 2.2 The "Savings Effect" of Income Distribution on Growth

### 2.2.1 Profits as the Source of Savings

The influence of income distribution on savings is the aspect of the relation of equity to growth which has received the most attention in the literature. The argument is usually phrased in terms of functional distribution: a higher profit share (lower wage share) is supposed to cause a higher savings rate, on the assumption that the profit recipients save a higher fraction of their income than wage recipients. Thus, in the dual economy model of W. Arthur Lewis, a rising share of saving in national income is explained by a growing weight of the economy's "modern sector", in which entrepreneurial profits comprise a larger share of value added than in the "traditional sector." Using the same reasoning, Lewis observes that inflation may raise the share of saving in national income because as prices rise and wages lag behind, the profit share in national income rises.[2]

The idea that entrepreneurial profit is the major source of savings is also the basis of Galenson and Leibenstein's argument that in order to maximize the reinvested funds per unit of capital invested, capital intensive techniques should be used rather than

---

1. For example, emphasis in agriculture on "modern inputs" (and on mechanization) may cause the medium and large farmers to raise their output rapidly while small farmers without resources to increase investment, and landless workers, lag behind. This pattern, with its increased inequality of agricultural income distribution, seems to have occurred recently in India. See B. F. Johnston and J. Cownie, "The Seed-Fertilizer Revolution and Labor Force Absorption," American Economic Review, 59 (September 1969), pp. 569-582. In contrast, a specific policy of public works, offering employment on projects using labor intensive methods chosen because of "shadow price planning" will increase equality of income distribution.

2. W. Arthur Lewis, "Economic Development with Unlimited Supplies of Labor," The Manchester School, 22 (May 1954), pp. 139-191.

labor intensive techniques.[1] Their argument appears incorrect when pushed to their conclusion that the higher the capital/labor ratio, the higher the ratio of profits to capital invested.[2] However, given their assumption that savings come from profits only, the spirit of their argument is correct: the highest profits per unit of physical capital will occur at the capital/labor ratio dictated by the "market" prices of capital and labor rather than at the more labor intensive technique which would be determined by social "shadow price" analysis. The latter, in a surplus labor context, leads to the choice of labor intensive technique: labor will be combined with capital to the point where labor's marginal product equals its opportunity cost to the economy, which is zero or at least below the "market" wage. The "shadow price" technique choice gives maximum current production, but the "market factor price" basis for technique choice gives maximum profit per physical capital and therefore maximum reinvestment (savings), under the simple assumption that savings come only from profits.[3]

The implication for the above arguments for personal income distribution is clear: since the number of entrepreneurs will be small relative to the number of workers, a general development strategy favoring a high profit share implies the favoring of a highly skewed distribution of personal income. One might object that the entrepreneur does not really "have" the profit income so long as he reinvests it rather than consuming it. This objection is invalid: the entrepreneur has claim of ownership to the new capital resulting from his reinvested profits, and has the option at any time of liquidating his equity. Therefore in any meaningful sense entrepreneurial profits represent entrepreneurial

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1. W. Galenson and H. Leibenstein, "Investment Criteria, Productivity, and Economic Development," Quarterly Journal of Economics, 69 (August 1955), pp. 343-370.

2. Because this extreme conclusion ignores diminishing returns to capital as capital is applied in increasing intensity relative to labor. At some point the marginal product of an extra worker exceeds the fixed wage that must be paid; profit per unit of capital declines when capital per worker is increased beyond this point (or, equivalently, the number of workers is reduced while the capital stock is held constant) because the gain in production that could be obtained by hiring an extra worker for the given capital stock would exceed the worker's wage.

3. This series of arguments is summarized in Amartya K. Sen, "Some Notes on the Choice of Capital Intensity in Development Planning," Quarterly Journal of Economics, 71 (November 1957), pp. 561-584. Sen (as well as Chenery, and Eckstein, elsewhere) points out that, given the assumption that only profits are saved, the choice of technique depends on the social discount rate since the choice is essentially between present production and future production.

income even though they are reinvested.[1]

To summarize, the economic development literature has emphasized the relation of the savings rate to the share of profits in the "modern sector." By implication, this literature suggests that the more skewed personal income distribution, the higher the savings rate for national income -- so long as the upper-bracket income in question comes from entrepreneurial profit.

Houthakker[2] has made empirical estimates which tend to support the hypothesis that the propensity to save for entrepreneurial income exceeds that for labor income. Using eight-year averages for twenty-eight countries, he estimated:[3]

$$S_P = \underset{(.022)}{.043L} + \underset{(.041)}{.120P}$$

where $S_P$ = personal saving, L = employment income plus government transfers, and P = all other personal income; all data in per-capita terms in 1955 dollars at official exchange rates; figures in parentheses are standard errors.

From this estimate Houthakker concludes: "...the marginal propensity to save out of income from employment is much lower than that for income from property and entrepreneurship."[4] However, this conclusion is incorrect if it means that these two propensities differ even when the influence of income level of the recipient unit is removed. Houthakker's data are not observations from within each country, with many different income levels for each type of income; his data are not adequate to the task of testing whether <u>for a given household income level</u> saving is higher if the recipient is an entrepreneur than if he is an employee. The results obtained might be perfectly explained by the normal savings-income relationship with no resort to special propensity by income

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1. The argument of claim to equity and therefore real "receipt of income" applies whether the firm is incorporated or not, assuming in the case of the corporation that the share value reflects the value of retained earnings.

2. H. S. Houthakker, "An International Comparison of Personal Savings," <u>Bulletin de L'Institut International de Statistique</u>, 38 (1961, pp. 55-69.) Also, H. S. Houthakker, "On Some Determinants of Saving in Developed and Under-Developed Countries," in E.A.G. Robinson, ed., <u>Problems in Economic Development</u> (London: McMillan, 1966), pp. 212-224.

3. <u>Ibid</u>., p. 216

4. <u>Ibid</u>.

type. That is, his results say that if two countries are at equal dollar per-capita income levels, the country with the higher share going to non-labor income will have higher savings. But given the correlation of "entrepreneurial income" with "upper income level,"[1] this phenomenon could be completely explained by the fact that the country with higher entrepreneurial share simply has a higher share of income concentrated in the upper income brackets. A normal Keynesian consumption function with a higher savings rate for higher income levels would then explain the higher savings in the country which has a higher non-labor income share.

The present author therefore rejects the view that income type rather than income level (within the country) determines savings rates, in lieu of further evidence.[2] The issue is important to this study because the calculations below rely heavily on savings behavior by income level, for lack of data on income type. However, for the one country (Brazil) for which data by income type is available, additional tests are made to examine whether type of income influences savings, net of the income level's influence.

For policy purposes, it could be misleading to adopt the conclusion that property income recipients have a higher propensity to save than labor recipients. For example, if tax legislation were designed with lower rates for non-labor income (at given income levels), the result would be inequity without the desired effect of lower reduction of savings, if savings in fact were solely determined by income level. To avoid such a problem the solution would be simple. Income at identical levels would be taxed at

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1. Which exists despite the inclusion of small farmers' incomes as non-labor income, in most national accounts data. For example, in Argentina in 1961 salaried income recipients comprised 64% of the total units with entrepreneurs representing 29%, pensioned 7%, and renters .5%. Yet the corresponding participations in the upper 10% income bracket were: 25%, 68%, 3%, and 3%. Naciones Unidas, Comision Economica Para America Latina, El Desarrollo Economico y la Distribucion del Ingreso en la Argentina (Nueva York: 1968), p. 108.

2. Even for the United States, analyses on propensity to save by income type net of the influence of income level appear inconclusive. A 1957 study by Friend and Kravis, found, first, that national aggregate data showed an unimportant role of unincorporated entrepreneurial savings, strongly contradicting the household survey data. Second, the household survey data showed much lower (negative) savings rates for entrepreneurs at low income levels than for urban units generally, but much higher savings rates for entrepreneurs at high income levels. A plausible explanation is that the disturbance of "transitory income" is much greater for entrepreneurial groups than for salaried groups. Irwin Friend and I. Kravis, "Entrepreneurial Income, Saving and Investment," American Economic Review, 47 (June 1957), pp. 269-301.

identical rates, regardless of income type; however, tax credits would be granted for amounts actually saved (or, easier to identify, invested in specific forms). Healthy propensities would then be reinforced at worst and created at best.

### 2.2.2 Savings Rate as a Function of Income Level: Redistribution Effects.

While the literature on economic development has emphasized the relation of the savings rate to the kind of income, the more general economics literature is abundant with controversy over the relation of the savings rate to the level of personal income. Four alternative hypotheses summarize the controversy:

a) the average propensity to save rises asincome rises (Keynesian consumption function;

b) consumption is a constant fraction of permanent income (Friedman);

c) the savings rate is a function of income level relative to average income in the society (Duesenberry);

d) saving is done for the purpose of retirement plus desired bequests, and the savings rate depends mainly on the individual's age (Modigliani and Brumberg).

It is important to consider the implications of each of these hypotheses for the general question of this section: what effect would income redistribution have on aggregate savings? None of the hypotheses can be dismissed summarily since no conclusive empirical proof of one as opposed to the othershas been established. To the extent that the hypotheses suggest income redistribution would lower aggregate personal savings, a conflict between "equity" and "economic growth" is implied.

#### 2.2.2.1 Keynesian Functions

In the Keynesian case, consumption is related to income either linearly or curvilinearly. If the relation is linear, income redistribution cannot affect aggregate personal savings. This conclusion holds whether the *ex ante* marginal propensity to consume of each recipient is used as the basis of calculation,[1] or the *ex post* average propensity to save is used, as in this paper. That is, for all individuals (or family units),

$$(2.1) \quad c_i = a + by_i$$

where c = consumption spending, and y equals income level; i refers to the $i^{th}$ recipient unit. Using the *ex ante* marginal savings rate

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1. As suggested by Lubell, who also observes that in the linear case redistribution cannot change total consumption. Harold Lubell, "Effects of Redistribution of Income on Consumers'

(Continued on next page)

approach, the increment in consumption after redistribution of income from m losers (group L)to n gainers (group G) must be;

$$(2.2)\quad \Delta C = \sum_{i=1}^{n}(\Delta c_{i,G}) + \sum_{i=1}^{m}(\Delta c_{i,L})$$

$$= \sum_{i=1}^{n} b(\Delta y_{i,G}) + \sum_{i=1}^{m} b(\Delta y_{i,L})$$

$$= b\left[\sum_{i=1}^{n}\Delta y_{i,G} + \sum_{i=1}^{m}\Delta y_{i,L}\right]$$

where $\Delta C$ is the change in aggregate consumption, $\Delta c_{i,j}$ and $\Delta y_{i,j}$ are the changes in consumption and income, respectively, for the $i^{th}$ member of group j. Since the value of

$$\sum_{i=1}^{m}\Delta y_{i,L}$$

must be exactly the negative of

$$\sum_{i=1}^{n}\Delta y_{i,G}$$

if the total income is constant, $\Delta C = 0$. There is no change in consumption or in the aggregage personal savings rate resulting from income redistribution.

The "<u>ex post</u> average savings rate" basis of calculation also gives no change in aggregate savings after income redistribution, using the linear consumption function. In this method, instead of applying the marginal propensity to consume "b" to the change in income to obtain the change in consumption, one merely applies the whole consumption function to <u>ex post</u> income levels and sums across individuals to obtain the new consumption level. Thus,

$$(2.3)\quad \Delta C = \sum_{i=1}^{n}\Delta c_{i,G} + \sum_{i=1}^{m}\Delta c_{i,L}$$

$$= \sum_{i=1}^{n}(c_{i,G,1} - c_{i,G,0}) + \sum_{i=1}^{m}(c_{i,L,1} - c_{i,L,0})$$

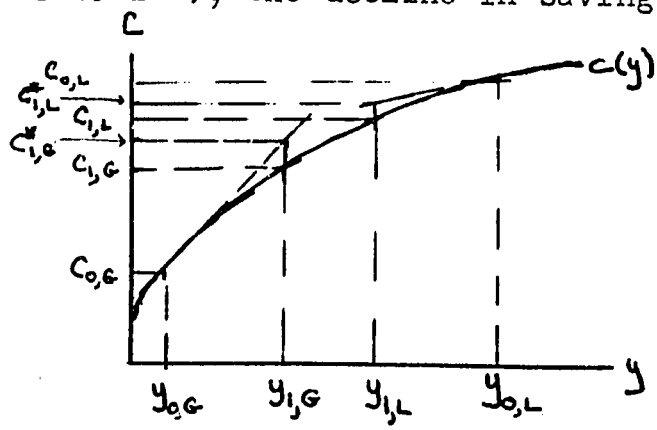
$$= \sum_{i=1}^{n}\left[(a + by_{i,G,1}) - (a + by_{i,G,0})\right] + \sum_{i=1}^{m}\left[(a+by_{i,L,1}) - (a+by_{i,L,0})\right]$$

$$= b\left[\sum_{i=1}^{n}(y_{i,G,1} - y_{i,G,0}) + \sum_{i=1}^{m}(y_{i,L,1} - y_{i,L,0})\right] = 0$$

(footnote continued from previous page)
Expenditures," in M. G. Mueller, ed., <u>Readings in Macroeconomics</u> (New York: Holt, Rinehart, and Winston, 1966), pp. 49-60.

where the third subscript on "c" and "y" is "one" for post-redistribution and zero for pre-redistribution.

If the Keynesian consumption function is curvilinear, then aggregate savings declines after income redistribution. If it is assumed that each household will consume an amount after redistribution equal to its previous consumption plus its pre-redistribution (ex ante) marginal propensity to consume multiplied by its change in income, the decline in savings will be greater; if the household consumes merely in accordance with the general consumption function applied to its new income level ("ex post average savings rate basis"), the decline in savings will be smaller.




Consider a two household economy. Subscripts i,j refer to pre-redistribution (0) or post-redistribution (1) for i; gainer (G) or loser (L) for j. The asterisk for ex-post consumption indicates behavior according to "ex ante marginal" propensities. The ex post values without asterisk indicate behavior based on average propensities applied to ex post income levels. In the diagram, $(y_{0,L} - y_{1,L})$ equals $(y_{1,G} - y_{0,G})$, so that total income is unchanged. Total consumption rises after redistribution. In the "ex ante marginal" case total consumption rises from $(C_{0,L} + C_{0,G})$ to $C^*_{1,L} + C^*_{1,G}$, a clear increase as shown in the diagram, and as could be demonstrated with quadratic or log-linear examples of a curvilinear consumption function. The rise in total consumption in the "ex post average" case, or $(C_{1,L} + C_{1,G}) - (C_{0,L} + C_{0,G})$ is positive but smaller.

If the income redistribution were considered to be a lasting phenomenon, it is likely that the households would behave according to the "ex post average" case rather than the "ex ante marginal" case. That is, a household with a particular income level after redistribution would consume the same amount that households with that income level before redistribution had consumed. An income-losing household would not consume as much as indicated by its pre-distribution level minus its pre-redistribution marginal propensity to consume times its decrease in income. The latter level of consumption might be maintained during a short period (as hypothesized in Duesenberry's ratchet effect for falls in income) but not over

a long time period, during which the family would come to realize it was living beyond its means by a greater degree than other families of identical means.

To summarize, a linear Keynesian consumption function would imply no decrease in aggregate savings after income redistribution. A curvilinear Keynesian consumption function would imply decreased savings after redistribution; the decrease would be greater if "ex ante marginal" propensities to consume prevailed, smaller if ex post consumption were based the consumption function applied directly to the ex post income levels. In the empirical simulations of this study it will be assumed that after redistribution, families would consume according to the latter model, the "ex post average" case.

2.2.2.2 Permanent Income Hypothesis

In the case of Friedman's permanent income hypothesis, redistribution of income would not affect aggregate savings so long as all families believed the new incomes to be permanent. By the Friedman hypothesis, an identical fraction of the believed "permanent" income is consumed by all households, regardless of level of permanent income.[1]

2.2.2.3 Life-cycle Hypothesis

In the life-cycle savings case,[2] redistribution of income would only affect aggregate savings if the "bequest" were an income-elastic consumption item. If not, then assuming length of work-life and retirement-life to be randomly distributed with respect to income level, redistribution of income would not affect aggregate savings. The savings rate would depend on age but would be invariant with respect to income level.[3] However, with demand for bequests

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1. Friedman's consumption function is: $c_p = k(i,w,u)y_p$

where $c_p$ = permanent consumption, y = permanent income, and k is the average propensity to consume, which is invariant with respect to $y_p$ but depends on interest rate (i), the ratio of non-human wealth to permanent income (w), and factors specific to the individual (u). Milton Friedman, A Theory of the Consumption Function (Princeton: Princeton University Press, 1957), p. 222.

2. See Franco Modigliani and Richard Brumberg, "Utility Analysis and the Consumption Function; An Interpretation of Cross Section Data," in K. K. Kurihara, ed., Post-Keynesian Economics (New Brunswick: Rutgers University Press, 1954).

3. Unless age and income were correlated. However, the variance of income is so great in developing countries that, while age might have a statistically significant relationship (positive) to income level, this relationship would explain such a small portion of the variance in income that it could be ignored as unimportant.

income-elastic, the high-income recipient would save a higher percent of his income than a low-income recipient of the same age, since the former would be saving to establish a more than proportionately higher bequest.

2.2.2.4 Relative Income Hypothesis

If the average propensity to save depends only on the level of income relative to the national average (or median) income, then income redistribution might or might not affect aggregate savings, depending on the specific form of the relationship. There is no way to judge *a priori* whether the "relative income" consumption function would be of a form which would cause aggregate savings to remain constant or to fall after income redistribution.[1]

2.2.2.5 Summary

In sum, of the four major alternative consumption function hypotheses, only the curvilinear version of the Keynesian function would unambiguously cause a decline in aggregate savings when income is redistributed from high-income to low-income recipients. The "permanent income" hypothesis implies no change in savings; the life-cycle hypothesis implies decreased savings only if bequests rise more than proportionately with income; and the relative income hypothesis (like the Keynesian hypothesis) gives decreased savings for some specifications of the function but not for a linear specification. Thus, by using the Keynesian function (and permitting it to be curved) in the empirical exercises below, this study should overstate rather than understate the negative effect of income redistribution on aggregate savings.

2.2.3 Adequacy of Demand

Before leaving discussion of the "savings effect" of income redistribution, it is necessary to examine an argument that runs in exactly the opposite direction -- the notion that income redistribution would stimulate long run growth because consumption would increase and buoy up investment in an otherwise stagnant economy. Certain economists, notably Celso Furtado, argue that

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1. As in the case of the Keynesian function, the answer depends on whether the form of the consumption function is linear or nonlinear. For example, consider the function $s = s_u - a(y/\bar{y})$ where y = income level, y = average income, s = savings as a fraction of income, and $s_u$ = the upper limit to the savings ratio. In this function, as income approaches infinity the savings rate approaches $s_u$; when income equals the average income, the savings rate is $s_u$-a; as income approaches zero the savings rate approaches negative infinity. With this function, aggregate savings decrease when total income is held constant but is redistributed from high income to low income recipients. In a linear function such as: $S=S_o+b\ (y-\bar{y})$, where $S_o$ is the level of savings corresponding to average income $\bar{y}$, redistribution of income could not change aggregate savings.

lack of consumer demand is causing stagnation in Latin American economies. If one accepts this position, then the negative "savings effect" of income redistribution becomes a stimulus rather than a hindrance to growth. Before considering the stagnation argument in its current context, it is useful to examine precursors of the argument.

The argument that inadequate consumption could cause stagnation goes back to Malthus. Ricardo asserted that high consumption of the landlord class, coupled with a rising rental share due to diminishing returns to capital and labor applied to a fixed amount of land, would hasten the economy towards a "steady state" where no more capital formation would occur. Malthus objected to the argument that a rising rental share reduced the investment rate: on the contrary, he maintained, without the high consumption of the landlords there would be poor prospective demand and thus little motive for investment. Malthus argued that there was some optimum level of consumption as a fraction of production: high enough to encourage more investment but low enough to leave surplus resources to be used for the investment. Ironically, in the Malthus-Ricardo debate there were no implications for size distribution of income; the debate referred only to distribution of income by type, between rents and profits.[1]

Oscar Lange[2] made the concept of an "optimum propensity to consume" much more explicit. Working in a Keynesian framework, he added one relationship to the normal model: investment was a negative function of the interest rate but a positive function of consumption. The influence of consumption was completely obvious, he maintained, and he criticized Keynes for treating investment and consumption as independent and alternative expenditures for determining aggregate income. Given a fixed money supply, the optimum consumption propensity was that which maximized investment. Consumption had a positive direct effect on investment (higher consumption made investors more sanguine about future sales) but a negative indirect effect: more consumption meant greater income, which required a higher interest rate to release money from speculative demand into transactions demand, but the higher interest rate depressed the level of investment (through the relationship of the marginal efficiency of investment to the quantity of investment).[3]

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1. For a summary of the controversy, see Marc Blaug, Economic Theory in Retrospect.

2. Oskar Lange, "The Rate of Interest and the Optimum Propensity to Consume," Economica, 5 (February 1938), pp. 12-32.

3. The exact optimal consumption propensity was that at which

$$\frac{\frac{\partial L}{\partial Y}}{\frac{\partial L}{\partial i}} = \frac{\frac{\partial I}{\partial C}}{\frac{\partial I}{\partial i}}$$

where L = demand for money, Y = income level, i = interest rate, and C = consumption. By dividing out identical items in the expression, there remains $\partial Y = \partial C$, the condition for maximum investment, i.e. $\partial I = 0$.

Two aspects of Lange's analysis are crucial for understanding its relevance for the less developed economy. First, it assumes a constant supply of money.[1] Lange concludes the analysis by saying that if monetary policy may be controlled adequately, there is no reason why a ceiling "optimum consumption propensity" need exist. Essentially, any increase in interest rate forced by increased consumption and therefore income could be offset by increasing the money supply. Yet in the cases of most of the countries examined in this study, rapid increase in the money supply is usually a fact of life; an "optimum consumption" model based on constant money supply is of questionable relevance.

Second, Lange's relation of investment to consumption postulates a point beyond which increased consumption no longer increases the investment rate (i.e. even holding the interest rate constant) because the supply elasticity of factors reaches zero and increased consumption merely raises the cost of factors and therefore does not increase the marginal efficiency of investment. Yet the present author's impression is that this case is the normal state of the less developed economy. There is no generalized excess plant capacity; the short run supply elasticity of capital and foreign exchange approaches zero. Increased consumption merely raises these factor prices and bids them away from use in investment activities.

For both of these reasons it is unlikely that Lange's approach to the "optimum consumption" rate would yield the conclusion that the countries examined here have suboptimal propensities to consume and therefore do not realize their full investment potential. Quite the contrary: the Latin American economies studied here (probably with the exception of Mexico and Venezuela) have been characterized by government deficits, rapid expansion of the money supply, and inflation. These characteristics make a "lack of demand" highly improbable. Secular government deficits reduce the possibility of "under consumption" in two ways. First, the deficits represent increased demand and movement of income toward a higher real or monetary level, using the standard Keynesian analysis. Second, the deficits are typically financed with borrowing from the central bank and thus monetary expansion and inflation. In the face of rapid inflation the hoarding of money becomes highly unattractive, and a drain on demand through leakage of money into speculative holdings -- essential to a Keynesian low level equilibrium -- is highly unlikely.

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1. Lange did present the model for the case in which money supply varied according to a specific function, $M = \phi(Y,i)$. In this case the optimum consumption rate occurs where

$$\left(\frac{\partial M}{\partial Y} - \frac{\partial L}{\partial Y}\right) / \left(\frac{\partial L}{\partial i} - \frac{\partial M}{\partial i}\right) = -\left(\frac{\partial I}{\partial C}\right) / \left(\frac{\partial I}{\partial i}\right)$$

Celso Furtado's version of the under-consumption argument incorporates the specific features of Latin American industrialization through import substitution.[1] His central hypothesis is that as import substitution moved from simpler consumer goods to more sophisticated consumer durables and capital goods, the capital/labor ratio increased, and, given a wage held constant in real terms by a pool of unemployed, increasing capital intensity meant that the value added generated in the new industries was increasingly concentrated in the hands of the owners. To Furtado, this process meant a lack of prospective consumer demand: implicitly the industrial workers themselves constituted the principal market for the producers, and since the growth of their aggregate earnings was slow, investment by the producers was discouraged. The result was stagnation of the economy in the late stages of import substitution.

There are various considerations Furtado's analysis ignores. First, it is not obvious that capital intensity must increase as production moves from consumer goods to capital goods: machine tools, for example, can be labor intensive -- although the labor required is skilled labor. But suppose Furtado's assumption about secularly increasing capital intensity is correct. Then a second, more important qualification of the argument is that prospective demand for goods sold by the new industries is not limited to the purchasing power of the industries' own workers. Government demand and demand from the agricultural and services sectors probably represent the bulk of demand for industrial goods, and with growing agricultural production and government activity there is no reason to expect demand from these quarters to be stagnant. If one objects that agriculture holds no prospects as a market because the masses of agricultural workers are at subsistence income and are out of the market, the answer is simply that the agricultural purchasing power is in the hands of landlords, and the question is not one of quantitative lack of demand but one of composition. To point out that landlords' demand (investment and consumption) represents a major market for the new industries is not to condone the rural distribution of income but merely to show that an argument suggesting "no rural demand exists" is fallacious.

Third, the Furtado argument ignores demand coming from the industrial profit recipients themselves. This demand may be in the form of more investment in the firm (which is questioned because of the supposed lack of prospective market) or in the form of investment in activities outside the firm, or in the form of increased consumption. Indeed, only in a few special cases will the entrepreneurs' use of profits be such that a depressing influence results. One such case would be simple remission of profits abroad; another would be use of profits for consumption of imported goods. A third would be the hoarding of profits -- unlikely in an inflationary context.

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1. Celso Furtado, "Development and Stagnation in Latin America: A Structuralist Approach," Studies in Comparative International Development, 1 (1965) pp. 159-175.

In sum, lack of sufficient demand in the economy, as formulated by Furtado, seems improbable.

At the heart of the under-consumption issue is the question of whether it is likely that the economy can be below full employment. Full employment here necessarily refers to full utilization of plant capacity, since disguised and open unemployment of labor are typical features of the less developed economy even when it produces at full capacity. It is worth reiteration that the prevalence of government deficits and inflation make it highly unlikely that conditions permitting production below "full employment" exist. However, one must resolve the apparent contradiction between this assertion and data showing excess capacity in certain industries in Latin American countries.[1]

There are considerations which would explain excess plant capacity as a phenomenon that does not indicate inadequate demand or "below-full employment." First, in a period of short-run stabilization after rampant inflation, it is highly likely that production will be below capacity; this adjustment does not indicate long run stagnation. Instead, it represents a rational trade-off of some current production in return for an increased stream of future production which would be unattainable unless rampant inflation and attendant uncertainty of future business calculations were eliminated. Second, a foreign exchange bottleneck can cause lack of imported intermediate materials and thus keep production below full capacity. In this case the adequacy of demand is not an issue; greater domestic demand would merely place greater pressure on imports.

Third, and most important in my view, any excess capacity is most likely not generalized to the economy but is focused in individual sectors. As such, it represents a problem not of inadequate over-all demand but one of balanced growth. Indeed, excess capacity can represent an optimal strategy of unbalanced growth[2] if it exists in sectors which have economies of scale and where large plants have intentionally been built ahead of demand in order to attain efficient scale. Without the "intended economies of scale" consideration, sectoral imbalance merely represents a lack of coordination in sectorial expansion; but whether the excess capacity is intended or unintended, the sectoral imbalance phenomenon cannot be solved by increased general demand -- which will merely cause prices to rise in the bottleneck sectors where production is at full capacity. Presumably the sectoral imbalance problem is solved either by investment in the lagging sectors (those producing at capacity), by exportation of production from the sectors with excess capacity, or

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1. See for example data on low utilization of capacity in heavy engineering industry in Brazil, for 1960. Nathaniel H. Leff, The Brazilian Capital Goods Industry, (Cambridge, Massachusetts: Harvard University Press, 1968), p. 29.

2. As suggested by Paul Streeten, "Unbalanced Growth", Oxford Economic Papers (June 1959).

by price policies (e.g. subsidization) which twist consumption and investment demand in favor of the sectors with excess capacity.

To summarize, the various arguments that savings is not a constraint but lack of consumer demand is, are unconvincing to this author. Therefore, the "savings effect" calculations below, examining the size of the negative effect of decreased savings after income redistribution, are important. The reader who adheres to an under-consumption analysis need simply note that the growth effects of redistribution would be more favorable than those calculated below, if the inadequate demand hypothesis were true.

### 2.2.4 Concept of Savings

Finally, concerning the savings effect of income redistribution on growth, it is necessary to clarify the definition of savings. The usual problem is how to treat consumer durables. National income accounts conventionally treat expenditure on home construction as investment, but expenditure on other consumer durables as consumption. To be sure, from the viewpoint of the individual, housing and other consumer durables represent assets that comprise part of a total portfolio; he presumably reaches some equilibrium portfolio decision in placement of his funds among these consumer durables and other, liquid, assets. And one might argue that an individual's purchase of consumer durables represents saving because the individual is appropriating future services of the good in exchange for self denial of alternative immediate or current consumption.

Nevertheless, for analysis of economic growth, "savings" must exclude consumer durables -- including housing. There are two reasons for this approach. First, purchase of a consumer durable may provide future services -- but it represents commitment of resources to consumption over a finite period, whereas liquid savings represent uncommitted resources which may be used for investment goods which will yield consumption goods and services at a much more distant future, with much greater productivity. The second reason is that liquid savings have an inherent "externality." Consider the "dual economy" model (i.e. of W. A. Lewis, and of J.C.H. Fei and G.Ranis). An individual's liquid savings permit capital formation in the modern sector; the demand curve for labor shifts out; modern sector production and employment increase. Product increases by the increment in the integral under the marginal product of labor curve. The portion of the increment above the labor supply curve belongs to the saver -- it is the increased profit and thus the return to the saver for his deposit of liquid capital. The present value of the future stream of this increased profit equals the amount the saver deposited plus the present value of the interest reward he required for his deposit. Yet this amount does not exhaust the increment in production: the increased area under the labor supply curve -- i.e. the amount of goods going out as new modern sector wage payments -- is the rest of the increased annual production. Thus the saver's deposit

of liquid assets has created an increment in production which exceeds his deposited capital and the present value of its interest reward. There is, in sum, an externality involved when the saver places his assets in the form of liquid capital available to the modern sector; there is no such externality involved when he purchases a consumer durable.

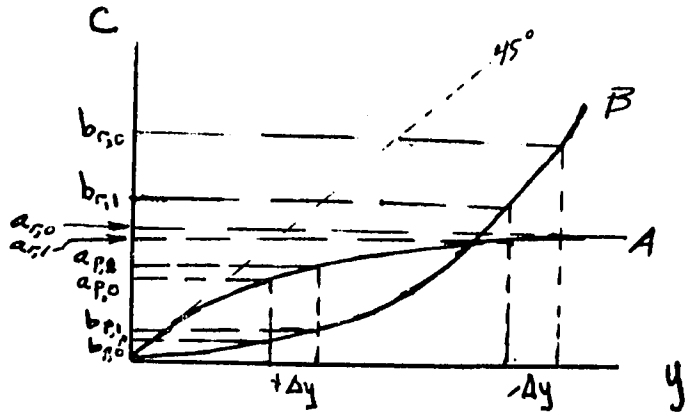
In the empirical analysis below, the concept of "savings" from personal income will not include expenditure on consumer durables, since the interest of this study is in growth from the standpoint of the economy as a whole rather than in the portfolio asset decision of the individual.

## 2.3 Effects on Composition of Demand

### 2.3.1 Import Effect

While redistribution of income should not affect total demand (i.e. consumption plus investment demand) in the economy, it may cause important changes in composition of demand. The discussion of the "savings effect" above may be seen as treating one of these changes: the shift in the shares of investment and consumption in total demand. Two other compositional shifts may be important. First, the shift in consumer goods demand may not be neutral with regard to imports. Second, the demand shift may not be neutral with respect to economies of scale.

Before considering the "import" and "economies of scale" effects, it is useful to clarify that the composition of demand shifts away from income-elastic toward income-inelastic goods when income is redistributed. A graphical example demonstrates this fact.




Returning to the example of the two-household economy, if $\Delta y$ is transferred from the rich household (r) to the poor (p), the decline in r's consumption of the income elastic good (B) exceeds the increase of p's consumption of the good (that is: $b_{r,o} - b_{r,1} > b_{p,1} - b_{p,o}$). The increase of p's consumption of the

income-inelastic good (A) rises more than r's consumption of the good falls (or: $a_{p,1}-a_{p,o} > a_{r,o}-a_{r,1}$ ). Thus the composition of demand shifts in favor of the income inelastic good, A.

Turning to the "import effect", if the average propensity to import rises with income, shift of demand toward more basic consumer goods should lower the demand for imports. A reduced import bill can be important if foreign exchange is a bottleneck restraining growth. The fact that most consumer goods are produced domestically because of a past policy of import substitution does not rule out an import effect" of the shift in demand toward basic goods. If the import content -- including required capital and intermediate goods -- is higher for income elastic goods than for income inelastic goods, the shift in demand composition after income redistribution will lower import demand.

### 2.3.2 Differential Economies of Scale

The second compositional influence is that of economies of scale. If income inelastic goods have greater economies of scale than luxury goods, the decrease in demand for luxury goods following income redistribution will release resources which, when applied in income-inelastic goods, will cause a more than compensating increase in production, since the scale of production for the basic consumption goods will increase and thus so will production efficiency for these goods. One could argue that even though economies of scale are important for some luxury goods such as automobiles, in the relevant range of domestic demand the efficient scales would not be reached, whereas if the same quantum of purchasing power were shifted into a mass market for basic goods, the scales of demand for these goods would be sufficient to achieve economies of scale in them.[1]

### 2.3.3 Supply Rigidity Costs

A short run cost of income redistribution's demand composition effect is that the supply pattern would no longer match the demand pattern; idle capacity in some sectors and scarcities in others would result. This problem would occur to the extent that resources in the income elastic goods are not transferrable (e.g. are in fixed plant and equipment). The escape of exporting luxury goods in return for imported basic consumer goods would probably not be an option, since the luxury goods which had been supplying the protected domestic market probably would have to sell at substantial

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1. The "differential economies of scale" argument is implicit in arguments such as those presented by Strassman and by Navarette. Strassman asserts, for example: "... consumption inequality... is likely to channel workers away from mass-production industries into luxury handicraft industries and personal services." W. Paul Strassmann, "Economic Growth and Income Distribution," Quarterly Journal of Economics, 70 (August 1956), p.431. A similar idea is expressed in Ifigenia de Navarrete, La Distribucion del Ingreso y el Desarrollo Economico de Mexico (Mexico: Escuela Nacional de Economia, 1960), p.27

losses to be internationally competitive and even then might not sell due to quality and brand considerations.

In the longer run the fixed-capacity problem disappears, since even with more equal income distribution demand will grow to the point where the capacity in income-elastic goods sectors is again fully utilized.

### 2.3.4 Differential Factor Opportunity Costs

A potentially important effect of income redistribution is that the resulting change in the composition of demand may shift demand away from goods requiring factor inputs with high opportunity costs and toward goods requiring factors with low opportunity costs.[1] A concrete example of this shift would be the increase in demand for foodstuffs requiring low-cost labor and a decrease in demand for certain consumer durables requiring scarce capital inputs. The net result for the economy would be increased production possibility for its same set of available resources.

## 2.4 Interpersonal, Intertemporal Welfare Maximization

In addition to the effects of income redistribution on savings, imports and economies of scale, the direct impact of redistribution on the social welfare function must be considered. In an economy in which planning takes place, a social welfare function is at least implicitly being used in decision making. Therefore, it is useful to consider the growth-equity trade-off in a specific form, although this study makes no empirical estimates using social welfare functions because of their arbitrary nature.

To simplify the problem, suppose the import and scale effects of income redistribution would be negligible but the savings effect would be substantial and negative. Suppose there are n persons in the economy and capital formation comes solely from personal savings. Then the income distribution decision becomes: choose the income distribution so as to maximize the welfare function over the planning horizon, subject to some terminal capital stock requirement. Thus:

$$(2.4) \qquad a) \qquad \max_{\sigma_t} \sum_{t=1}^{T} W_t$$

where T is the number of years in the planning horizon, and $W_t$ equals the value of the welfare function in year t. Note that

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1. This idea is suggested by Celso Furtado, Um Projeto para o Brasil (Rio de Janeiro: Fundo da Cultura, 1969). In an excellent analysis Furtado separates growth sources into capital accumulation, technical change, and demand change, and asserts that the change in world demand towards coffee favored Brazil in the late 19th and early 20th centuries, since coffee production required almost no capital but much labor, and Brazil's labor supply was abundant and the climate was appropriate for coffee).

there is assumed to be a zero rate of pure time preference.

$$\text{b)} \quad W_t = \sum_{i=1}^{n} \ln y_{i,t}$$

where $y_{i,t}$ is the income of the $i^{th}$ person in year t. Here the particular utility function chosen is logarithmic. Furthermore, total income is chosen as the source of utility since the individual has claim to total income -- not just consumption.

The remaining elements of the problem would be:

$$\text{c)} \quad \sum_{i=1}^{n} y_{i,t} = Y_t$$

$$\text{d)} \quad Y_t = F(K_t, L_t) = G(K_t) = AL_o^{\alpha} K_t^{\beta}$$

$$\text{e)} \quad K_t = K_{t-1} + S_{t-1} \; ; \quad K_{t=1} \equiv K_1$$

$$\text{f)} \quad S_t = \sum_{i=1}^{n} s_{i,t} \equiv \sum_{i=1}^{n} (y_{i,t} - c_{i,t})$$

$$\text{g)} \quad c_{i,t} = e^a y_{i,t}^b$$

$$\text{h)} \quad \sigma_t \equiv \left[ \sum_{i=1}^{n} (y_{i,t} - \bar{y}_t)^2 \right]^{1/2} / \bar{y}_t$$

$$\text{i)} \quad \bar{y}_t = \frac{1}{n} \left[ \sum_{i=1}^{n} y_{i,t} \right]$$

$$\text{j)} \quad K_T \geq \bar{K}_T$$

Equation c) constrains the sum of individuals' incomes to total income or production. Equation d) is the production function; a constant population is assumed, therefore there is a constant labor force $L_o$. $K_t$ is capital stock in year t. Equation e) shows capital stock is increased by yearly personal savings ($S_t$); there is no depreciation. Equations f) and g) show savings as a function of incomes; a log-linear consumption function is chosen. Equation h) shows the decision variable; the standard deviation of income level as a fraction of average income. Thus $\sigma_t$ measures inequality of income distribution in year t, and equals zero for perfect equality. Equation i) defines average income in year t ($\bar{y}_t$), and equation j) specifies the minimum required terminal capital stock.

The optimal inequality of income distribution for each year, $\sigma_t$, will depend on the parameter $\beta$ (reflecting the productivity of capital), and "a" and "b" (reflecting difference in average propensity to save associated with different income levels).

Computer simulation could be used to search for the optimal $\sigma_t$ as a function of various hypothesized values of $\beta$, a, and b, and of given variables such as $K_T$, $L_o$, A, and $\alpha$. However, the results would depend strictly on the mathematical forms chosen for the welfare function,[1] production function, and consumption function, and specific results would be of questionable informative value. The important point is that the above model clarifies the influences of the income distribution choice. The optimal distribution will be more equal (lower $\sigma_t$) the more rapid the decline in marginal utility of income (reflected by the choice of welfare function), the lower the elasticity of output with respect to capital (lower $\beta$), the lower the required terminal capital stock ($K_T$), and the closer the marginal propensity to consume to constancy over all income levels (the closer "b" to unity).

## 2.5 Labor Productivity

A final consideration is the impact of income distribution on labor productivity through health and education. Myrdal[2] argues in the context of countries such as India, standards of living of the masses are so low that increased consumption would improve labor's health and therefore productivity more than enough to compensate for the decline in savings associated with the increased consumption. Similarly, if the particular form of income redistribution were increased government spending on mass education financed by taxation on upper income groups, there would presumably be some increase in production. These two effects are mentioned for completeness; they are not measured in this study.

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1. Alternative welfare functions might be:

a) $$W_t = \prod_{i=1}^{n} y_{i,t}$$

b) $$W_t = \sum_{i=1}^{n} \left(B - \frac{\gamma}{y_{i,t}}\right)$$

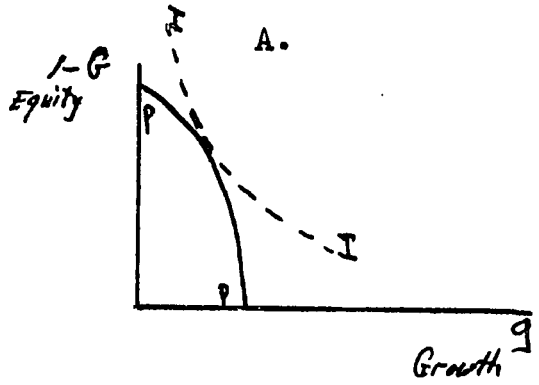
2. Gunnar Myrdal, Asian Drama: An Inquiry into the Poverty of Nations (New York: Pantheon, 1968), Vol. I, p. 59.

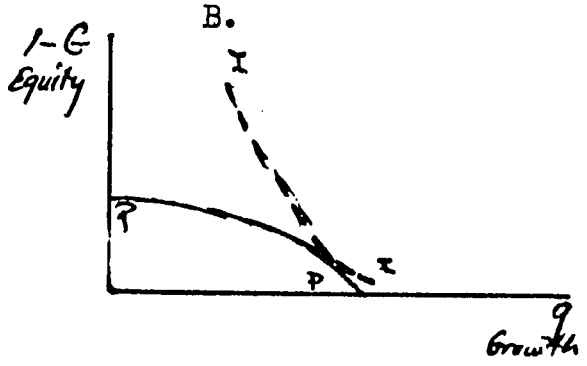
## 2.6 Summary

In sum, there are four major effects on growth which income redistribution (equalization) may cause: a decrease in aggregate savings, a change in the share of imports in total demand, a change in the possibilities for production at efficient scale in specific goods, and a shift in demand toward goods requiring factor inputs with lower (or higher) opportunity costs.

If one assumes the net effect of these influences is that some growth must be sacrificed for increased equity, then the policy choice between the two objectives may be conceptualized in terms of a production possibility-indifference curve graph. Let the vertical axis represent an equity index, with increasing values for increasing equality. The variable 1-G where "G" is the Gini coefficient of income concentration[1] would be one such index. Let the horizontal axis represent the growth rate for the economy (and, assuming population growth to be independent of the policy choice, the growth rate of per capita income). The production possibility curve PP shows the possible combinations of equity and growth rates; the social indifference curve II shows the planner's relative valuation of the two goals (or that of the combined influence of "dollar votes" and political influence in an unplanned economy). Policies should then be followed which place the economy at the optimal combination -- the point where the indifference curve is tangent to the production possibility curve. Note that the indifference curve would reflect both society's valuation of immediate equalization (i.e. its notion of the marginal utility of income and application of this notion on an interpersonal basis) and its time-discount rate (for the relative weight of growth).

In case A below, society would choose policies which would attain high equity with little sacrifice in growth; in case B more growth and less equity would be chosen because the technical trade-off between them (shown by the production possibility curve) requires greater sacrifice in growth for a given increase in equity.




1. The Gini coefficient is the ratio of the area between the Lorenz curve and the diagonal to the total area under the diagonal in a Lorenz diagram of cumulative percent of recipients (horizontal) plotted against cumulative percent of income (vertical).

While this study will not attempt to estimate the exact shape of the production possibility curve (and certainly not that of the indifference curve), it does attempt to make empirical estimates of the savings effect and the import effect under specific hypothesized income redistributions. The savings effect is examined on a basis of estimated consumption functions relating consumption to family income level. The import effect is examined by investigating change in the composition of demand by product after income redistribution and calculating the direct and indirect effects of this change on imports. These two estimates (in Chapters 4 and 5 respectively) follow an initial examination (Chapter 3) of data presently available for income distribution in six Latin American countries.

## 3. Income Distribution Data for Six Latin American Countries

The purpose of this section is to discuss the available estimates of distribution of income by size, for Argentina, Brazil, Chile, Colombia, Mexico, and Venezuela. Some of the data are from published sources; others are estimates made by the author from sources such as family budget studies and census statistics. In each case an effort is made to identify any likely direction of bias in the estimated distribution. The income distribution data themselves are shown in Table I of Appendix A.

It is important to note that while the data to be examined below should include all estimates presently available, there should be new sources of income distribution data available within one or two years. A series of family budget studies is being conducted in most of the Latin American countries. The series is being coordinated by the Brookings Institution. At the present time, data has been gathered in this series for: Mexico (by the Banco de Mexico), Colombia (urban data only; by the Universidad de los Andes), Peru (urban data only), and Brazil (three cities only; by the Getulio Vargas Foundation). To the author's knowledge, data processing and analysis has not been completed in any of these cases. Furthermore, a budget study in the series is in process in Chile (Direccion de Estadistica y Censos) where data has been gathered for only one of four survey quarters; and in Argentina a similar survey will be done but the field work has not yet begun.

### 3.1 Argentina

Two sources are available for personal income distribution in Argentina. The first is a United Nations (ECLA) study;[1] the second is a family budget study done by the Consejo Nacional de Desarrollo (CONADE) as part of an effort by the Joint Tax Program of the OAS, BID, and ECLA.[2] The ECLA study itself is an analysis based on a

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1. Naciones Unidas, Comision Economica para America Latina, El Desarrollo Economico y la Distribucion del Ingreso en la Argentina (New York: 1968).

2. Republica Argentina. Presidencia de la Nacion. Consejo

(to be continued on next page)

statistical study by CONADE and ECLA[1]. The ECLA study gives income distribution for the whole country, whereas the CONADE budget survey refers only to urban families.

### 3.1.1 ECLA Estimate

The ECLA study[2] is constructed from various sources, including national accounts, social security registers, public employee rolls, the economic census, and the 1963 family budget survey. The advantage of this type of study is that it avoids the under-reporting of high incomes often encountered in household surveys and in tax records. A disadvantage is the difficulty of combining data from different sources and even different years, and the need to resort to assumptions.

The ECLA study considered active workers in four divisions: salaried workers, employers, pensioners, and renters. It examined the first two categories by economic sector. For each sector a size distribution of income was found. For urban salaried workers and for persons on pensions, data came from the social security registers. Since these data did not cover high-income wage earners, the ECLA authors conducted a special survey of private firms and obtained employers' records of income tax withheld for employees, as a basis for estimating wages of upper-income employees. Data for government employees came from government accounts.

For agricultural workers and domestic servants, social security data did not exist. Instead, average wage estimates were calculated on as detailed a disaggregation as possible, by region and job classification. Since the very lowest-income agricultural and domestic service workers would have had incomes below the averages for their particular categories, this method introduces at least some bias toward underestimation of the inequality of income distribution.

The incomes of entrepreneurs were also estimated on an "average income by category" basis, through special tabulation of economic census data. Legal corporations were first removed from the census data. Then the census reports on unincorporated firms were classified into some 1500 groupings of enterprises: by crop and farm size in agriculture, and by firm size otherwise.

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(footnote continued from previous page)

Nacional de Desarrollo. Sector Presupuesto Economico Nacional. Encuesta Sobre Presupuestos de Consumo de las Familias Urbanas por Niveles de Ingreso para 1963)

1. Consejo Nacional de Desarrollo, Distribucion del Ingreso y Cuentas Nacionales en la Argentina, V. Vols. (Buenos Aires: 1965).

2. The description of the ECLA Argentina study draws from El Desarrollo... op. cit., pp. 48-51. A description of the methods

(to be continued on next page)

The total profits in each subgroup were derived by deducting costs from production value. Then these profits were divided evenly among the firms to estimate the average income of an entrepreneur in the sub-group. The assumption of no dispersion of entrepreneurial income within each sub-group is a source of underestimation of the skewedness of income distribution. However, this underestimation is probably less than that which occurs in sample surveys. Indirect estimation of entrepreneurial income from census materials avoids the problem of intentional under-reporting of income in sample responses.

Renters' incomes and incomes of roughly one-third of entrepreneurs (not subject to estimation from the economic census) were calculated on a basis of the CONADE sample survey of urban families for 1963.

Once the distributions of incomes per active workers, by occupation, were found, the ECLA authors estimated the incidence of multiple jobs held by individual workers, and aggregated, to obtain the over-all income distribution for active workers. To estimate the distribution of family income, the study used the information on workers per family from the CONADE family budget study.

There is no reason to expect the ECLA estimates to be greatly biased. Whatever bias exists is presumably toward overstating equality of distribution, since income dispersion is underestimated by the point-average method applied to entrepreneurs, agricultural workers, and domestic servants. The study warns that the reliability of the active worker estimate is greater than that of the family estimate; and since some entrepreneurial incomes were estimated on assumptions, entrepreneurial income estimates are less reliable than estimates of salaried income.

The income distributions of the ECLA study are shown in Tables I.A.1 and I.A.2, Appendix A.

### 3.1.2 CONADE

In 1963 the planning agency CONADE conducted a stratified random sample of 4,000 households, representing cities of over 10,000 inhabitants. A distribution of income (after direct taxes and social security contributions) may be derived from the published results, which were already expanded to represent the survey's universe. This distribution of urban family income is shown in Table I.A.3.

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(footnote continued from previous page)
used is also given in "Income Distribution in Argentina", Economic Bulletin for Latin America, United Nations, Vol. XI, No. 1, April 1966, pp. 108-112.

The sample design was not the best for capturing accurate data on income; it did not give higher representation to high income areas -- which would be advisable on the general criterion that a given stratum's sample size be proportional to that stratum's standard deviation of the variable examined, income, as well as weighted by the stratum's population. Instead, the sample was random, except that Buenos Aires had only half as many interviews per capita as the other cities. (If the highest incomes were in Buenos Aires, the result was to give less rather than more than proportional effort to sampling high income areas.)

Great care seems to have been taken in administering the sample. While the primary interviewee was the woman of the house, frequently the husband and other household members were consulted, especially in high income families. More important, whenever reported spending appeared inconsistent with reported income, a return visit to the household was made for verification.

The probable bias in the CONADE data is toward income equality, since the source is a sample survey and underreporting of high income is likely. The CONADE data are shown in Table I.A.3. For comparison, the author estimated an urban family income distribution from the ECLA data, by deducting the "agricultural" sector[1] from the total. The result is shown in Table I.A.4. As expected, the CONADE distribution is more equal: the top 5% of urban families receive 19.4% of the income according to the CONADE data, while the same group receives 28.5% of the income according to the adjusted ECLA data. For the lower 50% of the urban population, however, the two sources give almost identical income shares.

### 3.1.3 Distribution of Income After Taxes

The ECLA study includes an estimate of the impact of taxes and government spending on income distribution.[2] These estimates are shown in Table 3.1. Export and corporate profits taxes are not included in the analysis, although the study asserts their inclusion under various incidence assumptions affects the after-tax distribution very little.

Calculation of the impact of government spending on income distribution is based on an allocation of education, public health, and government subsidy expenditures that is proportional to population in each income bracket. The ECLA authors emphasize that taxation has a smaller redistributive impact than government spending. Even so, the redistributive effect of both is very small. Thus, while taxation alone shifts the income share of the bottom 50% of families only from 23.4% to 23.9% government spending alone shifts the share

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1. As shown in El Desarrollo..., op. cit., p. 52.

2. The estimate was taken from calculations of the Joint Tax Program of the O.A.S./B.I.D./ECLA. The methods of the tax incidence calculations are not described in the ECLA publication.

Table 3.1 - Argentina: Effect of Taxation and Government Spending on Income Distribution

| Percent Families | Percent Income in Group - 1961 | | | | |
|---|---|---|---|---|---|
| | | Tax Effect | | Gov. Expenditure Effect | |
| | A | B | C | D | E |
| 0-10 | 2.9 | 3.0 | 3.1 | -- | -- |
| 10-30 | 8.9 | 9.1 | 9.1 | 7.0* | 7.7* |
| 30-50 | 11.6 | 11.9 | 11.7 | 16.4** | 17.2** |
| 50-70 | 15.0 | 15.4 | 14.7 | 15.0 | 15.3 |
| 70-80 | 9.6 | 9.8 | 9.3 | 22.5*** | 22.3*** |
| 80-90 | 12.9 | 13.2 | 12.5 | -- | -- |
| 90-100 | 39.1 | 37.7 | 39.6 | 39.1 | 37.5 |

A, D = Before tax income

B = Income after direct taxes

C = Income after indirect and direct taxes (export and corporate income tax incidence excluded)

E = D plus redistribution effect of government spending

* = for 0 to 20% of families

** = 20% to 50% of families

*** = 70% to 90% of families

from 23.4% to 24.9%. The joint effect of taxation and government spending is not calculated by the ECLA authors, but it is clearly very small.

3.1.4. Summary

The ECLA estimates appear to be relatively unbiased and reliable, and will be used subsequently in this study.

3.2 Brazil

3.2.1 General

The principal basis for estimation of income distribution in Brazil is the 1960 population census,[1] which contained a question on monthly income per active worker in an economic questionnaire given to 25% of the census population. On this basis, the United Nations published a preliminary estimate of income distribution;[2] this estimate has been revised[3] but the altered estimate is still unpublished.

There are two additional data sources that conceivably would yield income distribution estimates for Brazil: the 1962-1963 family budget studies of the Getulio Vargas Foundation;[4] and the National Sample Survey of Households of the Instituto Brasileiro de Estatistica,[5] a series of quarterly samples beginning in 1968. These sources are discussed below.

3.2.2 Estimate based on 1960 Population Census

The question on income in the 1960 census, administered to 25% of the respondents, referred to monetary income, before taxes,

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1. I.B.G.E., Serviço Nacional de Recenseamento, VII Recenseamento Geral do Brasil - 1960, Censo Demografico: Resultados Preliminares, (Rio de Janeiro: 1965), p. 10.

2. Naciones Unidas, Consejo Economico y Social, Comision Economica para America Latina, Estudios Sobre la Distribucion del Ingreso en America Latina, E/CN.12/770 (Caracas: 1967).

3. April, 1969: Internal Document, U.N. ECLA, Santiago, Chile. It is the author's understanding that the revised estimate was obtained through a joint project of ECLA and IPEA -- The Instituto de Planejamento Economico e Social in Brazil.

4. Fundação Getulio Vargas, Instituto Brasileiro de Economia, Pesquisa Sobre Orçamentos Familiares, (Rio de Janeiro: n.d.). The series includes 12 volumes on urban areas, already published, in addition to still unpublished volumes on rural areas.

5. Fundação IBGE, Pesquisa Nacional por Amostra de Domicilios. (Rio de Janeiro: quarterly, beginning November 1968).

during the month preceding the census date (September 1, 1960). For persons on fixed incomes, the month's salary was recorded; for those on variable income, the figure was the monthly average of income over the preceding twelve months.[1] From the definition given in the census and in the instructions to census takers, it appears that entrepreneurial income reported included only income "withdrawn" from enterprises. Furthermore, income in kind was not estimated.

Table 3.2 shows the basic census data on income distribution, with some aggregation but with the agricultural sector shown in its original detail since adjustments for this sector are made below. Two major problems are immediately clear from the table. First, there is a large group of men and women in agriculture "without income." Yet it is highly likely, given the family organization of the large number of very small and medium sized farms, that these unremunerated personnel are unpaid family workers associated with heads-of-family who are entered in income brackets in the table. Second, the upper income bracket is open-ended, so one does not know the total income in the bracket.

### 3.2.2.1 Distribution with Unadjusted Data

A first approximation of the distribution of income for active workers in Brazil may be drawn from the "total" figures in the first column of Table 3.2. In this estimate, the persons "without income" are merely excluded. Except for unpaid workers in agriculture, the population without income includes primarily inactive persons.

The percent of active workers in each income group derives directly from the table. The percent of income in each group is found in the following way. For all brackets except the lowest and highest, the midpoint of the bracket is multiplied by the number of workers to determine total income in the bracket. Then a Pareto curve is estimated, of the form:

$$N = A\, y^{-b} \quad \text{subject to} \quad b > 1.0 \quad \text{and } y \geq y_o$$

where N is the total number of workers with income in excess of level y, and $y_o$ is the lowest income received by any worker. This estimate is obtained through least-squares regression of the logarithm of N on the logarithm of y.

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1. This fact would tend to bias downward real income in upper brackets. Variable incomes would be in upper brackets. Given inflation of about 30% per year in 1959-1960, the monthly average of monetary income over the whole preceding year would understate the real level of income, in comparison with a figure based on the last month's salary alone. No adjustment has been made for this bias in the estimated distribution, which is highly skewed even without such an adjustment.

Table 3.2

Average Monthly Income, Brazil, August 1960

Persons of 10 years and older

| Average monthly income (Cruzeiros) | Total | Agriculture & Extractive Industry Men | Agriculture & Extractive Industry Women | Industry Men and Women | Other Activities Men and Women | Inactive Men | Inactive Women |
|---|---|---|---|---|---|---|---|
| Total | 48,761,467 | 11,046,649 | 1,224,592 | 2,854,976 | 7,525,046 | 5,542,295 | 20,567,909 |
| Less than 2100 | 4,899,925 | 2,752,353 | 294,154 | 294,323 | 1,447,344 | 32,505 | 79,246 |
| 2101 to 3300 | 3,375,719 | 2,193,989 | 120,096 | 275,637 | 652,000 | 83,215 | 50,7[illegible] |
| 3301 to 4500 | 2,600,515 | 1,500,665 | 49,323 | 308,648 | 605,416 | 98,020 | 38,443 |
| 4501 to 6000 | 3,000,032 | 1,013,212 | 27,357 | 685,904 | 1,160,890 | 83,989 | 28,7[illegible] |
| 6001 to 10000 | 3,304,709 | 677,711 | 13,621 | 781,346 | 1,707,605 | 88,491 | 35,935 |
| 10001 to 20000 | 1,843,919 | 250,858 | 5,680 | 321,762 | 1,154,856 | 81,581 | 29,182 |
| Greater than 20000 | 703,237 | 78,727 | 1,171 | 105,038 | 464,229 | 43,301 | 10,771 |
| Without income | 28,575,224 | 2,463,042 | 707,203 | 40,917 | 111,137 | 4,980,086 | 20,272,939 |
| Without declaration | 458,187 | 116,092 | 6,007 | 41,401 | 221,569 | 51,107 | 22,011 |

First, however, the minimum income $y_o$ must be estimated.[1] Once the minimum income is known and the coefficient "b" is found by regression, the amounts of total income in the bottom and top brackets may be found. Income in the lowest bracket equals the number of persons in the bracket times the midpoint between the minimum income and the bracket's ceiling. Income in the upper, open-ended bracket equals:

$$Y_u = \int_{y_{fu}}^{\infty} \left|\frac{dN}{dy}\right| y\,dy = \int_{y_{fu}}^{\infty} y\,b\,A\,y^{-b-1}\,dy = -\frac{bA}{1-b}\,(y_{fu})^{1-b}$$

where $y_{fu}$ is the income floor of the upper bracket. The value $\left|\frac{dN}{dy}\right|$ is the number of persons with exactly income y, and the integral of these values times their respective incomes gives total income in the upper bracket.

Using the quantile method[2] to estimate $y_o$ and then using the log-linear regression to estimate b, the census data give the following results: $y_o$ = 1630 cruz.; b = 1.299 (std.error = .12). The resulting estimates of total income, percent of recipients, and percent of total income in each bracket, are shown in table 3.3.

---

1. This estimate is crucial. It gives the first observation for the regression: N = total working population, $y = y_o$. If $y_o$ is merely assumed to be zero, the regression is impossible since the logarithm of zero does not exist. More important, the use of a $y_o$ arbitrarily close to zero (e.g. log $y_o$ = 0) distorts the estimate since the observation (N, $y_o$) then heavily dominates the "logarithm y" independent variables -- all of which lie in a fairly close range except for the arbitrary log $y_o$. The use of an arbitrary $y_o$ close to zero will bias the Pareto coefficient b downward, e.g. toward skewed distribution. On the other hand, merely to ignore the "first observation and consider the point ($N_{y1}$, $y_1$) as the first observation (where in this case $y_1$ = 2100 cruz., the ceiling of the bottom class) biases the estimate of "b" upward -- toward equal income distribution.

2. See R. E. Quandt, "Old and New Methods of Estimation and the Pareto Distribution, Metrika, Vol. 10, Fasc.1, 1966, pp. 55-82. In the quantile method, the probabilities of income less than two particular levels are selected, $P_1$ and $P_2$ corresponding to $y_1$ and $y_2$, where $P_1$ and $P_2$ are merely the percentages of total population receiving less than incomes $y_1$ and $y_2$ respectively, the Pareto distribution function gives:

$$F(y) = 1 - \left[\frac{y_o}{y}\right]^b$$

where F(y) is the probability that an individual will have an income of less than "y". The minimum income is $y_o$ and "b" is the same coefficient as discussed above. Then using the two percentages $P_1$, $P_2$ and $y_1$, $y_2$ with two unknowns, $y_o$ and b, the two unknowns

(continued on next page)

Table 3.3

Income, Percent of Recipients and Percent of Income in Each Bracket: Brazil, 1960 Census

| Monthly cruz. | Total Income: billion cruz./ month | % Recipients | % Income |
|---|---|---|---|
| <2100 | 9.15 | 24.84 | 5.05 |
| -3300 | 9.09 | 17.11 | 5.02 |
| -4500 | 10.13 | 13.18 | 5.60 |
| -6000 | 15.75 | 15.21 | 8.70 |
| -10 000 | 26.40 | 16.75 | 14.60 |
| -20 000 | 27.60 | 9.35 | 15.25 |
| ≥20 000 | 83.20 | 3.56 | 45.90 |
| | 181.32 | 100.0 | 100.0 |

It is worth noting that the still unpublished ECLA estimate of Brazilian income distribution does not agree with the figures of Table 3.3, although ECLA's calculation is based on the same census data. The ECLA estimate, for example, shows the top 5% of active workers receive 38.4% of the income, while the estimate of the present study shows the top 3.56% of workers receive 45.9% of the income. The ECLA estimate seems to be based on a log-normal distribution fitted to the lower income brackets and a Pareto distribution fitted to the upper brackets.[1] The result is a more even distribution than that estimated here.[2]

(Footnote continued from previous page)

$y_o$ and b, the two unknowns are found by direct solution.

Experimentation by the author with data for Brazil and the other countries of this study yielded consistently lower values of "b" from the quantile method than other methods (regression and "Lorenz Curve estimation" discussed in Appendix B.1). Often the quantile method gave "b" of less than unity -- meaning there was no finite limit to the upper incomes and an average income did not exist for the distribution. On the other hand, the minimum income estimates from the quantile method were always reasonable. Therefore the author chose to obtain the minimum income estimates from the quantile method but to use the regression method to obtain the coefficient "b" for this section.

1. As presented in a seminar by Pedro Uribe, Rio de Janeiro, March 23, 1970.

2. Note that in the growth analysis in chapters 4 and 5 below, a possible overstatement of inequality in our estimate of income

(continued on next page)

Finally, it should be noted that the author examined alternative estimates of income in the upper bracket, based on the "lognormal" distribution rather than the Pareto distribution. The several "lognormal" estimates fluctuated greatly,[1] one giving more income in the upper bracket, others giving less, than the Pareto method. It thus appeared best to remain with the above estimate, based on the Pareto distribution.

### 3.2.2.2 Adjustment for Unpaid Family Workers in Agriculture

The 3.2 million "unpaid" male and female workers in agriculture (see Table 3.2) represent about 15% of the roughly 20 million active workers. Yet they are excluded in the first approximation of income distribution. To include them costs a good deal in terms of departure from hard data into the realm of assumptions; but their exclusion substantially understates the skewedness of monetary income distribution.

This section attempts to estimate income distribution for active workers, including "unpaid" agricultural workers. The basic assumption is that these unpaid workers are members of families whose heads are recorded as receiving the whole of the

(Footnote continued from previous page)

distribution for Brazil would mean an overstatement of the negative growth effects that would result from income equalization.

1. The lognormal estimates were based on the quantile method described in J. Aitchison and J.A.C. Brown, The Lognormal Distribution (Cambridge: Cambridge University Press, 1957), pp. 14, 40. The estimates assumed the minimum income to be 1600 cruzeiros monthly (based on the Pareto quantile estimate), with a normal distribution of the logarithm of income as the density function for incomes above the minimum. The following estimates were calculated (total income = 19.73 million workers x estimated arithmetic average income).

| A<br>Quantiles used | | B<br>Estimated total income<br>Billion cruz. | C<br>Implied income in upper bracket (=B-98 billion cruz.) |
|---|---|---|---|
| 24.84% | 70.34% | 187 | 89 |
| 24.84% | 87.09% | 127 | 29 |
| 24.84% | 96.44% | 106 | 8 |

Note that the first estimate is based on quantiles closest to the combination (27%, 73%) which gives maximum efficiency in estimating the mean of the lognormal distribution. These three figures fluctuate around the previous estimate of 181 billion cruzeiros total income, based on the Pareto distribution.

family's income. Thus, the adjustment involves identifying these family heads, and dividing their reported income among them and their "unpaid" family helpers.

The estimation of this section follows these steps. First, the agricultural male[1] income distribution by brackets is disaggregated into salaried workers on the one hand and farm heads plus family workers declaring income, on the other hand. The number of salaried workers in each income bracket is based on the number of "permanent workers," "temporary workers," and "administrators" in each state (as shown in the 1960 agricultural census), in combination with the average monthly agricultural wage in each state (from the 1963 Anuario Estadistico). The calculation attributes the wage for male common workers (trabalhador de enxada) to "permanent" workers; the wage for administrators, to administrators; and one-half the permanent worker wage for temporary workers -- on the assumption that temporary help works half of the year.

Table 3.4 shows the estimated number of laborers and administrators in each income bracket (column B). The two peaks of the distribution represent the great split in wage levels between the poorer Northeast and the rest of the country. Column C shows this number of workers plus those "sharecroppers and other condition" workers who are not the "responsible head" of the farm, from the agricultural census of 1960. These figures are based on the assumption that these sharecroppers and "other condition" workers have the same percentage distribution across income brackets as the previous group -- temporary and permanent employees, and administrators. Finally, column D shows the residual in each income bracket -- the number of farm heads plus family workers declaring income.

Second, the "unpaid" male workers in agriculture are allocated to farm heads in each income bracket. According to the agricultural census, in 1960 there were 6.44 million male "farm heads and family workers" on the 3.17 million farms run by family heads (i.e. excluding 166,236 farms run by administrators). Thus, there was almost exactly one (1.03) male family helper for each farm head. This figure supports the basic idea that the 2.46 million "unpaid" males were family helpers, for this is very close to the number one would expect on a basis of the disaggregation of Table 3.4. That is, the male worker totals by categories are:

---

1. The calculations are based on data for males, because the agricultural census data are required for estimates, and these data agree almost exactly with those of the demographic census on the male agricultural labor force, but diverge greatly from the demographic census's data on female workers.

| | |
|---|---|
| Total reporting income (Demographic Census) | a) 8,467,515 |
| "Unpaid" | b) 2,463,042 |
| Employees, administrators, sharecroppers, "other condition" | c) 4,665,738 |
| Farm heads | d) 3,171,533 |
| Income-declaring family helpers (e = a -c -d) | e) 630,244 |
| Implicit unpaid family helpers (f = d 1.03 - e) | f) 2,642,421 |

Category "f" is close to category "b".

It is assumed, therefore, that the 2,463,042 "unpaid" males are family helpers to be allocated to the farm heads. This allocation requires a disaggregation of the "farm heads" and "income-declaring family workers" of Column D, Table 3.4.

A scanning of the agricultural census data on family male helpers per farm suggests that the ratio of one male family helper per farm head is roughly constant over all farm sizes, and hence over all income levels. Thus there should be one family male helper associated with each farm head, in all income brackets. The problem is to determine which of the helpers were included in the income brackets, as declaring income, and which were recorded as "unpaid".

A crucial assumption of the estimate to be made is that while all farms, on the average, have one male family helper associated with the head, it is the richer farms on which the helpers tend to report income. That is, on the richer farm the helper receives a specific income, whereas on the poorer farm he merely shares in what is viewed as the farm head's income. Furthermore, it is assumed that the farm head and male helper share income evenly, whether the helper reports income or not.

To determine which farms the "unpaid" family helpers are associated with, the "income declaring" family helpers are first identified by income bracket. Then the unpaid members are allocated residually so that in total there is one family male helper associated with each farm. One possible assumption would be that all of the 630,244 income declaring male helpers are associated with the richest 630,244 farms. In this case, the richest 1.26 million persons in Column D of Table 3.4 would be farm heads and income-declaring family helpers, on a one-for-one basis in each bracket. This assumption is in keeping with the notion that the income-declarers tend to be helpers on rich farms, but it yields a strange break in the income distribution of farm heads and family helpers. That is, the income categories for all but the

Table 3.4

Disaggregation of Agricultural Male Labor

Force by Income Bracket

| Income level | Census Total | Employees (temporary and full time) and administrators | All directed workers (B + sharecroppers and squatters not heads of farms) | Farm heads and income-declaring family workers |
|---|---|---|---|---|
| | A | B | C | D = A-C |
| < 2,100 | 2,752,353 | 1,753,761 | 2,265,491 | 486,862 |
| -3,300 | 2,193,989 | 1,137,404 | 1,469,287 | 724,702 |
| -4,500 | 1,500,665 | 81,302 | 105,025 | 1,395,640 |
| -6,000 | 1,013,212 | 527,517 | 681,441 | 331,771 |
| -10,000 | 677,711 | 98,659 | 127,447 | 550,264 |
| -20,000 | 250,858 | 13,191 | 17,040 | 233,818 |
| ≥20,000 | 78,727 | 0 | 0 | 78,727 |
| Subtotal | 8,467,515 | 3,611, 834 | 4,665,738 | 3,801,784 |
| Without income | 2,463,042 | --- | --- | --- |
| Not declared | 116,092 | --- | --- | --- |
| Total | 11,046,649 | 3,611, 834 | 4,665,738 | 3,801,784 |

top 1.26 million males would be abruptly halved by this assumption, as the unpaid members would be allocated to the poorest 2.4 million farms and recorded income there would be split between farm head and helper.

Instead, the assumption is made that the probability that the farm's male helper reports his income grows gradually, linearly, from zero to unity at the richest farm. That is, after a certain income level, the probability becomes positive and gradually higher that a son (e.g.) will report his share of income rather than that the family head will report all family income.

Since there are 630,244 income-declaring helpers to be allocated and the fraction of farms on which the helper reports his income rises linearly from 0 to 1, and since the average fraction (.5) times the number of farms for which the probability exceeds zero must equal 630,244, it follows that for the richest 1.26 million farms the probability that the family helper reports his income equals (1/1.26 million) x N where N is the ordinal position of the farm in the top 1.26 million farms.

Based on this method, the disaggregation of Column D of Table 3.4 is shown in Table 3.5. The number of unpaid males allocated to each income bracket merely equals the number of farms which are not associated with an income-declaring family helper (determined residually). Note that this method allocates 2.54 million unpaid workers instead of the desired 2.46 million (3.17 million family helpers, assumed on a one-per-farm basis, minus 630,244 helpers already recorded in the income brackets, leaves slightly more than the desired residual of 2.46 million unpaid helpers).

The third and fourth steps are to allocate unpaid female workers, and to adjust the income brackets so they reflect the lower per-worker income (by virtue of splitting family head income by the total number of family workers).[1] The unpaid women are allocated in proportion to the allotments of unpaid men, on the assumption that those farms on which male family helpers did not report income would also tend to have non-reporting by females, whenever females were working (i.e. in about one-third of the cases). The women originally recorded in income brackets are merely left in these brackets: it is assumed that none are farm heads and thus there is no question of estimating their income by dividing their recorded income among them and family helpers.

Table 3.6 shows the number of males and females inagriculture in each income bracket, after adjustment of income level is made

---

1. Original income is divided by 2.278 -- among 1 male head, 1 male helper, and .278 female helpers.

Table 3.5 Disaggregation of Brazilian Farm Heads

Plus Income-Declaring Male Family Helpers and Unpaid Helpers

| Original Income Bracket | A<br>Farm Heads & Income-declaring helpers | B<br>Number of Income-declaring Male family helpers | C<br>Number of Farm heads Assoc. with Income-declaring Male Helpers | D ★<br>Number of Farm Heads Without Inc. Declaring Male Helpers = A-B-C | E ★<br>"Unpaid" Males allocated | F ★<br>"Unpaid" Females allocated |
|---|---|---|---|---|---|---|
| 2,100 | 486,862 | 0 | 0 | 486,862 | 486,862 | 135,487 |
| -3,300 | 724,702 | 0 | 0 | 724,702 | 724,702 | 201,674 |
| -4,500 | 1,395,640 | 128,641 | 128,641 | 1,138,358 | 1,138,358 | 316,789 |
| -6,000 | 331,771 | 115,571 | 115,571 | 100,629 | 100,629 | 28,004 |
| -10,000 | 550,264 | 234,974 | 234,974 | 80,316 | 80,316 | 22,351 |
| -20,000 | 233,818 | 113,004 | 113,004 | 7,810 | 7,810 | 2,173 |
| -20,000 | 78,727 | 38,060 | 38,060 | 2,607 | 2,607 | 725 |
| | 3,801,784 | 630,250 | 630,250 | 2,541,284 | 2,541,284 | 707,203 |

★ Income bracket no longer applies after adjustment for income-sharing; here bracket refers to original position of farm heads.

Table 3.6 Distribution of Agricultural Workers

By Income Bracket, after Allocation of "Unpaid" Family Workers

| | Males | | | | Females | | |
|---|---|---|---|---|---|---|---|
| | A. | B. | C. | D. | E. | F. | G |
| Bracket | Salaried, Sharecroppers "other cond." | Farm heads Income declaring helpers: Income Unchanged | Farm heads, non-declaring helpers: Income Changed | Total = A + B + C | Income Recorded | Unpaid Allocated | Total = E & F |
| < 2,100 | 2,265,491 | 0 | 4,739,444 | 7,004,935 | 294,154 | 655,800 | 949,954 |
| - 3,300 | 1,469,287 | 0 | 248,858 | 1,718,145 | 120,096 | 34,400 | 154,496 |
| - 4,500 | 105,025 | 257,282 | 73,862 | 436,169 | 49,323 | 10,200 | 59,523 |
| - 6,000 | 681,441 | 231,042 | 5,780 | 918,263 | 27,337 | 804 | 28,141 |
| -10,000 | 127,447 | 469,948 | 9,851 | 607,246 | 13,621 | 1,335 | 14,956 |
| -20,000 | 17,040 | 226,008 | 3,560 | 246,608 | 5,680 | 495 | 6,175 |
| ≥ 20,000 | 0 | 76,120 | 1,213 | 77,333 | 1,171 | 169 | 1,340 |
| | 4,665,731 | 1,260,400 | 5,082,568 | 11,008,699 | 511,382 | 703,203 | 1,214,585 |

for those farm heads to whom "unpaid family labor" is allocated. Table 3.7, Column A, then shows the over-all income distribution for Brazil after this adjustment. Also shown are the percentages of active workers and total income in each bracket. The total income in the bottom income bracket is calculated on an assumption of average non-agricultural income of 1865 cruzeiros (the midpoint between the estimated minimum of 1630 and the ceiling of 2100), and average agricultural income of 1407 (the midpoint between the adjusted minimum of 715, or 1630/2278, and the ceiling 2100). The distribution is much more skewed than that shown in Table 3.3 Total income is unchanged.

### 3.2.2.3 Adjustment for Income in Kind

The second major adjustment to the census income data is an estimation of the income in kind received through "own consumption" of foodstuffs produced on the farm. Income in kind outside of agriculture is presumably negligible, except for imputed value of housing granted to domestic servants.

The household survey in 1963 by the Getulio Vargas Foundation provides information on income in kind in agriculture. Data from the rural sectors of this survey are unpublished, and are available to the author for only two states: Espirito Santo and Minas Gerais, representing 410 family sample observations.

The method of adjustment in this section is the following. First, the farm operators and their families are considered for income adjustment, but employees, administrators, and directed sharecroppers and "other condition" workers are not. It is assumed that the directed workers receive payment in cash, or, to the extent that they receive income in kind, its monetary value is already included in the "average wage" which was used in the calculations of the previous section. This assumption should be valid since the wage (from the Anuario Estatistico) is for monetary payment, and comparable workers with some income in kind would presumably have total real income equal to this wage.

Second, a relationship is estimated between the weight of "own-consumption" in the farm family's budget and the family's level of monetary income.

Third, this estimated relationship is applied to increase the income categories of farm directors' families. Then the over-all income distribution is recalculated.

The Getulio Vargas Foundation (FGV) budget studies report total family income including income in kind; they also show food consumption as a fraction of total consumption, total consumption as a fraction of income, and the fraction of food consumption, which is produced on the farm. Table 3.8 shows the "own-consumption" of food as a fraction of total real income, by income level. The final column shows the value Ø by which a reported monetary income must be multiplied to obtain total income including own-consumption.

Table 3.7 - Brazilian Income Distribution,

Active Workers, with "Unpaid Family Workers" Included

| Income | A Number | B Total Income | C % Active Workers | D % Income |
|---|---|---|---|---|
| Cruzeiros/Month 1960 | | Billion Cruz./ Month | | |
| < 2,100 | 9,808,307 | 14.66 | 42.6% | 8.13% |
| -3,300 | 2,934,275 | 7.90 | 12.72 | 4.38 |
| -4,500 | 1,546,219 | 6.03 | 6.71 | 3.34 |
| -6,000 | 2,905,523 | 15.25 | 12.63 | 8.45 |
| -10,000 | 3,235,579 | 25.90 | 14.10 | 14.35 |
| -20,000 | 1,840,164 | 27.60 | 8.00 | 15.30 |
| ≥ 20,000 | 702,012 | 83.10 | 3.06 | 46.10 |
| | 22,972,079 | 180.44 | 100 | 100 |

Table 3.8 Income in Kind

In Relation to Total Income Level

Farm Families, Minas Gerais, Espirito Santo

| A | B | C | D |
|---|---|---|---|
| Income level | | | |
| Family: Thous.Cruz./ year | 1960 Cruz./month per Active Worker | Own consumption of food as fraction of total real income | Multiplier of monetary income to obtain total income $\emptyset = \frac{1}{1-c}$ |
| A. Espirito Santo 1962 | | | |
| < 99 | < 3,940 | .579 | 2.37 |
| - 249 | - 9,840 | .523 | 2.10 |
| - 499 | -19,700 | .375 | 1.60 |
| - 799 | -31,500 | .279 | 1.39 |
| -1,199 | -47,099 | .171 | 1.21 |
| ≥ 1,200 | ≥ 47,100 | .115 | 1.13 |
| B. Minas Gerais, 1963 | | | |
| < 99 | < 2,260 | .715 | 3.50 |
| - 249 | - 5,650 | .582 | 2.39 |
| - 499 | -11,300 | .520 | 2.08 |
| - 799 | -18,300 | .432 | 1.76 |
| - 1,199 | -27,200 | .345 | 1.53 |
| ≥ 1,200 | ≥ 27,200 | .200 | 1.25 |

By dividing annual family income by 2.3 active workers per farm family[1] (the number implied in the agricultural census, as discussed in the previous section), and by deflating by the wholesale price index, the income data are converted to monthly cruzeiros of 1960, comparable with the census income data. A plotting of Ø against the income level showed that observations from both Minas Gerais and Espirito Santo lay very close to two line segments. These two segments were estimated by regression as:

a) $Ø = 2.54 - (1.33 \times 10^{-4})\ (y)$ $\qquad y < 6430$ cruzeiros

b) $Ø = 1.96 - (4.502 \times 10^{-5})\ (y)$ $\qquad y \geqslant 6430$ cruzeiros

where y is monthly income per active worker, in 1960 cruzeiros.

The categories of workers with incomes to be multiplied by this estimated variable, Ø, are: farm heads and family workers; that is, workers shown in columns B, C, and F of Table 3.6. Note that the income adjustment assumes a rectangular distribution of workers within each income bracket.

Table 3.9 shows the income-class distribution of farm heads and family workers, after adjustment for "own consumption." Columns B and C of this table show the resulting number of workers in each income class for agriculture, and for all sectors, respectively.

A useful piece of information in the calculation is that inclusion of agricultural "own consumption" raises total personal income (before taxes) from 183 billion cruzeiros monthly to 201 billion cruzeiros. Thus, agricultural own-consumption appears to be roughly 10% of national personal income.

Finally, Table 3.10 summarizes the alternative income distributions based on the 1960 census. This table shows that inclusion of "unpaid" agricultural workers in the distribution makes it more skewed; however, once adjustment is made for own consumption in agriculture, the distribution becomes more equal again and is slightly less skewed than in the original census version.

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1. Note that only 6% of sampled families were headed by salaried workers. Therefore, it is assumed that the over-all data from the FGV sample may be used to determine the income-in-kind characteristics of farm operators' families (as opposed to families of salaried personnel and sharecroppers not in control of their farm operations).

Table 3.9 Brazilian Income Distribution

Active Workers After Adjustment for "Own Consumption in Agriculture

| Income Class | A<br>Farm Heads and Family Workers | B<br>Agriculture (A + Salaried Employees Administrators Directed Share-Croppers ) | C<br>Total (B + Total Non-agricultural) | D<br>Total Income Billion Cruz. | E<br>% Workers | F<br>% Incom |
|---|---|---|---|---|---|---|
| < 2,100 * | 770,750 | 3,330,395 | 5,183,813 | 11.26 | 22.57 | 5.60 |
| - 3,300 | 1,926,875 | 3,516,258 | 4,577,892 | 12.36 | 19.93 | 6.15 |
| - 4,500 | 2,312,250 | 2,466,598 | 3,517,125 | 13.72 | 15.31 | 6.82 |
| - 6,000 | 527,005 | 1,235,790 | 3,195,273 | 16.78 | 13.91 | 8.35 |
| - 10,000 | 625,549 | 766,617 | 3,379,994 | 27.04 | 14.71 | 13.45 |
| - 20,000 | 714,214 | 736,934 | 2,324,315 | 34,86 | 10.12 | 17.34 |
| ≥ 20,000 ** | 169,522 | 170,693 | 794,032 | 85.02 | 3.46 | 42.29 |
| | | | 22,972,444 | 201,04 | 100.0 | 100.0 |

* Average Income = 1900 cruz. for 770,750 farm heads and family workers, 1,835 cruz. for all others

** Average Income = 20,650 cruz. for 92,000 agric. workers moved into class by "own consumption" adjustment

= 118,400 cruz. for others (those originally in class)

Table 3.10 Summary: Brazilian Income

Distribution Estimates

Cumulative Percentages. W = workers Z = income

| A Census | | B Estimate allocating Unpaid agricultural workers | | C Estimate B Adjusted for own-consumption in agriculture | |
|---|---|---|---|---|---|
| W | Z | W | Z | W | Z |
| 24.84 | 5.05 | 42.60 | 8.13 | 22.57 | 5.60 |
| 41.95 | 10.07 | 55.32 | 12.51 | 42.50 | 11.75 |
| 55.13 | 15.67 | 62.03 | 15.83 | 57.81 | 18.57 |
| 70.34 | 24.37 | 74.66 | 24.30 | 71.72 | 26.92 |
| 87.09 | 38.97 | 88.76 | 38.65 | 86.43 | 40.37 |
| 96.44 | 54.22 | 96.76 | 53.95 | 96.55 | 57.71 |
| 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

### 3.2.3 Getulio Vargas Foundation Sample Data

The 1962-63 household budget survey of the Getulio Vargas Foundation (FGV) is an alternative source of income distribution data. The FGV data are for families rather than active workers. These data are somewhat questionable, due to the fact that the interviewee was asked his annual income during July 1961 - June 1962, while the dates of the interviews were in late 1962. Given annual inflation rates of roughly 40% and 50% in 1961 and 1962, accurate recollection of 1961-1962 income would be difficult for the respondent. However, there is no particular reason to assume that error in recollection would have been related to income level, and therefore that the percentage income distribution would be biased. It is probable that the reported levels of all incomes were biased upward due to probable reporting of income levels nearer the date of the interview than the supposed period of July 1961 - June 1962.

One advantage of the FGV data over the demographic census data is that for the former the average income in the upper bracket was reported directly and thus need not be estimated by a Pareto curve. A second advantage is that income before and after direct taxes is available in the FGV data.

The FGV budget studies were done in three groups: the rural sector, capital cities, and interior cities. In this section only the data for capital cities are examined: the rural data are unpublished, and the interior urban data are for a different year than the capital city data.

Table 3.11 shows an over-all urban family income distribution, based on the FGV data for Belem, Fortaleza, Recife, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo, and Curitiba. The sample

Table 3.11 - Urban Income Distribution

Brazil

A. Family Income:

Major Capitol Cities *

Cumulative Percentages

| Families | Income (a) | (b) |
|---|---|---|
| 3.25 | .33 | .34 |
| 8.01 | 1.27 | 1.30 |
| 24.37 | 6.51 | 6.54 |
| 39.53 | 13.70 | 13.70 |
| 59.37 | 26.87 | 26.80 |
| 78.21 | 45.61 | 45.48 |
| 88.96 | 61.94 | 61.77 |
| 97.84 | 84.15 | 84.08 |
| 100.0 | 100.0 | 100.0 |

B. Active Non-Agricultural Workers **

| Workers | Income |
|---|---|
| 17.23% | 2.44% |
| 27.12 | 4.50 |
| 36.92 | 7.44 |
| 55.13 | 14.84 |
| 79.44 | 29.87 |
| 94.20 | 47.00 |
| 100.0 | 100.0 |

* FGV. July 1961 - June 1962 Belem, Fortaleza, Recife, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo, and Curitiba
(a) = Before Direct Taxes
(b) = After Direct Taxes

** 1960 Demographic Census

data for each city were expanded by the ratio of the city's total population to sample size for the city. The table also shows a percentage income distribution for non-agricultural workers, based on the 1960 demographic census data (see previous section).[1] One would expect the FGV distribution to be less skewed than the census urban income distribution. The FGV data are for family incomes and lower income families should tend to have higher incidence of multiple workers than do high income families. In fact, the FGV data do show much more even income distribution than do the census data. For example, the bottom 78% of the families have 46% of the income according to the FGV data, while the bottom 79% of the active workers have only 30% of the income, according to the estimate based on census data. This divergence is so great that it suggests an overstatement of income inequality in the census-based estimates above.

Finally, Table 3.11 shows that income after direct taxes is distributed almost identically to income before direct taxes.

### 3.2.4 National Sample Survey of Households

Another potential source of income distribution data for Brazil is the quarterly sample of households that the Instituto Brasileiro de Estatistica has carried out since November 1968. To date, none of the published reports have presented data in such a way that any type of income distribution could be calculated. The published data have shown the number of non-agricultural entrepreneurs by income class, and the number of laborers by income class -- excluding farmers who direct their own activities. The data are thus unsatisfactory for even an urban income distribution -- since they include salaried agricultural workers in the general category of laborers.

### 3.2.5 Summary

The income distributions for Brazil estimated by the author from data in the 1960 population census will be used subsequently in this study. If the estimates are biased, the error is probably toward exaggerated inequality; income in the upper, open-ended bracket had to be estimated by an assumed (Pareto) distribution and this estimate is more probably overstated than understated. Of the three distributions calculated, the third -- including "unpaid" agricultural workers and an adjustment for income in kind in agriculture -- most accurately reflects the distribution of real income in Brazil.

## 3.3 Chile

There are three sources known to the author for data on Chilean distribution of income by size. The best source, and only source

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1. The average income assumed for the lowest bracket was 1835 cruzeiros; for the highest bracket, 118,400 cruzeiros.

for distribution by families, is a sample survey of 10,500 households, conducted by the Direccion de Estadistica y Censos in March through June, 1968. An income distribution for active persons in 1965 was estimated by the agency CORFO, and by a candidate for the engineering degree at the University of Chile, Patricio Millan.

### 3.3.1 Direccion de Estadistica y Censos

This sample survey[1] was one of a series of quarterly investigations made with the same sample set in the Direccion's continuing sample on labor conditions. The results of the income survey are to be published in the fall of 1969. The sample is random, and therefore does not have the advantage of high representation (before sample expansion) of high income families. However, the large size of the sample tends to compensate for this shortcoming.

The survey[2] is a stratified random sample. Each set of sample questions is administered over a period of three months. Each week 1/13 of the family units to be interviewed in a given area are visited, thus randomizing across areas the influence of inflation. Another characteristic of the sample is that one-sixth of the families are replaced every three months. Thus, while the families gain experience in answering survey questions, they are eventually replaced to avoid their growing tired of survey visits.

There is no bias that should exist in these sample data, other than the general bias of direct sample data toward underreporting of upper incomes.

The data represent income before direct taxes. Furthermore, they include the imputed value of rural "own consumption" of foodstuffs produced on the farm. The income distribution data of this sample are shown in Table I.C.1, Appendix A. Tables I.C.2 and I.C.3 show the data disaggregated into urban and rural sectors.

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1. Dirección de Estadistica y Censos. "Encuesta Nacional Sobre Ingresos Familiares." Typed. Santiago: 1969.

2. The method of the continuing sample is described in Direccion de Estadistica y Censos, Serie de Investigaciones Muestrales, Muestra Nacional de Hogares: Encusta Continua de Mano de Obra, Julio-Octubre 1966, pp. 10-31.

### 3.3.2 CORFO

An economic geography of Chile, published in 1966 by the Corporacion de Fomento de la Produccion,[1] contains an estimate of income distribution for active workers and for families in 1965. Unfortunately the author of the section, Juan Crocco Ferrari, gives absolutely no description of the sources of his data. Therefore, these estimates are included in Tables I.C.5 and I.C.6, Appendix A for reference only: they will not be used in this study.

### 3.3.3 Millan Estimate

Patricio Millan[2] has estimated income distribution for active persons by combining information from the social security service, the office of protection of private employees, and the service of internal taxes.

Millan obtained the breakdown of number of workers by classes of "vital wages" from the social security service. This service has income data based on workers who receive subsidies due to sickness. He considered this information as a sample representative of the total population of blue collar workers, including agricultural workers. (He does not clarify whether the information on agricultural workers includes data on income in kind.) Millan adjusted the social security income data upward, to account for the fact that the data show only the incomes relevant for social security contributions, but these are the minimum wages of each sector rather than the income actually received. However, the author does not state how he made the upward adjustment.

For white collar workers (empleados), Millan took data from the office of protection of private employees, which covered 30% of the total white collar workers. He also drew on a census survey of 1960 which covered 70% of white collar workers.

Finally, for entrepreneurial incomes, Millan used data from the internal tax service. From these data on incomes, he deducted

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1. Corporacion de Fomento de la Produccion, Geografia Economica de Chile, Primer Apendice, (Santiago: 1966), p. 110. The writer briefly describes certain data sources: published salary data of the Serviço de Seguro Social, and an estimate of income distribution in greater Santiago in 1964 and 1965 by the Instituto de Economia of the University of Chile. Then he merely adds: "The combination of information from various sources permits the estimation of the probable distributions of individuals and familes..." and without further detail he gives the income distribution data.

2. Patricio MillanS., "Estructura de Costos y Distribucion del Ingreso en la Economia Chilena," Memoria de Prueba para optar al Titulo de Ingeniero Civil, Universidad de Chile, 1968.

the data for blue collar and white collar workers. The use of this source would suggest understatement of high incomes: the high incomes should be concentrated in the entrepreneurial class, but these incomes are estimated from tax rolls and could be expected to be underreported.

Millan divided entrepreneurs into two categories: those with higher incomes, and those with incomes comparable to blue collar incomes (especially small farmers and artisans). Data from the planning agency, ODEPLAN, showed the number and total income of employers and self-employed. Millan considered the tax roll to be a sample of the upper-income entrepreneurs and calculated their average income. He assumed the average income of lower-income entrepreneurs equaled average income of blue collar workers. He then solved for the number of entrepreneurs in each category (using two equations: total entrepreneurial income equaled the sum of the number of each type times average income of each type; and total number equaled the sum of the number of each type).

Finally, Millan estimated the over-all income distribution by aggregating for each income bracket the number of workers and total income in the three sub-groups: blue collar workers plus low income entrepreneurs; white collar workers; and upper income entrepreneurs. This estimate gives the Lorenz curve point of 60% of population as its lowest observation. Using Millan's data, the Lorenz curve point for 25% of the population can be estimated.[1] The resulting income distribution estimate is shown in Table I.C.4, Appendix A.

The Millan estimate compares fairly well with the Direccion de Estadistica y Censos estimate. Being for active workers rather than families, the Millan estimate should be the more unequal of the two, and this difference does appear in the two estimates. For example, the top 9.3% of families receive 33.5% of family income, according to the Direccion estimate, while the top 9.3%

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1. The problem is that the lowest income bracket for Millan's upper-income entrepreneurs includes from 0 to 2 "vital wage" multiples, whereas the other worker categories have separate brackets for 0 to 1 and 1 to 2 "vital wage" multiples. The additional estimate in this paper assumes that the ratio of the percent of upper-income entrepreneurs in the first bracket (0 to 1 wage levels) to the percent in the second bracket equals that ratio for white-collar workers. Note that the over-all income distribution is not sensitive to this assumption: a very small percentage (3%) of upper-income entrepreneurs are estimated to be in the first income bracket, and alternative assumptions would imply even smaller rather than larger percentages -- since these entrepreneurs have higher incomes than the while collar workers.

of active workers receive 39.2% of worker income according to Millan. The divergence is reasonable, for a difference between family and worker income distribution.

### 3.3.4 Summary

The best available income distribution for Chile is that estimated by the Direccion de Estadistica y Censes on a basis of a random sample of 10,500 urban and rural families. The two alternative estimates of which the author has knowledge are based on aggregation of data from partial sources; and one of these (the CORFO estimate) gives virtually no description of the method used.

## 3.4 Colombia

There are two published and two still unpublished sources of income distribution data for Colombia. The published estimates are those by Taylor[1] and by Musgrave.[2] An estimate is in preparation by Professors R.Albert Berry and Miguel Urrutia[3], and the United Nations ECLA has made an estimate.[4] The best of these estimates appears to be that by Berry and Urrutia.

### 3.4.1 Taylor Estimate

The income distribution of active workers, estimated by the Joint Tax Program's Fiscal Mission to Colombia in 1962 was based on aggregation of partial data from different time periods. For upper income workers the study used the 1958 tax rolls to determine percentage distribution of taxpayers by taxable income brackets (expressed in dollars). These percentages were then

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1. Joint Tax Program of the Organization of American States and the Inter-American Development Bank, Milton C. Taylor, et. al., Fiscal Survey of Colombia, (Baltimore: Johns Hopkins Press, 1965), p. 225.

2. Comission de Reforma Tributaria, Richard Musgrave, et. al., Informe Musgrave: Bases para una Reforma Tributaria en Colombia, Bogota: Biblioteca Banco Popular, 1969), p. 44.

3. Of Yale University and Universidad de los Andes, respectively.

4. See reference below.

applied to the total of taxpayers in 1962 (more than double the number of taxpayers in 1958), although approximately the richest 500 taxpayers were enumerated directly from 1962 tax rolls.

For urban salaried and non-salaried employees, the study calculated the percentage distribution by (dollar) income brackets from a 1953 sample survey of 1500 workers. The 1961 average wage of secondary and tertiary sectors was estimated from national accounts and Department of Planning data. Then the 1953 percentage distribution of workers was applied to the 1961 total number of workers, with the 1953 income brackets multiplied by the ratio of the 1961 average wage to the 1953 average wage.

Finally, wages of agricultural workers were obtained from a 1962 sample of 1167 workers. The percentage distribution of agricultural workers from this sample was applied to the total number of agricultural workers in 1961 (including self-employed farmers on the assumption that their incomes were comparable to those of agricultural workers), and the income brackets for the resulting distribution were multiplied by the ratio of average agricultural wages in 1961 (from national accounts) to the average wage in the 1962 sample.

The resulting over-all income distribution is shown in Table I.D.5, Appendix A. Despite the ingenuity of the estimate, it would seem very questionable because of its many risky assumptions. To cite only one questionable method, the conversion of data from different years to dollars raises the question of temporary swings in the ratio of the exchange rate to domestic purchasing power of the peso.

### 3.4.2 Musgrave Estimate

In 1968 the Colombian government commissioned a special task force headed by Professor Richard Musgrave, to recommend changes in the country's tax system. The report of the commission included an estimate of the distribution of income of active workers, before taxes, as well as an estimate of the effective percentage tax burden by income bracket. These estimates are shown in Tables 3.12 and 3.13.

Table 3.12 Income Distribution of Active Workers

Colombia. Musgrave and Taylor Estimates

| Cumulative % workers | Cumulative % Income | |
|---|---|---|
| | Musgrave (1964) | Taylor (1962) |
| 50 | 14.0 | 17.5 |
| 60 | 20.0 | 22.5 |
| 70 | 26.0 | 30.0 |
| 80 | 35.0 | 40.0 |
| 90 | 50.0 | 58.0 |
| 95 | 60.0 | 71.5 |
| 100 | 100.0 | 100.0 |

Source: Informe Musgrave..., op. cit., p. 44

Table 3.13 Effective Tax Rates by Income Bracket: 1966

| Net Income (pesos/yr) | Total Taxes | Personal Income Tax | Alcohol tobacco beer | Imports |
|---|---|---|---|---|
| 0 - 3000 | 12.81% | .04% | 6.96% | 3.11% |
| - 6000 | 11.93 | .01 | 3.53 | 3.71 |
| - 10000 | 14.13 | .07 | 2.15 | 5.17 |
| - 40000 | 13.34 | .80 | 1.18 | 5.27 |
| - 80000 | 16.41 | 4.29 | 1.35 | 5.00 |
| -100000 | 17.68 | 6.10 | .98 | 5.01 |
| -200000 | 17.75 | 7.55 | .77 | 4.43 |
| ≥200000 | 16.84 | 7.08 | .17 | 4.43 |
| Total | 14.16 | 2.03 | 2.15 | 4.60 |

Source: Informe Musgrave..., op. cit., p.

Table 3.13 shows the same pattern as that found in Argentina and Brazil: the burden of total taxes has almost no progressivity, and thus the distribution of income is virtually unaffected by taxation.

The derivation of the income distribution estimate by the Musgrave report is not described in the publication but is described at length in a paper[1] by C. McClure, the person on the Musgrave staff apparently responsible for the estimate. McClure had available the same types of data as did the authors of the Taylor survey in 1962: tax rolls, national accounts data, and a survey of agricultural households in 1962. McClure's basic method was to obtain income distribution directly for groups on which data were available, and to estimate income of remaining groups by residual -- using national accounts and the estimate of the labor force in the 1964 population census.

McClure's estimate is based on a large number of important assumptions. First, only tax returns for Bogota were examined; therefore it is assumed that they are representative, and their data are merely multiplied by the ratio of the total number of tax returns in the country to the number in Bogota. Given the concentration of high income persons in Bogota, this method causes bias toward skewedness in the distribution, as acknoledged by Mc Clure. Second, tax returns are in two groups: hand processed and machine processed; it is assumed that the former represent wholly capital incomes, because they are "more complicated" returns. Furthermore, it is always assumed that any income recipient receives either wholly labor income or wholly capital income. Third, roughly 500,000 tax returns with no tax due are assumed to be for labor income with the average income equal to the maximum still below the taxable level.

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1. Charles McClure, "The Distribution of Income and Incidence of Taxes," Bogota, 1968, typewritten.

For labor and capital income not reported in tax returns (representing 72% of the working population and 62% of total national income at factor cost), McClure makes a series of further assumptions. For example: a) the large body of agricultural workers receive an average wage equal to agricultural wage bill divided by the number of workers -- after the number and wage bill of agricultural white collar workers (with a high wage assumed) are removed: b) the number of workers and amount of labor income still unaccounted for are arbitrarily separated into a block receiving a low (assumed) wage which is not taxable, and a smaller block (with a much higher assumed average income) which should report income but does not: furthermore the labor income still unaccounted for is assumed to represent tax-evasion and the population of laborers filing tax returns has its income levels written up accordingly (by 8%). To distribute members of the various non-tax-reporting worker categories around their mean wages, McClure uses the Taylor survey's agricultural sample for agricultural workers, but merely assumes arbitrary distributions for the other categories.

For recipients of capital income not included in tax returns, McClure uses the same technique of assigning a mean wage to each type of capital income recipient, and atributing the final residual income (in comparison with the national accounts figure for capital income) to tax evasion by taxpayers. Thus, an average wage of self-employed farmers is assumed (at a level 50% above that of agricultural workers); a slightly higher wage is assumed for farm employers on less than 100 hectares, while larger farmers are assumed to be already in the tax rolls. The block of independent "artisans" is assumed to have a given average wage -- based on an urban sample survey (Empleo y Desempleo en Colombia); a residual number of capital income recipients (compared with the number in the population census of 1964) is assumed to represent persons who should file tax returns but do not; the number is three times the number of capital income recipients who file returns. The number of persons and amounts of incomes on capital income tax returns are thus multiplied by four. Still a residual capital income exists, compared with national accounts, and it is allocated as unreported income to the taxpaying persons receiving capital income -- whose reported incomes are therefore written up by 14%.

An assumed distribution around the average wage is set for each of the groups mentioned: small and medium farm employers; artisans; and larger income recipients who should file tax reports but do not.

While the Musgrave (McClure) data represent ingenuity in the face of a great lack of information, the income distribution estimate is based on so little direct data and so many assumptions that it must be considered to be very rough. That the Musgrave estimate shows income distribution more skewed than the Taylor estimate cannot have great significance in this circumstance. At best, one might conclude that the Musgrave estimate suggests that income distribution is at least as skewed as shown in the Taylor estimate.

### 3.4.3 Berry-Urrutia Estimate

Potentially the best estimate of income distribution for active workers in Colombia is that forthcoming by Professors R. Albert Berry and Miguel Urrutia. The urban data for this estimate are based on a 1967 sample survey of 8 major and 3 minor cities, with 8,227 persons interviewed in the sample.[1] The sample was random, but sufficiently large that the merely proportional sampling of upper-income persons should not have been too unsatisfactory for obtaining upper-income data. The rural data for the estimate are based on the 1960 agricultural census. The authors have kindly supplied me with their basic data, and I have calculated total Colombian income distribution -- since Professors Berry and Urrutia have not yet reached their final total estimate.[2] Any credit for the estimate goes of course to them, but they are not responsible for errors in the estimate below.

The 1960 agricultural census showed value added, number of workers, total farm area, and number of farms, by farm size class. For farms larger than two hectares, the Berry estimate subtracted an estimated wage bill (equal to the number of workers times the regional average wage) from value added to obtain entrepreneurial income of farm owners.[3] Assuming one entrepreneur per farm, the estimate calculated average income per farm entrepreneur by dividing total profits by the number of farms, for each farm size class. This method yielded an average income for a given number of entrepreneurs in each class, and covered roughly the richest 30% of agricultural "active workers." Then, the average agricultural wage was assumed as the income of each of the agricultural workers in the body of hired laborers working on the farms of over two hectares. On farms under two hectares, value added, minus the number of workers multiplied by the regional wage, was negative. Thus it was assumed that income on these farms was shared evenly among the farm directors and the other workers. Thus there was another set of average income estimates: one for each of the three farm size classes below two hectares. Average income per active person equalled value added divided by number of farm directors and workers. Finally roughly 14% of the rural active population was classed by the census as unpaid family labor.

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1. The income distribution data from the urban sample are to be published in Empleo y Desempleo 1967, Centro de Estudios para el Desarrollo Economico, Universidad de los Andes, forthcoming.

2. As of October, 1969.

3. No deduction was made for capital depreciation, but this value should have been small relative to total value added. Capital in the form of machinery was probably small in value relative to total output, and depreciation on farm buildings would be small due to long economic life.

The present author adopted these basic data from the Berry study.[1] Then, for reasons similar to those discussed in section 3.b.2b for Brazil, I allocated the "unpaid family workers" to the poorest farms, one per farm until the number of unpaid family workers was exhausted, and recalculated average income per worker for the farm size groups affected.

Then an income distribution for agriculture was estimated; it is shown in Table I.D.1, Appendix A.

The urban data were taken directly from the estimate by Professor Urrutia based on the 1967 sample, mentioned above. The distribution of income for urban workers for 1967 is shown in Table I.D.2, Appendix A.

To obtain an over-all estimate for Colombia, I used the following procedure. The year 1964 was chosen, because it was intermediate between the dates of the two sources, and because the exact number of active workers by sector was available from the population census of that year. The average rural income of 1960 was increased by the official price index to account for inflation between 1960 and 1964, and by a factor to account for real agricultural output (from national accounts) per worker (with rural population growth accounted for, estimated at .08% per year on a basis of census and Anuario Estadistico data). The result was to increase the average income per worker from 3,586 pesos per year in 1960 to 6,700 current pesos per year in 1964. Similarly, the urban average income per worker was deflated -- both for price change and for change in real output in comparison with urban population (with urban population growth estimated at 5.7% per year) -- from the 1967 survey level of 11,000 pesos per worker to a level of 7,600 current pesos of 1964, per worker.

The rural and urban data were then aggregated by multiplying the average income in each income category by the ratio of the 1964 average income to the 1960 rural average income (for rural data) or to the 1967 urban average income (for urban data). Thus the estimate obtained the average 1964 income in each of 18 classes for rural data and 34 classes for urban data, and the number of workers in each class was known. All of these classes, regardless of rural or urban source, were then ranked by level of average 1964 income per worker in the class. Total income in each class was average income times the number of workers. The ordered set of classes of workers and total income gave the over-all income

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1. Note that Professor Berry experimented with adjustments to the data to account for rental as opposed to ownership, since value added per farm director would overstate the director's income if he were a renter. This examination showed the distribution was not sensitive to adjustment for rental income, however.

distribution reported in Table I.D.3, Appendix A.

The resulting estimate should be clearly superior to the Taylor and Musgrave estimates, because it draws from only two, comprehensive, sources of information, and requires a minimum of assumptions. The estimate is surprisingly close to the Musgrave estimate for the top 5% of active workers: they received 40% of the income according to both estimates. The present estimate is more skewed than the Musgrave estimate on the lower end: the poorest 50% of workers received 14% of the income according to the Musgrave estimate, while the figure would be 11.1% based on the Berry-Urrutia data.

### 3.4.4 ECLA Estimate

Finally, an income distribution for active workers in Colombia has been estimated by ECLA.[1] The estimate is shown in Table I.D.6, Appendix A. While there is no description of the data sources in the U.N. publication, in conversation with ECLA technicians in Santiago[2] the author was informed that the ECLA estimate was based on a sample of urban workers by the Colombian Institute of Social Security (also used in the Taylor estimate); on census and national accounts data; and on a study by the Centro Interamericano para Reforma Agraria about land tenure in Colombia. Further details on the ECLA estimate are unavailable to the author.

### 3.4.5 Summary

There is no available distribution of family income for Colombia. Of the various estimates of distribution of income by active worker, the best is the still unpublished estimate of Berry and Urrutia, based on a sample survey of urban workers and on the agricultural census. The alternative estimates are based on combinations of partial data from different sources and years, and require many heroic assumptions.

## 3.5 Mexico

Three data sources[3] permit estimation of Mexican distribution of family income: a special survey of the 1950 census; a 1956

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1. Naciones Unidas, Consejo Economico y Social, Comision Economica para America Latina. Estudios Sobre la Distribucion del Ingresso en America Latina (Nota Complementaria al Documento E/CN.12/770), E/CN.12/770/Add.1 (Caracas, 1967). Note that the "internal document" of ECLA in April 1969 shows the same income distribution, so this estimate will presumably remain unchanged in the next published ECLA data.

2. Interview, Santiago, July 1969.

3. Note that a fourth potential source exists: data based on samples of roughly 800 families in each state of Mexico.

(to be continued on next page)

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These data are reported in: Secretaria de Industria y Comercio, Direccion General de Muestreo, La Poblacion Economicamente Activa de Mexico. 1964-65. Resumen General de la Republica Mexicana. Tomo VII. Novembre de 1965, (Mexico: no date). Unfortunately these data are of little use. It is unclear whether they include income in kind. More important, none of the published tables presents income data in such a way that a distribution can be calculated.

household sample survey by the Secretaria de Industria y Comercio; and a 1963 family budget survey by the Banco de Mexico. The first two data sources were examined in a study by Ifigenia de Navarrete.

### 3.5.1 Navarrete Estimates

In her 1960 study,[1] Ifigenia de Navarrete made what appear to be careful and reasonably reliable estimates of family income distribution for 1950 and 1956. Both estimates are for income before taxes. The 1950 estimate she based on a special part of the 1950 census.[2] This census study contains an estimate of the number of families and total monetary income in each of twelve income brackets. The families are separated into those with labor income, those with capital income, and those with mixed income. A surprisingly large portion of the families is recorded as receiving strictly capital income: 2.8 million of a total of 5.1 million families. Presumably the independent farm and artisan families are considered as earning capital income, which would explain the high frequency of capital income (in low income brackets as well as high).

Navarrete makes two adjustments to the census data. First, she increases the average income in lower brackets by a multiple for income in kind.[3] The multiple is based on the relation of income in kind to total real income as found in the 1956 household survey[4] (see below). Second, Navarrete increases the re-

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1. Ifigenia de Navarrete, La Distribucion del Ingreso y el Desarrollo Economico de Mexico, (Mexico: Instituto de Investigaciones Economicas, Escuela Nacional de Economia, 1960).

2. Estados Unidos de Mexico, Setimo Censo General de Poblacion: Parte Especial, 6 de Junio de 1950, (Mexico: Secretaria de Economia, Direccion General de Estadistica, 1955), p. 68

3. For example, average income in the bottom bracket is increased from 50 pesos to 129 pesos per month.

4. Note that results for a similar survey are published in: Secretaria de Industria y Comercio, Departamento de Muestreo, Ingresos y Egresos de la Poblacion de Mexico: Investigaciones por Muestreo, Julio de 1958 (Mexico: 1960). To my knowledge, the results of the 1956 survey were not published, except in altered form in Navarrete's study. A major problem with analysis of income in kind is that the tables calculated, both in the 1958 and 1956 surveys, showed average income in kind per family declaring income in kind, in each bracket, rather than the average for all families in the bracket. Navarrete dismisses the problem (op. cit., p. 77), saying that the 85% of the families in lower income brackets declared income in kind; thus she assumes the figures represent approximately average income in kind for all families in the bracket. While her assumption should be reasonable for the rural poor, it seems unreliable for the urban poor, since they do not raise their own foodstuffs -- the primary form of income in kind.

ported income to account for the discrepancy between total personal income from national accounts and total personal income implied by expansion of the sample. Even after income in kind is added, personal income as expanded from the sample must be increased by 21.4% to obtain the national accounts figure. Navarrete assumes this discrepancy is due to underreporting of income in the census survey. She allocates the difference in total income primarily to the upper income brackets, on the assumption that underreporting is greatest for high income recipients. The result is that income per family is doubled for the top income bracket (the richest .88%), raised by 50% in the penultimate bracket (the next 1.5% of families), and so forth, with no increase at all for the poorest 73% of families.[1]

The two adjustments by Navarette seem reasonable, although the heavy allocation of underreported income to upper income brackets probably overstates inequality of distribution. Table 3.14 shows the final distribution estimated. For comparison, the table also shows the distribution ($z^*$) based on the census sample adjusted for income in kind but not for "underreported income." It is clear that Navarrete's allocation of underreported income substantially increases the estimated degree of inequality. For example, the top 2.4% of families receive 32.3% of the income in her estimate but only 14.6% of the income when unreported income is not allocated to the upper brackets. The column $z^*$ does not necessarily represent a more accurate estimate than Navarrete's; it represents a lower bound on the degree of inequality for a distribution based on the 1950 census data.

Similarly, Navarrete does not present the income distribution directly from the 1956 sample of 5,000 families. Instead, personal income based on the sample must be increased by 36.5% to attain the level of personal income from the national accounts.[2] She therefore allocates this discrepancy to the upper income brackets. Table 3.14 shows her final estimate (columns w and z for 1956), as well as the estimate calculated on a basis of the sample results alone (column $z^*$). Note that the sample data already include income in kind. In this case as in the case of the 1950 data, the allocation of "underreported income" to upper income groups increases the estimated inequality.

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1. Navarrete, op. cit., Table 9, p. 78.

2. Which in turn Navarrete has estimated as about 10% below the official Banco de Mexico figure. Her figure for national income is based on an input-output table. She argues that the adjustment, if anything, leads to underestimation of the degree of inequality in income distribution, because the reduction in national income primarily represents reduced estimates of profits of medium and large firms in the commercial sector (Navarrete, op.cit., p. 82). To my mind, this source of possible underestimation of inequality is not nearly so important as the possible overestimation of inequality due to Navarrete's allocation of "unreported income" to upper income brackets.

Table 3.14 Distribution of Family Income in Mexico: 1950 and 1956. Navarrete Estimates

| 1950 | | | 1956 | | |
|---|---|---|---|---|---|
| W | Z | Z* | W | Z | Z* |
| 3.7 | .9 | 1.1 | 3.9 | .6 | .86 |
| 29.5 | 9.7 | 11.8 | 18.9 | 4.0 | 5.49 |
| 49.0 | 18.6 | 22.6 | 34.8 | 9.2 | 12.53 |
| 66.4 | 28.9 | 35.11 | 46.1 | 13.8 | 18.84 |
| 77.3 | 37.6 | 45.11 | 56.3 | 18.9 | 25.76 |
| 88.1 | 48.4 | 58.11 | 74.5 | 32.6 | 42.09 |
| 95.2 | 60.2 | 71.01 | 83.9 | 43.5 | 53.80 |
| 97.6 | 67.7 | 77.84 | 95.1 | 63.4 | 75.82 |
| 99.1 | 77.2 | 85.44 | 97.7 | 76.0 | 84.47 |
| 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

W = Cumulative percent of families

Z = Cumulative percent of income. Navarrete estimates, including adjustment for discrepancy between sample income and national accounts (assumed underreporting of income).

Z* = Cumulative percent of income: author's estimate: based on Navarrete's data. No adjustment made for underreporting of income.

Source: Navarrete, op. cit., pp. 78-83

An important trend in the two Navarrete estimates (including underreported income or not) is the shift of income shares toward the middle brackets between 1950 and 1956. Both the poorest and richest groups lost income shares to the middle groups during the period, according to these data.

### 3.5.2 Banco de Mexico 1963 Estimate

In 1963 the Banco de Mexico carried out a national sample survey of roughly 5,000 households, for data on income and consumption patterns. The sample was random and therefore unfortunately did not contain high representation of high income families. There is no particular bias to be expected in the results, except the general bias of sample surveys toward underreporting of income by upper income families. The Banco de Mexico study itself does not include an income distribution estimate, but Table I.E.1, Appendix A shows an estimate based on direct calculation with data from the study's table of the number of families and total income in each income bracket.[1] Note that these income data include income in kind.

Comparing the Banco de Mexico data to the two Navarrete estimates of 1950 and 1956, one might be tempted to conclude that a continuous process was occurring from 1950 to 1963 -- a continuing decline in the share of income received by the families with highest income. That is: the top 5% of the families received roughly 40%, 37%, and 27% of income in 1950, 1956, 1963, on a basis of these sources. Yet the 1963 data are from a sample, with no adjustment for hypothesized underreporting of income by upper income families. Therefore they should be compared not with Navarrete's adjusted data but with the data of the z columns in Table 3.14. On this basis, the share of income going to the top 5% of families increased, if it changed at all, between 1956 and 1963 (roughly 24% of income in 1956 versus 27% in 1963).

### 3.5.3 Summary

Of the three Mexican income distributions examined, the best for the purposes of this study is that calculated from published data of the 1963 Banco de Mexico family survey. It is more recent than the two Navarrete estimates. Also it is not subject to what is probably a bias toward inequality introduced by Navarrete's method of allocating the shortfall of sample-based personal income from the national accounts figure. Navarrete assumes this difference is underreported income and allocates it heavily to the upper income brackets. On the other hand, it should be recognized that the Banco de Mexico data probably understate skewedness of distribution, since they are sample survey data with no adjustment for underreporting of income.

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1. Banco de Mexico, S.A., Oficina de Estudios sobre Proyecciones Agricolas, Encuesta sobre Ingresos y Gastos Familiares en Mexico -- 1963 (Mexico: 1966), p. 306 and p. 232.

## 3.6 Venezuela

Only one source is available to the author for Venezuelan income distribution: a sample survey in 1962 of 3,697 families.[1] The sample was well designed in that it gave higher representation per capita to the major urban areas than to rural areas, on the hypothesis that urban incomes were higher than rural and therefore urban incomes and consumption were subject to greater variation than rural. The income data included rural foodstuffs produced and consumed on the farm.

The family income distribution shown in Table I.F. Appendix A, was calculated by expanding the published sample data on number of families and total income in each income bracket. These data were presented for three sample sectors: major urban areas, minor urban, and rural areas. To obtain the estimate of Table I.F.1, Appendix A, the data for each were expanded on a basis of the total universe population in each sector, relative to sample size in each.[2]

The estimate for Venezuela should be relatively good, subject to the general qualification of bias toward estimated equality due to underreporting of upper income in sample surveys.

## 3.7 Comparative Indicators

### 3.7.1 Gini Coefficients

It is highly interesting to compare the degree of inequality of income distribution among the six countries of this study. The conventional index of inequality is the "Gini" coefficient. This index equals the area between the diagonal of the Lorenz diagram and the Lorenz curve, as a fraction of the total area below the diagonal. The index varies from zero, showing perfect equality, to unity, showing absolute inequality. If a simple piece-wise approximation of the Lorenz curve is made by considering the straight line segments connecting the Lorenz curve points for which observations are available, then the gini coefficient may be measured as:

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1. Republica de Venezuela, Oficina Central de Coordinacion y Planificacion de la Presidencia de la Republica, Primeira Encuesta Nacional de Ingresos y Gastos Familiares en Venezuela. Segund Semestre de 1962. Documento 5. Descripcion de la Encuesta y Resultados Preliminares de Ingresos y Gastos Familiares, (Caracas:1964).

2. Note that in the published study itself no income distribution is calculated. However, an erroneous aggregation of families and income by income bracket is shown. Having carefully designed the sample to have differing sample proportions in the three sectors, the authors of the study then proceded to aggregate the sample results directly, without first weighing each sector's results by the ratio of population to sample size in the sector.

$$G = 1 - (2)\left[\sum_{i=1}^{m} (w_i - w_{i-1})(z_{i-1}) + \frac{1}{2}(w_i - w_{i-1})(z_i - z_{i-1})\right]$$

where $z_i$, $w_i$, is the $i^{th}$ observation of the cumulative fraction of income and the cumulative fraction of recipients, and the $m^{th}$ observation is the final point (1,1). This "G" will tend to underestimate the true gini coefficient, since the line segments connecting Lorenz curve points must always lie above the curve itself. In practice, however, "G" gives a good approximation, especially when there are many observations and the piece-wise approximation comes close to being a curve.

Table 3.15 shows the estimated "G" for the "best" income distribution for each country, as discussed in the closing section for each country. It should be remembered, in comparing countries, that distributions for active workers should be more skewed than distributions for families, due to greater incidence of multiple-worker families at lower income. However, as the comparison between Argentine families and active workers shows, the difference in inequality between the two types (as indicated by the Gini coefficient) is not great, and differences across countries are greater than differences caused by family as opposed to active worker estimation.

Table 3.15 suggests that income is most unevenly distributed in Colombia; that Brazil, and then Mexico, have the next most unequal distributions; and that Argentina, Chile, and Venezuela are all similar in their distributions and have the most equal distributions of the countries examined. This ranking is appealing in that it follows the pattern one might expect a priori. Brazil's great difference in income between the Northeast and the South should cause a high measured index of inequality in income distribution. The measured inequality for Colombia is particularly sobering given the fact that whereas the Brazilian estimate may overstate inequality, the Colombian data (with their urban information based on a sample) should be biased toward equality, if biased at all. Given Argentina's level of development, it is not surprising that it should have income more evenly distributed than Brazil and Colombia, although one might expect more of a difference between Chile and Argentina, and the Chilean data (based on a sample survey) may overstate equality of income distribution. To the author, it is surprising that income is as evenly distributed to Venezuela as in Argentina, given the stereotype of Venezuela as a country of an enclave economy (i.e. in petroleum) in which the high per capita income is misleading due to very unequal distribution. Again, one suspects that the Venezuelan data (from a sample survey) overstate equality of distribution more than do the Argentine data.

The "gini" coefficients for the United States and United Kingdom are included in Table 3.15 for comparison. The fact that family distributions for Chile, Venezuela, and Argentina have inequality indices relatively close to that of the United States suggests again that the estimated data (at least for Chile and Venezuela) understate inequality of distribution.

Table 3.15 Gini Coefficient of Concentration

Comparison among Countries

| Country | Data description | Year | "G" |
|---|---|---|---|
| Argentina | a) Active workers | 1961 | .487 |
| | b) Families | 1961 | .434 |
| Brazil | a) Active workers | 1960 | .619 |
| | b) " " | 1960 | |
| | including unpaid workers in agric. | | .657 |
| | c) Active workers | 1960 | |
| | including unpaid workers in agric. and adjusted for "own consumption" | | .590 |
| Chile | Families | 1968 | .446 |
| Colombia | Active workers | 1964 | .640 |
| Mexico | Families | 1963 | .534 |
| Venezuela | Families | 1962 | .438 |
| United States[1] | | | .400 |
| United Kingdom[2] | | | .340 |

1, 2 As shown in "Income Distribution in Latin America," Economic Bulletin for Latin America, Vol. XII, No. 2, October 1967, p. 39.

Finally, it should be mentioned that alternative estimates of the gini coefficients were made, based on a) a continuous estimate of the Lorenz curve, and b) regression estimates of the Pareto coefficient.[1] As these estimates were volatile, they have been rejected in favor of the more conventional estimate of the gini coefficient by the piece-wise approximation of the Lorenz curve.

### 3.7.2 Rural versus Urban Income Distribution

While the focus of this study is on income distribution for each country as a whole, the data available permit analysis of the difference between rural and urban distributions. One might expect urban inequality to be greater than rural, due to the existence of very high incomes in urban centers. However, the data available for this study suggest that there is little or no difference between urban and rural inequality. In terms of absolute income levels, the data of course show a larger percentage of rural recipients in the lower brackets than for urban recipients, but the percentage distribution of income differs little between the two sectors. In one country, Colombia, rural income appears to be even more unevenly distributed than urban. The data on urban and rural income distributions are in the following tables: Argentina, I.A.2 and I.A.4 (Appendix A); Brazil, 3.10 part A and 3.11 part B; Chile, I.C.2 and I.C.3 (Appendix A); Colombia, I.D.1 and I.D.2 (Appendix A); Mexico, I.E.2 and I.E.3 (Appendix A); Venezuela, I.F.2 and I.F.3 (Appendix A).

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1. The author estimated, by iteration solving for an estimate of "b" yielding the smallest sum of squared residuals of estimated "z" from observed z, the Lorenz curve $z = 1\ (1-w)^{[1-1/b]}$. This Lorenz curve can be shown to follow from the Pareto distribution, where "b" is the same Pareto coefficient discussed in section on Brazil. Given "b" the gini coefficient equals 1/(2b-1). (See Appendix B).

Inspection of the estimated Lorenz curves showed a bias in every case toward estimated z greater than observed z for low points in the cumulative distribution and estimated z lower than observed z for high points. This bias is consistent with the fact, observed by Quandt (op. cit., p.62) that the Pareto-based Lorenz curve is not symmetric around the upper-left/lower right diagonal of the Lorenz diagram. In every case examined here, the observed Lorenz curve points traced a curve much more symmetric to this "alternate"diagonal" than the "estimated" Lorenz curve. Furthermore, the coefficient "b" estimated by the iterative Lorenz curve method was consistently much larger (more equal distribution) than the same coefficient when estimated by regression (see 3.3.2.1) above). In sum, the estimates of the Pareto coefficient were abandoned in favor of the simpler method of estimating the Gini coefficient through piece-wise linear approximation of the Lorenz curve.

### 3.8 Conclusion

In this examination of income distribution data, the author has attempted to discuss the merits and faults of the available estimates -- published and unpublished -- for Argentina, Brazil, Chile, Colombia, Mexico, and Venezuela. Several estimates were calculated by the author. The more simple of these involved deriving percentage distribution observations from published data on population and income in given income brackets. The most detailed new estimates of the author are those for Brazilian income distribution.

The general picture that emerges is one of highly skewed income distribution in Colombia, Brazil, and Mexico, and more even distribution in Argentina, Chile, and Venezuela. It is also important that where data are available for distribution after taxes (i.e. Argentina, Brazil, and Colombia) the pattern emerges that tax policy does virtually nothing to redistribute percentage shares in income; and for Argentina, the only country with an available estimate of the incidence of government spending, redistribution through government outlays also appears very minor. Finally, for all of the countries examined, there appears to be little difference in the degree of inequality between the urban and rural sectors.

## 4. The Savings Effect: Estimates

With the estimates of income distribution data obtained in the previous section, the study may now turn to analysis of the trade-off between growth and equity. The first estimates are of the "savings effect."

### 4.1 Consumption Function Estimates

As a basis for the calculations of income redistribution's effect on savings, this section presents statistical estimates of consumption functions for Argentina, Brazil, Mexico, and Venezuela, after first describing the data used for the estimates. For all four countries the data are cross-sectional and are drawn from household budget surveys. Family consumption data are not available to the author for Chile or Colombia.

#### 4.1.1 The Data

##### 4.1.1.1 Argentina

In 1963 the "Joint Tax Program" of the Organization of American States, the Inter-American Development Bank, and the Economic Commission for Latin America conducted a household budget survey for urban areas in Argentina. The sample included four thousand households. In most cases, the housewife was interviewed. The interviewer asked the monthly income of all persons in the household (excluding domestic servants); their expenditure during the previous year (1962) on consumer durables, vacations, medical expenses, transportation, and certain other annual items; and their

expenses during the most recent "normal" month in some forty categories of frequent expense, such as foodstuffs, domestic servants, and household items. The survey included repeat interviews in cases where consumption seemed highly inconsistent with reported income, thus increasing the reliability of the data for consumption function analysis. Although the survey included questions on the household's change in real and financial assets during the year, as a check on income minus consumption as the estimate of savings, there was a high rate of failure to respond to these questions and their results were not processed.

Only aggregative results of the survey are available to the author.[1] The observations for the consumption function estimates are average family income and average family consumption in each of ten income classes.

It is noteworthy that the study treated consumer durable purchases as consumption, registering as consumption the payments actually made on the durable good during the year.

4.1.1.2 Brazil

In 1963 and 1964 the Getulio Vargas Foundation conducted family budget surveys in the major capital cities[2] of Brazil and in several smaller interior cities. Also in 1963 the Foundation carried out a rural budget study in coordination with a survey of characteristics of agricultural production; however, the family budget data from these rural studies were not yet published as of mid-1969.

The urban surveys were relatively large: 4,625 families were included in the surveys of eight capital cities and the surveys of interior cities included 2,684 families. The households visited were selected from the census register of households which had been included in the 25% coverage in the "economic survey" of the 1960 census. The observations were chosen so as to be representative of the income distribution according to the 1960 census economic survey.

The published results[3] for the urban studies show average family income, before and after direct taxes, and average family expenditure by major category, for nine income groups. For the consumption function analysis below, consumption includes the category "current expenses" as well as expenditures on automobiles, housing, and furniture. These consumer durables are thus excluded from the concept of savings, as discussed above in section 2.2.4. The income data refer to disposable income. The data for each

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1. As published in the CONADE report, Consejo Nacional de Desarrollo, Encuesta... 1963, op. cit.

2. Fortaleza, Recife, Salvador, Belem, Rio de Janeiro, São Paulo, Belo Horizonte, Curitiba.

3. Fundação Getulio Vargas, Instituto Brasileiro de Economia, Pesquisa Sobre Orçamentos Familiares, op. cit.

income bracket are aggregated across all capital cities (1961-62 data) on the one hand and across all interior cities (1962-63 data) on the other hand, after appropriate sample expansion based on the universe population of each city.

The reliability of these data is subject to challenge primarily because the interview date was so long after the period to which the answers were supposed to pertain, in the face of rapid inflation in the interim. For example, for the capital cities the interview dates fell between August and December of 1962, whereas the year to which the data referred was July 1, 1961 to June 30, 1962. In the period December 1961 to December 1962 wholesale prices rose by 53% in Brazil. Yet the questions on income and current expenditures referred to average monthly values during the year in question. One wonders, then, whether the typical respondent answered questions in terms of values current at the interview date or in terms of values truly relevant for the average over the period July 1961 - June 1962.[1]

For interpretation of the estimated consumption functions, it is necessary to ask what bias would result if the respondents answered thinking in terms of monthly data for the interview date of, suppose, October 1962 instead of the monthly average for July 1961-June 1962. There are essentially four possible cases. First, all respondents answered perfectly, accurately recalling values of roughly a year previous. Second, all respondents answered thinking of values current at the interview date, and thus roughly 50% higher in monetary terms than true values for the period requested. Third, some respondents answered perfectly and some erroneously on a basis of values at the interview date, but the proportion of right to wrong responses was not related to income level. Fourth, the proportion of right to wrong responses was related to income level: in this case one would expect the lower income groups to have been the less sophisticated and therefore the more likely groups to answer erroneously (giving values relevant to the interview date) while the higher income groups answered correctly.

In the first and second cases the estimated consumption functions should be satisfactory. In the first case there is no problem at all. In the second case one need only interpret the absolute values as cruzeiros of late 1962 instead of cruzeiros of late 1961; and if the results are used for estimation of savings propensities by relative positions in the income distribution, the absolute units drop out and cause no problem.

In the third and fourth cases biases occur. In the third case the whole consumption function estimate is biased upward;

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1. This and other weaknesses in the date were called to the author's attention by Professor Albert Fishlow.

at any income level expressed in 1961-62 cruzeiros, estimated consumption is higher than true consumption. The reason is that the estimate is an average of the curve for erroneous respondents and that for accurate respondents. The curve for erroneous respondents lies everywhere above that for accurate respondents; all consumption and income values for erroneous respondents are 50% above what they should be for true 1961-62 values. Thus as observed income level $y^*$ for an incorrect response represents a true income of 2/3 $y^*$ and thus, given normal consumption propensities, will be associated with a higher fraction of income consumed than that associated with true income of $y^*$. For any observed income level $y^*$, observed consumption for the erroneous respondents will therefore always exceed that for accurate respondents.

In the fourth case, the bias is toward overestimation of consumption for low income levels and true estimation for high income levels, and thus also a strong downward bias in the marginal propensity to consume.

To summarize, consumption functions based on these data will, if biased, have either a bias toward over-statement of consumption at all income levels or a bias toward over-statement of consumption at low-income levels.

Finally, in preparation of the data for consumption function analysis, the author included in the same regressions data for interior cities and data for capital cities, by deflating the former (which were for the year 1962-63) by the wholesale price index change from December 1961 to December 1962 -- the midpoints of the two survey periods. To test for error resulting from this inclusion, dummy variables were first included in the consumption functions, to see whether parameters differed significantly for interior versus capital cities. These shift variables would have represented a mixture of: error in the wholesale price index, changes in consumption behavior over one year, and true difference in consumer behavior between smaller and larger cities. However, the dummy variables were not significantly different from zero and joint estimation from the two sets of data appeared valid.

4.1.1.3 Mexico

In 1963 the Banco de Mexico S.A. carried out a family budget survey with the primary purpose of projecting future demand for agricultural products. The publication[1] containing results of the survey, expanded to universe magnitudes, warned of a tendency of high income respondents to understate both income and consumption, and a tendency of low income respondents to overestimate their consumption but understate their income. The study therefore warned against use of the data for income distribution or consumption function analysis. Since this set of data is the only

1. Banco de Mexico, S.A., Encuesta ... 1963, op.cit.

source available for consumption function analysis for Mexico it is used in this section but the results must be interpreted with the warning of bias in mind.

The survey included 5,070 households, interviewed in 327 rural and 165 urban population centers. The sample was random, stratified in an attempt to get higher representation of higher income geographic regions, under the valid assumption of higher variance in consumption and income variables for higher income units. Interviewers asked for the annual income of the household, including "own-consumption" of goods produced (especially important on farms) as well as imputed rent for owned housing (with this imputed rent also recorded as an expenditure). The income concept requested was disposable income after deduction of direct taxes and contributions for social security and labor fees. Data requested for consumption expenditures referred to weekly outlays for food, beverages and tobacco; monthly, for housing, fuels, electricity, and other services; yearly, for clothing, vehicles, furniture, and appliances. The week, month, or year immediately preceding the interview was the period of reference. Due to price stability in Mexico in the period, adjustment of data for inflation was not necessary. Outlays on consumer durables were counted as family expenditures; the amounts of payments actually made on these items during the year were recorded as the expenditure (i.e. not the total purchase prices in the case of items bought on credit).

For the purposes of this section, the data used were those published on total income, total consumption, and total number of families, grouped in nine income categories. For each income category average family consumption and average family income were calculated and used as the variables for the functions below.

The Mexican data appear to have a bias toward overstatement of consumption relative to income in the lower income brackets -- as warned by the authors of the study. The observed dissaving is very high in lower brackets, and roughly the bottom seventy percent of the population supposedly have expenses in excess of income. One wonders where financing of large amounts of dissaving would come from, especially for low income families.

Finally, there is a second source of consumption function data for Mexico. The income distribution study published by Navarrete in 1960 contains a table of income and consumption in each income bracket.[1] By adding "income in kind" both to monetary income and monetary consumption, figures for average real income and consumption per family may be obtained for each

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1. Navarrete, op. cit., p. 113

income bracket. These figures are used below for a second set of consumption function estimates. Since the Banco de Mexico data are published in much greater detail and are used below in the demand composition analysis, they remain the basic data reference for Mexico in this study. The Navarrete data are used primarily as a check, to indicate the probable direction of bias in the Banco de Mexico data.

4.1.1.4 Venezuela

The family consumption data for Venezuela come from a family budget survey of 1962 conducted by the government's "Central Office of Coordination and Planning."[1] A sample of 3,697 households was taken on a random basis, with stratification to give higher representation to urban areas in view of higher income in urban areas than in rural. The sample was taken between June and November of 1962. The income recorded included regular salaried or business income as well as own-consumption of farm produce and imputed rent of owned housing. Expenditures were collected on a basis of weekly outlays on each item in a detailed list, plus other expenditures on a monthly or annual basis.

The publication points out that the overall monthly spending in the sample exceeds total monthly income (by about 10%) and attributes this difference not to true dissaving but to exaggeration of reported consumption expenses and underreporting of income by respondents.

To obtain the over-all average family income and consumption levels by income category, used below in the consumption function estimates, it was necessary to expand the publication's data for each of the three regions (urban, minor urban, rural) by the ratio of population to sample size for each. The publication's aggregate data appeared incorrectly based on simple summation of data for the three regions.

4.1.2 Results

The forms of the consumption function estimated are:

a) Linear: $C = a + by$

b) Quadratic; $C = a + by + cy^2$

c) Log-linear $C = e^a y^b$ or $\ln C = a + b (\ln y)$

where C = family consumption and y = family disposable income. Table 4.1 shows the results for these three models.

The very high R-squared values for all models of all countries are due in large part to the small number of observations. The

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1. Reported in Oficina Central de Coordinacion y Planification, et. al, Primera Encuesta... op. cit.

Table 4.1 Consumption Function Estimates

| Country | | a | b | c | R-Square |
|---|---|---|---|---|---|
| Argentina | L | 65.04<br>(12.9) | .5128<br>(.03) | -- | .9767 |
| | Q | 28.74<br>( 7.5) | .7677<br>(.04) | $-.2145 \times 10^{-3}$<br>$(.3 \times 10^{-4})$ | .9968 |
| | LL | 1.077<br>(.1) | .7711<br>(.02) | -- | .9956 |
| Brazil | L | 107.9<br>(30.2) | .7134<br>(.02) | -- | .9856 |
| | Q | 8.911<br>(8.3) | 1.008<br>(.02) | $-.7057 \times 10^{-4}$<br>$(.4 \times 10^{-5})$ | .9994 |
| | LL | .5628<br>(.06) | .9030<br>(.01) | -- | .9978 |
| Mexico | L | 798.7<br>(254.3) | .5631<br>(.04) | -- | .9533 |
| | Q | 266.1<br>(83.9) | .9152<br>(.04) | $-.2907 \times 10^{-4}$<br>$(.3 \times 10^{-5})$ | .9974 |
| | LL | 2.244<br>( .17) | .7062<br>(.02) | -- | .9931 |
| Venezuela | L | 257.9<br>( 99.1) | .6770<br>(.04) | -- | .9709 |
| | Q | 232.7<br>(129.2) | .7177<br>(.13) | $-.689 \times 10^{-5}$<br>$(.2 \times 10^{-4})$ | .9713 |
| | LL | 1.751<br>(.19) | .7529<br>(.03) | -- | .9864 |

Note: Units; Number and range of observations:

Argentina: Monthly, 1000 pesos of March 1963. 10 obs. Max=1185 Min= 39

Brazil: yearly, 1000 cruzeiros of Dec. 1961. 18 obs. Max= 4533 Min= 52

Mexico: monthly, pesos of 1963. 9 obs. Max= 13,539 Min= 216

Venezuela: monthly, bolivars of 1962. 12 obs. Max- 6488 Min= 76

Models: L=linear Q=Quadratic LL = Log-linear (Naperian base)

small number of observations is not damning; the functions should be valid as central tendencies since each of the observations represents an average for all sample observations within a given income bracket, and therefore a highly representative datum. The variation around the function would be much higher if each sample household were treated as an individual observation in the regression, but the values of the function's parameters could be expected to be the same as those estimated here.

A visual plotting of the observations clearly shows the consumption function to be curvilinear for Argentina, Brazil, and Mexico, but linear for Venezuela. This fact is confirmed by the statistical significance of a negative coefficient for $y^2$ in the quadratic model for each of the first three countries but lack of significance of this coefficient for Venezuela.

The data for the functions for Mexico in Table 4.1 are from the Banco de Mexico study (1963). As a check on these basic data, functions based on data from the Navarrete study are shown in Table 4.2 below. The log-linear (LL) form is most easily compared for the two sets of results. Since the constant is lower and the exponent of income (b) higher in the results for the Navarrete data, the average propensity to consume is lower at low income levels and the elasticity of consumption with respect to income higher in these results than in those from the Banco de Mexico data. This difference tends to confirm the observation above that the Banco de Mexico data overstate consumption at low income levels.

Table 4.2 Consumption Functions
Mexico, Navarrete Data

| | a | b | c | R-Square |
|---|---|---|---|---|
| L | 192.4<br>(36.4) | .64039<br>(.02) | -- | .9940 |
| Q | 93.0<br>(21.1) | .81506<br>(.03) | $-.3178 \times 10^{-4}$<br>$(.5 \times 10^{-5})$ | .9992 |
| LL | .9990<br>(.05) | .83816<br>(.01) | | .9994 |

Notes: Monthly pesos of 1956. 10 observations. Maximum income observed = 5496; Min = 185. L = linear, Q = quadratic, LL = log-linear (Naperian base).

In addition to the estimation of the over-all consumption functions, for Brazil it is possible to make a highly interesting hypothesis test; do entrepreneurs have a significantly higher savings rate than other persons receiving identical levels of income? To the extent that entrepreneurs save more than others at similar income levels, the analysis of this study ignores an important consideration; the analysis below of the "savings effect" of income redistribution considers income level as the only determinant of personal savings and thus could be misleading

if the type of income is of major importance, net of income level's influence. The Brazilian data include one stratification with all family heads classed in one of four categories: "employer", "employee," "retired," or "not working." While this stratification includes only data on disposable income and on "current" expenses, but not on consumer durable expenditures, any differential savings propensity for "employers" as opposed to others should be evident even though the consumption data are only for "current consumption.

Using average family income and family "current consumption" data[1] for each of nine income brackets, with data aggregated from six cities[2] weighted by their populations relative to their sample sizes, and with one set of observations for "employers" and another for all other income recipients, the following models were estimated:

a) $\ln C = a + b \ln y + cD$

b) $\ln C = a + b \ln y + dD (\ln y)$

c) $\ln C = a + b \ln y + cD + dD (\ln y)$

d) $\ln C = a + b \ln y$

where C = family "current" consumption, y = family disposable income, and D = 0 for "employers" and D = 1 for all others.

The results are shown in Table 4.3

Table 4.3 Hypothesis Test for Difference in Savings Propensity: Entrepreneurs versus Others, Brazil

| model | coefficient a | b | c | d | R-squared |
|---|---|---|---|---|---|
| a) | .7799 (.12) | .8534 (.02) | .0385 (.045) | -- | .9925 |
| b) | .796 (.12) | .850 (.02) | -- | .0071 (.007) | .9926 |
| c) | .862 (.16) | .840 (.03) | -.145 (.24) | .0299 (.039) | .9928 |
| d) | .803 (.12) | .853 (.02) | -- | -- | .9921 |

1. With consumption of "own production" added both to income and consumption.

2. Belem, Fortaleza, Recife, Salvador, Rio de Janeiro, São Paulo.

It is clear that the dummy variables "D" and "D (ln y)" have coefficients that are not significantly different from zero. A positive, significant coefficient "c" would mean that non-entrepreneurial consumption is always a multiple $e^c$ times entrepreneurial consumption, for any given income level. If the coefficient "d" were satistically significant and positive, then non-entrepreneurial consumption would be greater than entrepreneurial consumption at a given income level, and the multiple would increase as income level increased. But neither of these two "shift" variables is statistically significant, and one must therefore reject the hypothesis that entrepreneurial consumption differs from non-entrepreneurial consumption for a given income level.[1] The analysis below of the "savings effect" of income redistribution, which is based solely on level and not type of income, should therefore not be misleading.

## 4.2 Savings Effect Simulation

### 4.2.1 Method

The basic elements in calculation of income redistribution's effect on savings are: the over-all consumption function, the present income distribution, and the alternative hypothesized new income distributions. The purpose is to apply the estimated consumption function to the new or simulated levels of income for the new income distributions and aggregate the implied savings to determine new aggregate personal savings for comparison with original personal savings. It is important to keep in mind that the consumption function assumed is the curvilinear Keynesian function, which automatically gives a negative savings effect for income equalization. Thus, the estimates here should be viewed as maximum statements of the negative effect of income redistribution. Alternative consumption function theories (Friedman, Modigliani-Brumberg) would hold that there is no savings change at all after income redistribution.

The savings effect calculation first considers twelve income distribution brackets: the lowest nine deciles of recipients, then the brackets 90%-95%, 95%-97.5%, and 97.5%-100%. Let $\lambda$ be a vector of twelve elements with the $j^{th}$ element $\lambda_j$ being the fraction of total disposable personal income going to the $j^{th}$ income bracket. Let $\bar{y}$ be over-all average family income, taken from the set of data for which the consumption functions (of section 4.1) are estimated. (These sources are not necessarily the same as those for $\lambda$ -- the "best" income distribution sources as determined in section 3.) Let $w_j$ be the fraction

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1. This finding contradicts the implicit conclusion of Houthakker, that the marginal propensity to save is greater for entrepreneurs than for non-entrepreneurs -- although Houthhakker is vague as to whether his conclusion refers to a difference net of the influence of income level. See section 2.2.1 above.

of total recipients in the $j^{th}$ bracket. Thus $w_j$ equals .1 for the first nine brackets, and .05, .025, .025 for the final three.

The first step in the savings effect calculation is then to calculate the original average savings rate in each income bracket. To do this, the average family income for each bracket is calculated as:[1]

$$(4.1) \qquad \bar{y}_j = \bar{y} \left(\frac{\lambda_j}{w_j}\right)$$

Then the level of consumption occurring at this income level is calculated as

$$(4.2.a) \quad \bar{c}_j = a + b\bar{y}_j + c\bar{y}_j^2$$

o4

$$(4.2.b) \quad \bar{c}_j = e^{a} \bar{y}_j^{b}$$

that is, the consumption at each bracket's average income level is estimated by applying the quadratic or log-linear consumption function (from section 4.1) to the average family income level for the bracket. Note that the linear consumption functions of section 4.1 are ignored since one knows <u>a priori</u> that they will yield no savings change after income redistribution.

The average savings rate for each income bracket is then calculated as:

$$(4.3) \qquad \bar{s}_j = 1 - (\bar{c}_j / \bar{y}_j)$$

The original over-all average savings rate for personal disposable income will then be the sum of each bracket's average savings rate weighted by its fraction of disposable personal income. If S is defined as a vector with $\bar{s}_j$ as its $j^{th}$ element, then the total average savings rate for the community (from personal disposable income) defined as $\bar{s}_T$ is:

$$(4.4) \qquad \bar{s}_T = \underset{1xn}{(S')} \; \underset{nx1}{(\lambda)}$$

At this point, the original average savings rate for personal income is estimated. Note that the savings effect estimate concerns only personal savings, not savings by incorporated businesses or by government. Since much of business is unincorporated in the countries in question, much of business saving

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1. Proof: by definition $\bar{y}_j = Y_j / N_j$ where $Y_j$ = total income in bracket j and $N_j$ = total number of recipients in the bracket. But $Y_j = Y \lambda_j$ and $N_j = Nw_j$ where Y is total income and N total population. Thus $Y_j/N_j = Y \lambda_j / Nw_j = (Y/N)(\lambda_j/w_j) = \bar{y}(\lambda_j/w_j) = \bar{y}_j$. Q.E.D.

should be included in the personal saving of upper income brackets as shown in the family budget data.

To simulate the effect of income redistribution on savings, the next step is to define a new vector $\lambda^*$ of fractions of total income going to each of the original 12 income brackets. (The fraction $w_j$ of recipients in each bracket is unchanged.) In the two calculations made below, one assumption is that the new $\lambda^*$ equals that of disposable income in England; the other assumption is that the new $\lambda^*$ is such that enough income is taken from the upper brackets to insure a minimum income of one-half total average family income to all lower brackets. Given the hypothesized $\lambda^*$ a new set of income and consumption levels is calculated for the twelve brackets, and a new average over-all savings ratio $\bar{s}_T^*$ is calculated. That is, all of the above steps of equations 4.1 through 4.4 are repeated but in the initial equation $\lambda_j^*$ is substituted for $\lambda_j$, and in the subsequent equations $\bar{y}_j$, $\bar{c}_j$, $\bar{s}_j$, S, and $\lambda$ are replaced by their "starred" counterparts.

4.2.2 Results

Table 4.4 shows the $\lambda$ vectors (shares of income by bracket) for England, for each of the four countries examined in this section, and for "experiment 2" (minimum income equals one half over-all average family income) for each of the four countries. Table 4.5 shows the estimated "original" average savings rates by income bracket on both the quadratic and log-linear consumption function bases. Table 4.6 shows the simulated savings effect of the two income redistribution experiments, under the two assumed consumption functions.

The data for the income distribution vectors $\lambda$ are the following. For Argentina, the United Nations data for families in 1961 are used (see table I.A.2, Appendix A). For Brazil, the income distribution chosen is that of "active non-agricultural workers" from the population census of 1960 (see table 3.11, part B). This choice is due to the fact that these data are "harder", i.e. involve fewer assumptions, than the data for the "best" income distribution estimated for Brazil after including unpaid agricultural workers and agricultural income in kind (see section 3.2.2 above).[1] For Mexico, the income distribution data come from the Banco de Mexico survey of 1963, and for Venezuela the data are from the family budget survey of 1962 (the only source available to this study).

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1. With the data available it is difficult to determine whether non-agricultural income is more unequally distributed than agricultural, and thus whether use of the non-agricultural data overstates or understates the negative savings effect of income redistribution. When line-segment Lorenz curves for the two sets of data are interpolated at standard deciles, the result is that a larger share of income goes to the lower deciles

(continued on next page)

Table 4.4 Percentages of Income Received by Each Income Bracket: Original and Experimental

| Percent Position Recipients | English Distrib. % | Argentina O % | Argentina E2 % | Brazil O % | Brazil E2 % | Mexico O % | Mexico E2 % | Venezuela O % | Venezuela EC % |
|---|---|---|---|---|---|---|---|---|---|
| 0-10 | 2.4 | 2.9 | 5.0 | 1.4 | 5.0 | 1.7 | 5.0 | 1.5 | 5.0 |
| 10-20 | 3.7 | 4.1 | 5.0 | 1.6 | 5.0 | 2.0 | 5.0 | 2.3 | 5.0 |
| 20-30 | 5.0 | 4.8 | 5.0 | 2.3 | 5.0 | 3.4 | 5.0 | 3.2 | 5.0 |
| 30-40 | 6.8 | 5.5 | 5.5 | 3.3 | 5.0 | 3.4 | 5.0 | 4.4 | 5.0 |
| 40-50 | 8.3 | 6.1 | 6.1 | 4.1 | 5.0 | 5.2 | 5.2 | 6.8 | 6.8 |
| 50-60 | 9.8 | 7.0 | 7.0 | 5.1 | 5.1 | 6.1 | 6.1 | 8.6 | 8.6 |
| 60-70 | 11.9 | 8.0 | 8.0 | 6.2 | 6.2 | 7.8 | 7.8 | 8.6 | 8.6 |
| 70-80 | 13.6 | 9.6 | 9.6 | 6.5 | 6.5 | 12.4 | 12.4 | 11.4 | 11.4 |
| 80-90 | 15.4 | 12.9 | 12.9 | 11.6 | 11.6 | 16.4 | 16.4 | 16.4 | 16.4 |
| 90-95 | 10.1 | 9.7 | 9.7 | 12.2 | 12.2 | 13.1 | 13.1 | 13.0 | 13.0 |
| 95-97.5 | 5.8 | 9.3 | 9.3 | 22.9 | 16.7 | 9.7 | 9.5 | 8.8 | 7.5 |
| 97.5-100 | 7.2 | 20.1 | 16.9 | 22.9 | 16.7 | 18.8 | 9.5 | 15.1 | 7.5 |

Notes: O= Original E2= Experiment 2
Source: English: Calculated from United Nations, Economic Commission for Europe, Incomes in Postwar Europe: A Study of Policies, Growth and Distribution. Economic Survey of Europe in 1965: Part 2 (Geneva, 1967), pp. 15 and 6.

Other countries: see text

Table 4.5 Original Average Savings Rates (%) by Income Distribution Bracket

| Distribution Position | Quadratic basis Arg. | Quadratic basis Braz. | Quadratic basis Mex. | Quadratic basis Venez. | Log-linear basis Arg. | Log-linear basis Braz. | Log-linear basis Mex. | Log-linear basis Venez. |
|---|---|---|---|---|---|---|---|---|
| 0-10 | -14.5 | -11.4 | -114.1 | -169.2 | -9.9 | -14.8 | -94.4 | -73.6 |
| 10-20 | - 2.4 | -10.0 | - 96.5 | - 94.7 | -1.5 | -13.5 | -85.9 | -54.9 |
| 20-30 | 2.1 | - 6.6 | - 51.1 | - 63.0 | 2.1 | - 9.4 | -58.1 | -44.3 |
| 30-40 | 5.5 | - 4.2 | - 51.1 | - 35.9 | 5.1 | - 5.7 | -58.1 | -32.8 |
| 40-50 | 7.9 | - 3.1 | - 30.0 | - 12.5 | 7.3 | - 3.6 | -40.2 | -19.7 |
| 50-60 | 10.8 | - 1.9 | - 23.5 | - 2.7 | 10.2 | - 1.4 | -33.5 | -12.6 |
| 60-70 | 13.3 | - 0.9 | - 15.1 | - 2.7 | 12.9 | .5 | -23.8 | -12.6 |
| 70-80 | 16.6 | - 0.6 | - 3.7 | 5.9 | 16.5 | .9 | - 8.3 | - 5.1 |
| 80-90 | 21.4 | 2.5 | 1.9 | 13.9 | 21.9 | 6.4 | .4 | 3.9 |
| 90-95 | 27.9 | 8.3 | 10.3 | 20.7 | 28.9 | 12.9 | 13.1 | 14.3 |
| 95-97.5 | 40.3 | 34.8 | 17.5 | 23.4 | 38.7 | 23.3 | 22.5 | 19.7 |
| 97.5-100 | 57.8 | 34.8 | 33.7 | 27.3 | 47.4 | 23.3 | 36.3 | 30.4 |

Table 4.6 Aggregate Average Savings Rates for Disposable Personal Income. Simulated.

| | | Original | English Distribution (Experiment 1) | Experiment 2 Distribution |
|---|---|---|---|---|
| Argentina | Q | 24.6% | 19.2% | 23.1% |
| | LL | 22.6 | 19.8 | 21.5 |
| Brazil | Q | 16.3 | 3.1 | 9.2 |
| | LL | 12.0 | 6.5 | 9.0 |
| Mexico | Q | -2.3 | -7.3 | -6.0 |
| | LL | -3.5 | -11.1 | -9.3 |
| Venezuela | Q* | 2.1 | 2.1 | 2.1 |
| | LL | - .5 | -5.1 | -4.8 |

Notes: Q = quadratic consumption function basis LL = log-linear consumption function basis. * = for Venezuela linear consumption function used in place of quadratic (quadratic term not significant.)

It appears from table 4.6 that income equalization to the degree of equity in England would cause little decline in personal savings in Argentina but declines on the order of 5-1/2% of personal income in Brazil and 7.6% of personal income in Mexico (on the log-linear basis). In Venezuela the linear consumption function appears the best and the savings effect of income redistribution would be zero.

Various clarifications of the results of Tables 4.5 and 4.6 are necessary. First, in the calculation of average savings rates by income bracket, for brackets with income levels in excess of the maximum income observed in estimation of the consumption function the savings rate was not calculated by direct application of the consumption function. Instead, it was assumed that the consumption equaled that at the maximum income observed (in estimation of the consumption function) plus the difference between the bracket average income and maximum observed income multiplied by the marginal propensity to consume at the maximum observed income. This method avoided absurdly high savings rates for the quadratic function in which the negative term for $y^2$ makes the consumption function unreliable for values outside the original range of estimation.

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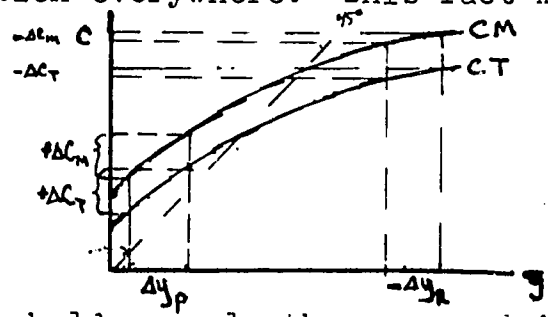
(footnote continued from page 77)

(up to 90% of recipients) in the "total" than in the non-agricultural data; but a smaller share goes to the group 90%-97.. leaving a larger share going to the top 2.5% in the "total" data than in the data for the non-agricultural sector. Comparison in the top group is difficult due to the difference in the base points from which interpolation along the Lorenz curve is made. See table 3.10 part A and table 3.11 part B for data in question.

Second, the large negative savings rates at low income levels in Mexico and Venezuela (Table 4.5) are very questionable. Nevertheless, the simulated savings change can be perfectly correct even with an incorrect set of original absolute savings rates. More explicitly, under the condition that the true consumption function is exactly parallel to the observed function (i.e. the observed minus a constant value), the change in savings after income redistribution will be accurately measured even though the observed consumption function overstates consumption everywhere. This fact may be seen in the graph below.




In the two-household example the measured increase in consumption is identical for the measured consumption function (CM) and for the true consumption function (CT) even though the measured function lies above the true -- because the two are parallel. In sum, while the absolute levels of the Mexican and Venezuelan savings rates seem very questionable, the savings effect calculations for the two countries should be more reliable since these calculations refer to differences in levels before and after redistribution and do not hinge crucially on the absolute savings levels observed. Nevertheless there does appear to be downward bias (in terms of what seems reasonable a priori) in the measured savings rates for low income levels in Mexico and Venezuela, although it is hard to determine whether the bias represents a parallel or non-parallel distortion from the true consumption function.

Third, from the negative savings rates at low income levels shown in Table 4.5 one might immediately conclude that income redistribution would have to yield very negative savings effects. Consider for example the large difference between the 23% savings rate in the top 5% bracket and the -15% rate for the bottom 10% bracket in Brazil (log-linear case). However, one must remember that it is not these ex-ante savings rates that are relevant for the "savings effect" but rather the ex-post savings rates at the after-redistribution income levels that matter. (This distinction is emphasized in the discussion in section 2.2.2.1 above).

Fourth, for the Mexican case there is a check on these results available from estimates based on the Navarrete data (discussed above). The savings simulation calculation applied to the Navarrete data yields much more reasonable savings rates. These range from an average savings rate of -22% in the bottom bracket to 34% in the top bracket, as opposed to a range from -94% to 36% for the corresponding brackets in the Banco de Mexico data (Table 4.5), using the log-linear basis for both sets of data. The original aggregate savings rate is 14.7% in the

Navarrete data (simulated, log-linear basis) versus -3.5% in the data of Table 4.5. The aggregate savings rate after change to the English distribution is 10.6%: after change to the Experiment 2 distribution it is 11.7%, for the Navarrete data (log-linear basis.) Thus the alternative data set implies smaller decline in savings after income redistribution (a decline of 4.1% of personal income versus the decline of 7.6%, for the English distribution.)

Fifth, it should be remembered that the calculations for Argentina and Brazil refer to urban data, both for income distribution and consumption functions. It is impossible to say a priori whether inclusion of the rural sector would make the negative savings effect of redistribution larger or smaller. One might expect the savings rate for a given income level to be higher in the rural sector given the immediate outlet for investment in the farm and given the more obvious consumption pressures of the demonstration effect in the cities. The overall lower income level in the rural sector might offset a higher savings rate at specified income for purposes of the savings effect calculation. In the absence of rural data for these two countries, it is assumed below that the results for the urban sector apply validly to the whole economy.

## 4.3 Growth Implications

To translate the "savings effect" calculations of Table 4.6 into figures for sacrifice of growth rates, two parameters are required: the incremental capital output ratio and the fraction which disposable personal income constitutes in gross national product. If "d" is disposable personal income as a fraction of GNP, "B" is the incremental capital output ratio, and "v" is the decrease in savings due to income redistribution expressed as a fraction of aggregate personal disposable income, then the decline in the growth rate of the economy as a whole ( $\Delta g$) equals

$$(4.5) \quad \Delta g = \frac{dv}{B}$$

from a simple Harrod-Domar growth relationship ($g = \frac{s}{B}$ where s is average savings rate for the whole economy and g is the growth rate.) To obtain an approximate idea of the growth costs implied by the calculations of savings results, it may be assumed[1] that

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1. Assumption of these parameters is necessary since actual data from national accounts are either non-existent or unreliable. National accounts frequently do not show private income distinctly separated into retained corporate earnings versus personal income. Savings data are notoriously inaccurate and are usually derived as the residual between foreign capital inflow and domestic capital formation. Of the countries examined here, the United Nations data on household savings as a fraction of capital formation include only Venezuela -- for which the fraction was an average of about 30% during the period 1960-67. United Nations, Yearbook of National Accounts Statistics, 1968, Vol. II, International Tables, p. 129.

personal disposable income represents .7 of GNP and the incremental capital output ratio is 3. Table 4.7 shows the change in the economy's growth rate implied by each of the savings declines shown in table 4.6.

Table 4.7 Decline in Percentage Growth Rate of The Economy Resulting from Redistribution of Income.

| | | English Distribution (Experiment 1) | Experiment 2 Distribution |
|---|---|---|---|
| Argentina | Q | 1.26% | .35% |
| | LL | .65% | .25% |
| Brazil | Q | 3.40 | 1.65 |
| | LL | 1.28 | .70 |
| Mexico | Q | 1.17 | .86 |
| | LL | 1.77 | 1.35 |
| (Navarrete data) | LL | .96 | .72 |
| Venezuela | Q* | 0 | 0 |
| | LL | 1.07 | 1.00 |

Notes: Assumes incremental capital/output ratio = 3 and aggregate disposable personal income = .7 (GNP). Q = quadratic basis, LL = log-linear basis. * Linear function.

As an example of the results of Table 4.7, suppose the economy is growing at 4% annually in Argentina. Redistribution of income to the level of equality found in England will then reduce the total growth rate by 1.26% to a rate of 2.74% -- assuming the quadratic function is the basis for calculation.

The most serious damage to the growth rate is in the quadratic case for Brazil, in a shift to English equality. Detailed investigation of the consumption function data and estimates strongly suggests that the quadratic function overstates savings in the upper income bracket,[1] despite the precaution taken for observations beyond the original range of observed data (described above). The quadratic case for Brazil may therefore be ignored.

The sacrifice of growth due to income equalization is relatively small for Argentina and is nill for Venezuela (assuming the linear function for Venezuela). For Mexico the loss is relatively high for the English experiment -- 1.77% is lost (log-linear basis). But the Navarrete data for the same experiment find only a .96% loss. In light of the discussion above

1. Estimated average consumption by income bracket differs

(Continues on next page)

of these two data sources for Mexico, the latter should be considered more accurate.

To summarize, a redistribution of income towards the level of equality found in England would cause decreases in growth rates on the order of 1% in Brazil and Mexico and smaller decreases in Argentina and Venezuela. While one percentage point is a serious growth sacrifice, it might very well be a reasonable price to pay for a country growing at 5% with inequality so extreme that political instability is chronic. For Brazil and Mexico this characterization is fairly accurate.

## 5. Effects on the Composition of Demand

This section examines the effect income redistribution would have on growth through influence on the composition of demand. The effect on imports is examined for Brazil and Mexico, and economies of scale effects as well as factor cost effects are discussed briefly for these two countries.

### 5.1 Detailed Consumption Function Estimates

Brazil and Mexico are the only two countries of this study for which detailed data are available to permit estimation of demand composition effects of income redistribution. Two types of data are required: consumption functions by product, and input-output data. While detailed consumption function data were available for Argentina, the most recent input-output data available were for 1953, so Argentina was excluded from this analysis.

For Brazil the Getulio Vargas Foundation family budget studies of capitals and interior cities in 1962 and 1963 show average family income as well as average family expenditure on twenty "current consumption" items and two consumer durables -- housing and automobiles. The Brazilian input-output table for 1960[1] included 32 sectors. The author determined the correspondence between the input-output sectors and the products of the Getulio Vargas Foundation study and then estimated log-linear consumption functions for individual or combined products from the budget study data.[2] A similar method was used to estimate

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(footnote continued from p. 82)
by only about 1% for the log-linear versus the quadratic function in the lower 10 brackets but is approximately 15% lower for the quadratic function than for the log-linear in the two top brackets.

1. Instituto de Pesquisa Economico-Social Aplicada (IPEA). Ministerio de Planejamento e Coordenação Geral, Relações Inter-industriais no Brasil.

2. The data were first expanded by population and aggregated. Six capitals were included (Belem, Fortaleza, Recife, Salvador, Rio de Janeiro, São Paulo) and nine interior cities (with appropriately deflated data) were included (those from Rio de Janeiro/Espirito Santo, Minas Gerais and São Paulo).

from the Banco de Mexico study with 44 products, consumption functions corresponding to each of the 45 product sectors of the 1960 Mexican input-output table.[1] The individual consumption functions and the budget study/input-output table correspondence are shown in appendix A, tables II through IX.

## 5.2 Import Effect

### 5.2.1 Method

To calculate the effect income redistribution would have on imports, it is first necessary to calculate the change in the final demand which would result for each product sector; then input-output analysis may be used to determine the resulting change in imports. The full version of the analysis was applied only to Mexico and follows these steps. First, let

$$(5.1) \quad c_i = e^{a_i} y^{b_i}$$

be the consumption function for the product of the ith production sector in the input-output sector (as determined from the budget study -- input-output correspondence discussed above). Here, c = consumption expenditure per family and y = average family income.[2] Then calculate a "numeraire" vector $\theta$ with n elements (for an n-sector input-output table) where the $i^{th}$ element of $\theta$ is

$$(5.2) \quad \theta_i = \sum_{j=1}^{m} e^{a_i} \bar{y}_j^{(b_i - 1)} \lambda_j$$

where $\bar{y}_j$ is average family income in the $j^{th}$ income bracket and $\lambda_j$ is the fraction of total personal disposable income received by the $j^{th}$ bracket and there are m income brackets altogether. It is apparent in equation 5.2 that $\theta_i$ essentially represents the aggregate fraction of personal income spent on good i. That is, the first two elements combine to represent the average propensity to consume good i in income bracket j, and the third element ($\lambda_j$) is the weight of the bracket in aggregate personal income. The interpretation of $\theta_i$ as the aggregate average propensity to consume good i is imperfect, because in the transformation from budget study data to input-output sectors certain products overlap -- they may enter in more than one sector "i" for example. Thus $\theta$ is merely considered as a numeraire, and the object is to determine a new level of $\theta$ for each sector after income redistribution. Naming the new level for sector i "$\theta_i^*$",

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1. Banco de Mexico, S.A., Cuadro de Insumo Producto de Mexico, 1960 (Mexico, 1966).

2. As shown in the appendix tables, consumption functions including family size were also calculated. The results were erratic in some cases and the author chose to deal with only income-consumption functions. In most cases the income elasticities in the two types differ very little.

the calculation of the value is:

$$(5.3) \quad \theta^*_i = \sum_{j=1}^{m} e^{a_i} \bar{y}^*_j \; (b_{i-1}) \; \lambda^*_j$$

where the variables are as in equation 5.2 but starred values correspond to levels after income redistribution.

Given each element of vector $\theta$ and vector $\theta^*$, a new vector is constructed giving the ratio of the two vectors' elements. The new vector $\phi$ has element $\phi_i$ calculated as:

$$(5.4) \quad \phi_i = \theta^*_i \; / \; \theta_i$$

The vector $\phi$ is now used to calculate a new vector of final private consumption. If final private demand in the $i^{th}$ sector was $P_i$ before income redistribution, it will be $P_i\phi_i$ after redistribution. In matrix notation, convert vector $\phi$ into a diagonal matrix $\hat{\phi}$ which has original element $\phi_i$ as its $i^{th}$ diagonal element and zeros elsewhere; then the new vector of final demand $P^*$ is:

$$(5.5) \quad \underset{n\times 1}{P^*} = \underset{n\times n}{\hat{\phi}} \; \underset{n\times 1}{P}$$

To calculate the effect of the change in the vector of final private demand on imports, two further steps are required. First, a new vector of gross output by sector must be calculated, corresponding to the new vector of final private consumption demand. Second, the vector of non-competitive import coefficients $\mu$ is applied to the new vector of gross output to determine the new total of intermediate imports. This amount is added to the original level of "competitive" imports (which for the Mexican data are not specified by sector) to obtain the new total of imports.

If $X_i$ is gross output (original) in sector i and the imports of intermediate inputs used in sector i equal $M_i$, then the vector of intermediate import coefficients $\mu$ has as its $i^{th}$ element:

$$(5.6) \quad \mu_i = M_i / X_i$$

The calculation of the new vector of gross output $X^*$ is as follows. Two versions are used. In the first, final private consumption varies but final demand for exports (vector E), government (vector G) and private investment (vector V) do not change. Total final demand (vector F) thus becomes:

$$(5.7.a) \quad F_1^* = P^* + E + G + V$$

In the second version, the sum of final demand is constrained not to exceed the original final demand total. Exports are assumed not to change by sector, so the difference must be absorbed by decreased G and V in each sector. This new set of $G_i$ and $V_i$ for the $i^{th}$ sector is calculated such that

$$(5.7.b) \quad \sum_{i=1}^{n} G_i^* + \sum_{i=1}^{n} V_i^* = \sum_{i=1}^{n} G_i + \sum_{i=1}^{n} V_i - \left[\sum_{i=1}^{n} P_i^* - \sum_{i=1}^{n} P_i\right]$$

and

$$(5.7.c) \quad G_i^* = G_i \frac{\left[\sum_{i=1}^{n} G_i^* + \sum_{i=1}^{n} V_i^*\right]}{\left[\sum_{i=1}^{n} G_i + \sum_{i=1}^{n} V_i\right]}$$

and $V_i^*$ similarly equals $V_i$ multiplied by the final fraction in equation 5.7.c.

Given the revised vectors $G^*$ and $V^*$ (in the second version), the revised final demand vector is:

$$(5.8) \quad F_2^* = P^* + G^* + V^*$$

If the matrix "A" of nxn dimensions is defined as the technical input-output coefficients matrix, where element $A_{ij}$ equals

$$(5.9) \quad A_{ij} = Z_{ij}/X_j$$

where $Z_{ij}$ is the value of inputs from sector i into sector j and $X_j$ is the value of gross output in using sector j, then the new vector of gross output $X_1^*$ equals:

$$(5.10) \quad \underset{nx1}{X_1^*} = \underset{nxn}{(I - A)^{-1}} \underset{nx1}{F_1^*}$$

where I is the identity matrix, and the alternative (second version) new vector of gross output $X_2^*$ equals:

$$(5.11) \quad X_2^* = (I - A)^{-1} F_2^*$$

Finally, if original "competitive" imports equal $M_o$ and if the vector of intermediate import coefficients $\mu$ is converted into a diagonal matrix $\hat{\mu}$ with the $i^{th}$ diagonal element equal to the original element $\mu_i$ and zeros elsewhere, then total imports after income redistribution equal:

$$(5.12) \quad M_1^* = Mo + \underset{nxn}{(\hat{\mu})} \underset{nx1}{(X_1^*)}$$

or, in the second version,

$$(5.13) \quad M_2^* = M_o + \underset{nxn}{(\hat{\mu})} \underset{nx1}{(X_2^*)}$$

The above series of calculations is applied for the Mexican data. For the Brazilian case, the input-output data do not give intermediate imports for each sector. Instead, the authors (Rijckeghem and Camargo) assume that all imports are competitive

and place them as a column in the final demand section of the table. For the Brazilian data, if the imports contribute the value $m_i$ to availability of the good of sector i, then define the fraction of total availability of good i coming from imports as $\gamma_i$ where

$$(5.14) \quad \gamma_i = m_i / (X_i + m_i)$$

Then the calculation of the change in imports is more simple than in the full model used for Mexico. For Brazil, with the new vector of final demand calculated as in equation 5.7.a, the new level of imports will be greater than the original level by:

$$(5.15) \Delta M = \sum_{i=1}^{n} \left[\gamma_i \left(F_{1i}^{*} - F_i\right)\right] + \sum_{i=1}^{n} (1-\gamma_i)\left[\sum_{j=1}^{n} \gamma_j A_{ji}\right]\left[F_{1i}^{*} - F_i\right]$$

In this calculation the first set of elements represents the direct import propensity as applied to the increase (decrease) of demand for the good in question; the second set of elements accounts for the indirect demand -- working through the import propensity for the intermediate goods required as inputs for the increase (decrease) of demand for the good in question.

### 5.2.2 Results

The results of the import simulation are surprising: imports decline but by negligible amounts. For Mexico, imports after a move to the English income distribution are only .8% less than original imports (version 1) or 2% less than original imports (version 2). In the income redistribution of "experiment 2" (see section 4) imports decline by .5% (version 1) or 1.5% (version 2). For the Brazilian case, the calculations yield only a 1.7% decrease in imports if a shift to English equity occurs and a .8% decrease in imports if a shift to equity of "experiment 2" occurs.

In sum, careful calculation of direct and indirect import changes after income equalization suggests that the resulting decreases in imports would be very minor. Thus, income redistribution could not be expected to help growth substantially through reduction of the import bill.

## 5.3 Other Demand Composition Effects

### 5.3.1 Economies of Scale

Aside from the effect of income redistribution on imports, two other demand-composition effects were suggested in section 2.3 above: the "differential economies of scale" effect and the "factor opportunity cost" effect. While it is beyond the scope of this study to analyze these effects in detail, a brief examination of demand shifts with regard to these influences is useful.

Of the sectors in the Brazilian input-output table, the following are the most likely to have economies of large scale production: electricity (3), metallurgy (11), machine tools (12), electrical materials (13), transportation materials (14), rubber (18), plastics (23). In the other sectors returns to scale seem less likely. In agriculture particularly returns to scale as such are probably constant. Similarly, textiles are presumably produced with labor-intensive methods with constant returns to scale.

It may be seen in Table X that the final private consumption demand for the sectors listed above declines (except for electricity) after income redistribution. The percentage decline for rubber and transportation materials is particularly large (about 75% in the English distribution case); however, the weight of these sectors in the over-all total of final demand is not large. More important is the sector "electric materials" which does not suffer as large a decline in demand after income redistribution (approximately a 27% decline).

In sum, for the Brazilian case it appears that there would be no gain from increased demand in sectors with returns to scale, after income redistribution; instead, there might be some loss since the sectors most likely to have economies of scale would experience some decline in demand.

For Mexico the analysis may be made in terms of gross output rather than in terms of private consumer demand alone, since in the simulation exercises bove the new vector of gross output after income redistribution was calculated for Mexico. Gross output is more significant for analysis than private consumption demand alone, since it is gross output that is relevant to the sector's productive capacity and therefore relevant to economies of scale in the sector.

In the Mexican input-output sector list, the sectors most likely to have economies of large scale production are the following: petroleum (7), paper (17), rubber (20), chemicals (21), plastics (22), fertilizer (23), pharmaceuticals (25), basic metals (29), metals (30), machinery (31), electrical machinery (32), transport equipment (33), automobiles (34), and electricity (37). Table XII shows that of these sectors, substantial declines in desired gross output would occur in only a few: automobiles (17% decline in one estimate), and transportation materials (13% decline) are the main cases. On the contrary, gross output required would increase in some of the others of these sectors with increasing returns to scale: petroleum, plastics, fertilizers, pharmaceuticals, electrical machinery would experience small percentage increases.

It is informative to compare the implicit structural change of production based on final private demand (from Table XI) against the change based on gross output, just examined. The changes in gross output are smaller in percentage terms than

those for final demand. For instance, in the case of automobiles, Mexican final demand would decrease by 49% (Table XI, experiment 1) but gross production of automobiles would fall by only 17% (Table XII, experiment 1, A). Thus, accounting for intermediate use of the goods may make the decline of demand for certain products less than the fall implied through analysis of final demand alone. Thus, one should place more confidence in the Mexican results than in those for Brazil, concerning demand composition. The Mexican case (using gross output for analysis) suggests that there would be little incidence of loss through decline in demand for sectors with economies of large scale production.

To summarize, while the Brazilian data suggest possible loss after income redistribution due to declining demand for sectors with returns to scale, the Mexican data (with analysis on the more relevant gross-output basis instead of a final demand basis) suggest little such loss. Furthermore, it must be remembered that any excess capacity in large-scale sectors caused by income redistribution could possibly be used for vent-of-surplus exports, and moreover the general level of the economy would presumably grow to the point where the capacity would once again be fully utilized at the large scale.

### 5.3.2 Factor Opportunity Cost

Only one major aspect emerges, concerning the effect of change in demand composition on factor costs. The main sectors to benefit from demand change after income redistribution would be agriculture, food products generally, and to some extent textiles. This fact is apparent in Tables X, XI, and XII, for Mexico and Brazil. Yet these two general sectors tend to be labor intensive. The land input is available at little cost (presumably less cost in Brazil than in Mexico). In contrast, some of the sectors for which demand would decrease are presumably capital intensive: automobiles, transport material, rubber, electrical materials. An exception is construction (for which demand would decrease, in the Brazilian case): the sector is labor intensive. On balance, the very large weight of agriculture and foodstuffs in the increased demand suggests that income redistribution would raise over-all economic efficiency by shifting demand to a sector with low factor opportunity cost (land and labor) and away from sectors with high factor opportunity cost (capital). However, as in the case of the economies of scale analysis, it is beyond the scope of this study to present a rigorous analysis of the question. Such an analysis would require data on factor coefficients by sector and economy-wide shadow prices for factors.

## 6. Methods of Income Redistribution

To this point the present study has suggested that income redistribution would have little influence on imports but some negative effect, perhaps not excessive, on savings and growth. The general implication of these findings is that any policy

which tends to equalize income distribution will tend to have these hypothesized and estimated effects. However, the exact effects of an income redistribution depend on the particular policy used to bring about redistribution. Certain redistributive policies would seem more efficient than others in terms of effect on production. The policies that are most usually considered for income redistribution include: a) increased progressiveness of income tax and decreased weight of indirect taxes on basic consumer goods; b) increased employment opportunities; c) expenditures on specific items of welfare such as education and health; d) a negative income tax; e) high legal minimum wages. Of these policies, the most efficient and effective appears to be expansion of employment opportunities; in contrast, high minimum wages are likely to be detrimental to production and even to income equalization.

The possibility of increased progressiveness of personal income tax is relatively low in the countries in question. The rates already in the law are quite progressive, and tax evasion is the problem. Increased enforcement of collection (through, for example, more serious punishment of evasion) would help equalize the distribution of disposable income. A shift in indirect taxes away from basic goods toward luxury goods would further help income equalization. (The relatively high incidence of indirect taxes on low income groups is shown for the Colombian case in section 3.4.2 above.)

While improved collection of income taxes and revised indirect taxes would presumably improve equity, it seems that a more basic policy for income equalization is an employment policy aimed at maximizing the expansion of employment in "modern sector" jobs. Thus, policies which stimulate investment in sectors and in techniques (within sectors) which are labor intensive will increase the transfer of workers from activities with low marginal productivity of labor and low "institutional wage" to activities with a higher wage and labor productivity. This type of strategy has the advantage of being efficient in terms of international comparative advantage; the abundant factor of the countries in question is unskilled labor.

A specific policy which might be considered to increase the opening of employment opportunities would be a tax rebate for employment. A corporation would receive a tax rebate of a fixed amount per employee. The general level of corporate profits taxes could be raised to recapture the revenue thus lost, since a transfer from the government to the private sector is of questionable value from a growth viewpoint (assuming the marginal propensity to invest is higher for the government than for the private sector, since it is government consumption that tends to be fixed -- salaries of functionaries, e.g. -- and government investment that tends to be variable.) The corporate tax would then become a burden primarily on those firms which chose capital intensive techniques rather than labor intensive techniques. Furthermore, the exact amount of the tax rebate could be set equal to the difference between the "modern sector

wage" and an estimated shadow price for unskilled labor in the economy at large. Thus the effective price of labor to firms would come to equal labor's shadow price, and firms would have the proper incentive for technique choice.

Income redistribution through government expenditure on welfare items such as education and health may have serious limitations. If analysis shows that the return to investment in education is high in a productive sense, then there is a happy coincidence between efficiency and equity concerning education policy (so long as the high return is not limited to advanced degrees to be earned primarily by the upper and upper-middle classes). However, if education and health are expanded on grounds that they are consumer items for low-income families, then the simple question arises, why not make $100 available to the family for spending as it wishes, rather than earmarking the $100 for expenditure only on education or health?

The negative income tax is an unrealistic method for redistributing income. The requirements for checking the validity of reported income would exceed reasonable possibilities.

High minimum wages and artificially low rates for urban services are examples of inefficient means of redistributing income. In the case of minimum wages, an increase in the wage will only increase the income of laborers as a group if the price elasticity of demand for labor by firms is less than unity. While this condition may exist in a few sectors, it certainly should not exist in the economy at large. Wage increases even in sectors with inelastic labor demand will be detrimental to workers at large, to the extent that the raises spill over into other sectors where the demand for labor is elastic. High minimum wages will merely cause still further distortion in the incentives affecting choice of technique between capital and labor, and will further limit future expansion of employment opportunities.

Low prices for urban services and for foodstuffs similarly distort economic incentives and are ultimately self-defeating since they discourage investment for future supply expansion.

To summarize, it is the author's view that tax incentives and direct government activity which tend to expand employment opportunities in the modern sector constitute the best policies for income equalization. Revisions in income and excise taxes may be helpful but involve the traditional problems of collection (for income taxes) and perhaps the problem of transferring income from the government to the private sector (to the extent that reduced excise taxes on the poor cannot be offset by increased excise and income taxes on the rich.) Finally, land reform is a policy which is both efficient and income-redistributive, since appropriate reform should be capable of increasing agricultural production.[1]

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1. See William R. Cline, Economic Consequences of a Land Reform in Brazil (Amsterdam: North-Holland Publishing Company) forthcoming.

## 7. Conclusion

### 7.1 Theory

The major theoretical conclusions of this study are that income redistribution may have a negative effect on savings and therefore growth; redistribution may have growth effects through changes in demand composition affecting the levels of imports, the exploitation of economies of scale, and the incidence of demand for scarce productive factors; but that alleged increases in "market size" from income redistribution are dubious since redistribution would change composition but probably not the level of total demand in the economy. Concerning the savings effect, it is important that several consumption function theories (those of Friedman, Modigliani-Brumgerg, and a linear Keynesian hypothesis) would predict no change whatsoever in savings after income redistribution. Only a specific form (curvilinear) of a Keynesian consumption function (or a similar "relative income" hypothesis) yields a decline in savings after income redistribution.

### 7.2 Empirical Findings

On the basis of the best available estimates among several alternative data sources for each country, it was found that equality of income is greatest in Argentina, Chile, and Venezuela, and distribution is much more unequal in Mexico, Brazil, and Colombia.

Using the estimated income distributions and consumption function estimates from family budget studies, simulation exercises suggested that for Argentina, Brazil, Mexico, and Venezuela income redistributions toward equality of the level found in Britain would cost on the order of 1% annual growth in GNP (with the sacrifice of growth slightly less in Argentina and Venezuela). Since these calculations assumed the curvilinear Keynesian consumption function, they represent a maximum statement of the growth loss: alternative theories would suggest no change in savings despite income redistribution. Even assuming the calculations to be realistic, one might conclude that the sacrifice of 1% in growth rates would be worth the improved equity, especially in countries where unequal distribution is the basic source of political instability. Furthermore, if a welfare function were actually applied, the gains from increased equity could outweigh the loss from a decreased stream of production. Nevertheless, the trade-off does appear to exist between production and equity, under the assumptions yielding a negative savings effect of income redistribution.

Contrary to what one might expect *a priori*, the import effect of income redistribution appears to be negligible. Calculations for Brazil and Mexico show that demand composition changes after redistribution would cause very slight declines in the import bill, including both direct import effects and indirect effects calculated through use of the input-output table.

Similarly, demand composition changes appear to have little effect on opportunities for exploitation of economies of scale, on a basis of cursory examination of the changed vectors of gross output for Mexico (or of final consumer demand for Brazil.) However, the large shift of demand toward foodstuffs after income redistribution suggests that gains in economic efficiency could be obtained due to the low opportunity cost of factors essential in agriculture-- land and labor.

## 7.3 Policy Implications

The major policy implication of this study is that even under conservative assumptions income redistribution would not do irreparable damage to economic growth and the growth costs could be very reasonable in comparison with the resulting equity gains. However, the opposite view that redistribution would be a great stimulus to growth seems to have little theoretical or empirical basis. The arguments concerning "market size" or "import effects" appear incorrect (for the former) or of little empirical significance (for the latter). The main possible growth stimulus from redistribution appears to be the possible utilization of low-cost factors for agricultural production to meet new demand for foodstuffs.

The policy measures by which income redistribution may be achieved are varied, but the most promising seems to be any set of policies (e.g. taxation or government investment) stimulating production in labor-using sectors and techniques within sectors. The resulting increase in employment opportunities appears to be economically efficient and would channel a larger share of national income to the working class, while alternative measures -- especially high minimum wages or artificially low prices for urban services -- are less efficient or self-defeating.

In sum, it is the hope of the author that this study contributes to an increased clarity of the equity versus growth issue in the economic development literature, both in theoretical terms and in terms of empirical magnitudes affecting policy decisions.