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Paper No. 79

Income Distribution and the Composition of Final Demand:

Some New Findings for Colombia

by

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Fall, 1977

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Errata Sheet

Page 12: before top line, add "the small firm component of each activity, other versions of the model..."
(sentence is completed in first line on p. 12)

Page 14: line 5 from the top:

The 11th word should read "value."

Some Fresh Perspectives on Aggregation Bias, Income Distribution and the Composition of Final Demand in Colombia

by

Wayne R. Thirsk

Abstract

Recent empirical studies have discredited the hypothesis that there exists a strong, or even reliable, relationship between expenditures by income class and the distribution of income. A weakness in all of these studies is that the composition of firm size in each industry is not permitted to vary in response to a redistribution of income. This paper examines the importance of such an aggregation bias. Within the framework of a partially closed input-output model for Colombia, the following question is posed. To what extent will a fiscal redistribution favoring the poor be reinforced if the poor (rich) purchase their goods and services exclusively from small (large) firms in every industry? Reinforcement in these circumstances is found to be substantial: a dollar of income transferred to the poor will ultimately raise their incomes by as much as two, or perhaps even three, dollars. There may thus be a high payoff to designing future expenditure surveys that are linked directly to the firm size characteristics of the supplier.

Income Distribution and the Composition of Final Demand: Some New Findings for Colombia

1. Introduction

Recent efforts to measure the impact of income redistribution on total employment and the structure of factor earnings have reached the verdict that the effect of such policies is extremely modest. In his useful survey of the empirical literature on this topic Cline stressed the limited impact that has been discovered in a number of countries including Mexico, Brazil, Venezuela and Colombia.[1] This accumulation of evidence has acted to undermine the confidence many people had in this policy as a possible solution to the income distribution problem in LDCs. Adelman and Robinson, for example, argue in their recent book on the subject that only more radical measures involving a redistribution of assets will achieve a significant change in relative income levels.[2]

A variety of factors explain why the expenditure effects of a redistribution of income do not strengthen the results of the initial redistribution and contribute to a further change in relative incomes in the same direction. In the first place the variation in consumption patterns by income class is not as great as many had supposed.[3] Secondly, the range of factor proportions across industries is not as wide as had been expected, particularly when indirect

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[1] W. R. Cline, "Distribution and Development : A Survey of the Literature," Journal of Development Economics (February, 1975).

[2] I. Adelman and S. Robinson, Income Distribution Policy in Developing Countries: A Case Study of Korea (Stanford University Press, 1976).

[3] See, for example, V. Tokman, "Income Distribution, Technology and Employment in the Venezuelan Industrial Sector," in Income Distribution in Latin America, ed. by A. Foxley (Cambridge: Cambridge University Press, 1975); "Income Distribution, Technology, and Employment in Developing Countries: An Application to Ecuador," Journal of Development Studies, Vol. 2 (1975).

factor requirements are considered. The "universal" intermediate goods sector appears to impart considerable uniformity to the interindustry profile of total factor demands. Where there exists some significant difference in consumption behavior by income class its effect tends to be diluted by offsetting variations in the factor intensity of production. Thus, for example, the poor devote a larger fraction of their expenditures on the output of the relatively labor intensive agricultural sector than the rich. Conversely, however, the rich spend more of their income on direct purchases of labor services than the poor.

A number of studies have attempted to quantify the net effect of these opposing influences on the level of total employment and the level of income earned by the poor. In the case of Colombia Ballentine and Soligo found that the reduction in the demand for labor services by the rich was dominant: taxing the rich and transferring the proceeds to the poor shifted the pre-tax distribution of earnings in favor of the rich.[1] Roughly comparable results have been obtained by Tokman who reports that "in Ecuador, as well as in Venezuela,...the reduction in service employment more than offsets the expansion registered in the agricultural sector."[2] In a quite different context Golloday and Haveman have attempted to trace through the expenditure repercussions that would occur if the United States were to adopt a negative income tax. Their conclusions confirm those that have been alleged for LDCs

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[1] J. G. Ballentine and R. Soligo, "Consumption and Earnings Patterns and Income Redistribution," forthcoming in Economic Development and Cultural Change, 1977.

[2] V. Tokman, "Distribution of Income, Technology, and Employment: An Analysis of the Industrial Sectors of Ecuador, Peru, and Venezuela," World Development, Vol. 2, no. 10-12 (October-December, 1974), p. 56.

in that "these induced effects...tend to undo in part the initial redistribution...Low income families tend to spend their income increments on goods and services produced by relatively high earnings groups while higher income families tend to concentrate their spending reductions on sectors employing workers with relatively low earnings."[1]

While all of these studies attest to the vigor of the "trickle-down" from rich to poor and lend comfort to the notion that the welfare of the poor depends on the rich remaining rich, many of them can be faulted for some obvious shortcomings. Two of the more important ones are neglect of the substantial inequality in labor earnings and the possibility of significant aggregation bias. The first deficiency arises from the emphasis that is frequently placed on changes in total employment as an indicator of changes in labor's incomes and, therefore, shifts in the distribution of total incomes. In view of the large variance in labor income, however, it is possible for significant alterations in the dispersion of income to occur even though total employment is unchanged.[2] Berry and Urrutia show that in Colombia the distribution of labor income is much more unequal than that in England.[3] In

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[1] F. Golladay and R. Haveman, "Regional and Distributional Effects of a Negative Income Tax," American Economic Review (September, 1976), 629-641.

[2] Even in the United States it has been estimated that about 40 percent of all income inequality originates in the disparity of labor incomes. See A. Blinder, Toward an Economic Theory of Income Distribution (MIT Press, 1974), p. 139.

[3] A. Berry and M. Urrutia, Income Distribution in Colombia (Yale University Press, 1976).

Colombia the top ten percent of wage and salary recipients garners almost 35 percent of total labor income, whereas in England the uppermost decile receives only about 20 percent of all wage and salary earnings. Although this comparison underlines the need to disaggregate labor payments, it is the second deficiency which is of primary concern in what follows.

The next section of this paper discusses the nature of the aggregation bias contained in previous work while a subsequent section outlines a simulation model for Colombia designed to uncover its importance. This is followed by a brief treatment of the characteristics and limitations of the data and a presentation of the results and major findings of this study. An appendix offers a detailed description of the main data sources and a summary of some of the peculiarities that characterize the structure of the Colombian input-output table.

2. The Basis for the Aggregation Bias

The source of the aggregation problem rests in the independent procedures used to collect information on the composition of consumption and production. Expenditure surveys of households classify items according to the type of commodity consumed. Censuses of production, on the other hand, decompose economic activity according to industry. No direct attempts are made to follow the expenditure on a commodity back to its industrial origin. Instead, economists and others normally face the task of allocating commodities to industry activity with the guidance of S.I.C. manuals and conventional rules of thumb. In some cases a large amount of guesswork is unavoidable, but the possible error that is involved in assigning commodities to industries is apt to be minor.

More worrisome, however, is the possibility that the use of averages or totals to describe the production characteristics of a given industry may mask substantial heterogeneity in the composition of that industry. This loss of information could prove fatal to any effort seeking to measure the factor intensity of consumption by income class. An example will help to illustrate this concern. Expenditures on shirts are usually assigned to the clothing industry, but no distinction is drawn between cheap shirts and expensive ones. If the latter type is produced with a different technology than the former kind, a potentially measurable relationship between income class and the factor intensity of demand may exist. It would not, however, be revealed by data which described only the aggregate dimensions of each industry and thus lumped together firms which utilized disparate technologies and paid entirely different wage levels.

These reservations carry special weight in Colombia where a number of recent studies have focused on the dual nature of its industrial structure. Nelson, et al., analyzed Colombian manufacturing development in terms of a "two-technology" diffusion process.[1] They noted that there are much greater differences in output per worker between large and small firms within an industry in Colombia than in the United States, that large firms tend to use a different, more capital intensive technology than small firms and that wage rates paid by large firms in an industry were typically three times or more larger than those in small ones.

Berry has also shed some light on the historical importance and evolution of the small firm manufacturing activity in Colombia.[2] He

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[1] R. Nelson, T. P. Schultz, R. Slighton, Structural Change in a Developing Economy (Princeton University Press, 1971).

[2] R. Albert Berry, "The Relevance and Prospects of Small Scale Industry in Colombia," Yale University Economic Growth Center Discussion Paper No. 142, 1972).

distinguishes between cottage shops which employ fewer than five workers and small scale factory firms with a work force of less than twenty-five. During the decade of the 1960s cottage-shop workers, not all of whom were employed full time, constituted about 60 percent of the entire manufacturing labor force, a percentage which displayed some slight tendency to rise over the course of the decade.[1] Workers in small scale factories, on the other hand, comprised about 27-29 percent of all factory workers, a proportion which has remained fairly stable over time.

In 1964 it appears that the bulk (over 75 percent) of cottage-shop employees were active in the textiles, clothing and footwear, wooden furniture, transportation and food and beverages industries. In most of these sectors cottage-shop employment grew as fast or faster than factory employment over the period 1951-1964. Only in the clothing and footwear industry did cottage-shop employment lose ground. Berry suggests that in this and other sectors there is direct and vigorous competition between large and small scale plants but that only in the case of clothing and footwear is there any discernible tendency for the large competitor to drive out the smaller one.[2] Although their productivity growth is less, smaller firms seem to be "holding their own" in Colombia.

The study by Berry and that by Nelson, et.al., conclusively document the existence of a wide range of factor proportions within broad industry classifications, a range which may even exceed that which exists among different

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[1] Manufacturing surveys and censuses typically exclude this craft component of the manufacturing sector.

[2] It should be noted, nonetheless, that real factory wages rose by 66 percent during the period 1953-64 compared to only 24 percent for cottage-shop workers.

industries. What has not been adequately documented, however, is the presence of a systematic relationship between the income class of the purchaser of industry output and the industry technology used to produce that output. Casual impression supports the view that the poor transact most of their business with small-scale firms in which the majority of the poor are employed. Conversely, large firms that utilize the services of the upper income groups seem to cater primarily to the rich and well-to-do.

There are, of course, exceptions to this pattern and the preceeding statements, rather than being ironclad, are more nearly in the nature of a broad generalization. Tokman, for instance, provides an interesting counter-example.[1] In the Chilean shoe industry large, capital-intensive firms produce a standardized, low-cost item tailored to fit the budgets of the poor. Smaller firms produce a more expensive shoe of higher quality that is bought by those with higher incomes. It is obviously important to know whether or not this behavioral pattern is violated in other industries.

The notion that there is a tight linkage between expenditures at various income levels and factor proportions has a long tradition in Latin America. It is closely associated with the structuralist school of economic development. According to one version of this school's line of thought, new industries that have been established in Latin America, cars in Brazil for example, provide incomes primarily for the rich who in turn use their incomes to purchase the products of the newly established industries. A corollary to this position is that the poor are employed in activities that sell their

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[1] V. Tokman, "Income Distribution, Technology and Employment in Developing Countries: An Application to Ecuador," Journal of Development Studies, Vol. 2 (1975), p. 56.

output mainly to the poor. If development follows this pattern in which the income and expenditure chain feeds on itself once it is put in motion, fiscal transfers may be a powerful instrument for alleviating any drift towards greater income concentration. Taxes imposed on the rich and transferred to the poor would augment the income of the poor by an amount larger than the sum that would be transferred.

In the rest of this paper a model of Colombia is developed and applied to test the efficacy of this fiscal policy option. It is assumed as a maintained hypothesis that the rich (poor) buy exclusively from large (small) firms in each industry. This has the effect of making the expenditures of low (high) income groups pro-poor (pro-rich) and, so, as its starting point, this exercise assumes what others have tried to demonstrate. At the same time, however, it may also reveal some aspects of behavior which other studies have so far concealed.

3. The Simulation Model

The model used to test for the importance of demand shifts within different activities is an extension of the earlier methodology developed by Ballentine and Soligo. In common with other models of this type, the setting is distinctly non-neoclassical. The model is demand driven by an exogenous shift in income distribution and operates without supply constaints given the initial amounts of excess labor and capital that are assumed. Relative prices of all inputs and outputs are assumed to be fixed so that only income effects account for any redistribution of income. The particular static model used here is also partially closed as household expenditure levels are endogenously determined. Not all markets, moreover, are maintained in an equilibrium state. Neither the government budget nor the

foreign trade account will be balanced when a new equilibrium is achieved in the model but without the ability to specify how government policy would react to these imbalances, it is not possible to treat them in any satisfactory manner. That is, probably not all of the adjustments which occur in response to an exogenous fiscal policy change are captured in the workings of the model.

With these caveats out of the way, we proceed to a description of the model. The approach consists of partitioning each activity in the input-output table used by Ballentine and Soligo into small and large firm components and then imposing the assumption that, for a given activity, poor (rich) income groups buy exclusively from small (large) firms. In order to see this more clearly, the following matrix notation is introduced here:

A is an m by m Leontieff matrix of input coefficients in an economy with m activities.

$\bar{V}$ is an k by m distribution matrix showing how much each of the k households earns as a fraction of the value of gross output in the m activities.

H is an k by k consumption matrix showing the fraction of each household's income that is spent on the services supplied by other households.

C is an m by k matrix of consumption coefficients (average consumption propensities) indicating the allocation of household expenditures from a dollar of household income.

E_x is an m by one column vector of exogenous demand for the output of the m activities.

E_y is an k by one column vector of exogenous household incomes originating from the exogenous final demands.

X is an m by one vector of gross output values for the m activities.

Y is an k by one vector of household income levels (it indicates the distribution of household income).

Suppose that there are only three income groups (k=3) called poor, middle, and rich which are denoted by the subscripts p, m, and r respectively. Further, let the subscripts "L" and "S" represent large and small firms respectively. Then, for example, V_{Sr} is a row vector with an element which measures the value-added earned by the rich income group from the m activities per dollar of gross output. H_{mr}, on the other hand, is the spending out of a dollar of income by the middle income group on the services provided by rich households while C_p is an m by one column vector representing the average consumption propensities of the poor.

A system of commodity balance equations can then be written along with a set of disposable income equations:

(1a) $AX_S + C_pY_p + C_mY_m + E_{SX} = X_S$

(1b) $AX_L + C_rY_r + E_{LX} = X_L$

(2a) $V_{Sr}X_S + V_{Lr}X_L + H_{pr}Y_p + H_{mr}Y_m + H_{rr}Y_r + E_{Yr} = Y_r$

(2b) $V_{Sm}X_S + V_{Lm}X_L + H_{pm}Y_p + H_{mm}Y_m + H_{rm}Y_r + E_{Ym} = Y_m$

(2c) $V_{Sp}X_S + V_{Lp}X_L + H_{pp}Y_p + H_{mp}Y_m + H_{rp}Y_r + E_{Yp} = Y_p$

Equation (1a) states that the sum of intermediate demands for small firm output and the final demands of poor and middle income households plus exogenous demand should equal the value of small firm output supplied in each of the m activities. A comparable statement for large firms is contained in the next equation, except that final demands belong only to rich households in this case. The next set of three equations indicates that all three income groups receive income from the production of output by small and large

firms, from the sale of household labor services to other households and from the influence of exogenous demand.

If this system of equations is written as a reduced form it can be solved simultaneously for the levels of gross output and household incomes as a function of the value of the exogenous variables. Thus the solution appears as:

$$(3) \quad \begin{bmatrix} X_S \\ X_L \\ Y_p \\ Y_m \\ Y_r \end{bmatrix} = \left[I - \begin{bmatrix} A & 0 & C_p & C_m & 0 \\ 0 & A & 0 & 0 & C_r \\ V_{Sp} & V_{Lp} & H_{pp} & H_{mp} & H_r \\ V_{Sm} & V_{Lm} & H_{pm} & H_{mm} & H_{rm} \\ V_{Sr} & V_{Lr} & H_{pr} & H_{mr} & H_{rr} \end{bmatrix} \right]^{-1} \cdot \begin{bmatrix} E_X \\ E_{LX} \\ E_{Yp} \\ E_{Ym} \\ E_{Yr} \end{bmatrix}$$

The dimensions of the large matrix to be inverted are 2m plus three by 2m plus three. Its first m columns, after the identity matrix I, portray the production technologies of small firms in each activity while the next m columns perform the same role for large firm technologies. Their combined sum of 2m columns describes how income is earned in the economy--the sources of income in the model. The final three columns in this matrix describe how the different income groups allocate their incomes to expenditures on the various goods and services--the uses of income side of the model. Since the expenditures here refer only to those for domestic output, the sum of the expenditure coefficients for any given household group differs from unity by the fraction of income devoted to savings and expenditures on imports.

Several features of the model deserve some further comment. Although the previous formulation assumes that the middle income group purchases from

make the polar assumption that this group buys only from the large firm subsector. In that particular case the penultimate column is transformed such that the C_m vector exchanges places with the zero vector. Another variant of the model merges the middle and lower income groups and considers only the top income classes, the rich and the poor. Thus some experiments operate with two income groups and others with three. This level of aggregation is dictated by the degree of detail found in the input-output table. Although Ballentine and Soligo worked with twenty-six income groups, the extent of their disaggregation is somewhat misleading as they treated each sector's capital, wage and salary payments in a manner equivalent to the classification discussed above. That is, capital income, for example, was received either by poor, middle, or rich income recipients. Since in the input-output table the average consumption propensities are the same for any income level regardless of source, no information is really lost in aggregating from twenty-six to three income groups. Moreover, we are presumably interested in the poor no matter how they earn, or in what form they receive, their income.

It is also desirable to make explicit some assumptions that are hidden in the structure of the model. According to equation (3) both small and large firms have an identical set of interindustry coefficients (the A matrix is the same for both kinds of firm). This is undoubtedly a distortion of the true picture, but there is simply no data which would permit an alternative assumption to be made. As a tentative proposition, it could be plausibly argued that, for most items, the rich have a greater demand for transformation and that large firms consequently exhibit more and stronger backward linkages than smaller firms do. Another way of asserting this proposition is to hypothesize that the rich consume an item of higher quality (and pay a higher price)

than the poor given the typically broad definition of any commodity enumerated in the expenditure survey. There is little doubt that the rich, for example, purchase more processed foods than the poor and may even pay greater margins for marketing, e.g., home delivery, than the latter group does.

Imports to satisfy final demand of households are viewed as imperfect substitutes for domestic output (although the degree of substitutability varies by income class). Increments to final demand are therefore never reflected by an adjustment in only the demand for imports, but rather fall on a mixture of domestic and foreign goods instead. An additional, and important, assumption is that the output of large and small firms are substitutes rather than complements in consumer demand. For most, but not all, activities this would appear to be a reasonable assumption. In the transportation sector, however, small firms are concentrated in repair shops that are complementary to the new vehicle output produced by large firms. On the other hand, repairs may extend the lifetime of a vehicle and pose an alternative to the purchase of a new one. If the "poor" repair their vehicles and the rich replace theirs, the basic assumption of the model still holds.

Given the values of the exogenous variables, equation (3) depicts an initial equilibrium for the economy.[1] This equilibrium is disturbed by introducing a fiscal experiment the effect of which is to impose a tax on the incomes of the rich of ten percent and to transfer the proceeds either to the poor or to the middle income group. A chain of income and expenditure adjustments is sparked by this disturbance that may either reinforce or offset the initial redistributive impact of the fiscal change. The major purpose of the model is to

[1]Exogenous demands emanate from government, the foreign trade sector, inventories, capital accumulation and what is apparently a balancing item, "inputs not elsewhere specified."

determine the direction and strength of these second-round effects.

Unlike other studies which simply assume that a redistribution of income is feasible, this model has an explicit mechanism for achieving a new distribution of income. It is accomplished by multiplying each value-added received by the rich by ten percent and adding the v ue of this product to the value-added received by either the poor or middle income group in every activity. Total value-added per unit of gross output remains the same under this procedure.

It might be objected that this method of achieving an initial redistribution of income is also not feasible since neither income taxes nor transfers in Colombia cover the agricultural or service sectors. This is a correct description of the tax system, but it is also irrelevant. Restricting the scope of the tax-transfer system makes no difference at all to the degree of redistribution that results. Although the scale of the redistribution is affected, the change in relative income positions is not. For example, in the case where only two income groups, rich and poor, are considered the income change experienced by both the poor and the rich differs by a factor of 1.6 between the situation where agriculture and services are included in the fiscal scheme and that where they are excluded. The explanation for this outcome is straightforward. As long as the excluded groups have the same consumption behavior as those that are included, restricting the scope of the fiscal change can only affect the scale on which the simulation outcomes occur--all relative magnitudes will be preserved.

Another question might arise concerning the constancy of the average propensities to consume. Unless all income elasticities of demand are unitary, the average propensities should be responsive to income levels and thus the extent of the initial redistribution that is envisaged. While

there is no disputing this point, it is argued here that its practical significance is slight. If C/Y is the initial average propensity for some item, then the appropriate propensity subsequent to the fiscal redistribution is $C/Y + \Delta(C/Y)$. However, $\Delta(C/Y)$ can be easily transformed to give the expression $\Delta(C/Y) = C/Y(\Delta Y/Y)(h_y-1)$ where h_y is the income elasticity of demand for the item in question. The implications are clear enough: the smaller is the initial redistribution ($\Delta Y/Y$), the less the value of the income elasticity departs from unity and the smaller the initial propensity (C/Y), the more one can ignore the adjustment in the value propensity in good conscience. For example, if $C/Y = .2$, $h_y = 2$, and $\Delta Y/Y = .01$, the change in the average propensity is only of the magnitude of .002.

Following Ballentine and Soligo it is possible to disentangle the solution of the model into a change in the distribution of income which results from the operation of the fiscal device and that which results from a change in pre-tax and transfer market earnings. The size of the latter constitutes the "second-round" impact of the fiscal change which is of primary interest. If primed matrices represent the after-tax and transfer situation, it is possible to write the alteration in the distribution of disposable income as:

$$(4)\quad Y'-Y = (V'_S-V_S)X'_S + (V'_L-V_L)X'_L + (H'-H)Y' + (E'_{SY}-E_{SY}) + (E'_{LY}-E_{LY}) + V_S(X'_S - X_S) + V_L(X'_L - X_L) + H(Y' - Y).$$

The first five additive terms represent the impact of the fiscal mechanism in redistributing income while the last three terms measure the change in factor earnings that is induced by the tax and transfer process. These final three terms are the algebraic manifestation of what has been referred to as the "second-round" impact.

4. The Data

Many of the shortcomings of the data have been mentioned before by Ballentine and Soligo. The poor, it will be recalled, comprise about 72 percent of the economically active population and earned less than 12,000 pesos in 1968. The middle income group earned between 12,000 and 36,000 pesos annually and constituted about 22 percent of the population. The six percent of the population classified as rich each received more than 36,000 pesos in 1968. One of the concerns of Ballentine and Soligo was that the distribution of income implicit in the input-output table appeared to be more egalitarian than the numbers above suggest is true. To counter this potential source of bias the distribution of value-added has been adjusted in a number of activities, particularly agriculture, so that the totals more nearly conform to the figures given above.[1]

A significant omission from the table is the consumption of housing services which are normally considered to be of a capital intensive nature. Services of the intermediate or investment activity, construction, are included instead. This neglect would be unimportant if the income elasticity of demand for housing services were unity and if the technology used to furnish these services was invariant to the income class of the consumer. Not much is known about the latter issue, but there is some recent evidence which suggests that the unitary income elasticity may be close to the

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[1]This adjustment has the cost of unbalancing the transactions matrix and forcing reliance instead on the coefficients matrix in order to obtain the A matrix.

truth.[1] Thus, the omission of housing services may not be terribly damaging to the results.

A troublesome feature of the table is its confusing method of aggregation and the inadequate documentation which accompanies the table. Two-digit industries are combined in a bewildering manner which makes it almost impossible to check the accuracy of the data in the table against other sources of information. Nowhere is this classification difficulty more prevalent than in the household services sector. The rich are reported to spend 20-25 percent of their income on the services supplied by poor households but because the nature of these services is never identified this important aspect of expenditure behavior cannot be verified from the expenditure surveys. In the CEDE survey of household expenditures, for example, the richest income group spends only 4.4 percent of its income on household services, mainly servants. What could account for the remaining services is left to one's imagination. Similarly, expenditures by the poor on household services furnished by rich households are a mystery unless they comprise the services of doctors, lawyers, and the like.

On the whole, however, the average consumption propensities seem very reasonable and wholly consistent with other studies. The poor spend about 65 percent of their income on food and beverages compared to around 24 percent by the rich. The marginal propensity to import rises monotonically with the level of income, from about .015 for the poor to around .10 for the rich. The marginal propensity to spend on the labor services of the poor

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[1] "Urban Household Income and Consumption Patterns in Latin America: A Comparative Analysis of Colombia, Paraguay, Peru and Venezuela," ECIEL, The Brookings Institution, Washington, 1974.

(rich) rise (fall) with the level of income. However, for some items such as textiles the average propensity first rises and then falls in a curious fashion. Only two instances were detected where this pattern occurred, however.

In the appendix to this paper there is a detailed discussion of the data sources and techniques which were used to partition value-added into large and small firm components. All forty-five activities in the table were disaggregated in this manner with the exception of number 44 which consists primarily of different type of public utility service. The distinction between large and small firms is unlikely to be valid for this particular sector. While the functional income distribution between labor and capital did not ordinarily vary a great deal across firm sizes, the variation in the size distribution of income was much more substantial. A certain amount of guesswork was involved in estimating the size distribution because the existing sources of information report only on the average wage paid by firms or plants of different size. They are silent about the dispersion of wages around this average in most cases.

5. The Results

Eight different kinds of experiments were attempted as shown in Table 1. All of them ask the same basic question: if the poor buy products produced predominantly by the poor, to what extent will a fiscal redistribution favoring the poor be reinforced by subsequent market adjustments? There are, however, some minor variations on this theme. The last experiment should be considered as one that provides a benchmark measurement since it essentially replicates the situation that Ballentine and Soligo were concerned with. In it there are three income strata and each of these spends

TABLE 1: Simulation Assumptions

Experiment	Number of income groups	Expenditure Behavior	Tax-Transfer range
Ia,b,c	two	0-50% of exogenous demand met by small firms	transfers to the poor
IIa,b,c	three	middle income group purchases from small firms; 0-50% of exogenous demand met by small firms	transfers to the poor
IIIa,b,c	three	middle income group purchases from large firms; 0-50% of exogenous demand met by small firms	transfers to the poor
IVa,b,c	three	middle income group purchases from small firms; 0-50% of exogenous demand met by small firms	transfers to the middle income group
Va,b,c	three	middle income group purchases from large firms; 0-50% of exogenous demand met by small firms	transfers to the middle income group
VI	three	all demands met by small firms technology	transfers to the poor
VII	three	all demands met by large firm technology	transfers to the poor
VIII	three	all income groups spend on the existing mix of large and small firm technology in each industry	transfers to the poor

its income on the existing mix of large and small firms found in each industry. In terms of equation (3), the value-added coefficients of large and small firms are summed and the result is inserted into both technology columns of the equation. It is necessary to provide this benchmark since the difference between other experiments and the Ballentine-Soligo results reflects both the altered initial distribution of income and the new assumption about expenditure behavior. A comparison with the original Ballentine-Soligo results would, by failing to hold the initial income distribution constant, make the interpretation of any differences extremely hazardous.

The first experiment assumes that there are only two income groups, rich and poor, that the former group is taxed in order to provide transfers to the latter, and that the poor buy all of their consumption items from small firms. The subscripts a, b, and c attached to this and the next four experiments refer to the alternative assumptions about the amount of exogenous demand that is satisfied by small firms. It is assumed, respectively, that zero, twenty-five, and fifty percent of the exogenous demand vector is met by small firms. In the next experiment the previously poor income stratum is subdivided to form a middle income class and a new, smaller, group of poor. This new middle income group is assumed to purchase from only small firms while the succeeding experiment reverses this assumption and substitutes large for small firms. Transfers are made to the poor income class in this and in all of the preceding experiments. The next two experiments differ from the earlier ones in that transfers are made to the middle income group instead of the poor.[1] In experiment four (five) the middle income group is assumed to

[1]This experiment is perhaps closer to what really happens in LDCs than the others. For some evidence that redistributive measures do not reach lower income groups, see V. Tanzi, "Redistributing Income Through the Budget in Latin America," Banco Nacional del Lavoro, 1974.

transact its business with only small (large) firms.

The sixth and seventh experiments are of a different nature than the rest. While the earlier experiments dealt with intraindustry variation in technology, these two are concerned only with interindustry differences in the choice of factor inputs. Experiment six asks what would happen if the fiscal redistribution occurred after all firms in an industry had adopted the technology currently being used by only small firms in these activities. Or, what is more probable, what would the result be if small firms disappeared in each industry and production took place only in large firms? This is the issue raised in the seventh experiment. Notice that these two experiments do not ask what would happen to the distribution of income were the economy to move from the present system of a mixture of large and small firms to one where firm size was homogenous. Since this question frequently emerges in any debate over the merits of alternative technology options, it is addressed at the end of this section where the results of some additional simulations are reported.

The results of the various experiments are displayed in Table 2. Before considering these in detail, some comment on the nature of the last column in this table is in order. In almost all of the experiments there is a tendency for total income in the economy to increase due to the shift of income towards those groups with lower marginal propensities to import This higher level of total income disguises the extent of any redistribution of income since all income groups share in the expansion of total income.[1] A group's position in the income scale is indicated by where it stands relative

[1]Since the model is not closed with respect to the external and public sectors, higher total incomes may be a fiction of the model. The redistributive pattern is, however, independent of this fact if macro-policy changes do not affect relative incomes.

TABLE 2: Simulation Results

Experiment	Income	(1) Change in disposable income (pesos)	(2) Percent	(3) Change in factor income	(4) Percent	(5) Percent Change in total income	(6) Extent of percentage redistribution: (2)-(5)	(4)-(5)
Ia	poor	64,456,817	19.4	45,041,068	13.54	11.13	8.27	2.41
	rich	- 7,206,708	- 3.96	12,209,039	6.7		-15.1	-4.43
Ib	poor	64,206,692	18.95	44,866,287	13.25	10.96	7.99	2.29
	rich	- 7,178,742	- 3.96	12,161,662	6.71		-14.9	-4.25
Ic	poor	63.956,567	18.53	44,691,505	12.95	10.8	7.73	2.15
	rich	- 7,150,777	- 3.96	12,114,285	6.71		-14.76	-4.09
IIa	poor	45,013,411	16.92	29,259,000	11	8.68	8.24	2.32
	middle	5,362,163	5.21	5,362,163	5.2		- 3.47	-3.48
	rich	- 5,552,343	- 3.77	10,202,466	6.9		-12.45	-1.78
IIb	poor	44,902,829	16.43	29,186,723	10.68	8.55	7.88	2.13
	middle	5,348,990	5.2	5,348,990	5.2		- 3.35	-3.35
	rich	- 5,538,703	- 3.77	10,177,402	6.92		-12.32	
IIc	poor	44,792,248	15.98	29,114,845	10.4	8.42	7.56	1.98
	middle	5,335,817	5.2	5,335,817	5.2		- 3.22	-3.22
	rich	- 5,525,063	- 3.77	10,152,338	6.92		-12.2	-1.50
IIIa	poor	40,458,646	22.75	25,035,679	13.91	9.4	13.35	4.51
	middle	5,757,298	5.27	5,757,298	5.27		- 4.13	-4.13
	rich	- 5,532,901	- 3.77	10,390,066	6.98		-13.17	-2.42
IIIb	poor	40,858,647	21.82	24,974,555	13.34	9.23	12.6	4.11
	middle	5,743,242	5.26	5,743,242	5.26		- 3.97	-3.97
	rich	- 5,519,392	- 3.72	10,364,649	6.98		-12.95	-2.25
IIIc	poor	40,758.647	20.96	24,913,431	12.81	9.07	11.89	3.74
	middle	5,729,185	5.25	5,729,185	5.25		- 3.82	-3.82
	rich	- 5,505,883	- 3.71	10,339,332	6.98		-12.78	-2.09
IVa	poor	17,203.726	6.46	17,203,726	6.46	4.60	1.86	1.86
	middle	16,675,602	16.21	1,430,485	1.39		11.61	-3.21
	rich	-10,128,550	- 6.87	5,116,566	3.47		-11.47	-1.13

TABLE 2--continued

Experiment	Income	(1) Change in disposable income (pesos)	(2) Percent	(3) Change in factor income	(4) Percent	(5) Percent Change in total income	(6) Extent of percentage redistribution: (2)-(5)	(4)-(5)
IVb	poor	17,161,519	6.28	16,161,520	6.28		1.75	1.75
	middle	16,634,692	16.18	1,426,976	1.39	4.53	11.65	-3.14
	rich	-10,103,702	- 6.87	5,104,013	3.47		-11.4	-1.06
IVc	poor	17,119,313	6.1	17,119,914	6.10		1.64	1.64
	middle	16,593,781	16.16	1,423,466	1.39	4.46	11.7	-3.07
	rich	-10,078,853	- 6.87	5,091,461	3.47		-11.33	- .59
Va	poor	3,291,284	1.83	3,291,284	1.83		- .73	- .73
	middle	17,925,232	16.46	2,501,087	2.29	2.56	13.9	- .27
	rich	-10,003,374	- 6.72	5,420,402	3.64		- 9.28	1.08
Vb	poor	3,283,259	1.75	3,283,259	1.75		- .76	- .76
	middle	17,881,523	16.38	2,494,989	2.28	2.51	13.87	- .23
	rich	- 9,979,350	- 6.72	5,407,185	3.64		- 9.23	1.13
Vc	poor	3,275,234	1.68	3,275,234	1.68		- .79	- .79
	middle	17,837,816	16.35	2,488,891	2.28	2.47	13.88	- .19
	rich	- 9,954,957	- 6.72	5,393,968	3.64		- 9.19	1.17
VI	poor	41,104,975	10.91	25,643,116	6.80		4.24	.13
	middle	5,497,106	5.71	5,497,106	5.71	6.67	- .96	- .96
	rich	- 5,398,977	- 3.73	10,062,880	6.96		-10.69	.29
VII	poor	21,132,604		5,035,004	5.4		16.51	-1.09
	middle	7,416,164	6.38	7,416,164	6.4	6.49	- .11	- .09
	rich	- 5,288,297	- 3.52	10,809,302	7.2		-10.01	.71
VIII	poor	23,877,035	18.37	7,793,378	5.99		11.83	- .55
	middle	7,058,533	6.27	7,058,533	6.28	6.54	- .27	- .26
	rich	- 5,252,087	- 3.50	10,831,569	7.22		-10.72	.68

to other members of the economy. It is presumably worse off if the income gains experienced by others is larger, in percentage value, than any increment it may have received. For this reason from the percentage change in disposable income realized by each group is subtracted the percentage change in overall income in column six.[1]

An appropriate place to begin is with the benchmark case of experiment eight. The fiscal maneuver is successful in raising the incomes of the poor (a rise of slightly over 18 percent) at the expense of the rich (whose incomes fall by 3.5 percent). Nonetheless, as Ballentine and Soligo discovered, the distribution of pre-tax and transfer incomes shifts in favor of the rich. Factor incomes received by the poor increase by almost six percent, but the extent of the income gain realized by the rich is greater, slightly more than seven percent. For the reasons adduced earlier, the second-round effects oppose rather than reinforce the effect of the fiscal change. The size of the offset, however, is sufficiently small that a substantial redistribution of income still occurs. Compared to the average, incomes of the poor rise by 11.8 percent while the rich undergo a relative income decrease of 10.7 percent. The relative position of the middle income group is virtually unchanged.

The picture changes considerably when it is assumed that the poor purchase from small firms in each industry. In the first experiment with just two income groups the second-round effects are strongly reinforcing with the poor experiencing a gain in factor income that is about twice as large as that enjoyed by the rich. In this and all of the other experiments the results are wholly insensitive to whatever is assumed about the firm size origin of exogenous demand.

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[1]An alternative, and useful, comparison is the change in the ratio of factor (pre-tax) income to total income, or the difference between

This conclusion carries over virtually intact to the situation where there are three rather than two income groups. In the second and third experiments the factor incomes of the poor rise by about twice as much as those for the middle group and nearly that much compared to the rich. The middle income group loses ground to both poor and rich, however, so it is impossible to say that there has been an unambiguous improvement in the distribution of income.[1] From the point of view of disposable incomes, both the rich and middle income groups are net losers to the poor. As can be seen from Table 2, it does not seem to matter much whether the middle income group buys from either small or large sized firms in each industry. As would be expected, the poor gain somewhat more in the case where the middle income group directs its expenditures towards small firms.

When, however, the transfers are made to the middle income group rather than the poor it matters a great deal about where the middle group spends its income. If, as in the experiment four, this group buys from small firms, there is a net redistribution of factor income in favor of the poor and at the expense of both the middle income and rich groups. The second-round effects are very helpful to the incomes of the poor but oppose the intent of the fiscal transfer by raising the factor incomes of the rich more than those of the middle group.

This pattern is largely overturned if the middle group directs its purchases instead to large firms. In this scenario, seen in experiment five, the second-round effects are wholly offsetting: the income gains accruing

columns (4) and (5) that is also shown in Table 2.

[1]This is equivalent to the situation which arises when Lorenz curves intersect. A social welaare function is needed to rank different distributions in this case. For a theoretical treatment see A. B. Atkinson, "On the Measurement of Inequality," Journal of Economic Theory, Vol. 2, No. 3, 1970.

to the rich are greater percentage amounts than those received by the middle and poor income groups. However, the size of the second-round effects is relatively modest. As a fraction of average income the incomes of the poor decline by less than one percent. Still, the fact that they declined in this case and rose in the previous experiment underlines the importance of knowing exactly how people spend their incomes.

The next pair of experiments present hypothetical situations which differ markedly from the others. Both experiments examine the consequences of conducting the same tax and transfer policy when the heterogeneity of firm size in each industry is eliminated. Experiment six supposes that all firms in each industry utilize the same technology as that which is currently used by small firms. Conversely, the seventh experiment envisages the complete disappearance of small firm technology as all firms adopt the technology that presently characterizes large firms.

As Table 2 indicates, it does not matter a great deal which initial firm size situation is chosen. In both experiments the second-round effects appear to be more or less neutral across income classes although there is a slight tendency for the rich to share disproportionately in the expansion of national income when all firms are of uniformly large size. These results underline the importance of intraindustry differences in factor usage in explaining how the poor may benefit from a redistribution of income due to favorable second-round effects. If these differences are obliterated, and it does not seem to matter how uniformity is achieved, the favorable second-round effects also vanish. When only interindustry variation in technology is taken into account, it is impossible to uncover a reliable relationship between the income position of spenders on the one hand and that of beneficiaries from this expenditure on the other. In the absence of intraindustry dualism there is no discernible

difference in the income distribution change that is effected by expenditures of any income group.

A natural extension to the set of completed experiments is a consideration of the income cistribution consequences of various choices from the available technological menu. What would be the distributional effect, for instance, of moving from the observed mixed technology in each industry to either homogeneous large firm or small firm technology? The model that was designed to explore the repercussions of a fiscal redistribution can be easily adapted to provide some preliminary answers to the last question.

If, in the initial situation of mixed technology the middle income group is assumed to purchase the products of small firms and small-firm technology subsequently becomes diffused throughout each industry, the structure of earnings will alter in favor of the poor at the expesne of both the rich and middle income groups. Because of the lower propensity to import on the part of the poor, the switchover to this new technological regime raises the level of total income by 16.6 percent. Despite the higher level of total income, the incomes received by the rich and middle income groups decline by 1.4 and 6.3 percent respectively. On the other side of the economic ledger, the favored poor enjoy a gain in income of 34 percent.[1]

In the alternative, and perhaps more likely, scenario where each industry is ultimately comprised of large firms only, the preceding distributional outcome is reversed. In this case the poor income group loses to the middle and rich income groups. Total income falls by 32.4 percent when income is transferred to groups with markedly higher propensities to import. Income

[1]Berry and Urrutia, op. cit., p. 256, hypothesize that slower economic growth induced by balance of payments constraints after 1966 made distribution of income more equal due to the enhanced competitive position of small firms.

received by the poor is diminished by an astonishingly high amount of 67.2 percent. At the same time incomes realized by the middle and rich income groups undergo increments of 13.2 and 2.41 percent respectively.

The immediately preceding results should be regarded as having primarily illustrative value. For one thing, the data on which they rest is extremely crude in places. More importantly, however, it is highly unlikely that major and dramatic shifts in technology across a broad front would or could occur without altering the structure of relative factor prices in a way which would preclude the firm size uniformity envisioned in the experiments. For example, rapid growth of large firms would likely widen the existing pattern of wage differentials and, by raising the relative cost of large firm output, insure the continued survival of small firms. Relative product prices may also change if small and large firms produce outputs which are imperfect substitutes for each other. In short, the income effects that have been measured within the constraining framework of the input-output model illuminate only a portion of the adjustment path which the economy would follow in its reactions to a wide-ranging technology policy.

6. Conclusions

This study has attempted to determine whether the redistribution of income which occurs in response to a fiscally motivated transfer of purchasing power is sensitive to the manner in which various income groups allocate their expenditures within industries. Specifically, it has been shown that, if the poor buy exclusively from relatively labor-intensive and lower paying small firms, a fiscal redistribution will feed on itself and spark an adjustment in which the beneficiaries receive income benefits that are substantially larger than the amounts initially transferred by the

fiscal mechanism. According to our experiments, transferring a dollar of income from the rich to the poor would raise the incomes of the poor by somewhere between $2.50 and $3.34 and by somewhat less if national income were held constant.

The implications of this finding are encouraging for policies seeking to alleviate the inequalities in income distribution in LDCs. Measures to create new income opportunities for the poor, by fiscal or any other means, are likely to have a cumulative impact in improving the status of the poor. Earlier studies may have been entirely too pessimistic on this score because of their failure to examine the linkages considered here.

Of course, this optimistic note rests on an unsupported assumption about expenditure behavior. It is too extreme to suppose that the poor buy none of their goods and services from large firms. But how important are the exceptions to this rule? This is a challenge for future research. The research reported here has some strong implications for the design of future expenditure surveys. Knowing <u>who</u> supplies the goods and services may turn out to be just as important as knowledge of <u>what</u> goods and services are bought by different income groups.

APPENDIX

The purpose of this appendix is to set forth the assumptions and the data that were used to construct the model's technology columns for small and large firms and the consumption columns for different income groups shown in equation (3) of the text.

The primary source of information for this exercise is the 76 sector AID input-output table.[1] Based on data for the year 1968, this table contains 76 sectors comprised of 45 industrial activities and 26 household income groups, each of which belongs to one of the three income groups which are labelled as poor, middle or rich. The poor, earning less than 12,000 pesos annualy, receive 32 percent of all income but make up nearly 72 percent of the economically active population.[2] The middle income group, earning between 12,000 and 36,000 pesos annually, receives one-third of all income and is about 22 percent of the total population. Making more than 36,000 pesos in 1968, the rich comprise six percent of the population, but they enjoy about 35 percent of all income.

The income distribution implicit in the input-output table is more equal than the foregoing figures suggest so an attempt has been made to adjust the numbers in the table in an effort to conform to the income configuration given above. This task is discussed after a brief digression.

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[1] Input-Output Matrices Condensed for Employment and Income Distribution Analysis, 76 Sectors, AID Statistical Working Document No. 3, 1972.

[2] The Income distribution statistics are those reported by DANE, the National Statistics Agency, in Boletin Mensual de Estadistica, no. 237, 1971.

Because of its orientation towards analysis of the agricultural sector the table combines a detailed description of the agricultural sector and related activities with a fairly high level of aggregation for nonagricultural activities. Food processing, S.I.C. no. 20, for example, is broken down into ten different components while the capital goods sectors, S.I.C. nos. 36, 37, 38, and 39 are combined to form a single activity.

Table A-1 presents estimates of the proportion of value-added in each industry that is supplied by small and large firms and its distribution among the three income groups. These numbers are used to calculate the coefficients in the technology columns of equation (3). An example provides the best illustration of the type of conversion involved. From Table A-1, the poor employed in small firm food processing supply .15 of total value-added in that industry while small firms as a group are responsible for .25 of total value added. Thus the appropriate coefficient in the small firm technology column for this activity is the ratio $\frac{.15}{.25}(\frac{V}{X})$ where $(\frac{V}{X})$ is the ratio of value-added to gross output value for the entire industry found in the original table.

The value-added distributions were obtained by applying a consistent set of assumptions to all manufacturing activities and treating agriculture, commerce and construction as special cases. If small farms are defined to be those having less than 5 hectares, medium sized farms as those having 5-40 hectares and large farms as anything larger, Berry's data gives the fraction of total value-added attributable to these size classes as .2, .3, and .5 respectively. Labor's income share, moveover, varies from .67 to .5 and .25 as one moves from the smallest to the largest grouping.[1] Also, according

[1] R. A. Berry, "Land Distribution, Income Distribution and the Productive Efficiency of Colombian Agriculture," Economic Growth Center

to Berry, the fractions of income received by the poor, middle and rich income classes are about .33, .25, and .42 respectively. A set of assumptions that is both plausible and consistent with these numbers is that:

(1) All income earned by small farms accrues to the poor.

(2) Capital income is divided evenly between rich and middle on medium sized farms; two-thirds of labor income generated on these farms goes to the poor, the rest to the middle.

(3) All capital incomes on large farms are received by the rich; twenty percent of labor income goes to the poor, the rest to the middle. Applying these assumptions to the preceding data generates the size distribution which appears in Table A-1. In some future study it may be worthwhile to attempt to obtain similar information on a crop-by-crop basis or at least distinguish between crops and cattle raising.[1]

Merchandising activities included in the input-output table are most closely identified with the functions of the commerce sector although they may also include some portions of the transport sector. Larger establishments are much more common in wholesaling than in retailing. A recent study by Berry furnishes a comprehensive picture of the economic performance of the commerce sector.[2] In 1967 about one-third of the establishments in this sector employed more than five workers but accounted for 2/3-3/4 of all sales. The same size cutoff is used in Table A-1, where it is assumed that

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Discussion Paper No. 108, Yale University, 1971, Tables A-3, A-5, and A-6.

[1]Nonetheless, R. A. Berry, ibid., Table A-3, indicates that a surprisingly large share of all livestock activity is carried on by small and medium sized farms, 15 and 21 percent respectively.

[2]R. A. Berry, "Urban Labor Surplus and the Commerce Sector: Colombia," Economic Growth Center Discussion Paper No. 178, Yale University, 1973.

small firms share of total value-added is one-quarter. Small firms paid an average wage of 7,000-8,000 pesos in 1967 and had a labor share of about .5. Large firms, on the other hand, paid significantly higher wages, in the range of 12,000-24,000 pesos for the year, and exhibited a lower share of labor income, about .4. Average proprietor's income in small firms was of the order of 21,000 pesos compared to over 44,000 in large firms. While this information is useful, it does not provide a complete view of the size distribution of income in this sector. What is desired is data on the intra-firm wage distribution for firms of various size. What is observed instead is interfirm data on total and average wages. Since almost all income distributions are positively skewed, with the median income less than the average, the following assumptions are made with respect to the degree of skewness:

(1) All labor income of small firms is received by the poor; this implicitly assumes workers do not have other sources of income.

(2) One-third of capital income is earned by the rich and two-thirds by the middle income group.

(3) Two-thirds of capital income generated in large firms goes to the rich and the rest to the middle.

(4) Four-fifths of large firm wage income is received by the poor and one-fifth by the middle.

These assumptions are embodied in the estimates of size distribution for merchandising in Table A-1.

Information on the construction sector is also sparse. In 1969 average annual wages for three skill categories were as follows: unspecialized workers ("ayudantes")-$6,520 pesos; specialized workers ("oficiales")-12,546

pesos; white collar workers ("maestros")-25,203 pesos.[1] As fractions of the labor force in construction, these same groups comprised 50, 40, and 10 percent respectively. From the same source it is suggested that small firms employing fewer than ten workers may, if an allowance for sub-contracting is made, constitute about 20 percent of the industry in terms of value produced. The labor share in these firms may be of the order of .8 compared to a value of .67 in larger firms.[2] The following assumptions are made about the shape of the wage and nonwage income distributions:

(1) For small firms, three-quarters of all labor income is received by the poor and the remainder by the middle.

(2) One-half of small firm capital income is received by the rich and the other one-half by the middle.

(3) All large firm capital income goes to the rich; one-half of all labor income is received by the poor, 40 percent by the middle and ten percent by the rich.

All of these suppositions are reflected in the size distribution for the construction sector in Table A-1.

All of the estimates for the various activities included in the manufacturing sector were based on the following allocation rules:

(1) Small firm labor income was divided in the proportions 90 percent to the poor, 10 percent to the middle.

(2) Small firm capital income was allocated in the proportions 30:40:30 among poor, middle and rich income groups.

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[1] S. Daines and J. Ricardo, Construction Sector: Estimates and Statistical Data, General Working Document No. 13, AID, January, 1975.

[2] S. Daines and J. Ricardo, ibid., Tables 21 and 23.

(3) All of large firm capital income was attributed to the rich.

(4) Skilled (white-collar) labor income was assumed to be received by people in the middle group.

(5) One-half of unskilled (blue-collar) wage income was assumed to be earned by people in the poor income group and the rest by people in the middle group.

Shares of labor and capital, the further division of labor income into blue and white collar segments, and the importance of small firms are taken from information assembled by Berry.[1] Small firms are considered to be those employing fewer than 24 workers in each industry. The factor share data is presented in Table A-2. As can be seen from this table, the variance in functional income shares among firms of different size is relatively small. However, given that the small firm sector admits of poor capitalists, that large firms employ higher paid white-collar workers, and that blue collar wages are two or even three times greater than those paid by small firms, these small differences in functional income distribution mask a considerable diversity in the size distribution of income.[2]

How accurate these size distributions are can only be gauged against the much more aggregate income distribution data that are available for 1964 and 1970. For all manufacturing activities a weighted-average (using value-added in the input-output table as the weighting factor) of the underlying size distributions gives the income shares of the rich, middle and poor as .51, .23, and .26

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[1] R. A. Berry, "The Relevance and Prospects of Small Scale Industry in Colombia," Economic Growth Center Discussion Paper no. 142, Yale University, 1972. See Tables 3, 10, A-132 in particular.

[2] In 1968 according to Berry, ibid., p. 28, average annual blue collar income per worker was 6,017 pesos compared to 14,713 pesos for white-collar workers, while the range of the firm size wage differential was 3:1 for blue-collar workers.

respectively. A similar set of shares for household services, taken from the data in Table A-3 , is .36, .27. and .37. If a new weighted average of income shares by size is calculated for the nonagricultural sector (construction, merchandising, manufacturing, utilities, agricultural transport and household services), the result is an income share for the poor of .33, for the middle of .29, and for the rich of .38. If these shares are in turn combined with those of the agricultural sector, the picture is one of an overall distribution that is only slightly more concentrated than that which was described at the beginning of the appendix. The estimates made here suggest a share for the rich of .39 compared to the value of .35 reported by DANE. The share of the poor is the same in either case.

The expenditure data used to fill in the consumption matrices of the model appear in Table A-3. In versions of the model which employ only two income groups, rich and poor, the spending column of the middle income group is ignored while the household services matrix in part B of Table A-3 is collapsed by simply adding the coefficients of the poor and middle income groups together. The average propensities themselves are the values displayed in the coefficients matrix of the AID input-output table. There is no simple and direct method of checking the accuracy of these estimates since other expenditure studies refer to commodity classifications rather than the industry groupings that are used here. However, where it is possible to easily relate commodity to industry, as in the case of agriculture, the consumption pattern that is portrayed seems to correspond closely to the results of other expenditure analysis for Colombia.

TABLE A-1: Numerical Disaggregation of the Input-Output Table

Industry	I-O No.	Value-added share of small firms	Value-added share of large firms	Income Shares of small firms in total value-added θ^S_p	θ^S_m	θ^S_r	Income Shares of large firms in total value-added θ^L_p	θ^L_m	θ^L_r
Agriculture	1-9	.2	.8	.2	0	0	.13	.25	.42
Food Processing	10-19	.25	.75	.15	.05	.05	.09	.21	.45
Beverages	20	.05	.95	.02	.02	.01	.07	.17	.71
Tobacco	21	.25	.75	.21	.02	.02	.17	.18	.4
Textiles	22	.05	.95	.03	.01	.01	.20	.27	.48
Leather	23	.2	.8	.13	.04	.03	.10	.18	.52
Wood Products	24	.25	.75	.16	.04	.05	.16	.17	.42
Tailoring	25	.3	.7	.21	.05	.04	.09	.15	.46
Rubber	26	.05	.95	.04	.01	-	.10	.26	.59
Petroleum Prod.	27	.25	.75	.13	.06	.06	.03	.07	.65
Agric. Machinery	28	.45	.55	.33	.06	.06	.07	.15	.33
Agric. Transport	29	.3	.7	.22	.04	.04	.16	.25	.29
Merchandising	30-38	.25	.75	.12	.04	.09	.23	.31	.21
Clothing	39	.25	.75	.15	.05	.05	.10	.15	.5
Furniture	40	.4	.6	.32	.04	.04	.11	.17	.32
Chemicals	41	.15	.85	.11	.02	.02	.18	.24	.43
Metallic Goods	42	.15	.85	.11	.02	.02	.11	.23	.51
Other Machinery	43	.4	.6	.25	.08	.07	.09	.15	.36
Utility Services	44	No disaggregation							
Construction	45	.2	.8	.12	.02	.06	.26	.22	.32

NOTES: 1) The input-output numbers correspond to those of the table contained in AID Statistical Working Document No. 3.

2) The income shares of small and large firms refer to the fraction of total value-added earned by the poor, middle, and rich income groups respectively. Thus, for example, θ^S_m is the fraction of industry value-added earned by the middle income group that is employed in small firms.

TABLE A-2: Income Shares for Large and Small Firms in Colombian Manufacturing

Industry	Labor share	capital share	Total Labor share	Capital share	White-Collar share of labor income
Food Processing	.4	.6	.4	.6	.41
Beverages	.4	.6	.25	.75	.45
Tobacco	.8	.2	.46	.54	.12
Textiles	.56	.44	.45	.55	.29
Clothing	.5	.5	.35	.65	.23
Wood Products	.5	.5	.44	.56	.26
Furniture	.7	.3	.46	.54	.25
Leather	.4	.6	.35	.65	.27
Rubber	.6	.4	.38	.62	.41
Chemicals	.3	.7	.3	.7	.62
Petroleum Products	.2	.8	.13	.87	.56
Transport	.58	.42	.58	.42	.23
Metal Products	.51	.49	.4	.6	.36
Machinery	.55	.45	.4	.6	.39
Non-Metallic Minerals	.6	.4	.4	.6	.29

NOTES: 1) See appendix references for sources.

2) In Table A-1 chemicals and non-metallic minerals are combined using equal weights for each activity.

TABLE A-3

A. Average Consumption Propensities by Income Class

I-O Number	Poor	Middle	Rich
1	0	0	0
2	.0264	.0220	.0132
3	.0120	.0075	.0043
4	.0450	.0265	.0075
5	.1415	.1174	.0735
6	0	0	0
7	.0150	.0104	.0027
8	.0093	.0069	.0045
9	0	0	0
10	.0013	.0010	.0004
11	.0121	.0125	.0055
12	.0011	.0018	.0002
13	.0001	.0001	.0001
14	.0201	.0146	.0039
15	.0389	.0260	.0087
16	.0102	.0070	.0013
17	.0132	.0080	.0013
18	.0150	.0080	.0022
19	.0180	.0082	.0023
20	.0475	.0490	.0157
21	.0149	.0147	.0050
22	0	0	0
23	.003	.004	.0042
24	.0008	.008	.0068
25	0	0	0
26	.0022	.0053	.0066
27	0	0	0
28	0	0	0
29	.0022	.0072	.0090
30	.1010	.0791	.0550
31	.0470	.0374	.0120
32	.0170	.0152	.0120
33	.0328	.0233	.0140
34	.0943	.0834	.0330
35	.0010	.0005	.0001
36	.0859	.1112	.1390
37	0	0	0
38	0	0	0
39	.0527	.0676	.0721
40	.0019	.0071	.0433
41	.0310	.0329	.0370
42	.0026	.0061	.0087
43	.0015	.0047	.0087
44	0	0	0
45	0	0	0
Sum	.9185	.8274	.6147

TABLE A-3--continued

B. Household Services Consumption Matrix

Percent of Income Spent on the:	by the: Poor	Middle	Rich
poor	.018	.0294	.1230
middle	.018	.0067	.1000
rich	.039	.0753	.0503
	.075	.1114	.2733

NOTES:

1) The sectors corresponding to the input-output numbers can be obtained from Table A-1.

2) The sum of the average propensities to spend on domestic goods and services is .993 for the poor, .939 for the middle group, and .888 for the rich.

3) A zero value indicates the absence of any final demand.

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