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"DISTRIBUTION OF INCOME IN PUERTO RICO"


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by

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This study examines the effects of economic development on family income distribution with special reference to Puerto Rico. The investigation has been directed towards the determination of the factors contributing to a more equal distribution of income. On one hand the study has been directed to the relationship between economic development and income distribution by size in general, and on the other to the change in the distributive pattern of incomes in Puerto Rico in particular. Rapid economic growth, involving considerable social change has taken place in Puerto Rico during the last two decades. Study of this period is made possible by the statistical materials published by government agencies and surveys conducted to provide data on income distribution by size over a number of years; hence, the current hypothesis that income inequality diminishes with economic development is tested with reference to this particular developing country.

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INTRODUCTION

The purpose of this chapter is to outline the aims, scope, and method of the present work, and to indicate the statistical and conceptual difficulties encountered in a study of this kind and show very generally the conclusions we have reached.

I. The Aims of the Study.

1. The Aims and the Scope of the Study.

This study of size distribution of income has two related but distinguishable aims: First, it tries to show the direction of movement in the inequality of the distribution of incomes when economic development takes place, and secondly it tries to fill the gap created by the lack of any study of income distribution in Puerto Rico. In other words, it attempts to examine Kuznets's thesis, that economic development tends to reduce income inequality with the aid of the empirical evidence provided by Puerto Rico's economic development from the forties on. This involves the analysis of the forces which influence the distribution of income in a less-developed country. From this analysis emerges the second aim of our study. The second part of the study presents estimates of changes in the degree of inequality in the distribution of income in Puerto Rico. We explain below why we have chosen Puerto Rico rather than any other less-developed country to provide an empirical basis for the examination of the impact of economic development on income inequality.

2. Income Distribution in Developed and Underdeveloped Countries.

In the literature on the size distribution of income one can find studies
concerning various countries. Most of these studies refer mainly to the so-called developed countries, very few of them refer to the underdeveloped countries and some of them involve interspatial as well as intertemporal comparisons. Substantial evidence has been brought forward in recent works to show that incomes are more unequally distributed in underdeveloped than in developed economies. T. Morgan's comparative study on income distribution in two developed and two underdeveloped countries indicates the difference in the degree of inequality between the two groups of countries, this degree being less in the former than in the latter.¹ P. Strassmann compared the share of the top twenty per cent of family spending units in income in the United States, Denmark, Italy, Ceylon, India and Puerto Rico and found these shares to be lower for the developed economies, thereby indicating the lesser degree of concentration in income.² A Predetti comparing the two regions of Italy, namely the South and the North, reaches the conclusion that within the prevailing economic conditions the distribution of income is much more equal in the industrialized North than in the agricultural South.³ I. B. Kravis compares the income distribution in ten different countries, some developed


and some underdeveloped, showing the divergencies in the degree of inequality according to the degree of development.  

The question that follows from these examples is whether inequality in income distribution will decrease in underdeveloped countries through time when economic development takes place; in other words, will economic development bring about a more equal distribution in incomes?


Kuznets, in a presidential address to the American Economic Association, attempts to provide an answer to this question by a general analysis of the character and causes of long-term changes in the personal distribution of income for the developed countries of today. His argument leads to two main conclusions:

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(i) Income inequality has narrowed the developed countries over roughly the last 50 years. Narrowing of income inequality is, however, by no means characteristic of the total span of development of these countries. They have experienced a widening of income inequality in their first phases of development, which was subsequently followed by stability and later on by a narrowing.

(ii) Income inequality to-day is narrower in developed than in underdeveloped countries.


The question then is whether the underdeveloped countries of to-day will repeat the experience of the developed countries of to-day by passing through the same phases of widening, stability and narrowing in income inequality. Kuznets implies that although history does not always repeat itself, income inequality may not decline in underdeveloped countries. "There is no empirical evidence to check this conjectural implication, but it is suggested by the absence in these areas of the dynamic forces associated with rapid growth that in the developed countries checked, the upward trend of the upper-income shares that was due to the cumulative effect of continuous concentration of past savings; and it is also indicated by the failure of the political and social systems of underdeveloped countries to initiate the governmental or political practices that effectively bolster the weak positions of the lower income classes. Indeed, there is a possibility that inequality in the secular income structure of underdeveloped countries may have widened in recent decades."


This sombre picture depicted by Kuznets may not necessarily apply to all developing countries. Depending upon the pace of industrialization, a rapid rise in real per capita product may be achieved; internal tensions of political instability or long-run inefficiencies may be minimized; government fiscal activity may introduce progressive direct taxes and provide free economic and social assistance or services extending to the lower income groups. In short, given certain dynamic conditions of growth, which will be explained below, income

1. S. Kuznets, op. cit., p. 24
inequality may be narrowed in developing countries. We should like to stress that to achieve a widening of income equality in these countries, conscious efforts towards these goals are necessary. If such efforts are taken, then it is by no means inevitable that underdeveloped or developing countries will repeat the past pattern of the now developed countries of having a widened economic inequality before ultimately settling down to a situation of relatively greater income equality. Furthermore, developing countries may not wish to see any widening in income inequality especially where political stability is likely to be endangered by the consequent elimination of the middle classes.


We aim to show that there is empirical evidence, at least as far as Puerto Rico is concerned, that Kuznets' conjectural implication may not hold true and that dynamic forces associated with rapid growth in Puerto Rico are in fact tending to make income distribution more equal rather than unequal. The choice of Puerto Rico as a basis for this empirical study is not a haphazard one, and can be explained on two major grounds.

1. Statistics on employment, labour force, national product and expenditure are regularly provided since 1940 and information for some series is available for even earlier years. But most important of all, data on the distribution of income in Puerto Rico has been made available at different intervals since 1941, so that we possess now a series of sample surveys on the incomes of wage-earner families for the years 1941, 1952 and 1953 and on incomes of all families for 1946/47, 1950 and 1955. Furthermore,
the Department of the Treasury have been providing since 1955
data on individual tax returns by gross income brackets.

ii. Puerto Rico is a very rapidly developing country. Between
1940 and 1955 its national income has shown a real annual
increase of 5.3% at the compound rate. The real per capita
national income also has almost doubled during the same
period.

Consequently Puerto Rico constitutes a fairly good setting for a study of
this kind. There is, however, one shortcoming, namely that the time period
over which our material extends is not long enough for a really long-term study.
This may be counteracted somewhat by the rapid rate of growth so that the period
of our study may possibly correspond to a longer one of a slower rate of growth
in another underdeveloped country.

II. Comparison of the Present Study with Previous Investigations.

1. Investigations concerning income distribution in underdeveloped countries.

There is no study,1 to our knowledge, which specifically examines the relation-
ship between economic development and the change in income distribution in a
developing economy, which is what we set out to do. As a matter of fact, inform-
ation on the size distribution of incomes in these countries is very scanty.
None of these investigations, except that for Japan, is sufficiently long-term
for the purpose of establishing any quantitative relationship. Moreover, almost
all the studies that have been made of this question contain serious weaknesses,

1. After our work had been completed, a study published in Mexico came to our
attention in which the author examines the impact of the failure of economic
development, and finds among other things, an increasing inequality in the
distribution of incomes. See I. M. de Navarrete, La Distribución del
Ingreso y el Desarrollo Económico de México, Mexico, D.F., 1960; especially
Chapter IV, pp. 67-92.
so that it is dangerous to reach any definitive conclusions based upon them. For instance, an intertemporal study on the distribution of income is now available for India. It indicates a move towards greater equality in the six years between 1953/54 and 1958/59. However, it suffers from a number of limitations which cast doubt on the reliability of the conclusion.

Firstly, the analysis is confined to the incomes of individuals assessed for income tax and these form less than one per cent of the self-supporting population of the country. Secondly, it does not include agricultural incomes and excludes all incomes below 5,000 rupees (approximately $1,000). Finally, some of the families classified as single spending units are Hindu undivided families which are too large to be considered simply as one spending unit.

The study of the distribution of income in Brazil is based on income tax returns, representing less than ten per cent of the total national income of the country. It is a short-term intertemporal, comparative study covering the three years from 1946 to 1948, the conclusion being that a slight increase in the degree of equality has taken place. The main concern of the author is

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to expound different methods of measuring income inequality with the help of the data from income tax returns, rather than to analyse the income inequality in Brazil.

The study of the Japanese income distribution in a development context covers the longest period so far examined. The period of analysis covers the first half of the twentieth century from 1899 to 1956, and makes use of income tax as well as survey data. The emphasis of the study is placed on the examination of the hypothesis that incomes are distributed lognormally. However, one striking fact emerges as a by-product of the analysis, and it is that a number of exogenous and endogenous factors have prevented the equalization of incomes over this long period of economic development. One finds that the tendency towards equalization only began to set in after the Second World War. This may have been due to some radical economic and fiscal measures taken in this period, e.g., a large capital levy.

Information on income distribution is also available for Ceylon, Barbados and El Salvador, and is more reliable than that for Brazil and India in terms of coverage, since it is obtained from sample surveys. Unfortunately it is confined to single years and, therefore, provides no grounds for intertemporal comparisons.


The problem of income distribution in Puerto Rico was first mentioned in a treatise by H. Perloff on the island's economy. In this volume, Perloff devotes only two and a half pages to this subject. He gives the estimate of the distribution of income among Puerto Rican families in 1946/47, which is based on a combination of the sample survey made by the Puerto Rican Department of Labour and Income tax data. His analysis is confined to a few general and sketchy remarks. Other comparative studies of income distribution which mention Puerto Rico such as those by Morgan, Strassmann, Kravis and the United Nations, simply refer to the information given by Perloff. No attempt has ever been made to analyse the economic, demographic and institutional changes brought about by the growth of the economy and to relate them to the problem of income distribution, although statistical material has been made available by the appropriate government agencies. Hence we believe that this comparative study of the distribution of incomes in Puerto Rico covering a relatively long period is the only study of its kind.


2. United Nations, National Income and its Distribution in Underdeveloped Countries, Statistical Papers E.3, New York 1951. This publication provides information on the size distribution of income in the United States, Denmark, Italy and Puerto Rico, all of which are taken from previous publications and hence give no new data.
III. The Method of the Study.

The study is divided into two parts. The first part deals with the changing conditions brought about by economic development, and with the statistical and conceptual problems encountered in a study of income distribution. In a sense it constitutes the theoretical framework against which the development of Puerto Rico is to be judged in Part Two. Part One deals specifically with three questions:

i. What are the general economic, demographic and institutional forces governing income distribution when economic development takes place?

ii. What are the statistical problems encountered in a study of this kind?

iii. What are the conceptual difficulties implicit in the statistical data? Plainly, the evaluation of the Puerto Rican data will depend upon a recognition of its limitations when we draw our conclusions.


The level of a person's income, as well as the distribution of incomes among individuals and families, largely depends upon the socio-economic conditions of a given country. We have referred above to the general scheme put forward by Kuznets regarding the character and causes of long-term changes in the distribution of personal incomes towards greater equality over approximately the last 50 years in the developed economies. Kuznets finds the reasons for greater equality in incomes in:
i. the increase in the real per capita product which is accompanied by a faster rise in the per capita incomes of the lower income groups than that of the higher income groups;

ii. the legislative and political factors counteracting the cumulative effect of concentration of savings in the hands of the upper income groups, and

iii. within certain limits, in the shift from the agricultural sector to the non-agricultural sector and the rise in the income share of the lower income groups within the non-agricultural sector.

These three factors are, however, by no means exhaustive, numerous others must be added to them. The shift in the functional distribution of income in favour of wages, changes in the labour force structure from unskilled to relatively skilled, changes in the age and sex composition of the labour force, the decrease in unemployment and finally the role of the government as consumer, employer, and as ruler and regulator, all affect the distributive pattern. The possible impact of economic development on income inequality are analyzed in Chapter II. Our considerations are undoubtedly influenced by the historical development of numerous economies, but are by no means a mere repetition of these events. With the help of these developments, however, we have been able to build a scheme within which the effects of changing conditions on income inequality in a given country may be analysed. The changes in the Puerto Rico economy are examined in Part Two with the help of this scheme.
2. **Statistical Problems.**

Two kinds of statistical problems emerge in the study of income distribution, namely (a) the preparation of data, in other words the problems of sampling, and (b) the problems connected with the measurement of the degree of inequality.

Fortunately the first problem was solved for us because sample surveys were conducted and the results were extended to the total population and then made available by the appropriate agencies. The problem of the measurement of inequality, however, remained, i.e., what kind of index provides a summary of a frequency distribution and thereby a numerical value for the degree of equality? Different measures of income dispersion have been used and recommended by different authors. Some of these dispersion co-efficients are simple measurements, such as median, standard deviation, concentration ratio, etc., while others describe laws to which income distributions are assumed to conform, such as Pareto and Gibrat co-efficients. These different statistical methods are discussed in Chapter III where an attempt to distinguish between "measurement" and "law" is made and reasons for the method adopted in this study, (i.e., the Lorenz curve and the concentration ratio) given. Our choice has been determined by the desire not to commit ourselves to any particular theory, and on grounds of relative advantage for our study. It should be understood, however, that we do not regard the Lorenz curve and the concentration ratio to be the universal measure for all types of concentration.

3. **Conceptual Difficulties.**

The main conceptual problems in a study of this kind revolve around the difficulty of defining income and income recipient. This is important because
one's concept of income will differ according to the aim pursued. For instance, if one is interested in the earnings of families, then personal income seems to be the best measure; but if one is interested in the effect of direct taxes, then disposable income is the most convenient magnitude. It is also important because the degree of inequality may differ according to the definition of income or income recipient chosen. It should be kept in mind that a student of income distribution is not always fortunate in devising his own source of information, and information available to him may have been compiled for entirely different purposes. In a great many cases, surveys which cover family income distributions are primarily designed not for income distribution studies as such, but for other purposes, such as consumer price indices, health statistics, etc.

In these studies, income and income recipient are defined as to emphasize their own specific purposes. In other words, different connotations may be given to income and income recipient units, and the possible advantages and/or disadvantages of these definitions may be argued. But if the case is like the case we have in hand, where prepared data are presented to us and there is no possibility of conducting our own survey with the specific aims in mind, it is crucial to understand the implications of the different definitions to reach a fairly reliable conclusion.

In fact, the data available was not consistent in terms of definitions throughout, therefore it is very important to understand the implications of the definitions and to adjust the given data, as we have done, to make it comparable where necessary.¹ These issues are dealt with in Chapter IV.

¹ The corrected data and the procedure of correction are given in the relevant chapters, see especially Chapter VI.
4. Examination of the Puerto Rican Data.

This constitutes the subject matter of Part Two. In Chapter V we analyse the changes in social and economic conditions over approximately the last two decades, from the point of view of their effects on income distribution. Briefly we can say that this is analogous to Chapter II in that it shows the effect of the Economic Development Programme in Puerto Rico on the income level, the structure of the economy, the wage structure, the composition of the labour force, government spending, and the distribution of income. We conclude in this chapter that the distribution has been moving toward greater equality.

Chapter VI quantifies the findings of the previous chapter on the basis of available data through the use of the Lorenz curve and Gini's concentration ratio. It deals with the effects of price changes on different income groups. Gini's concentration ratio, being a relative measure of dispersion would not be affected by the application of one and the same price index to all income groups and hence would not indicate the effect of the variation in the price level on income distribution. In order to be able to appreciate the effects of price changes we have constructed separate price indices for different income groups based on their relative expenditure pattern. The method is given in the Appendix.

Chapter VII is a further elaboration of Chapter VI. It is generally believed that in underdeveloped countries indirect taxes play a dominant role; in fact they constitute a fairly large portion of government receipts in Puerto Rico. Consequently one might argue that if incomes after all taxes have been
deducted were to be taken, instead of personal income, conclusions concerning
the equality of the distribution of personal income would have been different.
Hence in this chapter we study the effects of taxation and government spending
in general terms, indicating the conceptual and statistical difficulties
relating to redistribution which have not been discussed elsewhere in this
study. We try to show, by a study of total government fiscal activity, that
our original conclusions still hold.

The last chapter summarizes our findings which are that income distribution
has become more equal most probably as the result of the various economic and
social changes brought about by economic development. Our findings are also
compared with income inequality in other developed and underdeveloped countries.
This comparison shows, that despite greater equality in incomes to-day, incomes
are far less equally distributed in Puerto Rico as compared to some of the
developed countries such as the United Kingdom. However, it may be expected
that continued economic growth should bring further equalization of incomes in
the future.
PART ONE.
CHAPTER II.
CHAPTER II.

ECONOMIC DEVELOPMENT AND INCOME INEQUALITY.

A Theoretical Framework.

I. Introduction.

Empirical evidence provided by several studies, already referred to in the Introduction, have shown convincingly that incomes are more equally distributed in developed countries than in underdeveloped countries. This state of affairs has been explained by Kravis, Morgan and Kuznets in terms of the social and economic conditions that distinguish developed economies from underdeveloped economies. The former have "proceeded farther in the integration of all segments of their populations into their social and economic life". They have fewer barriers to economic mobility, less concentration of wealth and of land ownership, lower interest rates and interest income is a smaller proportion of national income. Education and health facilities are more widespread and advanced, and forms of work are not so highly differentiated as to cause very large income differentials.

The question, therefore, is: what happens to these economic and social conditions in the process of economic development, how likely is it that they will change the income distribution and in which direction? The studies mentioned above do not give a satisfactory answer to this question. Morgan's comparative study does not attempt to provide any answer. Kravis is doubtful about the assessment of the possible effects of changes in industrial structure
upon income inequality. Kuznets says that income distribution may possibly move towards greater inequality in the underdeveloped countries, but also provides a general analysis of the character and causes of long-term changes in income distribution involving, as already referred to briefly in the Introduction, two basic groups of forces, the effects of savings and of the shift from agricultural to non-agricultural sectors.

The purpose of this chapter is to discuss the possible effects of economic development on income distribution as comprehensively as possible. We shall incorporate in our discussion the effects of the changes mentioned by Kuznets. It will not be a mere repetition of his explanations, since we will consider other forces associated with growth and their possible repercussions on income inequality. This will provide a theoretical framework within which the effects of economic development on income distribution may be judged in any country.

It should be borne in mind that it is extremely difficult to separate these factors in order to analyse or measure their influence individually on the distribution of aggregate income. No quantitative analysis should be expected, therefore, at this stage. However difficult it may be to determine quantitatively the influence of these factors on income distribution, it is certain that singly or collectively they alter the distributive pattern. Development in each country does not follow the same pattern; different factors appear in different degrees and magnitudes. It is necessary to know the factors that are likely to change, to be able to appreciate their possible effects in any given country. It is within this theoretical framework that Puerto Rico’s
economic development and its influence on income distribution will be considered in Chapter V.

II. Economic Growth and Changing Conditions in a Community.

Economic growth, in its very general meaning, may be defined as the sustained increase in the per capita real output of a community. The increase in per capita output, however, is only a summary representation of all the complex structural changes occurring in a community and is itself the cause of further changes in this structure. It by no means indicates by itself the direction in which income distribution will move. The process of economic growth is characterized not only by the rise in real output per head, but also by changes in the technological, demographic and social framework of a country. An invariable accompaniment of growth is the shift away from agriculture, what is usually referred to as urbanization or industrialization, and the change in the relative importance of industrial sectors. It is also reflected in shifts in the distribution of income by factor shares; in rises in productivity due to improved methods of production and to improved skills, which may further change the relative importance of the sectors; in changes in wage levels and differentials and in variations in the level of employment. Movement from a traditional to a more dynamic setting alters the social outlook of the people, the character of family organization, and attitudes towards work. Finally, partly as a result and partly as a cause, governments acquire new attitudes.

It is inevitable that the distribution of incomes should be affected by all the socio-economic changes a country undergoes in its course of development. Consequently the relationship between the level and the trends of income inequality
and economic development must be sought in the question as to how these changes may possibly create widening or narrowing of income inequalities. This relationship, however, should not be considered as one-sided. As the process of economic development starts and continues through time, it is only natural to think that its pace will be affected by the degree of income inequality.

What we attempt to do in the following pages is to examine the possible effects of some of the socio-economic changes on income distribution.

III. Factors Affecting the Distribution of Income.

1. Rise in Per Capita Income.

We have seen already that income inequality tends to be less in developed economies than in underdeveloped economies. We also know that output per head is much higher and on the whole has shown significant rises at a faster rate. Can one then immediately deduce that income inequality declines with the growth in output per head? This question must be answered in the negative for a rise in per capita income may leave the relative income position of families unchanged. It is quite possible for the rich to experience the same percentage increase in their income as the poor, leaving the overall income distribution unchanged. If, however, the average rise in income for the economy as a whole is accompanied by a faster rise in the per capita income of lower groups than that of higher groups, then a reduction in income inequality will result. This means that the share of income going to recipients at the bottom of the scale, say, for example, of the lowest percentile, will increase at the expense of the top percentile. This change, may be simply a symptom rather than a cause and we have to search for other factors which would bring reductions in income inequality.
2. Structural Shifts.

Structural shifts among sectors of the economy account for a substantial part of the long-run changes in income size distributions. Among the most significant shifts of this kind is the relative decline in the importance of the agricultural sector, together with a decline in the proportion of rural to urban population. When this movement results in an increase in the mean farm income and a shift toward the mean urban income, there would be a diminution of inequality in the overall distribution of income. One could argue that it is mostly the low income farm families that leave agriculture for employment possibilities in the cities where they most probably enter the low income bracket. Since it is believed that income distribution is more unequal in urban areas, this movement would, therefore, seem to increase the overall inequality of incomes rather than decrease it. But one has to take into consideration that farm families are disproportionately concentrated at the bottom of size distribution and that the average income of the rural families is usually lower than that of the urban. A pronounced drop in the number of farm families must act, therefore, to reduce the number of low income units and raise the average income of farm families. If this rise is faster than for non-farm families, there will be a movement towards a diminution of income differentials.


In fact, this seems to have taken place in the United States between 1929 and 1948 during which period the median income of farm families rose nearly threefold. A similar development is also observed in Western European countries. The occupational and industrial shifts away from agriculture and domestic services into manufacturing industry, trade, public services, etc., has been given as a partial explanation for the more equal distribution of incomes in various countries after the Second World War.

One of the two arguments of Kuznets' theoretical model referred to above is centered in this movement of population from rural to urban areas as a result of industrialization. The argument is that the shift of population from 80 per cent agricultural to 60 or 50 per cent agricultural, results in widening inequality, but that a shift from 50 per cent to 20 per cent agricultural yields narrowing inequality. This argument seems to suggest that in the course of economic development when the stage of "semi-industrialization" is reached, which we presume is identified by the shift of population from 80 per cent agricultural to 60 or 50 per cent agricultural, income inequalities will increase; while in the stage of "full industrialization" represented by a shift from 50 per cent to 20 per cent agricultural income inequalities will decline. However, this


conclusion is limited by the assumptions, that per capita incomes of, and the distributions within, the agricultural and the non-agricultural sector remain the same in the course of the shift of the population. The widening and narrowing of income inequalities in the Kuznets model is to be experienced without any reduction in the per capita income differences between the sectors and without any change in the income dispersion within either sector. What happens if some of the assumptions are varied? Kuznets argues firstly, that the widening of inequality suggested by the model may be offset by the fact that the "immigrants" who now become the "natives", i.e., are born in the cities and/or identify themselves with the cities, are more able to take advantage of the increased opportunities offered by city life to improve their incomes. Secondly, in democratic societies urban lower income groups obtain political power which may influence governmental legislation and lead to intervention to counteract some of the undesirable effects of rapid industrialization and urbanization. This factor played little role in the course of the earlier development of the developed countries of to-day. The effect of these two qualifications will be that the share of the lower income groups in the urban sector will rise and that, therefore, the distribution within that sector moves towards equality; since the weight of this sector is increasing, its effect is to change the overall distribution towards equality. There is, however, one more qualification to be added, namely if there is a rise in the relative income position of the agricultural sector, greater equality may again be expected. It is reasonable to assume that, even if all other conditions remained constant, the shift from agricultural to non-agricultural sector will take away marginal workers. On the one hand, the
bottom income groups will become less crowded in that sector, and on the other, productivity and hence incomes, will rise. Consequently a constancy in the per capita incomes and in the income dispersions cannot be expected. We shall return to the role of the government later in this chapter.


The functional distribution of income measures the form in which income is earned in current production by the different factors of production. Changes in the distribution of income by type are apt to bring about changes in the distribution of incomes by size, since specified factor incomes reveal different patterns of distribution and are combined in different proportions as one moves up the income scale. Thus property incomes are highly concentrated in the upper income brackets and are subject to relatively higher inequality, while wages and salaries play the dominant role in low and middle income groups and reveal relatively less inequality. Therefore, factors that bring about changes in the functional distribution of income will also tend to change the direction in which size distribution of incomes is moving.

a) Several factors may bring about changes in the functional distribution of income. Short-run changes in the distribution of income by type reflect primarily the degree of utilization of resources during phases of the business cycle; long-term changes, however, are more apt to reflect structural shifts in the proportions in which factors of production are combined in the individual sectors of the economy and gradual shifts in the relative importance of these sectors. Shifts

of this latter type characterize the course of economic development. The relative decline in farming during the gradual process of economic development and the movement, mentioned above, of the labour force away from agricultural-rural to industrial-urban areas undoubtedly brings about a change in the composition of the total wage bill. The decline in the numbers employed in agriculture may cause a rise in per capita farm incomes - though the total wage bill in agriculture may be decreasing, absolutely and/or relatively because workers whose marginal productivity is relatively low are eliminated. It may furthermore increase the wage bill of secondary and tertiary industries, where the average wage is usually higher than in agriculture. It may then be expected that the effect of this change in functional distribution, in terms of higher share for labour, will be towards more equality in income distribution by size.¹

We can conclude then in general that to the extent that inequality of income distribution reflects differences in productivity among sectors, a decline in the importance of a less-efficient sector or an increase in its productivity will result in greater equality within the aggregate.

b) Changes in the labour share of national income arise not only from changes in the relative size of sectors, but also from changes in the composition of the labour force. Thus a rise in the share of labour may be due to a rise in the proportion of wage and salary earners to total occupied population. This phenomenon is observed during the process of gradual economic development, for the

¹. In fact, there is enough empirical evidence to support this statement in the United States as well as in several European countries. See, United Nations, Economic Commission for Europe, op. cit., Chapter IX, p. 12; S. Goldsmith, op. cit., p. 503, and S. N. Propokovich, op. cit., pp. 78-79.
simple reason that the shrinkage of the agricultural sector is usually responsible for a fall in the number of self-employed, i.e., a rise in the number of wage and salary earners. If this development causes the share of labour income to rise faster than the proportion of wage and salary earners, then per capita labour income will increase more than national income per capita, the result of which is expected to be a swelling of the middle income groups and hence a decline in the inequality of incomes.

c) Variations in the other components of national income, i.e., dividends, interest and rental income, will also influence the size distribution of income. Since these components are mostly concentrated in the upper income groups, a relative decline in their importance will result in a reduction of inequality.


2. Dividends and interest as a percentage of personal income declined from 14.7 per cent to 8.3 per cent in the United States during the last twenty-five years, while the share of rental income fell from 6.4 per cent to 3.8 per cent in the same period. The same trend may also be observed in several European countries. In the United Kingdom, for instance, net rent fell from 8 per cent of national income in 1938 to 2 per cent in 1955, and, as Lydall points out, rents, dividends and interests altogether fell from 22.3 per cent of total personal income in 1938 to 11.1 per cent in 1957. Strikingly similar percentage changes also appear in Norway, Switzerland, Finland and Ireland. See, S. Goldsmith, G. Janzi, E. Kaitz, M. Liebenberg, "Size Distribution of Income Since the Mid-Thirties", Review of Economics and Statistics, Vol. 36, February 1954, and United Nations, Economic Commission for Europe, op. cit., Chapter VIII, p. 7; and H. F. Lydall, "The Long-term Trend in the Size Distribution of Income", Journal of the Royal Statistical Society, Vol. 122, Part 1, 1959, p. 17.
Since savings are unequally distributed, at first glance one would expect that income yielding assets would be concentrated in the upper income brackets, thus increasing inequality. However, this may not take place, due to factors counteracting the cumulative effects of concentration of savings upon upper income shares, such as legislative and political intervention. In fact this line of reasoning forms the second point of Kuznet's thesis. In his own words legislative interference and political decisions "may be aimed at limiting the cumulation of property through inheritance taxes and other explicit capital levies; ... (or by) government permitted or induced inflation which reduces the economic value of accumulated wealth stored in fixed price securities, or other properties not fully responsive to price changes or by legal restriction of the yield on accumulated property as ... in form of rent controls, or of artificially low long-term interest rates maintained by the government to protect the market for its own bonds". 1

These arguments perhaps are more associated with direct government policies than economic development itself, though it cannot be denied that the former is a function of the latter, and vice versa, and there is no reason why similar policies may not be followed by a developing country. This would depend upon a number of complex factors pertaining to the country in question. Moreover, a constancy in the share of rental income and interest by itself is no guarantee that widening or stability of income inequality will take place. The dynamic forces accompanying economic development, such as increasing economic opportunities, emergence of new industries, etc., may very well widen the dispersion of these types of incomes among the various income brackets and tend to reduce the overall income inequality.

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1. S. Kuznets, op. cit., p. 9
4. Change in Wage Differentials.

The pattern of wage differentials, changes in which may influence the size distribution of income, is closely related to the degree of specialization of labour. It has been argued that the higher the degree of specialization, the greater the inequality in the distribution of income is bound to become, since individual contributions to the social product become more and more specific and thus less substitutable.\(^1\) We shall, however, argue to the contrary and maintain that specialization need not lead to greater inequality in the distribution of incomes. Granted that specialization, accentuates and creates differences, which modify the advantages of the skilled craftsman, and thereby affect the higher paid occupations. However, specialization also pays where there are no natural or acquired differences in skills, for in this way alone can a large enough volume of activity be reached to realize the economies of large scale production. Hence, specialization affects the middle jobs as well. Furthermore, the old concept of the entrepreneur seems to-day to have been replaced largely by a committee of specialists, everyone of whom is substitutable. Therefore, instead of one entrepreneur with an extremely large income, there are a number of executives with relatively lower managerial incomes. Moreover, looking at the trend in the United States for instance, one observes that the polarization of skills expected from specialization has not taken place, since between 1910 and 1955 the proportion of the unskilled workers in the labour force declined by one half, that of semi-skilled workers rose by 50 per cent, the importance of white collar workers increased by 100 per cent and the share of professional, technical and kindred workers also doubled.\(^2\) These changes would bring about a

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contraction in the low, and an expansion in the middle income groups and hence encourage the narrowing of income inequality. It might be argued that the line of reasoning given above holds more in developed than in underdeveloped countries, two characteristic features of which are the lack of skilled labour and entrepreneurship. We shall not dispute this point; however, once economic development gets under way, the composition of the labour force will inevitably change. The degree of this change will vary from country to country and depend on the stage of development, and will influence the distribution of income accordingly.

5. Income Inequality and Unemployment.

The effect of changes in the level of unemployment may vary with the nature of unemployment. During periods of cyclical unemployment, income equality may be seen to increase. This observation alone should not mislead one to a direct cause and effect relationship between unemployment and income equality, the increase in which may be more probably due to the decline in the importance of the higher incomes due to decrease in profits.

The changes in structural unemployment, however, are more relevant in judging the effect of long-term economic development on income distribution. It is quite probable that elimination of structural unemployment, especially if its decline is conducive to an increase in employment in industry, would lead to a more equal distribution of income. This would eliminate a large portion of very low incomes, both of the unemployed and also of workers on the margin of unemployment. In other words, the persistence of unemployment, ceteris paribus, may reduce the share of the low income groups while other groups enjoy an increase in income, hence contributing towards greater inequality, and vice versa.

The distribution of wealth is an old argument, perhaps one of the oldest that is brought forward as being responsible for the distribution of income. The relationship between the two distributions, however, is not one-sided; there is a mutual interdependence between the two; today's incomes change today's wealth distribution, and tomorrow's wealth distribution is partly responsible for tomorrow's income distribution. Any changes in wealth distribution towards more equality are, therefore, _ceteris paribus_, expected to bring about changes in income distribution towards equality. Bearing in mind that our primary concern is with the distribution of income rather than of wealth, we would like to point out briefly some of the apparent factors which would influence the change in the composition and the concentration of wealth.

First of all, several direct or indirect government interventions, such as heavily progressive inheritance taxation, induced inflation, artificially low interest rates, etc., which were mentioned above in connection with Kuznets' model, may alter the importance of savings as a source of income yielding assets. Secondly, frequent shifts in consumer demand may require greater responsiveness in the techniques of production, leading to a process of "creative destruction" and to a decline in the influence of accumulated property. Thirdly, as economic growth proceeds, a different kind of capital accumulation takes place in the form of a general improvement of human health, abilities, and skill. Hence an amount of income which cannot be determined quantitatively and which represents a return on this human capital, accrues to labour in the form of wages. In
other words what is specified as wages in our national income accounts contain an element of rent on acquired capital. If the above conditions are satisfied, then one should expect, against the argument that capitalism is supposed to be characterized by a long-run accumulation of capital relative to labour and that, therefore, the distribution of income is to become more unequal with its development, that a more equal distribution of wealth is taking place, which in turn should accordingly influence the income distribution by size. We should mention in this connection that these influences on the distribution of wealth through time with perhaps the exception of improvement in health and skills are more characteristic of a highly capitalist economy rather than of a developing country such as Puerto Rico. Hence it may be expected that movements toward equality in income distribution will be more influenced by factors other than "creative destruction", or heavily progressive inheritance taxation, or artificially maintained low interest rates. The factors influencing income distribution through time in Puerto Rico are specifically analysed in Chapter V. We now turn to the other factors influencing the income distribution in general.

7. Changes in Demographic Factors.

Income distribution is also affected by changes in the proportion of the total population which is economically active. Such changes may result from changes in the period of education, the retirement age, the marriage frequency, and from changes in the degree of participation in the labour force by married women. Demographic influences are often important, because government measures are closely tied to age groups. This is obvious in the case of changes in the period of education and the retirement age. We shall discuss the effect of
government below, we only call the attention to the fact that often deliberate
government policies change the age composition of the labour force by, for
instance, preventing the employment of children under a given age limit, by
providing free educational facilities and/or retirement pensions, thus
encouraging earlier retirement.

(a) The lengthening of the education period would have the effect of
reducing the size of the labour force and the very same effect is obvious when
different schemes for retirement and old-age benefits tend to reduce the number
of persons over 65 who are employed. These two ends of the labour force, i.e.,
15 years or under, and 65 years and above, which are becoming more and more
inactive due to the above mentioned reasons, may seem to be contributing to a
more unequal distribution of incomes. However, a close examination should
yield otherwise, since the relative decline in the employment of juvenile workers,
whose incomes most probably concentrate in the bottom income ranges will also
reduce the weight of these ranges in the over-all distribution.¹ The lengthening
of the education period is not necessarily accompanied by complete stoppage of
juvenile employment, but may very well go together with part-time employment such
as delivery of papers after school hours. What the effect of such a development
will be depends upon the concept of income recipient underlying the statistics.²

As far as the retired people are concerned, their incomes, which are also concen-
trated in the lower ranges of size distribution, would tend to show less dispersion

1. There is considerable evidence that in several European countries, a great
percentage of the incomes of juvenile workers falls into the lowest three
decile groups of the over-all distribution of income. See, United Nations,
Economic Commission for Europe, op. cit., Chapter IX, p. 12.

2. The implications of the definitions of income and income recipient are
discussed in detail in Chapter IV.
under the improved schemes of old-age and retirement pensions, be they public or private. However, the increase in equality which may be expected from increased transfer-payments, both in terms of coverage and amount, should be amended with two qualifications. First of all, in the periods of steeply rising prices, these transfer income recipients will be faced with rapid deterioration in their position. Secondly, it is also possible that these somewhat higher transfer payments may raise the incomes of elderly persons sufficient enough as to bring them into statistics primarily due to maintaining separate households, which would tend to increase the weight of very low income ranges.

(b) The shift from single to married women in the labour force may also be one of the factors contributing to a change in the size distribution of income toward greater equality, provided that the tendency of married women taking paid employment is accentuated where the earnings of the head of the family are particularly low, since this would tend to move families in the low income ranges to middle income ranges, and make incomes less dispersed. Therefore, as the proportion of married women in the active labour force rises, the relative importance of the incomes below average is generally reduced. This effect would only be seen where sample surveys on income distribution take the family as the unit or where income tax legislation obliges husband and wife to fill out a joint return.

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8. The Role of Government.

Income in our mixed system largely derives from the ownership of the
factors of production and their earnings in the market. At the same time,
however, a substantial part of private incomes originate in the public sector
and a substantial part of national output is used for the satisfaction of
public wants. Government, therefore, alters the distribution of income,
first of all, in its role as an employer of resources, especially of labour.
Since it may be assumed that there is less inequality in wages and salaries
in public than in private sector, an increase in government employment would
move the overall distribution toward equality. Secondly, as a supplier of
services for the satisfaction of public wants, governments influence the primary
distribution. For example, an increase in the scope of free education may lead
to a reduction in the scarcity of skilled labour and differences in the ability
to earn will be reduced. Among other interventions of the government which will
have this effect is the improvement of public health. Thirdly, as a rule-maker
and regulator of business, government affects the earning power of talents and
property. Among such policies, which are numerous, can be cited minimum wage
legislation, agricultural price support programmes, tariff protection, rent
controls, etc. Finally, we must also mention two important direct redistribu-
tive effects of government policies namely, taxes and transfers. Redistribution
of income may be carried out in several ways: through a reduction in
personal incomes, or of wealth by progressive direct taxes on income and property;

1. See, G. H. Moore, "Secular Changes in Distribution of Income", American
Denison, "Income Types and the Size Distribution", American Economic Review,
and Size Distributions of Income and Their Meaning", American Economic Review,
by increasing the personal disposable income through transfer payments; and
by increasing personal incomes through a greater availability of free public
goods and services.¹

It is very difficult to estimate quantitatively the redistributive
effects of government policy. It is necessary to differentiate between those
public revenues which bring about redistribution and those which do not.
Among the former are taxes, the issue of money to finance a budget deficit and,
in an indirect way, the issue of debt for open market operations. A definite
knowledge of shifting is required so that the fiscal burden can be made to fall
on those for whom it was intended. A statistical breakdown of the incomes of
individuals in various income brackets is required, giving the source of income
in the form of wages, salaries, dividends, etc., in order to be able to consider
the changes of income from one bracket to another. Detailed family budgets by
social classes and size of family are needed to study the effects of taxes on
consumption and savings. Income and consumption taxes affect differently
families of equal income but of different size.² Finally, it is indispensable
to have an analysis of public expenditures to know who receives benefits and to
what extent. This perhaps is the greatest of all difficulties even for countries
equipped with the best statistical techniques, institutions and facilities.

¹ For extensive discussion of these problems, see R. A. Musgrave, Theory of
Redistribution and Social Policy, London 1954; G. Cosciambi, Principios de
Ciencias de la Hacienda, Madrid 1960, pp. 269-305.

² A. H. Conrad, "Redistribution Through Government Budgets in the United States",
in Income Redistribution and Social Policy, (A. T. Peacock, ed.) London,
1954, p. 216.
Although it might be very difficult, especially for countries where the necessary statistical information is lacking, to assess the net result, nevertheless it should be expected that the redistributive effects of government fiscal and non-fiscal policies will alter the pattern of income distribution. An attempt will be made in Chapter VII to indicate roughly the direction of the redistribution and the effect of government fiscal activity in Puerto Rico.  

9. The Role of Unions.

Trade Unions by increasing the bargaining strength of the employees, by reducing the wage differentials due to sex and race differences, by insisting, for example, as in the United States, on equal pay for equal jobs, by helping increase the productivity of workers, etc., hence by reducing the inequality within wage incomes, may move the overall income distribution towards greater equality. Furthermore, as pointed out by H. Levinson, Union influence prevents wage levels from falling during periods of depression, as much as non-union wages. If this holds true, then one would not expect a violent mass decline from middle to low income ranges to take place. Moreover, the recent introduction of such systems like guaranteed annual wages in the United States, acting as built-in stabilizers, together with the Unions’ endeavours to prevent a fall in wages may be effective during a recession. In a major depression, nevertheless, it would be only natural to expect Union wages to fall together with non-union wages, though perhaps to a lesser extent, thereby changing the distributive pattern towards less equality.

It is very difficult to establish the relationship between the process of economic development and the growth of organized labour. In a number of underdeveloped countries Unions are either still too weak or reflect political aspirations rather than economic interests. Hence the effects of the Unions on income distribution will vary with the circumstances of particular countries.

IV. Summary.

We have, up to now, tried to explain some of the important economic forces bearing upon the distribution of income in a given economy. In the course of economic development it is very hard to distinguish them individually and measure the degree of their influence separately. However, the existence of many of them should lead to the conclusion that there must be a change in the degree of income inequality. In Chapter V, we shall show that at least some of these factors have played a role in the Puerto Rican economy so as to alter the pattern of distribution of income between 1941 and 1955. Before we proceed to the case of Puerto Rico and interpret the change in the degree of inequality of incomes, there are two more problems that have to be dealt with first. One of them is the problem of measurement and the other concerns the definitions underlying the distribution of income. We now turn our attention to them.
CHAPTER III.
I. Introduction.

The problem of formulating a mathematical expression to describe a frequency distribution of income and of finding a measure of inequalities in the size distribution of incomes has attracted many mathematical economists and statisticians. On the one hand, some mathematicians or mathematical economists concerned with the distribution of income and wealth per se have tried to formulate a universal law to describe distribution at all times and in all places, and to measure income inequality on the basis of these laws. Others have simply tried to devise a method of measurement of inequality of income without committing themselves to any particular theory of distribution. The purpose of this chapter is to discuss briefly some of these methods and to select the most suitable for the data we have in hand for Puerto Rico, without aiming to test the validity of any theory against our data. In the following pages we shall give a brief outline of the two well-known empirical distributions, those of V. Pareto and C. Gini. We shall then turn our attention to the rational law of R. Gibrat, or what has become to be generally known as the lognormal theory of income distribution, after which we shall discuss the empirico-mathematical measurements of distribution, mainly the Lorenz curve method and the concentration ratio. Ultimately, we shall discuss their advantages and disadvantages upon which we shall adopt one of them as
a measure of income distribution. We shall not enter into the intricacies of statistical analysis, nor do we aim to suggest a new method of measuring inequality.


1. Pareto's Law.

The investigation of V. Pareto in his "Cours d'Economie Politique" and subsequently in his "Manuel d'Economie Politique" of the curve of income distribution is the first scientific and perhaps the best known generalisation in the theory of distribution. ¹ After studying the tax statistics of various countries at different times, he concluded that there was a functional relationship between the number of persons and the incomes received. This relationship was a hyperbolic function with two parameters A and (α), so that

\[ N_x = \frac{A}{x^\alpha} \]

or

\[ \log N_x = \log A - \alpha \log x \]

whereby \( N_x \) denotes the number of persons and \( (x) \) the incomes received. In other words, if a cumulative frequency distribution is plotted of the numbers of incomes, both numbers and incomes being shown logarithmically, a straight line with a certain slope (α) will be obtained, (See Chart III. 1), which measures

1. Although Pareto is recognised as the forerunner of income distribution analysis, others prior to him have dealt with the same problem, though perhaps in a limited scope. K. Rodbertus, followed by E. Engel and A. Wagner, e.g., have compared the numbers of individuals in each of the groups into which the population is divided in taxation statistics according to the different rates of assessment at two different dates. See, S. N. Propokovitch, "Distribution of National Income", Economic Journal, Vol. 36, 1926, p. 71.
the dispersion of income and is independent of the average level of income or the size of population. The value of \((\alpha)\) varies between \((0)\) and \((\infty)\) representing perfect inequality and perfect equality respectively. Hence the greater the value of \((\alpha)\) over time or in space, the more equal is the distribution of income.¹

For a number of countries from Europe to South America at different times varying between the fifteenth and the nineteenth centuries, Pareto found that \((\alpha)\) was strikingly stable around 1.5, whereupon he concluded: "These results are very remarkable. It is impossible to say that they are accidental. There is definitely a cause which creates the tendency of incomes to be distributed according to a certain curve, the form of which seems to depend only weakly on different economic conditions, since results obtained are similar for countries with different economic conditions".²

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¹ In his "Cours" Pareto maintained the opposite, saying that a decrease in \((\alpha)\) would indicate a decrease in the inequality of incomes. This contradiction may arise due to the peculiar definition of inequality given by Pareto, that inequality diminishes when the number of individuals having an income less than a given amount fall relative to the number of individuals having an income greater than the said amount. The difficulty moreover arises in part from the fact that as an hypothetical income distribution approaches complete equality the plotted points approach a horizontal line up to the mean and a vertical line at the mean. For a discussion of this contradiction see, C. Bresciani-Turroni, "Pareto's Law and the Index of Inequality of Incomes", Econometrica, Vol. 7, 1939, p. 112; and N. J. Bowman, "A Graphical Analysis of Personal Income Distribution in the United States", in American Economic Association, Readings in the Theory of Income Distribution, London, 1950, p. 78 ff. Furthermore, if one investigates the relationship of \((\alpha)\) to standard deviation and mean difference, one finds that an increasing \((\alpha)\) corresponds to a smaller range of variation in the distribution and hence indicates decreasing inequality. See, e.g., W. M. Persons, "The Variability in the Distribution of Wealth and Income", Quarterly Journal of Economics, Vol. 23, 1909, pp. 420-421, and L. von Bortkiewitsch, "Die Disparitätamasse der Einkommenstatistik", Bulletin de l'Institut International de Statistique, Vol. 25, No. 3, 1931, p. 223.

² V. Pareto, Cours d'Economie Politique, Lausanne 1896, p. 312.
The determination of the parameters A and (α) of the Pareto Law is fairly simple. Using the least squares method or the Cauchy method, which in fact Pareto himself used and found sufficient, the values for A and (α) can be easily obtained.

After formulating his law, Pareto recognized the impossibility of extrapolating the straight line formula into the lower income ranges, where the formula involves the absurdity of having an infinite number of individuals with an approximately zero income. In other words, Pareto felt that this zero mode with an infinite ordinate was absurd and that there must inevitably be a definite mode well above the zero income. He then tried to use the normal curve of error, which however, he found unsatisfactory because it would only describe the upper ranges of income curves as given by income tax data. In the lower ranges such a curve would cut the y-axis and pass into the second quadrant indicating a large number of negative incomes. This was unacceptable to Pareto since he did not believe that it was possible for incomes to fall below a minimum subsistence level. ¹ He concluded, therefore, that income distribution could not be explained by the curve of errors, i.e., by the form which it would have if the acquisition and conservation of wealth depended only on chance.²

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² See, V. Pareto, Manuel d'Économie Politique, Paris, 1909, p. 385. We shall see later on, however, that R. Gibrnat uses the same idea of the normal curve of error quite successfully, though with some modification. See Section III below.
Chart III.1
Pareto Curve for Income Distribution
Tax Returns, Puerto Rico 1954/55

\[ \log N = 10.69947 - 1.82 \log x \]
With the aim of improving the fitness within the range of the data Pareto introduced two extra parameters into his general formula, \((a)\) and \((\beta)\), such that:

\[
\log N = \log A - \alpha \log (a + x) - \beta x.
\]

However, he found that \((\beta)\) was insignificant, being equal to zero in almost all cases, except in the Grand-Duchy of Oldenburg (0.0000631) and \((a)\) was positive for property income, negative for labour income, and negligible when incomes were considered in the aggregate. Hence he returned to his first general equation.


In contrast to Pareto, Gini\(^1\) took account of both the numbers of incomes above given levels, and of the aggregate of incomes received by those above any given point, such that:

\[
\log N_x = \delta \log R_x - \log C
\]

where \((N_x)\) is the number of income receivers with incomes of \((x)\) or more, \((R_x)\) is the aggregate income above the level \((x)\) and \((\delta)\) and \((C)\) are constants for any given distribution. If the cumulated numbers of income receivers are plotted on the y-axis and the corresponding aggregate income - not the size of individual incomes, as in Pareto - on the x-axis, both axes being logarithmically scaled, one would obtain a straight line, the slope of which is \((\delta)\) which is proposed by Gini as a measure of inequality such that the greater \((\delta)\), the greater inequality (See Chart III. 2 and note that the x-axis in the Gini diagram reads from right to left). The value of \((\delta)\) varies between \((1)\) and \((\infty)\).

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Chart III.2
Gini Curve for Income Distribution
Tax Returns, Puerto Rico 1954/1955

\[ \log N = 1.87 \log R - 11.02365 \]
representing perfect equality and perfect inequality respectively. According to Gini ($\delta$) is more sensitive than ($\alpha$) to changes in income distribution. It is sufficient to note that ($\alpha$) varied between 1.13 and 1.89 in the findings of Pareto, the corresponding variation in ($\delta$) would have been between 8.69 and 2.12. This means that the introduction of ($\delta$) into the study of income distribution made it clear that the stability of Pareto's ($\alpha$) was not due to the "remarkable" similarity of the distribution patterns of the world, but due to its own insensitivity.¹

The mathematical relationship between Pareto's ($\alpha$) and Gini's ($\delta$) is:

$$\delta = \frac{\alpha}{\alpha - 1}$$

hence the value of one parameter could be obtained from the other. In practice, however, this relationship may not hold. Gini's explanation is that tax evasion in different income groups affects ($\alpha$) and ($\delta$) in different directions.² Evasion in lower income groups lowers the value of ($\alpha$) since ($\alpha$) gives a better fit with higher incomes, and increases the value of ($\delta$), since the Gini formula describes the income distribution down to a much lower income than is adequately described by the Pareto formula. Under these circumstances the choice of the parameter to serve as an index of inequality depends upon which

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² C. Gini, op. cit., pp. 44-45
formula satisfies the condition of goodness of fit, \(^1\) i.e., which regression line represents a better approximation to the actual data. There are indications that Gini's formula ought to fit better than Pareto's simply because the Gini line represents the correlation of a thing with part of itself, i.e., the sum of a set of numbers and a weighted sum of the same numbers. The y-axis represents the sum of a set of numbers of income recipients, and the x-axis is the sum of this same set of numbers weighted by the income sizes.


The study of the distribution of income was taken further by R. Gibrat through the application of probability functions into income distributions. \(^2\) He assumed that a large number of small random factors act in a multiplicative way upon a set of objects. The effect of each of these numerous factors is not independent, but proportional to the effect of others. This is called the law of proportional effect and is expressed in Gibrat's formulation by the fact that

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the logarithms of the variable (in this case, income) are distributed normally. The distribution is defined by the equation:

\[ y = \frac{1}{\sqrt{2\pi}} e^{-\frac{z^2}{2}} \]

where

\[ z = a \log x + b \]

The mean value of \( z \) is zero and its standard deviation is one. Changes in \( z \) which are indicated by \( a \), show the movement toward equality or inequality, since changes in \( z \) bring about changes in the frequency distribution. In

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1. In other words, there are many influences acting on income, the effect of each one of which is small in relation to the effect of all of them. The relative effect, however, of each influence on income is independent of the level of income and is a random proportion of income. That is to say, that the changes in \( x \) \( (dx) \) is proportional to \( (x) (dx) \), but is independent of \( x \); now, if a certain function \( z \) of \( x \) can be found such that \( (dz = dx) \) then the new variable \( z \) will obey Laplace's law, i.e.

\[ (s = a \log x + b) \] where relative variation is the absolute variation in terms of logarithms. Laplace was the first to show that errors of observation can be considered as due to numerous elementary causes of which each separately has an invisible effect yielding a normal frequency distribution. Kapteyn, on the other hand, showed that if errors are large in relation to the magnitude measured, the distribution is not normal, but skewed. Consequently, Gibrat asserts that when the variable has a small variation range, Laplace's law will hold, but when the variable has wide variation range, as is the case with economic variables, the law of proportional effect will hold. Hence Gibrat transforms, by introducing logarithms into the power of the frequency distribution equation, proportional variations into absolute variations, thereby applying Laplace's law.
order to be able to render the skewed distribution into a normal one, Gibrat assumes that the
changes are proportional not to \((x)\) but to the difference between \((x)\) and a constant \((x_0)\), which amounts to shifting origins for \((x)\).
Then

\[ z = a \log (x - x_0) + b \]

\[ a = \frac{1}{\sqrt{2} \sigma} \]

and is the Gibrat index of inequality, and \(b = \frac{Ma}{\sqrt{2} \sigma}\), where \((\sigma)\)'s are in terms of logarithms of \((x - x_0)\).

The calculation of the parameters \((a)\) and \((b)\) however, can be reduced to a simple and empirical operation, which involves plotting the percentage cumulative frequency distribution on logarithmic probability paper (See Chart III. 3). If the distribution is already lognormal, this will yield a straight line.

1. In the formula for the normal distribution

\[ z^2 = \frac{1}{2} \left( \frac{x - Ma}{\sigma} \right)^2 \]

where \(Ma\) is the mean. In this case \((x)\) is replaced by \((x - x_0)\) and \(Ma\) and \((\sigma)\) are calculated in terms of the logarithms of \((x - x_0)\).

Hence,

\[ a \log (x - x_0) + b = \frac{\log (x - x_0) - Ma}{\sqrt{2} \sigma} \]

\[ a = \frac{\log (x - x_0) - Ma - b \sqrt{2} \sigma}{\sqrt{2} \sigma \log (x - x_0)} \]

Since

\[ Ma = \frac{b}{a} \]

then

\[ a = \frac{1}{\sqrt{2} \sigma} \quad \text{and} \quad b = -\frac{Ma}{\sqrt{2} \sigma} \]
If the plotted points yield a curve, rather than a straight line, the introduction of \((x_0)\) will render the distribution lognormal. The value of \((x_0)\) is arbitrarily chosen as the minimum income. If the value arbitrarily chosen is too small, the curve will bend towards the abscissa. The correct value of \((x_0)\) is found by raising its value until a straight line is obtained.\(^1\)

This index of inequality can be applied to all cases where the law of proportionate effect applies. In order to avoid decimals and to conform with the general usage of index numbers \(\frac{100}{a} = c\) is used. The value of \((c)\) changes between zero and \(\sqrt{N - 1}\), representing perfect equality and perfect inequality respectively. The lower the value of \((c)\), the less unequal the distributions. \((a)\) is inversely related to the standard deviation in logarithmic terms, \(100/a\) varies in the same manner as does standard deviation. Gibrat's method involves two parameters \((a)\) and \((b)\), the latter being the reciprocal of the coefficient of variation and one constant \((x_0)\) both of which have an organic relationship with the given type of the distribution.

The lognormal distribution of income has given rise to considerable discussion in recent economic literature. Attempts have been made to improve the Gibrat formula and investigate the rationale behind the lognormal distributions. To give only two examples: Kalecki\(^2\) maintained that Gibrat's argument implied that whatever the distribution of income at the initial date, it would

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1. R. Gibrat, *op. cit.*, p. 71
approach normality in time. This he claimed was unrealistic, since it implied that an increase in the standard deviation of the logarithm of income would take place through time, which he did not feel was borne out by the facts. He concluded, therefore, that random changes depend on the initial level of income and modified the Gibrat curve accordingly. Kalecki added increments of income to an initial income distribution in proportion to the levels already achieved thereby deriving a lognormal distribution. On the other hand, A. D. Roy favoured the lognormal hypothesis as a means of refuting the idea that a normal distribution of abilities should yield a normal distribution of earnings. Roy argued that the output of an individual depends on a large number of random influences acting independently.

It should be stressed that the above explanations of Roy and of others are more of an interpretative nature. They seek the causes underlying the tendency of income to be lognormally distributed but do not provide a new index which would measure the degree of inequality in a given distribution.


IV. Empirico-mathematical Measures of Income Distribution.

1. Coefficients of dispersion.

Coefficients of inequality may be said to measure the departure of income distribution from a condition of absolute uniformity. But different measures emphasize different aspects of the inequality phenomenon. The dispersion coefficients are either expressed in absolute terms or in relative terms. For instance, mean difference, mean deviation, quartile deviation and standard deviation are all absolute coefficients, while relative mean difference (mean difference divided by the arithmetic mean), relative mean deviation, coefficient of variation (standard deviation divided by the arithmetic mean), variance in logarithmic terms, mean deviation in logarithmic terms and standard deviation in logarithmic terms are relative dispersion coefficients. The arithmetic mean in the formulas for relative coefficients may be said to represent the income magnitude that would prevail under equal distribution. The coefficient of variation, since it implies squares of deviations from the arithmetic mean, gives greater weight to large values than does the relative mean deviation or relative mean difference, consequently it exaggerates the degree of inequality.  

1. It is interesting to note that as early as 1909 W. M. Persons put forward coefficient of variation as a better measure of inequality than that of Pareto's (α), maintaining that "Pareto's equation can be used only to represent the distribution of those incomes which decrease in frequency as the size of income increases. Hence, it cannot be used to represent the usual distribution of wages in which the number of wage earners increase until a modal wage is obtained, and then decreases as wages increase." See W. M. Persons, "The Variability in the Distribution of Wealth and Income", Quarterly Journal of Economics, Vol. 23, 1909, pp. 419-420.
The introduction of logarithms reduces the relative weight of the larger deviations.¹ A detailed discussion of these dispersion coefficients is beyond the scope of our study. Their properties are dealt with in any textbook of statistics.

2. The Lorenz Curve and the Concentration Ratio.

The technique most commonly used to-day to indicate income inequality is the simple geometric device known as the Lorenz curve. M. O. Lorenz, in his paper published in 1905², criticized logarithmic representations, saying that "...logarithmic curves are more or less treacherous. Forgetting that they are logarithms, we are apt to think of them as absolute amounts when they are plotted." In its stead he proposed a technique which would not involve any logarithmic scale and would also represent various tendencies existing at the same time. The technique consisted of plotting along one axis the cumulated percentage of the population from poorest to richest, and along the other, the percentage of total income held by these percentages of population. If income is equally distributed, 10 per cent of population would receive 10 per cent of total income, 20 per cent of population would receive 20 per cent of income, and so on. This would give a 45° line rising from the lower left-hand corner to the upper right-hand corner of the diagram (See Chart III.4). If income were


perfectly unequally distributed, with 99 per cent of the population receiving zero income and 1 per cent of the population possessing all the income, this would be represented by the lowest curve on the diagram, i.e., the right-angled line. Any actual distribution would be intermediate between these two extremes. The closer the actual curve to the diagonal, the more equal is the income distribution said to be.

The advantage of the Lorenz curve lies in its use of the arithmetic scale rather than the logarithmic one, for in this way neither end of the distribution is obscured. Furthermore, it is independent of any mathematical formula to which the data must present a reasonably good fit. On the other hand, there is the ambiguity of having two Lorenz curves intersecting each other which makes it difficult for comparative purposes to say which income distribution represents greater inequality or equality. This ambiguity remained until Gini turned his attention to this problem.¹ He introduced a measure called the "concentration ratio" which is given by the ratio of the area between the Lorenz curve and the line of perfect equality to the area of maximum inequality which is given by the triangle under the diagonal. This measure is the mean difference between the \( n \) incomes divided by twice the arithmetic average of the \( n \)

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terms, in other words, one half of the relative mean difference.¹

A fairly reliable approximation to the concentration ratio can be obtained through the use of the formula:²

$$R = \sum \left( \frac{p_k - \bar{q}_k}{p_k - q_k - 1} \right) \times \frac{1}{10,000}$$

The relationship between the Gini formula and the Lorenz curve can be shown fairly easily and consequently the ratio of concentration can be calculated with the help of $\delta$.³ The greater $\delta$ is the larger the area between the Lorenz curve and the diagonal will be, signifying a more unequal distribution.

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1. In a population of $n$ individuals the mean difference of their incomes equals the sum of the absolute values of $n(n-1)$ differences which can be found by taking the individuals two at a time in all possible combinations and then dividing by their number. The mean difference which was proposed as a measure of dispersion, seems at first sight, to have certain advantages, or at least theoretical attraction, over the standard deviation, since it depends on the differences of values between themselves and not on the spread about some arbitrary point such as the mean or the median. However, it was pointed out that there was a direct relationship between the standard deviation and the mean difference. "Such being the case, the mean difference of Gini loses most of the theoretical attraction". See, U. Yule and K. G. Kendall, An Introduction to the Theory of Statistics, 14th edition, London 1958, pp. 146-147.

2. See D. B. Yule, op. cit., p. 428

3. If we write

$$\frac{N_x}{N} = \left( \frac{R_x}{R} \right)^\delta$$

which follows from Gini's general formula $N = R^\delta$, then

$\frac{N_x}{N}$ is the per cent of population and $\frac{R_x}{R}$ is the per cent of income;

changing our notation to $(p)$ (population) and $(q)$ (income) we have

$$\frac{p}{100} = \left( \frac{q}{100} \right)^\delta$$

(continued on page 56)
Footnote 3, continued.

This is the equation for the Lorenz curve. The area between this curve and the line of equality is given by

$$\frac{1}{2} (100)^2 = \int_0^{100} p \, dq$$

$$= \frac{1}{2} (100)^2 = \int_0^{100} \frac{q^\xi}{(100)}$$

$$= (100)^{2\frac{1}{2}} \frac{1}{(100)^\frac{1}{2}} \frac{1}{\xi + 1}$$

Therefore, the concentration ratio is equal to

$$\frac{1}{5000} \cdot (100)^2 \frac{1}{2} \frac{1}{\xi + 1}$$

V. The Method of Measurement used in this Study.

So far we have discussed some of the methods that describe an income distribution. The problem now is which of these methods should be used to summarize our data for Puerto Rico.

We first draw attention to the fact that some of these methods involve a theory of income distribution while others are simply statistical measures. As we have already pointed out in the Introduction, the aim of this study is not to test the validity of any particular income distribution theory. It is very doubtful whether any single income distribution theory can possibly comprehend the fundamentally different ways in which broad categories of income such as wages, property incomes, transfer incomes, etc. are generated in our society.

It is still argued in the literature that some of these laws describe a certain part of the income distribution but not the whole. For instance, the Pareto law gives a good approximation in the high range of incomes and the lognormal distribution in the lower ranges.\(^1\) Since we are not committed to any given law of income distribution, can we use the coefficients provided by them to indicate unequivocably the state of the distribution of income? In other words, can we take \((\alpha)\) or \((\sigma)\) or \((\delta)\) to summarize the whole distribution of income? In this respect the goodness of fit of the observed data to the theoretical curve is of utmost importance, since our aim is to use these coefficients simply as

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tools of measurement. This requires not partial fitness, but overall fitness. The larger the deviation of observed data from the formula, the less reliable is the coefficient for our purpose.

Although Pareto believed that he obtained a "good fit" in his calculations, the results are dubious.\(^1\) Even as a simple measure \((\alpha)\) does not seem to be satisfactory. On the other hand, \((\delta)\) and \((c)\) are not free from this problem either. Although the Gini formula describes the income distribution in the lower ranges better than Pareto's formula, the emphasis is still on the behaviour of the income distributions in the upper and middle income ranges. This is due to the logarithmic treatment of cumulation from high to low incomes. If the process is reversed and incomes are cumulated from the lower levels upwards, the lines closer to perfect equality would in this case represent more unequal

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1. At one time Pareto's method had many ardent followers, so much so that Sir Josiah Stamp, for instance, calculated, on the basis of this formula, what he believed to be the exact degree of tax evasion. (See J. Stamp, Wealth and Taxable Capacity, 2nd edition, London 1922). H. T. Davis sought to explain the 1789 Revolution on the basis of the departures of the income distribution from the Pareto slope of 1.5 (see H. T. Davis, The Analysis of Economic Time Series, Cowles Commission for Research in Economics, Monograph No. 6, Bloomington 1941, Chapter 9). As early as 1909, however, W. M. Persons, using the same Prussian statistics for 1892, which Pareto himself used, found an average error of 30% in the calculated and observed frequencies (see W. M. Persons, "The Variability in the Distribution of Wealth and Income", Quarterly Journal of Economics, Vol. 23, 1909, pp. 426-427). F. R. Macaulay went to the extent of arguing that the Pareto law is quite inadequate as a mathematical generalisation. After studying the income distribution in the United States between 1914-18 he found that even the tail distribution does not show linearity (see, F. R. Macaulay, op. cit., pp. 393-394). In the case of India, Shirras found no goodness of fit even in the upper income ranges which led him to discard the Pareto law in studies of income distribution (see G. F. Shirras, "The Pareto Law and the Distribution of Incomes", Economic Journal, Vol. 65, 1935, p. 681).
distribution, as opposed to the case where closeness to the perfect equality line would signify more equal distribution, if the cumulation is from top to bottom. The difficulty lies in the fact that one method emphasizes one part of the distribution, the other method the other part, and the two need not be mutually consistent.\(^1\) Therefore, \((\delta)\) gives a better fit for lower income groups or for upper income groups, depending upon the direction of cumulation, but not for both.

The fact that Gibrat’s index of inequality \((c)\) may show a better fit than for example, Pareto’s \((\alpha)\), does not make it totally acceptable either. For, if \(x_0\) is not introduced, then the upper tail of the income distribution bends and the observed data will deviate from the formula in these ranges. If \(x_0\) is introduced however, then the incomes below the amount \(x_0\) — which may be appreciable — are no longer represented, and \((c)\) in this case would depend on the particular distribution of the middle and high income brackets, rather than the distribution among all brackets.

It appears, therefore, that none of the coefficients provided by income distribution formulas provides a satisfactory measure, even if one is not committed to a particular theory of income distribution. We are, therefore, obliged to return to a more pragmatic approach, i.e., to say to a statistical measurement in which the problem of goodness of fit does not arise. Under consideration are all the measures discussed in Section IV. Absolute measures such as mean, mean difference, standard deviation and quartiles are of no use since they are not independent of changes in the money unit in which the variate

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The concentration ratio is a relative measure, possessing the same properties as mean difference and standard deviation and it is easy to manipulate. There are, however, certain disadvantages to the Lorenz curve. When a number of Lorenz curves are drawn together there is danger of obscurity in the upper and lower ends. It is also difficult to show graphically small changes in income distribution which may come about from the improvements in the position of low versus high income ranges. This disadvantage may be overcome by calculating the percentiles and the concentration ratio. It should also be kept in mind that the concept of equality used, and against which departures are measured, is simply a rationalized mathematical concept of perfect equality, where every income recipient, individual or family, possesses the same amount of income. However, the use of a rationalized concept of equality is not confined to the Lorenz curve. All measurements have a hypothetical concept of equal distribution from which deviations are measured.  

1. Attempts have been made to replace the absolute perfect equality and inequality of the Lorenz curve with some other "realistic" concepts. E.g., R. Schutz suggested the construction of a hypothetical reference curve in the Lorenz diagram, called the curve of "economic equitability" which would be below the diagonal of perfect equality. See R. Schutz, "On the Measurement of Income Inequality", American Economic Review, Vol. 41, March 1951, pp. 107 ff. Gini suggested a reference line of inequality in terms of the minimum number of individuals among whom total income may be distributed in an extreme case. See C. Gini, "Sul Massimo degli Indici di Variabilità Assoluta e sulle sue Applicazioni agli Indici di Variabilità Relativa ed al Rapporto di Concentrazione", in Memorie di Metodologia Statistica, 2nd edition, Roma 1955, pp. 578-579. Finally, we can mention
It is impossible to determine whether one method is absolutely superior to all others. The advantage of one method over any other depends upon the aims pursued. The suggestion has been made "not to rely upon the evidence of a single measure, but on the corroboration of several". 1 This suggestion, however, has proved to be not so helpful. When D. Yntema calculated the relative mean deviation, coefficient of variation, mean deviation and standard deviation (both in logarithmic terms), (\alpha ), (\delta ) and (\alpha ) for the distribution of wealth and income in Australia, United States, United Kingdom, and France for the years between 1909 and 1923, he found little uniformity in the results given by the different coefficients. 2

Another method of procedure would be to confine oneself to the isolation of major causes of inequality, without summarizing the income distribution with one single measure. 3 This method is an integral part of income size distribution

(continued from page 60)

Mendelssohn's definition of perfect inequality as a situation where half of the population has no income. See, H. Mendelssohn, "On the Measurement of the Degree of Inequality of Income Distribution", Report of the Cowles Commission 1939, p. 63. However, these suggested concepts are just as arbitrary and their superiority over the Lorenz one is very difficult to prove scientifically.


2. For instance, if Pareto's (\alpha ) is taken as the measure of inequality, family income distribution in the United States in 1910 seems to be the most equally distributed as compared to Australia and the United Kingdom. On the other hand, the coefficient of variation shows the same distribution as being the most unequal of all. See, D. Yntema, op. cit., pp. 403-431.

studies, though not sufficient. On the other hand, it is not enough to measure an income distribution, whatever the method of measurement, and leave it at that. We believe that no size distribution study is complete without a general explanation of the causes of changes in the distribution, therefore some measure must be chosen and employed together with a general explanation.

V. Conclusion.

Our choice of a single measure is determined by the desire to summarize income distributions and compare them through time. The Lorenz curve and the concentration ratio have been chosen since they do not commit us to any one of the laws of distribution; they provide a visual picture, a numerical value and they are easy to calculate. We are aware of the limitations of our chosen method, but we will try to overcome these by constructing tables showing the share of total income by deciles. The use of the Lorenz curves will enable us to compare the distribution of incomes in Puerto Rico with that of a number of countries including the United States, some of the European and some of the underdeveloped countries, as will be seen in the Conclusion. It should not be misunderstood, however, that we regard the Lorenz curve and the concentration ratio to be universal measures for all types of concentration. They may not be suitable for measuring business concentration where absolute magnitudes are of importance.  

Before we proceed to the actual measurement of the change in the inequality of incomes in Puerto Rico, we will first discuss the implications of the different definitions of income and income recipient.
CHAPTER IV.
CHAPTER IV.

IMPLICATIONS OF DIFFERENT CONCEPTS AND MEASUREMENT OF INEQUALITY.

I. Introduction.

In the previous chapter we have discussed the problem of measurement and the advantages and disadvantages of various measures of inequality. The purpose of this chapter is to examine the implications of definitions used in studies of income distribution. This will serve as an introduction to the problems encountered in dealing with the available data for Puerto Rico.

The main conceptual problem confronting any student of income distribution is that of defining income and income recipients. This is of great importance to the interpretation of the data on size distributions since the degree of inequality shown by a given distribution depends on the underlying definitions of income, recipient unit and income period. Differences between degrees of inequality observed at different points of time or at different places may be due to differences in the definitions chosen, rather than to fundamental changes in income distribution. It is very important to make a choice between possible definitions that may underly distribution data and to have a clear understanding of their implications.

The problem confronting us has two main aspects: (a) what should be the concept of income or income recipient to be used; and (b) what would be the effect of any given definition of income and of income recipient on the degree of inequality observed?
II. Concepts of Income and Income Recipient.

The concept of the aggregate income of a community is not a unique one; the word may be given different meanings by the tax authorities, by national income experts and by academics. It may be designated as "National Income", referring to payments to factors of production for services rendered in a given period, whether actually disbursed or not, or as "personal income", comprising payments which are actually disbursed to factors of production plus various kinds of business and government transfers. Personal income, therefore, excludes payments which are accrued but not disbursed, such as corporate savings.

"Disposable income" reflects the total income left to the recipient units after payment of direct taxes on personal income. Taxable income on the other hand, depending upon the legislation of the country concerned, may be wider or narrower than any of the above concepts.

Which of these concepts is relevant to a study of size distribution of income depends upon the aim of the study. For instance, if one is interested in measuring the reward for employment in different occupations, earnings before taxes would be more suitable, because income after taxes may reflect certain factors that are not related to employment. On the other hand for a study of consumer behaviour, disposable income may be a better measure, since it would correspond more closely to what the average consumer considers his income to be.

If, to take another example, one is interested in understanding and measuring the distribution of abilities to acquire income, then a distribution is necessary which encompasses all types of compensation for participation in economic activity, whether currently distributed or not. In this case, if the basic data were
presented in the form of personal incomes, adjustments would be necessary to allocate undistributed profits to the appropriate income brackets. It may be necessary for some purposes to include imputed values of the usage of parks, museums, and free hospitals, as part of income.

The second aspect of the problem concerns the effect of definitions on the degree of inequality. This largely depends upon the items that are included or excluded from the concepts of income mentioned above. Since the distribution of incomes from different sources is not identical, the degree of inequality observed in the distribution of aggregate income will vary with the content of the aggregate. For instance it may be expected that personal income distribution may be more equal than that of national income because the former excludes (while the latter includes) undistributed corporate profits which would tend to increase the share of upper income brackets. Personal income includes certain transfer payments which may be more evenly distributed and, therefore, increase the share of lower income groups. What is included in national income may differ from country to country and within the same country at different times. The inclusion or exclusion of the subsistence sector, for instance, or the method of treatment of export duties, change the content of national income, hence of personal income. Since the distribution of these items varies, their inclusion or exclusion would change the overall distribution of income.

Similar problems arise in defining the income recipient unit. Variations in the definition of the recipient unit between countries and within a country through time will lead to variations in the observed degree of overall inequality.

In our study, in which intertemporal comparisons are made, and where
definitions are not consistent throughout, sufficient knowledge is required for the manipulation and interpretation of the data. Hence, as we have already mentioned, we shall concentrate our attention on the implications of different definitions. The emphasis, therefore, of this chapter is not on what an ideal definition of income should be, or on what the differences are in the concepts of, say, national income in developed and underdeveloped countries, but rather on the impacts of given definitions on the measurement of inequality, such that consistency and comparability can be achieved in the evaluation of the data. Once the implications are clearly understood, then we can evaluate our comparative findings concerning Puerto Rico, especially since certain adjustments on the data will become necessary, for the definition in the different surveys have not been kept constant.

III. Implications of the Various Concepts.

1. Implications of the Definition of Income.

There are two main sources of information on the distribution of incomes. These are income tax returns and the surveys conducted to obtain such information from the households themselves. The income concept of the former presumably comes close to personal income, as defined in national accounts, and that of the latter is predetermined by the conductor of the survey.

(a) The definition of income in the income tax returns: Although most income tax laws recognize a minimum exemption limit and cover total income from all sources, allowing for the deduction of losses or expenses which may be incurred in the process of acquiring such income, specific items of varying importance may be included in taxable income in one country or at one time, but
excluded in another, or of the same country at a future date.

Taxable or assessed income may seem, at first sight, to be rather close to personal income. This is not usually the case, however, for data based on tax returns are subject to various shortcomings. One of the most important of these is the limited coverage of income and income recipients due to fraudulent under-reporting. There are, of course, honourable exceptions in a few countries of high fiscal morality, such as Sweden, the Netherlands and the United Kingdom. It may be argued that under-reporting is not as important as it may seem, at least in intertemporal comparisons, since the tendency of tax evasion is said to remain unchanged over time, at least in the short-run. However, this is not a realistic assumption. Should, for instance, an increase in the progressiveness of the income tax cause tax payers in upper income groups to increase the rate of evasion, this will ceteris paribus, have the result that the income distribution will tend to show more equality which does not really exist. Furthermore, different evasion intensities and tendencies reduce the reliability of inter-spatial comparisons considerably. How relevant would then a comparison of distribution in two countries be where tax returns cover different proportions of income?

Even if the tax returns were to cover the total income receiving population, there still remains the discrepancy between personal income as normally understood by national income accounts and personal income as conceived by tax authorities. In its most general form, personal income according to national income statistics

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1. It is not uncommon to find a discrepancy as great as 80 per cent for instance in personal incomes in France. See, United Nations, Economic Commission for Europe, Economic Survey of Europe in 1956, Geneva 1957, Chapter IX, pp. 2-3.
includes current earnings - both monetary and imputed - attributed to factors of production minus the undistributed corporate profits and corporate taxes plus certain transfer items made by business and government, such as pensions, interest on government bonds, etc. Taxable income, however, includes certain items in the computation of net income which the personal income according to national income statistics may exclude, such as capital gains, or contributions to social insurance. On the other hand, the taxable income concept may exclude certain items - non-money incomes, such as food consumed on farm, net rentals of owner-occupied houses, etc. - which the personal income concept includes. ¹

It is mainly in the underdeveloped countries that income in kind is relatively important, and even if there were no fraudulent under-reporting, taxable income still would not come close to personal income hence the change in the emphasis of the non-monetary sector through time may alter the composition of taxable income, causing difficulties in intertemporal comparisons.

Consequently, the inclusion or the exclusion of various items will have different effects on the distribution of income by size. The inclusion of capital gains brings the distribution towards more inequality, whereas the

inclusion of income in kind may tend to make the distribution more equal. It is worth adding at this point that perhaps the exclusion of the income in kind may not affect the dispersion as greatly as it seems. G. Garvy and S. Goldsmith point out, for instance, in the case of the United States, that since the beginning of the Second World War, high personal taxes and high corporation taxes have made compensation in kind more profitable to the corporate executive and less onerous to the corporation, since they now become business costs. If these compensations in kind were to be allocated to the corresponding income ranges, which would be mainly the upper income groups, it would be very hard to say in which direction the tendency of the change in dispersion would lie: inclusion of income in kind in lower income groups would make for greater equality, but in higher income groups it would make for greater inequality.

Last, but not least, it is worth noting that many of the income tax data for size distributions suffer from the defect that the income range covering the lowest income groups is too large to reveal the distribution in this group wherein a considerable percentage of income recipients may fall. This would make exceedingly difficult the study of the changes in the distribution in the lower incomes, and necessitate data given in small intervals.


(b) The definition of income in survey data: Survey data, as opposed to tax data, are obtained in most cases by direct interview in a door-to-door canvas of households. These surveys, if expenses and time required for the training of interviewers, are no obstacles, can be as extensive as desired and the information can be obtained with a considerable degree of accuracy. Moreover, it is likely that they will contain more detailed information on money income and income in kind than the income tax data usually reflect, and they can be designed to shed light on the lowest income groups, where income tax returns usually fail to do so.

Income concept of surveys used for studies of income distribution may come closer to the personal income concept of national accounts, than that of income tax data. A number of tax-exempt items can be included into the income concept of surveys, such as income in kind, interest on government bonds, government and business transfers, etc. The income concept of a particular survey may even be wider than the concept of personal income, for it may include capital gains, property transfers, gambling gains and losses, and gifts.

It is only fair to add here that the particular definition of income or the changes in the definition of income through time, i.e., in different surveys, is likely to bring about a difference in the degree of inequality shown by the data itself. It is likely that an addition of non-marketed net output, such as not imputed rent of owner-occupied houses, will tend to decrease the inequality that would have been shown by money income alone. However, as we have

pointed out above, income in kind, especially in the United States, has come
to play a more and more prominent role in the higher income brackets, the
impact of the inclusion of which would be to increase the inequality rather than
to reduce it. The inclusion of personal transfers, such as gifts, the exclusion
of withheld dividends and deduction of personal taxes paid - if taxes are pro-
gressive - would have a diminishing effect on income inequality. The same
effect would be brought about by the evaluation of the free services of govern-
ment and their assignment to the individuals. This, however, is a tremendously
difficult task. On the other hand, if withheld dividends or corporate savings,
business expense accounts, employee fringe benefits are added to total money
income, an increase in the degree of inequality may be expected. It should be
added at this point, that the above statements refer to the isolated cases, and
that their interacting effect on income distribution may remain obscure, unless
separate quantitative studies are made on the behaviour of each. A last point
to be added is that the distribution of income may differ not only with the
comprehensiveness of the income concept, i.e., with the numbers of non-money
items included in addition to money items, but also with the method of their

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1. The problem of the inclusion of income in kind arose recently with respect
to comparison of the degree of inequalities in the United States and in
Ceylon. The data for the former country did not include income in kind,
but the data for the latter did; this led T. Morgan to the conclusion that
the difference between the two countries were as great as he found them to
be despite the fact that incomes in kind are more equally distributed.
See, T. Morgan and D. Choudhry, "The Distribution of Income in Ceylon and
the United States", Indian Economic Journal, Vol. 6, April 1959, pp. 438-
442. However, if incomes in kind of the upper income groups in the
United States had been included, the difference might have been less.

2. See S. F. Goldsmith, "The Relation of Census Income Distribution Statistics
to Other Income Data", National Bureau of Economic Research, Studies in
Income and Wealth, Vol. 23, p. 65 and the discussion of the same article
by R. J. Lampman, in the same volume, p. 115.
evaluation in money terms, for the higher the money values attached to them the less unequal the distribution of total income, since home production for home consumption, benefits in kind provided by government, such as free education, parks, museums, open air concerts, etc., may be assumed to be fairly equally distributed among the income recipients.  

2. **Implication of the definition of the Recipient Unit.**

The interpretation of income size distributions depends not only on the scope of the income concept, but also on the recipient unit, which again varies with the purpose of the study undertaken. If the interest of the study lies mainly on the effects of the changes in the current accrual of purchasing power, the family may be the more appropriate unit, since it is more significant unit of economic need and since some types of income flow not to individuals, but to family units, and its disposition is mainly through the family. On the other hand, when the focus is on the distribution of productive earnings capacity and direct relationship with the machinery of distribution, the individual may be a more suitable unit. It should be borne in mind, however, that an income distribution with the individual as the recipient unit has at least two more implications. In short-run comparisons the measure of inequality will vary with the inclusion or exclusion of the unemployed and the level of employment through time. In the long-run the changes in the age, sex composition of the labour force will introduce systematic changes in the meaning of inequality.

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Except for the fortunate ones in this field who are able to design and conduct their own surveys and hence define the recipient unit as well as the income concept in the way most suitable for their aim, many students of income distribution will find the definitions already set up and given. Consequently, if the available data are mainly based on income tax returns, the income recipient will either be individuals or couples, i.e., in a great many instances the units are persons liable to income tax, in other words all persons above a certain age limit excluding the married women who are taxed with their husbands, except in those countries where husband and wife may file separate returns. In surveys of consumer behaviour the usual unit is the household.

(a) The Meaning of Household: The household is an abstract term. Who forms a household? Who are its members? Biological families vary greatly in size and constitution. Are we then to take all blood relations living under one roof, or just the husband and wife and their dependents? Is, for instance, a grandfather with an independent but meagre income of his own sharing living expenses part of the family? He may or may not be depending on expenditures that fall within the scope of the study and it may not be stated how much grandfather contributes to these expenses.

Furthermore, the composition of the family is not rigid; it varies in the short-run with the level of business activity and in the long-run, especially in developing countries, with economic and social changes. It appears that families with low or no income disappear in depressions by merging with others and augment in prosperity by splitting into separate households.¹ In the long-run two important changes appear:

¹ See, D. S. Brady, op. cit., p. 11.
The first is the change in the fundamental structure and size of the family. The process of economic growth, especially in developing countries, is accompanied in the social sphere by a breaking away of the newly formed families from the existing large households. The movement to urban areas and the mobility created by greater economic opportunities induce a greater number of families to maintain separate households which was not possible for them before.

The second is the change in the scope of the responsibility for dependents through time. Although fundamentally our society obliges a man to care for his wife and other dependents, the scope of the dependency has not remained constant; within a given society it has varied through time. Responsibility for the care of minor children, the aged and the disabled has been gradually shifting from the individual to the society. Therefore, comparisons will have to take into consideration not only the effects of economic fluctuations on the family, but also the implications of the introduction of free education and the provisions for the aged, the disabled, etc.

(b) The meaning of Household and the degree of inequality: Different definitions of family underlying income distribution data at two different dates or in two different countries would no doubt affect the measurement of inequality. If family is taken in a large sense, or if distribution data refer to one depressed and one full employment year, and finally if the period over which the

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degree of inequality is measured is so long as to allow for structural changes in family and its scope of responsibility, the changes in the coefficient of inequality, other things being equal, may be attributed to the change in the recipient unit underlying the data. For instance, if family is taken in a large sense to include all the relations living under the same roof, this will reduce the degree of inequality; for a greater number of bread-winners will be grouped together in the same recipient unit, thus raising the levels of family incomes and reducing the weight of lower incomes, and vice versa. Again, if low income families merge in depression and undouble in prosperity, the degree of inequality in the depression may be calculated to be less, *ceteris paribus*, for the reason that families at the bottom of the income scale have disappeared, and vice versa. Similarly, comparison of periods before and after the introduction of social provisions should show, other things being equal, a decrease in inequality of incomes.

Comparisons of degree of inequality over time and space, therefore, have to take into account the composition of the recipient unit and its change over time before coming to a definite conclusion on the changes of or the differences in these degrees.¹

IV. Further Considerations.

In addition to the difficulties caused by variations in the concept of income and income recipient, there are other problems which we shall consider very briefly.

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¹ The income recipient concept, for instance, in the distribution study of the Indian Tax Administration, includes partly undivided Hindu families, i.e., a number of families living in the same household, which gives a degree of inequality which is less than what actually prevails and makes comparisons rather difficult. See, Indian Ministry Finance, Department of Economic Affairs, "Shifts in the Income Distribution among Individuals Assessed to Income Tax 1953-54 to 1958-59", in Special Supplement to Economic Review (mimeographed).
First of all there is the consideration of the time period in which incomes are assumed to originate. In a great many instances size distribution studies choose the time period as one year. If this period had been longer than a year, it is likely that relative income differences would have been smaller. The relative position of income units along the income scale tends to change to some extent from year to year. For instance, certain temporary factors, such as extraordinary business gains or losses, sickness and voluntary and involuntary unemployment tend to cancel each other when incomes received over several years are combined. Thus, provided that relative distribution in consecutive years was similar, combined distribution would show less concentration than if the income period had been defined as one year.¹ Consequently, the longer the income period, the more equal incomes would tend to appear.

Consideration should also be given to the fact that the existence of part-time earners and part-period principal earners may alter the distribution pattern by increasing the share of the lower end of an income distribution.

The economic and social significance of part-period (principal) workers is different from that of part-time workers. Obviously, $500 earned by a young man during the balance of the year on his first full-time job belongs in a different category from the same amount representing the annual income of a family head who was only able to obtain part-time employment.²


The time at which the survey is conducted can also influence the results obtained. Obviously a comparison between a depressed year and one of prosperity will indicate a great decline in inequality merely due to the rise in the level of employment. This is a perfectly legitimate comparison if the specific purpose is to compare the distribution of income in two economically different conditions. For the study of long-term trends in income distribution, however, it is essential for the years compared to have similar economic conditions.

Since many of the surveys are based on samples rather than on a complete enumeration of the population, hence they are subject to sampling variability and errors. Furthermore, the responses of interviewers to questions asked by the interviewer may have certain inaccuracies. Memory, on the basis of which the income amount is reported, may be faulty and minor or irregular sources of income may not be mentioned, leading to under-estimation of the level of income. Deliberate mis-statements may be made or errors may arise from lack of knowledge, from a misunderstanding of the questions, or from any bias that may exist in the questions themselves.

V. Summary of Part I.

With the discussion of the implications of different definitions of income recipient we conclude the first part of our study which constitutes the framework within which the case of Puerto Rico will be examined. So far we have considered

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1. Two surveys conducted in two different countries refer to the same problem. See, H. Miller, op. cit., and H. F. Lydall, "National Survey of Personal Incomes and Savings", Bulletin of the Oxford University Institute of Statistics, Vol. 15, February-March 1953, pp. 35-84. In the 1933 survey of thirty-three cities in the United States on which the study "Changes in Income Distribution During the Great Depression", National Bureau of Economic Research, Studies in Income and Wealth, Vol. 7, New York 1946, by H. Mendershausen is based, the interviewees were also asked on their 1929 incomes, whereby the 1929 income distribution was obtained, this problem is of greater importance, due to the elapse of four years.
the effects of economic development on the economic and social structure of a country and thereby on the distribution of incomes. We have explained our method of analysis and given our reasons for using the Lorenz curve and the concentration ratio for the measurement of the changes in the degree of inequality. Finally, in this chapter we have discussed the conceptual problems arising out of definitions of income and income recipient. It remains to be seen how and to what extent the economic growth observed in Puerto Rico during approximately the last two decades has changed the pattern of the distribution of incomes, to which we now turn our attention.
PART TWO.
CHAPTER V.
CHAPTER V.
ECONOMIC DEVELOPMENT AND INCOME INEQUALITY IN PUERTO RICO.

The main concern of this chapter is to investigate the changes in the socio-economic conditions of Puerto Rico as a result of its economic growth since the beginning of the forties and to evaluate with the help of the theoretical framework obtained in Chapter II, in which direction they would influence the income distribution. The quantitative measurement of the degree of inequality will follow in the next chapter. We shall begin by giving a brief description of the background of the Puerto Rican Economy. An analysis of the different forces at work will then be given, following the sequence of Chapter II. We conclude the chapter with a summary, where we examine the likely effects of the changing conditions on economic distribution.

I. Introductory Remarks on the Puerto Rican Economy.

Puerto Rico is a densely populated island, the smallest of the larger Antilles. It is roughly 100 miles long and 35 miles wide. It has a population of approximately 2.3 millions. It is mainly a sub-tropical country, originally settled by Spaniards as a colony, remaining as such until 1898\(^1\), when the Treaty of Paris was concluded, ending the Spanish-American War, and making Puerto Rico a United States possession. Its importance for Spain was mainly military, and the major purpose for the acquisition by the United States was also a military one.

\(^1\) For a detailed history of Puerto Rico during the Spanish era see: Ifilgo Abbad y Lasierra, Historia Geográfica Civil y Natural de la Isla de San Juan Bautista de Puerto Rico, Puerto Rico 1866, and Salvador Brau, Historia de Puerto Rico, New York 1914.
To-day, politically and economically, Puerto Rico is part of the United States. It was administered as a territory until 1950 when its status was changed to that of a Commonwealth (Estado Libre Asociado). As such it is self-governing in all domestic matters. The island is exempt from federal taxes on the principle of "no taxation without representation". However, it is an integral part of the United States economy; it shares the American currency, it is within the United States tariff boundaries and there are no barriers to the movement of either goods or people between the mainland and the island. It is subject to federal laws and benefits, therefore federal subsidies and assistance programmes are granted to Puerto Rico in the same way that they are granted to various states of the Union.

Until the beginning of the Second World War, Puerto Rico was a typical Caribbean country, agriculture was the leading activity, sugar cane, and coffee to a lesser extent, being the main cash crops. Poverty was very common, birth and death rates were very high, malnutrition and over-crowding were widespread. Public health facilities were quite inadequate, tuberculosis and similar diseases were consequently quite pronounced. The rate of illiteracy was high; and in all aspects Puerto Rico was an underdeveloped country. However, the picture is quite different to-day. Puerto Rico is in the process of a fundamental and rapid economic and social change. As Mrs. Ursula Hicks has said, "the envious eyes of many developing countries are turned towards the small Commonwealth of Puerto Rico", for it is one of the few countries where democracy and economic


development are successfully combined. Within the last decade the economy of Puerto Rico has changed from a predominantly agricultural into a semi-agricultural country.¹ Employment in agriculture and in handicrafts, such as home needlework, has declined rapidly, at the same time that the manufacture of modern products, such as electronic components and petrochemicals have increased greatly.

Between 1947 and 1957 national income² approximately doubled in nominal terms and rose by 66 per cent at 1947 prices, raising real per capita income by 54 per cent. Public health and educational facilities have been greatly expanded, living standards have advanced, and the death rate has fallen considerably - though the birth rate has remained fairly high. The lowest ever recorded was in 1957, being 2.5 per thousand.

II. Economic Development in Puerto Rico.

The economic development in Puerto Rico in general has been dealt with in a number of studies. Our aim is not to give a history or a description of this development. We explain in the following pages the changes that have come about as a result of development and which we believe have contributed to a more equal distribution of income in the island between 1940 and 1957.

Rising per capita incomes as well as reduced unemployment have been the major goals of Puerto Rico's drive for economic development. During the period

¹. United Nations publications designate as semi-agricultural those countries where manufacturing industries contribute up to 50 per cent more than agriculture (a ratio of 1:1½).

². Throughout the study our references will be to national income rather than gross national product although the latter may be considered a better indicator of the aggregate output of an economy. However, our choice of national income as an indicator is forced upon us by the fact that no gross national product figures are available for the years previous to 1947.
from 1930 to the outbreak of World War II the increase in national income was gradual. Dudley Smith's estimates of national income for the pre-war decade give the figure of 189 million dollars for the year 1930 in current prices.¹

The decrease between 1930 and 1935 was pronounced. In 1933 national income fell to 140 million dollars and then rose very gradually to 199 million dollars in 1936, when the application of the Federal Emergency Programmes was extended to Puerto Rico. Coupled with the emergency programmes of the insular government, national income continued to rise at a faster rate reaching the level of 271 million dollars in 1941, when wartime conditions gave considerable impetus to the rate of growth due to public as well as private investments. The greater part of this impetus came from Federal Government expenditures on armed forces, payments to civilian workers for the construction of military bases and highways, etc. Federal expenditures rose from 20 million dollars in 1940 to 136.9 million dollars in 1945.² Other factors that contributed to the growth of national income during this period were the rise in the price of sugar and its by-products, such as rum and alcohol.³ Furthermore, manufacturing activities expanded mainly due to the lack of goods from mainland factories.

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³ From 1940 to 1947 the price of sugar rose from 2 cents per pound to 5 cents per pound and about 7 million tons of sugar were produced, causing an inflow of 443 million dollars. See U.S. Bureau of Census, *Statistical Abstract of United States*, 1956, p. 333.
There was a decline in the rate of increase in aggregate output at the end of the War. National income rose by only 12 million dollars from 1945 to 1946 in contrast to 76 million dollars between 1944 and 1945. In 1947 the government of Puerto Rico revised its development programme (under the code name "Operation Bootstrap") which had begun modestly in 1940, shifting the emphasis from unsuccessfully operated government factories to the promotion of private industry. It was felt that as government resources were limited, each scarce government dollar could increase growth more if used to attract private investment through special incentives. Secondly, it was realized that given the low level of per capita income, domestic private savings were too small for the desired level of investment.

The main emphasis, therefore, was placed on governmental inducements to attract mainland entrepreneurs with their capital, technological skills and market connections.

1. Federal expenditures fell from 136.9 million dollars in 1945 to 111.4 million dollars in 1946 and 58.1 million dollars in 1947.

2. These were: cement, bottles, paper, glass and box factories. See, T. Moscoso, Industrial Development in Puerto Rico, Economic Development Administration, San Juan 1953, p. 3 ff.

3. These incentives are: tax exemption for ten years for the newly established manufacturing firms, and the provision of overhead facilities, such as building and leasing plants to private manufacturers and reimbursement up to 50 per cent of the cost of imported machinery to Puerto Rico, payment of the salaries of the technicians imported from the United States by the private firms to train the local labour. See, L. S. Descartes, Financing Economic Development in Puerto Rico, San Juan 1950, p. 4 ff. For a detailed discussion of the tax exemption programme in Puerto Rico, especially with reference to administrative problems, see M. Taylor, Industrial Tax Exemption in Puerto Rico, Madison 1957.

4. See, E. Macooby and F. Fielder, Savings Among Upper Income Families in Puerto Rico, Rio Piedras 1953, especially Chapter IV.
The effect of these inducements can be seen in the fact that foreign investment increased five-fold between 1947 and 1955 while domestic investment only doubled.

As shown in Table V.1 the national income of Puerto Rico in 1957 was 1.014 million dollars in current prices and 552.3 million dollars in 1940 prices, representing a real increase of 142 per cent, which is equivalent to an annual increase of 5.3 per cent at the compound rate.

Table V.1

<table>
<thead>
<tr>
<th>Year</th>
<th>In current prices</th>
<th>In 1940 prices</th>
<th>Index of real growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>227.8</td>
<td>227.8</td>
<td>100</td>
</tr>
<tr>
<td>1947</td>
<td>545.6</td>
<td>346.8</td>
<td>152.2</td>
</tr>
<tr>
<td>1957</td>
<td>1014.2</td>
<td>552.3</td>
<td>242.4</td>
</tr>
</tbody>
</table>

Note: For consecutive years between 1930 and 1958, see Appendix, Tables A.2 and A.3.


1957 - Puerto Rico, Junta de Planificación, Anuario Estadístico 1958.

The corresponding annual real per capita increase was 4.1 per cent during this period. The growth in per capita national income was slower than that of total national income; it rose from 123 dollars in 1940 to 446 dollars in 1957 in current prices, representing an increase of 93 per cent. This slower rate of increase was due to the growth in population as a result of falling death
rates and high birth rates.\footnote{In 1957 the birth rate was 32.5 per thousand, the lowest ever recorded, and the death rate was 7 per thousand. The situation would have been much worse but for the average annual emigration to the United States of 41,500 between 1947 and 1957. See, C. Senior, "Migration and Puerto Rico's Population Problem", The Annals, January 1953, and R. Hayn, "Puerto Rico's Economic Growth", Inter-American Affairs, Vol. 12, 1958, p. 66.}

**Table V.2**

*Per capita National Income in Puerto Rico, 1940-1957.*

(dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>In current prices</th>
<th>In 1940 prices</th>
<th>Index of real growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>123</td>
<td>123</td>
<td>100</td>
</tr>
<tr>
<td>1947</td>
<td>254</td>
<td>161</td>
<td>131</td>
</tr>
<tr>
<td>1957</td>
<td>446</td>
<td>243</td>
<td>198</td>
</tr>
</tbody>
</table>

As we have already explained above, the rise in *per capita* output is not an indicator in itself of the changes that take place in income distribution. We must investigate the changes in the Puerto Rican economic and social life to discover what impact economic growth has on income distribution.

III. *Factors Affecting the Distribution of Income in Puerto Rico.*

1. **Structural Shifts in the Economy.**

The relative contribution of each industry to the total product serves as an indicator of the structure of an economy, and the changes in sector shares acts as a measure of the degree and direction of change. Falling shares in the total product, however, do not necessarily indicate an absolute decline, but may merely represent a slower rate of growth.
Chart V.1
National Income at Current and 1940 Prices
(ratio scale)

Million Dollars

at current prices

at 1940 prices

1930  1935  1940  1945  1950  1955
Chart V.2
National Income per head at Current and 1940 Prices
(ratio scale)
Chart V.3
Indexes of Growth of National Income and National Income per head,
at 1940 prices
(Index 1940=100)

(ratio scale)
One indicator which reveals the structural changes caused by industrialization, it has been argued, is the growth of service-producing industries relative to commodity-producing industries. 1 This has not proved to be universally applicable. There is no necessary correlation between economic growth and a rise in the importance of tertiary industries as is shown by the experiences of certain European countries 2 and of Puerto Rico. The reason may be that the service group contains a number of heterogeneous items, such as domestic service, transport, entertainment, wholesale and retail distribution, education, public administration, etc., some of which are not closely associated with the level of economic development. 3 Table V.3 shows the share of various industries in the net income of Puerto Rico in 1940, 1947 and 1955. Service industries, including government, have risen in importance from 57.5 per cent in 1940 to 63.8 per cent in 1955, which is approximately a 10 per cent increase. However, if government is excluded, it is found that the share of service industries has not changed at all during this period. It would seem, therefore, that the composition of the commodity-producing sector would offer a better basis for examining structural changes. Using this, a considerable shift can be observed in the economic structure of Puerto Rico after the introduction of the economic development programme.

1. "Studying economic progress in relation to the economic structure of different countries, we find a very firmly established generalization that a high average level of real income per head is always associated with a high proportion of the working population engaged in tertiary industries .... Low real income per head is always associated with a low proportion of the working population engaged in tertiary production and a high percentage in primary production". C. Clark, Conditions of Economic Progress, London 1951, pp. 6 - 7.


Table V.3
(per cent of national income)

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Manufacturing and Construction</th>
<th>Services</th>
<th>Government Insular and Federal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>31.0</td>
<td>12.7</td>
<td>39.4</td>
<td>18.5</td>
</tr>
<tr>
<td>1947</td>
<td>26.0</td>
<td>19.2</td>
<td>37.2</td>
<td>19.7</td>
</tr>
<tr>
<td>1955</td>
<td>17.5</td>
<td>21.2</td>
<td>39.9</td>
<td>23.7</td>
</tr>
</tbody>
</table>

Note: For consecutive years between 1940 and 1958 see Appendix, Table A.6


(a) Shift from Agriculture to Industry.

Before the Second World War the economy of Puerto Rico was similar to that of most underdeveloped areas of the world. Agriculture accounted for 31 per cent of the total net income, divided about half and half between the growing of sugar cane and other crops. Only 12.7 per cent was contributed by manufacturing and construction, 4.1 per cent of which came from sugar milling and refining, a branch of manufacturing typically carried on in rural areas and closely related to agriculture. The developments of the next seventeen years brought Puerto Rico well on the way towards becoming an industrialized country. The net income arising in agriculture fell to 17.5 per cent, though absolutely it rose from 70.5 million dollars to 155 million dollars. The contribution of sugar cane growing fell to 7.1 per cent. On the other hand, the share of manufacturing and
construction rose to 21.2 per cent.

(b) **Employment in Different Sectors and Rise in Productivity.**

The structural change is also reflected by the shifts in employment in different sectors. In 1940, 42.5 per cent of total employment arose in agriculture, 22.2 per cent in manufacturing, mining and construction, 31.0 per cent in services (not including government) and 4.6 per cent in government. The corresponding figures for 1957 are 27.4, 25.6, 36.7 and 10.3 per cent respectively. In other words, the decline in agriculture of 15 percentage points was absorbed by mining, manufacturing and construction (an increase of 3.5 percentage points) and by services and government (an increase of 11.5 percentage points). This shift has also been accompanied by an increase in per capita labour income and in productivity in these four sectors.  

**Table V.4**

**Employment in various sectors of the Puerto Rican Economy, 1940-1957.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Manufacturing, Mining and Construction</th>
<th>Services</th>
<th>Government</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>212,000</td>
<td>111,000</td>
<td>155,000</td>
<td>23,000</td>
<td>501,000</td>
</tr>
<tr>
<td>1947</td>
<td>216,000</td>
<td>138,000</td>
<td>193,000</td>
<td>41,000</td>
<td>588,000</td>
</tr>
<tr>
<td>1955</td>
<td>161,000</td>
<td>137,000</td>
<td>205,000</td>
<td>55,000</td>
<td>558,000</td>
</tr>
<tr>
<td>1957</td>
<td>151,000</td>
<td>141,000</td>
<td>202,000</td>
<td>57,000</td>
<td>551,000</td>
</tr>
</tbody>
</table>


Puerto Rico, Junta de Planificación, *Anuario Estadístico*, 1958, p. 64

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1. In the calculations which follow no attempt has been made to allow for changes in the length of the working week or for different degrees of utilisation of labour resources in different sectors, i.e., no allowance has been made for those under-employed, fully employed or for over-time.
### Table V.5

**Per Capita Compensation of Employees in Different Sectors in Puerto Rico, 1940, 1947 and 1955. (dollars)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Manufacturing, Mining and Construction</th>
<th>Services</th>
<th>Government Insular and Federal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>124</td>
<td>191</td>
<td>223</td>
<td>1830</td>
</tr>
<tr>
<td>1947</td>
<td>290</td>
<td>491</td>
<td>503</td>
<td>2624</td>
</tr>
<tr>
<td>1955</td>
<td>432</td>
<td>930</td>
<td>894</td>
<td>4021</td>
</tr>
</tbody>
</table>

**Source:** Puerto Rico, Junta de Planificación, Net Income and Gross Product of Puerto Rico 1940, 1947-1955.

### Table V.6

**Productivity in Different Sectors in Puerto Rico 1940, 1947, 1955 and 1957. (dollars)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Manufacturing, Mining and Construction</th>
<th>Services</th>
<th>Manufacturing Alone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>382</td>
<td>261</td>
<td>580</td>
<td>280</td>
</tr>
<tr>
<td>1947</td>
<td>660</td>
<td>755</td>
<td>1052</td>
<td>541</td>
</tr>
<tr>
<td>1955</td>
<td>1008</td>
<td>1482</td>
<td>1800</td>
<td>1655</td>
</tr>
<tr>
<td>1957</td>
<td>1013</td>
<td>1834</td>
<td>2134</td>
<td>2140</td>
</tr>
</tbody>
</table>

**Source:** Same as Table V; and Puerto Rico, Junta de Planificación, Anuario Estadístico 1949-50.
Table V.5 is obtained by dividing the total wage and salary bill of each sector by the number of employees, and Table V.6 by dividing the net output of each sector by the number of employees. As can be seen from these tables, per capita labour income (in current prices) increased 3.5-fold in agriculture, as opposed to almost 5-fold in manufacturing and construction, 4-fold in services and a little more than two-fold in government. There was a productivity increase of 205 per cent in agriculture, 605 per cent in manufacturing, mining, and construction (664 per cent in manufacturing alone) and 267 per cent in the services.

The Planning Board of Puerto Rico have tried to estimate statistically the effects of the increase in the output per man-hour on the growth of aggregate output between 1940 and 1954. To do this, net income per employed person in 1940 was calculated for each industry. These values were then adjusted to 1954 price levels, and multiplied by the number of workers in the respective industry in 1954. This gave them what the 1954 net income would have been, given the industrial distribution of 1954, but assuming no change in productivity.¹

On the basis of these calculations it was found that the real increase in productivity in the manufacturing sector was 210 per cent between these two years as opposed to 70% in agriculture and 81% in the services, not including insular and federal government.

The chief explanation for the rise in productivity has been the higher degree of capitalization within industry, together with better management, improved

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education and training of employees. These latter factors cannot be measured statistically. However, we can indicate the growth of gross investment expenditures, which amounted to 18.1 million dollars during 1940 and 46.3 million dollars in 1947 and 218.9 million dollars in 1955. We should add that increasing investment expenditures are mainly due to the importation of United States capital. In fact, in 1955 approximately 5/6 of total private gross domestic investment was financed out of external capital.

To summarize, we can say that economic development in Puerto Rico has been accompanied by marked changes in the kind of work people do, rather than in an increase in the total number employed. As is shown from Table V.4, total employment was relatively constant whereas there was a considerable shift from agriculture to non-agriculture. Over half of those employed in agriculture were paid labourers. In 1956, about 60 per cent were employees, 30 per cent were self-employed, and about 10 per cent were unpaid family workers. Since 1947, all three groups have declined in number, but probably for different reasons. The decrease in the number of self-employed and unpaid family workers probably reflects the decline of subsistence, or semi-subsistence agriculture. Many of these workers accept casual employment from other farmers to supplement the income they derive from their own holdings. There has been a decline in the number of self-employed and unpaid family workers in non-agricultural pursuits.

2. Changes in Factor Shares.

We have pointed out in Chapter II that the relative changes in the shares received by the different factors of production may indicate the direction of shifts in the size distribution of income. This is so because the income received
by employees corresponds roughly to the lower income groups in the size distribution while the share going to capital and property corresponds to the upper income groups. The figures for the relative shares accruing to different factors in Puerto Rico between 1940 and 1957 show a definite increase in the share of labour incomes and a decline in the share going to profits, rents and interest.

Table V.7

<table>
<thead>
<tr>
<th>Year</th>
<th>Compensation of employees</th>
<th>Net private profit</th>
<th>Rent</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>54.0</td>
<td>32.7</td>
<td>8.8</td>
<td>4.0</td>
</tr>
<tr>
<td>1947</td>
<td>61.5</td>
<td>32.6</td>
<td>4.5</td>
<td>1.2</td>
</tr>
<tr>
<td>1955</td>
<td>66.6</td>
<td>26.2</td>
<td>5.4</td>
<td>1.1</td>
</tr>
<tr>
<td>1957</td>
<td>67.0</td>
<td>26.1</td>
<td>5.4</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Note 1: Totals do not necessarily add up to 100 because profits of government enterprises are not included.

Note 2: For consecutive years between 1940 and 1958, see Appendix, Table A.8

Source: 1940 - Puerto Rico, Bureau of the Budget, The Net Income of the Puerto Rican Economy, San Juan 1949;

Table V.7 shows the steady increase in the share of labour incomes from 54 per cent in 1940 to 67 per cent in 1957. It has remained constant at approximately
this latter percentage during 1953-1958. On the other hand, the share of profits declined by 6.6 percentage points. A considerable decline is observed in rent and interest, the former from 8.8 per cent to 5.4 per cent, and the latter from 4.0 to 1.3 per cent.

This is the general picture. An analysis of the distributive shares by industries shows a somewhat different pattern and indicates the importance that government expenditures exert on the overall distribution of income, especially during the Second World War. The considerable increases in Insular and Federal Government expenditures has already been pointed out. If the government is excluded from total national income, i.e., if only private net incomes are considered, the share pattern for different factors of production shows that factors in some industries have gained more than others. If sectors are considered separately the appreciable decline in rent and interest can be still observed. On the other hand, profits and compensation of employees appear to have been stable. Labour income in agriculture increased from 37.3 per cent to 42.8 per cent, profits remained stable (55.1 per cent in 1940; 54.3 per cent in 1955) while rent and interest declined from 7.6 per cent to 2.9 per cent. In manufacturing, mining and construction, the labour share declined between 1940 and 1947 from 73.2 per cent to 64.5 per cent and rose slightly to 66 per cent in 1955, coming very close to the overall average. Rent and interest, following the overall pattern, declined considerably. In the service sector, compensation of employees increased by 11.1 percentage points, while profits fell by 2.5 percentage points and rent and interest were almost reduced by one-half.

The overall pattern of distribution of income may be misleading, for the war
### Table V.3

**Compensation of Employees according to Sectors as per cent of Private National Income**

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Manufacturing, Mining Construction</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>37.3</td>
<td>73.2</td>
<td>38.5</td>
</tr>
<tr>
<td>1947</td>
<td>43.8</td>
<td>64.5</td>
<td>47.8</td>
</tr>
<tr>
<td>1955</td>
<td>42.8</td>
<td>66.0</td>
<td>49.6</td>
</tr>
</tbody>
</table>

### Table V.9

**Net Profits according to Sectors as per cent of Private National Income**

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Manufacturing, Mining Construction</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>55.1</td>
<td>23.7</td>
<td>36.0</td>
</tr>
<tr>
<td>1947</td>
<td>54.6</td>
<td>35.3</td>
<td>33.8</td>
</tr>
<tr>
<td>1955</td>
<td>54.3</td>
<td>33.3</td>
<td>33.5</td>
</tr>
</tbody>
</table>

### Table V.10

**Rent and Interest according to Sectors as per cent of Private National Income**

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Manufacturing, Mining Construction</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>7.6</td>
<td>3.0</td>
<td>25.4</td>
</tr>
<tr>
<td>1947</td>
<td>1.5</td>
<td>0.2</td>
<td>13.3</td>
</tr>
<tr>
<td>1955</td>
<td>2.9</td>
<td>0.7</td>
<td>16.8</td>
</tr>
</tbody>
</table>

**Note:** For consecutive years between 1940 and 1955, see Appendix, Table A.9.

**Source:** For Tables V.3, V.9 and V.10: Puerto Rico, Junta de Planificación, Net Income and Gross Product of Puerto Rico, 1940 and 1947-1955.
period deserves special attention, especially in the manufacturing sector, where net profits of business enterprises rose from 23.7 per cent in 1940 to 43.5 per cent in 1944. The reason for this is that distilling and bottling of spirituous liquors enjoyed a tremendous boom as a result of an expansion of exports to the United States. In fact, profits in this sector rose by approximately 1100 per cent. It appears, therefore, that the wartime operation of Puerto Rico's private economy have tended to increase the concentration of income. Towards the end of 1944 the tendency was reversed as wages were allowed to rise. During the period of 1947 to 1957 the share of profits in the overall functional distribution fell from 32.6 per cent to 26.1 per cent, while that of labour income rose from 61.5 to 67.0 per cent.

By comparing the share going to labour calculated as a percentage of private national income, with the same share calculated as a percentage of aggregate (private plus public) national income, we get some indication of the impact of government activities on the distribution of income. In 1940 labour's share was only 43.6% of private national income but 54.5% of aggregate income. The figures for 1947 and 1957 are 52.1 and 61.5, 58.2 and 67.0 respectively.

To what extent is the rise in the share of labour incomes due to a rise in the number of wage and salary earners in total occupied population? Table V, 11 column 1, shows the percentage of wage and salary earners in the total occupied population, column 2 their respective shares in national income, and column 3, the ratio between the two which gives the percentage by which the income per head of the factor group concerned exceeds or falls short of the national income per head.

of the occupied labour force. It can be seen that the share of labour incomes has risen from 54.0 per cent in 1940 to 67.1 per cent in 1958, while the proportion of wage and salary earners declined from 75.3 per cent to 72.5 per cent.

Table V.11


<table>
<thead>
<tr>
<th>Year</th>
<th>Number as % of Occupied Population</th>
<th>Income as % of National Income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>1940</td>
<td>75.3</td>
<td>54.0</td>
</tr>
<tr>
<td>1946</td>
<td>70.1</td>
<td>61.9</td>
</tr>
<tr>
<td>1952</td>
<td>71.5</td>
<td>64.9</td>
</tr>
<tr>
<td>1958</td>
<td>72.5</td>
<td>67.1</td>
</tr>
</tbody>
</table>

Source: 1946 - Puerto Rico, Junta de Planificación, Anuario Estadístico 1949-50;
1952 - Puerto Rico, Departamento del Trabajo, Resumen de la Situación de empleo en Puerto Rico, 1950-1956;
1958 - Puerto Rico, Departamento del Trabajo, Unpublished data.

A comparison of 1946 with 1958 shows that the share of labour income has risen from 61.9 per cent in 1946 to 67.1 per cent in 1958, i.e., by about 8 per cent, while the proportion of wage and salary earners has risen from 70.1 per cent to 72.5 per cent, i.e., by about 3 per cent. In other words, the income per head of wage and salary earners has increased more than national income per head of occupied population (see Chart V.4).
Chart V.4
Relation of Wage Share in National Income to Wage Earners
1940 - 1958
Despite the growth of manufacturing in Puerto Rico between 1947 and 1957, the volume of reported unemployment changed only slightly: 10.7 per cent of the total labour force was unemployed in 1947 and 13.0 per cent in 1957. In addition, Puerto Rico still suffers from that chronic malady of underdeveloped countries; namely underemployment and involuntary part-time work which is at least as important a cause of low family income as unemployment, although there was a slight relief since under-employment declined from 22 per cent in 1947 to 17 per cent in 1956.

Unemployment and under-employment show different characteristics in different sectors of the economy. The construction industry has the highest proportion of unemployed workers. Since 1947 average unemployment fluctuated around 25 per cent. Unemployment is also high in agriculture, showing a seasonal pattern. During the months of February to June, when sugar cane is harvested, unemployment in agriculture is the lowest of any industry. On the other hand, during the off-season, unemployment is much higher in agriculture than in other industries. Manufacturing also shows a high rate of unemployment. Government employment, as

---

1. We should mention in this connection without passing any judgment, the way in which underemployment is defined by the Department of Labour. Underemployed persons are classified as: (a) subsistence farmers, i.e., farmers who consume most of their output; (b) wage and salary workers who work less than 35 hours a week because they could not get work although they wanted to work more; and (c) self-employed persons and unpaid family workers who looked for work.

Table V.12
Average Annual Unemployment Rates by Industry, 1947 to 1956

Under-employment Rates by Industry, 1955

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Unemployed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Unemployed</strong></td>
</tr>
<tr>
<td>Total</td>
<td>11.7</td>
<td>13.2</td>
<td>13.9</td>
<td>14.3</td>
<td>12.7</td>
<td>20</td>
<td>11.9</td>
<td>13.2</td>
<td>12.0</td>
<td>10.1</td>
<td>7</td>
</tr>
<tr>
<td>Agriculture</td>
<td>9.2</td>
<td>12.0</td>
<td>15.8</td>
<td>16.7</td>
<td>14.5</td>
<td>35</td>
<td>12.4</td>
<td>8.1</td>
<td>6.8</td>
<td>8.6</td>
<td>b/</td>
</tr>
<tr>
<td>Non-agriculture, total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Under-employed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>13.7</td>
<td>14.2</td>
<td>12.5</td>
<td>12.7</td>
<td>11.6</td>
<td>10</td>
<td>9.3</td>
<td>8.1</td>
<td>7.9</td>
<td>6.8</td>
<td>6</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>24.8</td>
<td>32.7</td>
<td>25.3</td>
<td>24.7</td>
<td>23.1</td>
<td>14</td>
<td>9.3</td>
<td>8.1</td>
<td>7.9</td>
<td>6.8</td>
<td>6</td>
</tr>
<tr>
<td>Transportation, communications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Unemployed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>public utilities</td>
<td>16.4</td>
<td>15.0</td>
<td>16.8</td>
<td>16.4</td>
<td>13.7</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wholesale and retail trade</td>
<td>11.2</td>
<td>12.0</td>
<td>10.8</td>
<td>11.1</td>
<td>10.0</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic and personal service</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Under-employed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other services</td>
<td>11.4</td>
<td>14.7</td>
<td>11.1</td>
<td>11.1</td>
<td>11.0</td>
<td>(10)</td>
<td>10.0</td>
<td>5.0</td>
<td>5.0</td>
<td>5.4</td>
<td>(7)</td>
</tr>
</tbody>
</table>
| Government                    | 12.8 | 8.3  | 4.9  | 3.6  | 4.2  | a/                            | 4.1  | 5.4  | 2.5  | 1.5  | (a/)
| Home needlework               | 16.7 | 27.0 | 26.5 | 24.2 | 7                              |      |      |      |      |                                 |

* Excluding home needlework
a/ Less than 0.5 per cent
b/ Too few cases in sample to show separately

is to be expected, provides the steadiest work of all industries, for both
Federal and Commonwealth agencies have a well-developed civil service system.

The public sector has virtually no underemployment, at least according to
the statistics and the concept underlying them. Agriculture has the highest
rate for under-employment; manufacturing, construction and transportation also
have somewhat higher rates than the other industries, which is indicated in
Table V.12 for the year 1955. The relatively high rate of underemployment in
public utilities may be due to the inclusion of loading and unloading workers,
among whom irregular employment is customary.

4. **Occupational Changes and Wage Differentials.**

Major occupational shifts in Puerto Rico have taken the form of a decrease
in agricultural employment, an increase in white collar employment and of manual
workers outside of agriculture. Fortunately, figures are available for a study
of the occupational change in the labour force for roughly the last half-century.
The number of persons occupied in agriculture, including farm owners and managers
as well as farm labourers, fell from 229,000 in 1910 to 151,000 in 1957. During
the same period the number of white collar workers increased almost five times
from 35,000 to 151,000 and the number of manual workers increased only by 2.5 times.
If non-agricultural workers are considered separately, the major employment
increase is seen to be in the white collar occupations. In 1910 about 23 per cent
were white collar workers and 77 per cent manual, in 1955 the percentage of white
collar workers increased to 34 per cent and that of manual workers fell to 66 per
cent.¹

Among the manual workers the greatest change took place among the operatives

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whose number rose from 28,000 to 124,000 corresponding to a change from 24.5 per cent to 42.5 per cent of all manual workers. The relative importance of craftsmen, foremen and kindred workers remained approximately the same (17.5 per cent in 1910; 16.5 per cent in 1955). Labourers increased from 14,000 to 55,000, representing a change from 12.4 per cent to 18.7 per cent. The relative importance of service workers fell considerably from 45.6 per cent in 1910 to 22.7 per cent in 1955.

The effect of the shifts in the occupational pattern on the distribution of income cannot be clearly understood unless changes in the wages of different occupations are also studied. Unfortunately with the available statistics we cannot trace the weekly or hourly earnings back to as early a date as we can for employment. Nevertheless, figures for 1947 and 1957 indicate a sharp increase in weekly money earnings for all groups: 51% for farm labourers, 72% for white collar workers such as professional, technical and clerical workers, and 80% for manual workers such as craftsmen, foremen and operatives.¹ The white collar group includes the highest paid employees with incomes of over $50 per week going to professional and managerial salaried workers. Among the manual workers, craftsmen have shown the greatest increase in average weekly earnings which in fact for the said period changed from 15.10 dollars to 28.10 dollars, an increase of 86%.

It should be noted that the relatively advantageous position of white collar workers is due to the Puerto Rican government's being a major employer. Moreover, although it is not a main or even a major employer of white collar workers, the Federal Government of the United States maintains the same wage scale on the island.

as on the mainland and employs a sufficient number of professional, managerial and clerical personnel to act as a competitor with the Puerto Rican government. The relatively high earnings of white collar workers, accompanied by an increase in their numbers and a similar development among craftsmen has led to a swelling of middle income groups in number and in total earnings, as well as to a change in factor shares.

5. **Demographic Changes.**

Accompanying economic development have been social and demographic changes. The demographic factors which may have influenced income distribution are outlined in the following paragraphs.

(a) Changes in the composition of the labour force.

The composition of the labour force is affected firstly by changes in the period of education, the lengthening of which limits participation in the labour force. Table V,13 shows a considerable decline in the number of men and women aged between 10 and 19 years participating in the labour force. Juvenile workers of between 10 and 13 years of age have disappeared completely and the importance of the group of 14 to 19 years has fallen, for men from 50 per cent to 36 per cent, and for women from 20.8 per cent to 10 per cent. This change is at the same time observed in the statistics of school attendance.

A reduction can be seen in the participation of workers of 45 years or above. Among those of 65 years or older - male and female - there has been some decline in the number of male workers and a considerable decline in the number of female workers. This indicates a fall in the average age of retirement. On the other hand, participation of women in general in the labour force has not varied much,
Table V.13
Percentage of men and women in the labour force
Puerto Rico 1930 - 1956

<table>
<thead>
<tr>
<th>Year &amp; sex</th>
<th>All Ages</th>
<th>14 &amp; over</th>
<th>10-13 years</th>
<th>14-19 years</th>
<th>20-44 years</th>
<th>45+ years</th>
<th>65+ years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>81.0</td>
<td>3.8</td>
<td>50.1</td>
<td>92.2</td>
<td>86.0</td>
<td>n.a.</td>
<td></td>
</tr>
<tr>
<td>1940</td>
<td>79.3</td>
<td>0.0</td>
<td>46.1</td>
<td>91.7</td>
<td>79.9</td>
<td>51.1</td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td>79.8</td>
<td>0.0</td>
<td>44.4</td>
<td>91.3</td>
<td>84.7</td>
<td>44.8</td>
<td></td>
</tr>
<tr>
<td>1956</td>
<td>73.9</td>
<td>0.0</td>
<td>36.4</td>
<td>87.8</td>
<td>80.3</td>
<td>43.0</td>
<td></td>
</tr>
<tr>
<td>1960 *</td>
<td>72.6</td>
<td>0.0</td>
<td>28.6</td>
<td>90.3</td>
<td>77.5</td>
<td>36.3</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>18.7</td>
<td>0.0</td>
<td>20.8</td>
<td>18.9</td>
<td>15.8</td>
<td>n.a.</td>
<td></td>
</tr>
<tr>
<td>1940</td>
<td>17.0</td>
<td>0.0</td>
<td>15.1</td>
<td>19.2</td>
<td>13.3</td>
<td>7.9</td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td>20.7</td>
<td>0.0</td>
<td>17.7</td>
<td>24.8</td>
<td>15.1</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td>1956</td>
<td>19.6</td>
<td>0.0</td>
<td>10.0</td>
<td>26.1</td>
<td>13.8</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>1960 *</td>
<td>21.4</td>
<td>0.0</td>
<td>9.3</td>
<td>30.0</td>
<td>13.9</td>
<td>3.4</td>
<td></td>
</tr>
</tbody>
</table>

* January only


Table V.14
Enrolment in public schools (12 grades)
Puerto Rico 1930 - 1957

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
<th>Per cent of population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930</td>
<td>221,189</td>
<td>14.3</td>
</tr>
<tr>
<td>1940</td>
<td>286,113</td>
<td>15.0</td>
</tr>
<tr>
<td>1950</td>
<td>408,000</td>
<td>18.4</td>
</tr>
<tr>
<td>1957</td>
<td>554,000</td>
<td>24.3</td>
</tr>
</tbody>
</table>

Sources: 1930-1950: Puerto Rico, Junta de Planificación, Anuario Estadístico, 1949-50, p. 49
1957: Puerto Rico, Junta de Planificación, Anuario Estadístico, 1958, p. 47

These figures only show the students in public schools. In addition, there are private accredited schools and schools of college level. In 1957 there were 18,867 students in the latter. For the distribution of school children in different levels of grades, see E. Reimer, "La demanda de Recursos Humanos y Educación en Puerto Rico", Revista de Ciencias Sociales, Vol. III, Marzo 1959, p. 48.
although the emphasis in terms of age group and occupation has changed. In 1940, 17 per cent of the female population 14 years and over was in the labour force as opposed to 19.6 per cent in 1956. The number of unpaid family workers has declined whereas the importance of female office workers has increased and the percentage of women employed between 20 and 44 years of age has increased from 19.2 to 26.1. Although we have no data on the marital status of the female labour force, the increase in the age group of 20 - 44 years of age suggests an increase in the numbers of married women employed. The proportion of college-educated women entering the working force is high. In 1950, of all college-educated women between the ages of 45-54, 75.2 per cent were employed. Taking existing social values into consideration, it is projected that the overall rate of participation in the labour force by women may tend to decline. On the other hand, one can argue that economic changes may bring about fundamental reversals in these values so that women's participation may increase in the future. Although this is somewhat a speculative argument, the provisional 1960 figures given in Table V.13 seem to support it.

(b) The shift from rural to urban areas.

Table V.15 shows the composition of population in terms of areas of residence in urban and rural regions between 1930 and 1950. The growth of the urban areas was rather slow between 1930 and 1940, but accelerated between 1940 and 1950, when

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1. Puerto Rico, Junta de Planificación, Proyección de la Demanda y la Oferta de los Recursos Humanos en Puerto Rico, San Juan, 1957, pp. 149-50.

2. Puerto Rico, Junta de Planificación, op. cit., p. 77.
40.5 per cent of the total population resided in the cities. In fact, three metropolitan areas, San Juan, Ponce, and Mayaguez, experienced a rapid growth, as indicated in Table V.16. This tendency gives some indication of the better economic opportunities available in these parts of the island.

Table V.15


<table>
<thead>
<tr>
<th>Year</th>
<th>Total Population</th>
<th>Urban</th>
<th>Urban as % of Total Population</th>
<th>Rural</th>
<th>Rural as % of Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930</td>
<td>1,544,000</td>
<td>427,000</td>
<td>27.5</td>
<td>1,117,000</td>
<td>72.5</td>
</tr>
<tr>
<td>1940</td>
<td>1,869,000</td>
<td>566,000</td>
<td>30.2</td>
<td>1,303,000</td>
<td>69.8</td>
</tr>
<tr>
<td>1950</td>
<td>2,211,000</td>
<td>695,000</td>
<td>40.5</td>
<td>1,316,000</td>
<td>59.5</td>
</tr>
<tr>
<td>1957</td>
<td>2,281,000</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>1960</td>
<td>2,353,000</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Table V.16

Growth of the Metropolitan Areas - Puerto Rico 1930-1950

<table>
<thead>
<tr>
<th>Year</th>
<th>Mayaguez</th>
<th>Ponce</th>
<th>San Juan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930</td>
<td>58,270</td>
<td>87,604</td>
<td>207,098</td>
</tr>
<tr>
<td>1940</td>
<td>76,487</td>
<td>105,116</td>
<td>302,765</td>
</tr>
<tr>
<td>1950</td>
<td>87,307</td>
<td>126,816</td>
<td>465,744</td>
</tr>
<tr>
<td>1960</td>
<td>84,576</td>
<td>146,430</td>
<td>589,173</td>
</tr>
</tbody>
</table>

Note: For the total population of Puerto Rico between 1910 and 1960, see Appendix, Table A.1.


1. For the distribution of the population in Puerto Rico, see, A. F. Chaves, La Distribución de la Población en Puerto Rico, Rio Piedras 1950.
The San Juan metropolitan area has grown more than two-fold between 1930 and 1950 while Ponce and Mayaguez have increased by approximately 45 per cent. It would have been interesting to compare the relative growth of urban and rural areas for the two decades 1940-1950 and 1950-1960 in order to see the effects of the integrated government programme for economic development launched in 1947. Data for this decade are unfortunately not yet available, since the detailed publications refer to the census conducted in 1950. The last census conducted was in 1960, the preliminary results of which provide information only on the total population and on the population of the major cities. These indicate a further growth in the metropolitan areas of San Juan and Ponce. In fact, the total population increased from 1950 to 1960 by 6% while the population of San Juan rose by 25% and that of Ponce by 15%. The decline in the population of Mayaguez is closely related to the industrial and locational circumstances of the city and should not be considered as an indication of a reversed movement from urban to rural areas, but rather as one from one urban area to another.

6. The Role of Government.

(a) Government as an Employer.

As far as the role of the government in the distribution of income is concerned, we have already pointed out above the increase in government employment from 41,000 in 1947 to 57,000 in 1957. This means that to-day approximately 10% of the civilian labour force is employed in the public sector. Total wages and salaries paid by the government (insular and federal) constitute approximately one-third of the total employee compensation. What is not immediately apparent, however, is the redistribution of incomes through government activity, i.e., through its tax collection, and its spending.
(b) **Effects of Government Revenue.**

Puerto Rico has a progressive income tax\(^1\) from which redistributive effects on income distribution are expected. In a study of the effect of taxes on family income distribution statutory progressive tax rates are not sufficient as indicators, since the size of families must also be taken into consideration. Family income progression is not necessarily the same as the individual income progression. Furthermore, we believe that the tax-exemption programme to attract investment into the island may very well weaken the redistributive effects of a progressive income tax, since it affects mostly the higher income brackets. Indirect taxes\(^2\) are usually considered to be regressive. If so, their imposition would reverse the direction of redistribution. If through time the share of progressive income taxes rises in the total government revenue, while that of the indirect taxes falls, it may be expected that a gradual redistribution in favour of the lower income classes would take place. The Puerto Rican government, like many of the under-developed countries, still relies heavily on indirect taxes. Table V.17 indicates the relative importance of income taxes and of total indirect taxes in the total tax revenue.

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1. Other direct taxes such as property and inheritance taxes constitute a negligible part of the total tax revenue of the government, and their effect on income distribution is relatively unimportant. For further details see Chapter VII.

2. The indirect taxes in question are excise taxes on petroleum and petroleum products, cigarettes, alcoholic beverages, entertainment, photographic equipment, sugar, rugs, china, jewellery, cosmetic articles, motor vehicles, tubes and parts, licence plates, stamp duties and custom duties. See, Puerto Rico, Departamento de Hacienda, Contribuciones de Puerto Rico, San Juan 1957, pp. 27 ff.
Table V.17
Share of Income and Indirect Taxes in the Total Tax Revenue

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Income Tax</th>
<th>Indirect Taxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1946/47</td>
<td>31.3</td>
<td>54.5</td>
</tr>
<tr>
<td>1947/48</td>
<td>37.5</td>
<td>50.7</td>
</tr>
<tr>
<td>1948/49</td>
<td>32.9</td>
<td>52.9</td>
</tr>
<tr>
<td>1949/50</td>
<td>30.6</td>
<td>50.9</td>
</tr>
<tr>
<td>1950/51</td>
<td>29.0</td>
<td>52.8</td>
</tr>
<tr>
<td>1951/52</td>
<td>33.2</td>
<td>56.4</td>
</tr>
<tr>
<td>1952/53</td>
<td>32.1</td>
<td>62.0</td>
</tr>
<tr>
<td>1953/54</td>
<td>30.0</td>
<td>61.8</td>
</tr>
<tr>
<td>1954/55</td>
<td>27.8</td>
<td>63.8</td>
</tr>
<tr>
<td>1955/56</td>
<td>32.5</td>
<td>59.0</td>
</tr>
<tr>
<td>1956/57</td>
<td>35.3</td>
<td>57.0</td>
</tr>
</tbody>
</table>


The relative importance of either tax has not changed over the decade from 1946/47 to 1956/57 but has fluctuated around 35% and 55% respectively. One can plausibly argue that this constancy can be explained by the tax exemption programme in operation, in other words, one would have expected a rise in the share of income taxes and/or a decline in the indirect taxes had there not been a tax exemption programme in operation, and assuming the same rate of growth in the economy. Furthermore, the effect of the indirect taxes need not be very regressive. This depends upon their structural composition. In the case of Puerto Rico taxes on motor vehicles, licence plates, gasoline and automobile
accessories constitute approximately one-third of the total excises and are progressively levied. Almost all necessaries are exempt from taxation, except for tobacco and alcoholic beverages, if these can be considered as necessaries.

Finally, we should indicate one aspect of the composition of the total revenue of the public budget. As a result of agreements between the United States Federal Government and the Commonwealth of Puerto Rico, Puerto Rico obtains federal grants for purposes like schools, highways, etc., and retains all revenue from excise taxes collected on Puerto Rican goods, such as cigars, rum, etc., shipped to the United States. Federal payments have increased considerably (approximately four times) over the decade in question, from 5.7% of the total public revenue in 1947/48 to 16.3% in 1956/57, while retained taxes have increased by only 61%.

(c) Effects of Government Spending.

A substantial expansion in the role of the government as supplier of social services such as education, health, welfare, sanitation, housing and slum clearance has taken place. For instance, Education expenditures have risen from 7.9 million dollars in the fiscal year of 1941/42 to 34.6 million dollars in 1947/48 and to 61.6 million dollars in 1956/57, indicating a per capita increase from 4.1 dollars to 16.5 dollars and 26.7 dollars respectively in nominal terms and to 13.3 dollars and 17.8 dollars in 1940 prices. Health and Welfare expenditures have risen from 4.8 million dollars in 1941/42 to 15.3 million dollars in 1947/48 and to 64.5 million dollars in 1956/57, representing a per capita increase from 2.5 dollars to 7.3 dollars and 31.6 dollars respectively in nominal terms and to 5.9 dollars and 21.1 dollars in 1940 prices.1 Total social expenditures of the government have

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1. Per capita real expenditures are calculated through the implicit price deflator for government consumption expenditures, see, Puerto Rico, Junta de Planificación, Net Income and Gross Product of Puerto Rico, 1940, and 1947-1955, pp. 190-191
risen from 29.1% of aggregate government expenditures in 1947/48 to 53.2% in 1956/57. The expansion of government expenditures for education, health and welfare purposes,¹ has resulted in a reduction in illiteracy from 32% in 1940 to 17% in 1957; an increase in school attendance (public, private, and university - from 302,000 to 698,000) and an increase in the number of hospitals. Other results have been a rise in the number of doctors per head of population and a decline in the number of deaths due to undernourishment, and tuberculosis. The majority of these expenditures can be said to benefit the low income groups.

The Puerto Rican budget is not burdened by defence expenditure, all of which is defrayed by the United States Federal Government, which leaves the Puerto Rican government considerable freedom to meet social needs.

Another redistributive function of the government we can point to has been the increase in the proportion of personal income derived from transfer payments; this amounted to 8.4% in 1947 and 10.1% in 1957. The total contribution of government disburscements in the form of wages and salaries and public transfers, amounted to 25% in 1957 as opposed to only 18% in 1947.²

The redistributive effects of government fiscal activity in Puerto Rico, therefore, arise from both tax collection, and from the spending of revenues. An attempt will be made in Chapter VII to estimate roughly the redistributive effect of tax collection and government spending in 1955.


(d) **Government as a Rule Maker.**

Finally, we would like to refer to one activity of the government as a rule maker and regulator, i.e., to minimum wage legislation. On the whole, in Puerto Rico labour unions are weak and ineffectual. Although the labour movement can be traced back as far as the middle of the 19th century, unions have never become an influential power. ¹ After the American acquisition, at first the American Federation of Labour (A.F. of L.), and later the Congress of Industrial Organization (C.I.O.) in the forties attempted to organize the labour movement in Puerto Rico, but they did not have much success. ² Consequently the real protection of the wages came from the Federal and Insular governments in the form of minimum wage legislation. Since 1937 the Federal Fair Labour Standards Act has applied to the island. However, conflicting interests between the mainland employees and employers and the war interrupted the effective standardization of minimum wages in Puerto Rico, although the Minimum Wage Committee did set up different forms for different industries. In 1955 when the Fair Labour Standards Act was revised in the United States, raising the legal minimum wage to 1.00 dollar per hour, the minimum wage rate for federal employees in Puerto Rico was also set at $1.00. In 1956 the Commonwealth government revised its minimum wage law and set up minimum norms for different industries which varied from $1.00 for white collar and heavy industry workers to $0.26 in the needlecraft industries. In short, both federal and insular governments have actively intervened in setting wage

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¹ For the history of the labour movement in Puerto Rico, see F. Mejías, *Condiciones de Vida de las Clases Jornaleras de Puerto Rico*, Rio Piedras 1946, especially Chapter V.

rates in Puerto Rico. There is reason to believe that wage rates in Puerto Rico are higher than they would have been in the absence of government regulation.

One indication of this is the fact that "average hourly wages in most industries are either equal or slightly higher than the legal minimum". It is easier to draw conclusions as to the relationship between wage legislation and the level of wage rates than it is to show the effect on the distribution of income. An equalizing effect on income distribution may be expected if minimum wage legislation provides differentiated minima for different industries as in the case in Puerto Rico, rather than one standard for all. The more workers that are covered by upper minimum levels, the less will be the weight of the low wage groups in the income distribution. However, two points must be stressed here: firstly, the vigorous application of minimum wage legislation in Puerto Rico is very recent, and hence may not have an appreciable effect on our calculations; secondly it should be borne in mind that a number of mainland industries come to the island because of the comparative advantage of labour costs. Minimum wage legislation might have adverse effects in that it might repel these industries or even cause some of the existing industries to close down, thus adding to the weight of unemployment. Empirical research is needed into the relationship between minimum wages and level unemployment, into their effect on higher wages and, therefore, on wage differentials before anything definite can be said on their effects on the size distribution of incomes.

1. A. J. Jaffe, op. cit., p. 128.
7. The Distribution of Wealth and Saving.

Unfortunately there is no statistical information on the distribution of wealth in Puerto Rico, hence we cannot examine fully the effect of wealth distribution on income distribution. The only thing we know is that large land holdings have been broken up, the maximum land holding being limited to 500 acres. The Land Authority, created in 1941, has been acquiring land held in excess of 500 acres effectively only since 1950. The acquired land has been either divided and sold as small farms or used to set up producers' co-operatives, especially in the field of sugar cane. The only inference we can make is that there is deliberate government policy to reduce concentration in land holdings.

The information on savings is a little more comforting though not complete. The survey of savings in upper-income families in 1950 indicates that savings are used mostly to make investments in real estate, or for reinvestment, or to acquire consumer durables. Only a small fraction is channelled into capital formation for industrialization. Anyway, private savings are negligible and fluctuate between a very small percentage of personal income and a negative amount.

IV. Summary.

So far we have not made a general assessment of the possible effects of all the changes considered in this chapter. What effects on income distribution can be expected from our findings? The relative decline of the agricultural sector accompanied by an increase in agricultural productivity; the increase in the

2. S. Descartes, Saving and Investment in Puerto Rico, San Juan 1956, p. 86 ff.
relative importance of the industrial sector accompanied again by productivity rises; changes in the size of the labour force and its age and occupational composition; greater share of national income accruing to labour, and the decline in the share of property incomes; the growing importance of the public sector in terms of employment, transfer payments and expenditures on education, health and welfare, lead us to believe that income in Puerto Rico to-day is more equally distributed. On the other hand, the persistence of unemployment, and a too rapid change from rural to urban areas, where industrial slums are still in existence, would have effects to the contrary. Due to lack of information, we cannot, however, say anything about the effect of wealth distribution, and we should not expect a strong cumulative effect from savings toward increased inequality. All in all, the factors toward greater equality seem to be dominant. The degree of change in the inequality in the distribution of incomes remains to be seen in the following chapter.
CHAPTER VI.
CHAPTER VI.

MEASUREMENT OF THE DEGREE OF INEQUALITY IN PUERTO RICO

I. Introduction

The previous chapter dealt with the changes that have taken place in the Puerto Rican economy as a result of economic growth, suggesting that more equal distribution of income has taken place. The purpose of this chapter is to quantify this conclusion.

The data on which our study of income distribution in Puerto Rico is based are of two distinct types, perhaps not totally unrelated, but of somewhat different coverage and concept, and concerning different years. These are: (a) the distribution of incomes of wage-earner families for the years 1941, 1952 and 1953; (b) the distribution of incomes of all families for the years 1946/47, 1950 and 1955.

All of this data is based on sample surveys. The concepts and coverage of the two sets of results are somewhat different from one another and no attempt will be made in this study to combine them. The first one throws light over the longer period of the two, but is more limited since it concerns solely wage-earner families. The second one is much more extensive in coverage, since it includes all families, whether wage-earner, salaried or self-employed, and consequently is more representative of the distribution pattern. It would have been desirable to have information on the family distribution of income for the years after 1955. This would have enabled us to see more clearly the impacts of "Operation Bootstrap" which was initiated in 1947.
II. The Distribution of the Income of Wage-Earner Families.

The surveys concerning wage-earner distributions cover the years 1941, 1952 and 1953. In 1941 the Department of Labour of Puerto Rico in co-operation with the Bureau of Labour Statistics of the U.S. Department of Labour, sponsored a survey of incomes and expenditures of wage-earner families in Puerto Rico.¹ Most of the field work for this survey was conducted before the United States entered the Second World War, and consequently few of the changes in the Puerto Rican economy produced by the war are reflected in this survey. The purpose of the study was to gather information on how wage-earner families live, the income they receive and how they spend it. Another underlying objective of the study was to obtain information for the construction of a consumer price index. 2,000 families were actually interviewed and the survey results were extended to encompass all the wage-earner families. The 1952 and 1953 surveys² based on interviews with some 3,000 households, i.e., 1.3% of total wage-earner families were conducted directly by the Department of Labour of Puerto Rico. The purpose was to obtain up-to-date information about the income and expenditures of wage-earner families as well as to revise the consumer price index on the basis of the changed pattern of expenditures.

¹ Departamento del Trabajo de Puerto Rico, Estudio de Ingresos y Gastos de las Familias Obreras en Puerto Rico, San Juan, Mayo 1947.

² Department of Labor, Income and Expenditures of Wage Earners' Families in Puerto Rico in 1952, San Juan, and Departamento del Trabajo, Estudio de Ingresos y Gastos de las Familias Obreras en Puerto Rico, Informe No. 5, San Juan 1955.
<table>
<thead>
<tr>
<th>Income Group (dollars)</th>
<th>1941 No. of Families</th>
<th>Total Income (dollars)</th>
<th>1952 No. of Families</th>
<th>Total Income (dollars)</th>
<th>1953 No. of Families</th>
<th>Total Income (dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 100</td>
<td>16,082</td>
<td>1,141,822</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>100-299</td>
<td>92,004</td>
<td>15,916,692</td>
<td>5,220</td>
<td>903,060</td>
<td>3,000</td>
<td>663,000</td>
</tr>
<tr>
<td>300-499</td>
<td>43,197</td>
<td>14,946,162</td>
<td>29,625</td>
<td>10,250,250</td>
<td>14,000</td>
<td>5,926,000</td>
</tr>
<tr>
<td>500-749</td>
<td>19,865</td>
<td>12,219,035</td>
<td>46,920</td>
<td>28,715,000</td>
<td>47,000</td>
<td>30,646,000</td>
</tr>
<tr>
<td>750-999</td>
<td>10,429</td>
<td>8,928,823</td>
<td>54,510</td>
<td>46,878,600</td>
<td>44,000</td>
<td>39,919,000</td>
</tr>
<tr>
<td>1000-1999</td>
<td>83,425</td>
<td>117,963,000</td>
<td>102,000</td>
<td>145,994,000</td>
<td>145,994,000</td>
<td>145,994,000</td>
</tr>
<tr>
<td>2000 &amp; over</td>
<td>5,423</td>
<td>14,167,466</td>
<td>17,300</td>
<td>51,490,090</td>
<td>22,000</td>
<td>60,277,000</td>
</tr>
<tr>
<td>TOTAL:</td>
<td>187,000</td>
<td>67,320,000</td>
<td>237,000</td>
<td>256,200,000</td>
<td>232,000</td>
<td>283,425,000</td>
</tr>
</tbody>
</table>

Source: See Table VI.2
Table VI.2
Percentage Distribution of Income of Wage-Earner Families in Puerto Rico

<table>
<thead>
<tr>
<th>Income Group (dollars)</th>
<th>1941</th>
<th>1952</th>
<th>1953</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Families</td>
<td>Total Income</td>
<td>No. of Families</td>
</tr>
<tr>
<td>Under 100</td>
<td>8.6</td>
<td>1.3</td>
<td>-</td>
</tr>
<tr>
<td>100-299</td>
<td>49.2</td>
<td>23.5</td>
<td>2.2</td>
</tr>
<tr>
<td>300-499</td>
<td>23.1</td>
<td>22.5</td>
<td>12.5</td>
</tr>
<tr>
<td>500-749</td>
<td>10.6</td>
<td>18.2</td>
<td>19.8</td>
</tr>
<tr>
<td>750-999</td>
<td>5.6</td>
<td>12.8</td>
<td>23.0</td>
</tr>
<tr>
<td>1000-1999</td>
<td>5.6</td>
<td>12.8</td>
<td>23.0</td>
</tr>
<tr>
<td>2000 &amp; over</td>
<td>2.9</td>
<td>22.0</td>
<td>7.3</td>
</tr>
<tr>
<td>TOTAL:</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>


1953: Puerto Rico, Departamento del Trabajo, Ingresos y Gastos de las Familias Obreras en Puerto Rico en 1953, Informe B-1, San Juan.

(Absolute aggregate figures were privately provided by the Department of Labour).
Chart VI.1
Distribution of Income of Wage Earner Families in Puerto Rico

% of Income Recipients

1941

1952

1953

Income

Income

Income
1. Definition of the Income Recipient.

The income recipient was defined in all three studies as a wage-earner family. The wage earner was defined as a person receiving wages and working thirteen weeks or more during the year. The definition included families with one or more wage earners, but excluded any family in which any member was engaged for pay or profit in a clerical, sales, managerial, or professional occupation. The self-employed and those who employed at least one full-time worker or more than one part-time worker, and farmers owning ten or more cuerdas of land were also excluded. However, if a member of the family owned ten or less cuerdas with the additional condition that he had worked thirteen weeks or more during the year for wages, this family was considered a wage-earner family. Since the main concern of the survey was with family expenditures, it was necessary to find out whether a family was a single consumer unit. It was considered so only if the income of its members was pooled and if expenditures were made from a common fund. Single persons were excluded, so were families which formed a consumer unit for only a part of the year. Therefore, the data necessarily reflects in general more equality than it would have done if the income recipient had been defined as single individuals. However, the data are consistent in their use of the concept of income recipient, and, therefore, the movement towards greater equality cannot be attributed to changes in the concept of income recipient.

1. 1 cuerda = .97 acre

2. Definition of Income.

The definitions of income used in these surveys are not as consistent as the definition of income recipient. While the 1941 and the 1952 surveys included all money wages and other money receipts, even when not considered regular income, and the value of food produced for family use,¹ the 1953 survey excluded the value of food produced for family use, payments in kind such as living quarters and clothing, and articles and services obtained without pay from the family business.² Therefore, the income figures for 1941, 1952 and 1953 are essentially, though not exactly, comparable. The contention of the Department of Labour is that this difference should not be considered serious since the value per family of food produced for home use in 1953 was estimated to be approximately 34 dollars a year.³ Although this contention may be reasonable for the total number of families, the question remains whether its distribution is the same for all income groups. Food produced for home use may be more significant for low wage groups or for families in rural areas than in urban areas.

In order to make the data comparable we have attempted to allocate the value of home-produced goods to the appropriate income classes in the following way. We know that the value per family of food produced for home use was approximately $34 a year. One method of allocation would be to multiply this amount by the

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number of families in each income group and add the obtained figure to the total
income of the group. This hypothesis would have ignored the relative importance
of this item in the lower income groups. On the other hand, the percentage
distribution among families of the value of home-grown food was given for 1952.
Assuming that this pattern would undergo no significant change from 1952 to 1953,
we applied this distribution to the total value of home-grown food, which amounted
to 7,988,000 dollars, and thereby estimated the additional income of each group
due to this item. The figures for 1953 given in Table VI.1 are, therefore,
adjusted figures.

3. The Pattern of Distribution.

Published sources give only the percentage distribution of the income of
wage-earner families in 1941, 1952 and 1953. Absolute figures on the number of
families and the aggregate income of each income group were kindly provided by
the Department of Labour of Puerto Rico from their work sheets. Unfortunately,
the income group classification was not uniform for the three years in question.
In 1941 the 500-999 dollar group was given without a further breakdown, and in
1953 the lowest group was given as under 500 dollars. To standardize the
classification and ease comparison, and in order to obtain as many brackets as
possible, we have further divided the 500-999 dollar group in 1941 and the under
500 dollar group in 1953.1 The adjusted distributions are given in Table VI.1
and Table VI.2.

1. In breaking down the income groups we have assumed that a straight line
density function adequately represents the frequencies in an income
interval, i.e.

\[ f(x) = m_1 + m_2 x \]

Hence

\[ F = \int_{x_1}^{x_i} f(x) \, dx \quad \text{and} \quad A = \int_{x_1}^{x_i} xf(x) \, dx \]

(continued on page 127)
During the period under study, wage incomes have undergone considerable change. The mean income varied from 360 dollars in 1941 to 1081 dollars in 1952 and 1221 dollars in 1953, representing increases of 200% and 239% respectively.

As can be seen from Table VI.1 and Table VI.2, there has been a striking long-term change between 1941 and 1952. Firstly, we have mentioned above the threefold increase in nominal average income. Secondly, while 8.6% of the families had incomes of less than $100 in 1941, there were no such families in 1952. Furthermore, the percentage of families receiving an annual income of between 100-300 dollars became virtually unimportant. The importance of the 500-750 dollar group grew considerably from 10.6% to 19.0%, that of 750-1000 grew from 5.6% to 23% and that of 1000 dollars and above grew fourteenfold.

(footnote 1. continued from page 126)

where $F =$ total frequency of the original group

$A =$ aggregate income of the original group.

Consequently

$$f = \frac{F(kz(4-3z) - 6z(1-z)(A-F_{x0})}{k}$$

and

$$a = 2Fkz^2(1-z) - z^2(3-4z)(A-F_{x0}) + f_{x0}$$

where $f$ is the frequency lying between $x$ and $x$, $a$ is the aggregate income portion of this interval, $x$ is lower limit of the interval, $x$ is the income at the point of interpolation, $k$ is the size of the original interval and $z$ is the difference between $x$ and $x_0$ divided by $k$.


For 1953 we have further assumed the lowest income to be $100, since there was no indication in overall economic conditions that such a group would exist in 1953. On the other hand, we could not break down the 1,000 dollars and over group in 1941, since the upper limit of the incomes was not known.
While 80.9% of all wage-earner families had incomes of $500 or less in 1941, there were only 7.4% of families in this group in 1953, showing a most pronounced structural change in the distribution and contributing altogether toward greater equality. This can also be observed in the Lorenz curves of Diagram VI, 2.

The concentration ratios for the respective three years are 0.45, 0.33 and 0.30, indicating this tendency towards greater equality.  

Table VI, 3

Distribution of Incomes of Wage-Earner Families
Puerto Rico 1941, 1952 and 1953

<table>
<thead>
<tr>
<th>Families</th>
<th>Income %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1941</td>
</tr>
<tr>
<td>1st 20%</td>
<td>5.0</td>
</tr>
<tr>
<td>2nd 20%</td>
<td>9.0</td>
</tr>
<tr>
<td>3rd 20%</td>
<td>12.5</td>
</tr>
<tr>
<td>4th 20%</td>
<td>20.0</td>
</tr>
<tr>
<td>5th 20%</td>
<td>53.5</td>
</tr>
</tbody>
</table>

Table VI.3 gives the quintile distribution for the three years and shows the increase in the share of the first four quintiles of families and the decline in that of the top 20%.

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1. Throughout this study the concentration ratios are calculated as

\[ R = \frac{\sum (p_{k-1} \cdot q_k - q_{k-1} \cdot p_k)}{10000} \]

See, Chapter III. p. 55 above.
4. **The Effect of Price Changes.**

Much of the shift of family units to higher income brackets, indicating a considerable decline in inequality of income, reflects the long-term trend as well as the influence of rising prices. It is essential, therefore, to eliminate the price effect and to examine the real changes that have occurred in the incomes. The use of a single price index for all income brackets, such as the implicit price deflator for personal consumption expenditures, for the conversion of money incomes into real incomes, have the limitations of applying the same index to all income groups even though actual price changes do not affect them equally, since the proportion of expenditures on different commodities varies with the income level. Furthermore, such a procedure does not alter the cumulative percentage distribution, the Lorenz curve and the concentration ratio. Therefore, a separate price index for each income group is desirable, since the patterns of consumption differ and the prices of individual commodities change in varying degrees.

We have attempted to construct a price index for each income group, since it was not directly available. The changes in the prices of twelve different groups, such as food, tobacco, clothing, housing, etc., are published since 1941. It should be borne in mind, however, that within the groups, the prices of the specific type of goods purchased by one class may move differently from the prices of the type of goods purchased by another class. There was no way of solving this problem on the basis of available material. But it may be

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assumed that since wage earners form a more homogenous group, the differences in the specific type of good purchased may not be of great importance. On the other hand, the expenditure pattern of wage-earner families was available for 1953. Hence deflating the expenditures of each income group on various commodities by their appropriate price indices we have obtained the following index numbers for wage-earner families. Not much divergence is seen in the price index numbers for different income brackets. The variation is between 163.5 and 167.7, the lower figure relating to the highest income group. The explanation possibly lies in the fact that commodities, the prices of which have risen the most, i.e., food and tobacco, form a greater percentage of the lowest income groups. The rise in the price index for the 750-999 dollar income group may be explained by the continued relative importance of food expenditures, together with a pronounced increase in clothing expenditures, the price of which has risen even more than that of food.

<table>
<thead>
<tr>
<th>Income group (dollars)</th>
<th>Index number (1941=100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 - 299</td>
<td>167.7</td>
</tr>
<tr>
<td>300 - 499</td>
<td>167.6</td>
</tr>
<tr>
<td>500 - 749</td>
<td>164.7</td>
</tr>
<tr>
<td>750 - 999</td>
<td>167.6</td>
</tr>
<tr>
<td>1000 - 1999</td>
<td>164.9</td>
</tr>
<tr>
<td>2000 &amp; over</td>
<td>163.5</td>
</tr>
</tbody>
</table>

The new percentage distribution obtained after the application of the price indices is given in Table VI.5 which also includes the deflated aggregate incomes of the groups.

1. We shall also find very little divergence in the price index numbers constructed for all families, as will be shown below.
Table VI.5  
Percentage Distribution of Income of Wage-Earner Families in 1953 with 1941 prices

<table>
<thead>
<tr>
<th>% Families</th>
<th>% Income</th>
<th>Aggregate Income in 1941 prices (dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3</td>
<td>0.2</td>
<td>395,439</td>
</tr>
<tr>
<td>6.1</td>
<td>2.1</td>
<td>3,567,736</td>
</tr>
<tr>
<td>20.1</td>
<td>10.8</td>
<td>18,607,165</td>
</tr>
<tr>
<td>19.0</td>
<td>13.8</td>
<td>23,818,019</td>
</tr>
<tr>
<td>44.1</td>
<td>51.6</td>
<td>88,534,870</td>
</tr>
<tr>
<td>9.4</td>
<td>21.7</td>
<td>36,866,666</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>171,769,895</td>
</tr>
</tbody>
</table>

The difference in the Lorenz curves of the two distributions in 1953 was barely observable to the eye, hence they are not presented in the text. The concentration ratio showed only a difference of 0.01 in the direction of more inequality which is an extremely slight change. The result is hardly surprising, since the divergence in the index numbers of the income groups is not large enough to bring about large changes in the distribution.


The data for family income distribution for Puerto Rico are again of somewhat different nature. The distribution figures for 1946/47 are provided by H. S. Perloff based partly on his own investigations and partly on information from the Department of Labour. The data for 1950 and 1955 are based on sample

Chart VI.2

Distribution of Income in Puerto Rico

Income of Wage Earner Families
1941 - 1953

Income of All Families
1946/47 - 1955

Income /%

Population /%
surveys conducted by the Department of Labour among 6,000 households covering approximately 1.5% of all families.¹

1. **Definition of the Income Recipient.**

For the years 1950-1955 the sample surveys defined family units as groups of persons dependent upon a common or pooled income for the major items of expense and usually living in the same household.² On the other hand, the explanations given for the 1945/47 distribution are very scanty. However, the general tone of the discussion of the problem by Perloff suggests that the unit is the family. We do not know whether the family of the 1945/47 distribution is defined in the same terms as that of the 1950 and 1955 distributions. Our assumption will, nevertheless, have to be that the two are quite close. We are fully aware that, as discussed in Chapter IV, the change in definitions may exaggerate the changes in the distributive pattern. Unfortunately we have no lead to any clarification on this point.

2. **Definition of Income.**

Income is defined for family units to include money incomes as well as incomes in kind, in other words, all incomes originating as wages and salaries, net receipts from businesses, lodgers, rents, interest and dividends before payment of personal taxes and the value of food produced for family use and goods and services obtained from family businesses as well as pensions, social security benefits and other cash transfers.³ Again, no definition of income is given for

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¹ The percentage distribution figures for the years 1950 and 1955 are from Puerto Rico Junta de Planificación, Proyecciones del Desarrollo Económico en Puerto Rico, Diciembre 1957, p. 53. Absolute figures are provided from unpublished data.

² Departamento del Trabajo, *Ingresos y Gastos de las Familias en Puerto Rico*, San Juan, Informe A-1, p. 9

³ Departamento del Trabajo, *op. cit.*, Informe A-1, p. 8
### Table VI.6

**Distribution of Family Income in Puerto Rico.**

<table>
<thead>
<tr>
<th>Income Group (dollars)</th>
<th>1946/47</th>
<th></th>
<th>1950</th>
<th></th>
<th>1955</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Families</td>
<td>Total Income (000 dollars)</td>
<td>No. of Families</td>
<td>Total Income (000 dollars)</td>
<td>No. of Families</td>
<td>Total Income (000 dollars)</td>
</tr>
<tr>
<td>Under 500</td>
<td>154,300</td>
<td>42,500</td>
<td>98,803</td>
<td>41,021</td>
<td>54,901</td>
<td>24,399</td>
</tr>
<tr>
<td>500-999</td>
<td>115,900</td>
<td>83,500</td>
<td>112,235</td>
<td>79,350</td>
<td>97,314</td>
<td>68,801</td>
</tr>
<tr>
<td>1000-1999</td>
<td>88,300</td>
<td>117,500</td>
<td>107,590</td>
<td>139,377</td>
<td>126,121</td>
<td>177,079</td>
</tr>
<tr>
<td>2000-2999</td>
<td>23,100</td>
<td>55,700</td>
<td>41,380</td>
<td>95,030</td>
<td>65,237</td>
<td>158,439</td>
</tr>
<tr>
<td>3000-3999</td>
<td>7,650</td>
<td>26,650</td>
<td>20,690</td>
<td>63,353</td>
<td>34,792</td>
<td>121,159</td>
</tr>
<tr>
<td>4000-4999</td>
<td>4,800</td>
<td>21,700</td>
<td>12,414</td>
<td>50,683</td>
<td>21,745</td>
<td>93,200</td>
</tr>
<tr>
<td>5000-7499</td>
<td>5,600</td>
<td>33,650</td>
<td>12,001</td>
<td>61,452</td>
<td>20,005</td>
<td>108,111</td>
</tr>
<tr>
<td>7500-9999</td>
<td>1,402</td>
<td>11,827</td>
<td>3,724</td>
<td>29,142</td>
<td>6,523</td>
<td>50,327</td>
</tr>
<tr>
<td>10000 &amp; over</td>
<td>1,448</td>
<td>30,313</td>
<td>4,966</td>
<td>74,123</td>
<td>8,263</td>
<td>130,479</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>402,500</strong></td>
<td><strong>423,400</strong></td>
<td><strong>415,803</strong></td>
<td><strong>633,532</strong></td>
<td><strong>434,902</strong></td>
<td><strong>931,995</strong></td>
</tr>
</tbody>
</table>

**Source:** See Table VI.7
Table VI.7

Percentage Distribution of Family Income in Puerto Rico.

<table>
<thead>
<tr>
<th>Income Group (dollars)</th>
<th>1946/47</th>
<th></th>
<th>1950</th>
<th></th>
<th>1955</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Families</td>
<td>Total Income</td>
<td>No. of Families</td>
<td>Total Income</td>
<td>No. of Families</td>
<td>Total Income</td>
</tr>
<tr>
<td>Under 500</td>
<td>38.3</td>
<td>10.0</td>
<td>24.0</td>
<td>6.0</td>
<td>13.0</td>
<td>3.0</td>
</tr>
<tr>
<td>500-999</td>
<td>28.8</td>
<td>19.7</td>
<td>27.0</td>
<td>13.0</td>
<td>22.0</td>
<td>7.0</td>
</tr>
<tr>
<td>1000-1999</td>
<td>21.9</td>
<td>27.7</td>
<td>26.0</td>
<td>22.0</td>
<td>23.0</td>
<td>19.0</td>
</tr>
<tr>
<td>2000-2999</td>
<td>5.7</td>
<td>13.2</td>
<td>10.0</td>
<td>15.0</td>
<td>15.0</td>
<td>17.0</td>
</tr>
<tr>
<td>3000-3999</td>
<td>1.9</td>
<td>6.3</td>
<td>5.0</td>
<td>10.0</td>
<td>8.0</td>
<td>13.0</td>
</tr>
<tr>
<td>4000-4999</td>
<td>1.2</td>
<td>5.1</td>
<td>3.0</td>
<td>8.0</td>
<td>5.0</td>
<td>10.0</td>
</tr>
<tr>
<td>5000-7499</td>
<td>1.4</td>
<td>8.0</td>
<td>2.9</td>
<td>9.7</td>
<td>4.6</td>
<td>11.5</td>
</tr>
<tr>
<td>7500-9999</td>
<td>0.3</td>
<td>2.8</td>
<td>0.9</td>
<td>4.6</td>
<td>1.5</td>
<td>5.5</td>
</tr>
<tr>
<td>10000 &amp; over</td>
<td>0.5</td>
<td>7.2</td>
<td>1.2</td>
<td>11.7</td>
<td>1.9</td>
<td>14.0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>


(Absolute figures are provided by Junta de Planificación privately).
Chart VI.3
Distribution of Family Incomes in Puerto Rico

% of Income Recipients

1946/47

1950

1955
the 1946/47 study. However, it can be assumed that it includes, at least partly, income in kind, for the estimates prepared by H. Perloff were based both on a sample survey (for the lower income groups, i.e., up to 5,000 dollars) and income tax returns (for the upper income groups) since the sample survey was too small to be accurate for the upper income groups.\footnote{H. S. Perloff, \textit{op. cit.}, p. 166.} Hence it is quite likely that inequality in the upper income brackets would tend to be exaggerated.

Before we attempt to make comparisons for the three years in question, a few preliminary remarks are necessary. Perloff warns the reader that there is a certain amount of under-reporting in his study, and that in the upper income groups this might be considerable. In the other two studies no warning of this kind is given, but it would be too optimistic to take the data at their face value. It should be expected that in the "under 1000 dollars" group, under-reporting would occur, because families in this group would tend to overlook miscellaneous incomes, such as earnings of children from shoe-shining or from car-watching at parking places. Families may under-report their income for fear that they will be deprived from welfare payments. In the upper income brackets - 5,000 dollars and over - under-reporting in taxable income is also very likely to occur. This drawback is not confined solely to Perloff's study, where income tax returns are partially used. Even in sample surveys conducted by the Department of Labour, families in high income groups may tend to be "forgetful" of the exact amount of their income, since it would be fair to assume that they would not be willing to contradict their understatements in their income tax returns with true statements.
made to the interviewers. It is generally believed that income tax returns in Puerto Rico contain a certain degree of inaccuracy due to under-reporting. It is impossible to know, at this stage, how and in what direction the pattern of under-reporting has changed over the period covered by the above studies. This is a rather complex matter involving tax ethics, degree of confidence in survey techniques, and the degree of trust in government and its agencies. Our comparison of the degrees of inequality in income distribution can only be made under the assumption that this pattern has not substantially altered.

One last warning should be made concerning income in kind. It is not clear whether Perloff's study includes income in kind or not, while the 1950 and 1955 studies do include such income. If the Perloff study did not include income in kind, obviously the change towards equality in 1950 and 1955 would be exaggerated.

3. The Pattern of Distribution.

Tables VI.6 and VI.7 give the distribution of family incomes for the three years under question. It has undergone considerable change during this period. Average family income has risen substantially from 1,052 dollars in 1946/47 to 1,531 dollars in 1950 and 2,143 dollars in 1955, representing increases of 45% and 103%. In 1947 prices average income has also risen substantially to 1,673 dollars in 1950 and 1,906 dollars in 1955, representing increases of 59% and 81% respectively. The modal income group was the lowest income group in 1946/47, but


2. Converted by means of the implicit price deflator for personal consumption expenditures.
this gradually moved towards higher income groups, being 1000 - 2000 dollars for 1955. A comparison between 1946/47 and 1955 clearly indicates the growth of the importance of the middle and upper-middle classes. The proportion of families receiving incomes between 1000 - 2000, 2000 - 3000, 3000 - 4000, 4000 - 5000 and 5000 - 7500 dollars have all risen, the greatest increase being in the 3000 - 4000 and 4000 - 5000 dollar groups (approximately fourfold).

It can be concluded, therefore, that during this decade under study the pattern of distribution of family incomes has become more equal, which is also shown by the Lorenz curves in Diagram VI.4 above. The concentration ratios for these three years are 0.52, 0.49 and 0.46.

As we know, the concentration ratio simply summarizes the overall distribution and indicates its movement over a period of time, in our case towards greater equality. Nevertheless, the change in the pattern for different groups may not be the same, for which purpose we have prepared the quintiles given below.

| Table VI.9 |
|---|---|---|---|
| **Distribution of Family Incomes - Puerto Rico, 1946/47, 1950, 1955** | | | |
| **Families** | **1946/47** | **1950** | **1955** |
| 1st 20% | 3.5 | 4.5 | 5.0 |
| 2nd 20% | 7.5 | 8.0 | 8.0 |
| 3rd 20% | 13.0 | 12.5 | 13.0 |
| 4th 20% | 20.0 | 20.0 | 22.0 |
| 5th 20% | 56.0 | 55.0 | 52.0 |
| Top 5% | 29.0 | 26.0 | 24.0 |
Table VI.8 shows the increase in the share of the first quintile (approximately by 50%) and the decrease in the share of the top 5% (approximately by 16%). The bulk of the loss of the top five per cent was compensated by gains in the shares of other quintiles, namely the first and the fourth, so that the incidence of the gain was more widespread than that of the loss.

4. The Effect of Price Changes.

In order to find out to what extent the shift in distribution has been due to changes in the price level we have attempted to reconstruct the 1955 distribution with 1947 prices. The method is the same one used for the distribution of incomes of wage-earner families, and the same limitations of deflating hold here as well. They may even be of greater importance since the distribution for all families covers much higher incomes, consequently the differences in the prices of the specific type of good, within the commodity group, purchased by different classes may be much larger than it can be assumed to be for wage-earner families alone.

The price index thus obtained is given in Table VI.9 and it is remarkable that the differences of expenditure patterns, which are quite considerable, do not cause much divergence in the index numbers for different income brackets. In fact the index numbers for the higher income groups are slightly higher than the index numbers for the lower income groups. The explanation probably lies in the fact that the prices of those commodities consumed by the higher income groups,  

---

1. It is interesting to note that little divergence is also found in the United Kingdom in the price index numbers for "high" and "lower" income groups between 1938 and 1957. See H. F. Lydall, "The Long-term Trend in the Size Distribution of Income", Journal of the Royal Statistical Society, Vol. 122, Part 1, 1959, pp. 10-12.
such as housing, medical care, etc., have gone up more than those of the commodities consumed to a larger extent by lower income groups, such as food. On the other hand, the price index for clothing has come down by about 4%, expenditure on which is relatively more important in the upper income scales.

Table VI, 9
Consumer Price Index for Different Income Groups, 1955

<table>
<thead>
<tr>
<th>Income group (dollars)</th>
<th>Index number (1947=100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 500</td>
<td>112.4</td>
</tr>
<tr>
<td>500 - 999</td>
<td>111.7</td>
</tr>
<tr>
<td>1000 - 1999</td>
<td>112.2</td>
</tr>
<tr>
<td>2000 - 2999</td>
<td>113.2</td>
</tr>
<tr>
<td>3000 - 3999</td>
<td>113.2</td>
</tr>
<tr>
<td>4000 - 4999</td>
<td>113.3</td>
</tr>
<tr>
<td>5000 - 7499</td>
<td>113.4</td>
</tr>
<tr>
<td>7500 - 9999</td>
<td>114.0</td>
</tr>
<tr>
<td>10000 &amp; above</td>
<td>114.4</td>
</tr>
</tbody>
</table>

Hence, all in all, the increase in the index numbers from low to high income groups is slight. Therefore, if anything, it must be expected that the distribution of incomes among all families in 1955 at 1947 prices will show a very slight, perhaps even negligible, movement towards equality. In fact the concentration ratio calculated for the distribution in 1947 prices is 0.45, or 0.01 lower than for the distribution at current prices. This change is not even perceptible to the eye in the Lorenz curves, hence the diagrams have not been included. We simply give the new percentage distribution below. (Table VI, 10).
IV. Summary.

To summarize, we can say that, even taking the price changes into consideration, income distribution during the period under study has become more equal both for wage-earner families and for all families. The weight of low income groups decreased, and the modal income group has shifted to higher brackets. Nevertheless, even though a movement towards greater equality can be observed, the degree of inequality is still somewhat higher than in various other countries. This situation will be referred to in our conclusion. Concentrating on incomes received, may lead to erroneous conclusions about the trend of the distribution of income as a whole. Some attention should be given to the effects of taxation and to the benefits derived from certain services of the government. It should

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Table VI,10

Distribution of Income of all Families in 1955 with 1947 Prices.

<table>
<thead>
<tr>
<th>% Family</th>
<th>% Income</th>
<th>Aggregate Income in 1947 prices (dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.0</td>
<td>2.6</td>
<td>21,702,439</td>
</tr>
<tr>
<td>22.0</td>
<td>7.4</td>
<td>61,603,643</td>
</tr>
<tr>
<td>29.0</td>
<td>19.2</td>
<td>157,807,115</td>
</tr>
<tr>
<td>15.0</td>
<td>17.0</td>
<td>139,571,367</td>
</tr>
<tr>
<td>8.0</td>
<td>13.0</td>
<td>107,065,476</td>
</tr>
<tr>
<td>5.0</td>
<td>10.0</td>
<td>82,358,053</td>
</tr>
<tr>
<td>4.6</td>
<td>11.6</td>
<td>95,273,360</td>
</tr>
<tr>
<td>1.5</td>
<td>5.4</td>
<td>44,167,604</td>
</tr>
<tr>
<td>1.9</td>
<td>13.8</td>
<td>114,031,995</td>
</tr>
</tbody>
</table>

Total: 100.0  100.0  823,580,857
be clear by now that the data we have used so far already reflect the effect of some benefits provided by the government since family incomes have been defined so as to include transfer payments. Even though it may be exceedingly difficult to evaluate and allocate taxes and governmental services, especially those in kind, to the proper income groups, we should discuss their possible effects on the trend of income distribution. We now proceed to the examination of this problem.
CHAPTER VII.
CHAPTER VII.

DISTRIBUTION OF INCOME IN PUERTO RICO AND GOVERNMENT FINANCE

I. Introduction.

In the previous chapter we studied the income distribution in Puerto Rico as given by sample surveys which referred to personal income before taxes including government transfer payments. Our findings have shown that through time personal income distribution has become more equal. One might possibly argue, however, that this result is deceptive, especially if one considers the relative importance of indirect taxes, which constitute a large part of government revenue, and that income after all direct and indirect taxes are deducted may be differently distributed from personal income before taxes.

It is not our intention to study the redistributive effect of public finance. We merely wish to show the short-run effects of taxation and of certain public services. We are fully aware that a study of redistribution not only requires elaborate statistical data on items, the effects of which are to be examined, but also the solution of intricate problems of incidence of taxation and expenditure. Therefore, we first of all survey briefly the conceptual difficulties involved in the problem of redistribution. This will show the problems which we face and the shortcomings of the assumptions we shall have to make. Bearing these limitations in mind, we shall examine the short-run effects of personal income tax and of indirect taxes. Examination of the latter is especially important in developing countries, because an appreciable portion of government revenue is derived from these taxes, and Puerto Rico certainly is no exception to this case. Although the share of indirect taxes in total government revenue in Puerto Rico is not so
high as that of some other developing countries, it is still high compared to
developed countries. Therefore, we must at least see the relative burden of
indirect taxes to understand whether they would cause any drastic changes in
income distribution. Finally, we shall examine the trend in certain government
expenditures, namely those which are aimed specifically at particular income
groups.

II. Problems of Allocation.

A study of redistribution of income seems to imply in the first instance
that there are two stages in the distribution of income. One deals with the
initial income distribution which would exist in the absence of government
intervention, and the other with a finally established distribution after all
the effects of the important government interventions have been taken into
account. This is hard to conceive, for not only is it difficult to establish
the distribution of income that would have resulted had there been no government,
but it is inconceivable to assume that government taxation and expenditures will
not bring about adjustments and modifications in markets and hence in incomes.
Such government activities alter the initial distribution of income, apart from
the immediate effects of taxes, transfer payments and services. Therefore, even
if it can be assumed that the initial and final distributions can somehow be

---

1. The share of indirect taxes in total government revenue of Puerto Rico was
46.4% in 1955. This is relatively high when compared with 32% in the
United States (1957); 37% in Sweden (1956) and 44% in the United Kingdom
(1957). It is relatively low when compared with 69% in Ceylon (1956) and
70% in Mexico (1955). All percentages, except the one for Puerto Rico,
are calculated from data in United Nations, Statistical Yearbook 1959,
New York 1959. The Puerto Rican figure is calculated from data given in
Departamento de Hacienda, Informe Anual del Secretario, San Juan, 1955.
separated and compared with each other for a given year, the problem becomes much more intricate when an intertemporal comparison is made. One is not only comparing the distributed and redistributed incomes of a given year, which supposedly reflect the short-run effects of government finance, but one is comparing four different distributions through a period of time. The initial distribution at the end of the period will necessarily reflect the effects of government finance at the beginning of the period, therefore, the concepts of initial distribution are not strictly comparable. Consequently the problem of redistribution has both a short-run and a long-run aspect. The longer the period the more difficult will it be to assess the effects of government redistributive policy.  

Even if there were no problem such as we have discussed, the problem of allocating of government taxes and expenditures would still remain. As far as taxes are concerned, it is usually assumed that direct taxes remain where they are imposed, namely on the factors of production, while indirect taxes are passed on completely to the consumer. Such assumptions are based on the contradictory premises that the supply of factors of production is elastic so far as indirect taxes are concerned but is inelastic so far as direct taxes are concerned.  

The discussion of government redistribution policy and its short and long-run effects is beyond the scope of this study. We merely point out that many studies on this subject are concerned only with the short-run aspect, i.e., with redistribution in one given year. See, the different studies in A. T. Peacock (editor) Income Redistribution and Social Policy, London 1954. On the other hand, for example, A. R. Prest maintains the impossibility of such a study even in the short-run, and suggests as the only solution the application, for intertemporal comparisons, of price indices to take into consideration the effects of indirect taxes. See, A. R. Prest, "Statistical Calculations of Tax Burden", Economica, Vol. 22, No. 87, August 1955, pp. 234 ff.

In practice, it is difficult to believe that the supply of all factors of production is completely inelastic or elastic, and that the demand for all goods has an elasticity of zero. It is impossible to establish statistically the incidence of different taxes on different income groups.

Similar, if not greater, difficulties arise so far as government benefits are concerned. We will consider here the expenditures from a direct redistributive point of view. We will have to leave on one side income generating effects which arise when government incurs expenditure. These expenditures will be reflected in their turn in changes in the personal income distribution.

The problem of the allocation of government expenditures can briefly be summarized thus: Government expenditures have two aspects. They involve on the one hand cash payments to individuals who sell goods and services to the public sector, or receive special incomes in the form of transfer payments. On the other hand, these expenditures involve the provision of services and benefits in kind to individuals and families. Cash payments for the purchase of goods and services from individual units cannot be considered as having immediate redistributive effects; but transfer payments, such as public assistance, relief payments, pensions, etc., can be designated as redistributive, and can be assigned to the specific income groups that receive them without much difficulty.

The allocation of the benefits derived from public services to the relevant income groups is more complicated. Conceptual and statistical problems arise in this connection. The conceptual problem involves the question whether these services are allocable to different income groups. It has been argued that these expenditures benefit the total community and not one particular income group, and
and therefore cannot be allocated.\(^1\) On the other hand, attempts have been made to allocate all government expenditure to different income groups on the contention that various income groups benefit in varying degrees from these services.\(^2\) It seems to us that in this study a pragmatic approach would be sufficient to solve this conceptual difficulty. Since we are interested in the direct redistributive aims of the government, we can divide expenditures from which benefits are derived into two broad categories: into expenditures which are intentionally redistributive and which are aimed to benefit specific income groups, and into those the redistributive effects of which are coincidental and which are compulsory functions of the government and are said to benefit society as a whole. In the first category are the expenditures on health, public welfare (other than cash benefits), education, housing, etc.; in the second category are expenditures on defence, maintenance of law and order, general administration, etc.

The statistical difficulty arises first of all from the identification of the specific groups that benefit from government services. In most cases families

\[\text{\ldots}\]

\(^1\) It has also been argued that at least some of the government services are social inputs and cannot be considered as final output. See, S. Kuznets, "Government Product in National Income", in Studies in Income and Wealth, Series I, London 1951, pp. 193 ff. It has been pointed out that the logical result of this argument would be that most of the consumption can be taken as inputs and it would be confusing to go this far for the sake of consistency. See, Alan T. Peacock and F. F. Browning, "The Social Services in Great Britain and the Redistribution of Income", in Income Redistribution and Social Policy (A. T. Peacock, editor), London 1954, p.155.

and individuals who receive the benefits are not easily identified; and even if services are provided specifically for low income groups, such as free hospitals operated side by side with private ones, there is nothing to bar upper income groups from using the same facilities unless a means test is imposed. The second statistical difficulty is to assign a monetary value to incomes and benefits in kind most of which have no direct comparable commercial counterpart, even if families receiving benefits are easily identified. The most convenient assumption is the valuation of these services at cost, even though it may mean underestimation in some cases.

Considering all these difficulties and the shakiness of the assumptions, we have to make for practical purposes, what we aim to do in the following section is simply to indicate the immediate effects of government finance on the 1955 distribution of personal incomes. We shall allocate the income tax burden by means of data provided by the Treasury from income tax returns. We shall also attempt to show the burden of the indirect taxes for each income groups, without, however, adding it to that of the income tax.\(^1\) Finally we will show the relative importance of money transfers and allocate government expenditures on social services to specific income groups. Expenditures on public health, public welfare, education and housing will be considered as social services. Since we are not measuring the gains and losses from government finance, but simply

---

\(^1\) It has been argued that such an addition would be not only difficult but meaningless, since it can be assumed that direct taxes remain where they are imposed in the short run, and that indirect taxes raise the price of the commodities fully in the long run. See, A. R. Prest, *Fiscal Survey of the British Caribbean*, Her Majesty’s Stationery Office, London 1957, pp. 108-109.
indicating the redistributive aim of the government, it will be sufficient to show the relative distribution of such benefits among the different income groups. The method of allocation is given in the following sections.

III. Allocation of Taxes in Puerto Rico.

To be considered among direct taxes in Puerto Rico are the income tax on individuals and corporations, the property tax, the inheritance tax and the social security contributions. Income tax and the gift and inheritance taxes are progressive, the rest are proportional. In 1955 income tax contributed 78%, the property tax 21% and the inheritance tax 1% of the total revenue from direct taxes.\(^1\) Owing to lack of data, it is impossible to assess the effects of all the direct taxes on income distribution. It is meaningless to allocate the corporate income tax to the proper income brackets, since the personal income distribution data exclude undistributed corporate profits. Information on wealth distribution by income brackets is practically non-existent, therefore, instead of making shaky assumptions it seemed reasonable to us to omit the allocation of property taxes. The lack of data on social security contributions also compelled us to omit them. We shall only attempt to show the relative burden of personal income tax on income groups. It is assumed that income tax is paid by the units on which it is imposed.

The indirect taxes which are ad valorem contributed 46.4% of total government revenue in 1955. They will be allocated to the appropriate income groups in accordance with their relative expenditure patterns, the underlying assumption being, in all cases except one, that they are fully shifted to the consumer.

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We are fully aware of the weakness of the assumption underlying the allocation of direct and indirect taxes. No other assumption, however, can give a working possibility, nor has there been any previous study of this kind in Puerto Rico, which would assist our calculations.

1. The Personal Income Tax.

The Annual Reports of the Secretary of the Treasury of Puerto Rico give the number of incomes within specified adjusted gross income brackets, the amounts of adjusted gross income and the amount of combined individual income tax and surtax. This data covers approximately 20 per cent of the total personal income, and is, therefore, too small to serve as a complete basis for judging inequality in the distribution of income.¹

Income recipients are as defined for tax purposes. Tax units consist of single individuals and of families having a gross income of over 800/2000 dollars respectively and an additional 400 dollars for each dependent. Separate filing of returns by husband and wife is not permitted.

Income is defined as adjusted gross income. Gross income includes compensation for personal and professional services, business income, profits from sales

¹ First of all, the data include only individual liability and exclude the undistributed incomes of partnerships and corporations. Secondly, the tax exemption which has been in effect since 1948 allows the exempted firms not to file income tax returns. The Tax Exemption and Enforcement Division of the Department of Treasury investigate the cases with respect to their compliance with the specifications of the exemption law, but does not combine their returns with the individual returns. Thirdly, the law recognizes a generous limit of minimum exemption which reduces the weight of the low income groups, since people with incomes below the minimum exemption limit are not required to submit a return, unless their incomes are subject to withholding at source. Fourthly, the well-known evasion in the higher income groups reduces their weight and increases the importance of the middle income groups, thereby showing probably lesser inequality than would otherwise have prevailed.
<table>
<thead>
<tr>
<th>Adjusted Gross Income Bracket (dollars)</th>
<th>1955</th>
<th></th>
<th>1958</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Returns</td>
<td>Adjusted Gross Income (000 dollars)</td>
<td>Income After Tax (000 dollars)</td>
<td>No. of Returns</td>
</tr>
<tr>
<td>Under 2000</td>
<td>5,205</td>
<td>6,962</td>
<td>6,722</td>
<td>5,588</td>
</tr>
<tr>
<td>2. - 3999</td>
<td>8,287</td>
<td>24,999</td>
<td>24,247</td>
<td>11,709</td>
</tr>
<tr>
<td>4. - 5999</td>
<td>8,846</td>
<td>43,089</td>
<td>41,715</td>
<td>12,057</td>
</tr>
<tr>
<td>6. - 7999</td>
<td>4,447</td>
<td>30,306</td>
<td>28,755</td>
<td>6,727</td>
</tr>
<tr>
<td>8. - 9999</td>
<td>1,993</td>
<td>17,615</td>
<td>16,321</td>
<td>3,104</td>
</tr>
<tr>
<td>10. - 11999</td>
<td>1,016</td>
<td>10,910</td>
<td>9,949</td>
<td>1,689</td>
</tr>
<tr>
<td>12. - 13999</td>
<td>589</td>
<td>7,559</td>
<td>6,693</td>
<td>952</td>
</tr>
<tr>
<td>14. - 15999</td>
<td>318</td>
<td>5,183</td>
<td>4,501</td>
<td>554</td>
</tr>
<tr>
<td>16. - 17999</td>
<td>251</td>
<td>4,240</td>
<td>3,576</td>
<td>332</td>
</tr>
<tr>
<td>18. - 19999</td>
<td>163</td>
<td>3,006</td>
<td>2,546</td>
<td>227</td>
</tr>
<tr>
<td>20. - 21999</td>
<td>131</td>
<td>2,714</td>
<td>2,220</td>
<td>201</td>
</tr>
<tr>
<td>22. - 25999</td>
<td>181</td>
<td>4,306</td>
<td>3,354</td>
<td>210</td>
</tr>
<tr>
<td>24. - 31999</td>
<td>162</td>
<td>4,660</td>
<td>3,483</td>
<td>188</td>
</tr>
<tr>
<td>26. - 37999</td>
<td>100</td>
<td>3,454</td>
<td>2,513</td>
<td>117</td>
</tr>
<tr>
<td>28. - 49999</td>
<td>55</td>
<td>2,229</td>
<td>1,409</td>
<td>72</td>
</tr>
<tr>
<td>30. - 49999</td>
<td>38</td>
<td>1,782</td>
<td>1,198</td>
<td>32</td>
</tr>
<tr>
<td>50000 and over</td>
<td>102</td>
<td>8,850</td>
<td>4,851</td>
<td>85</td>
</tr>
</tbody>
</table>

**TOTAL** | **31,914** | **182,061** | **164,133** | **43,844** | **255,367** | **234,307**

*Source:* Puerto Rico, Departamento de Hacienda, Informe Anual del Secretario, San Juan 1955 and 1959. Brackets are adjusted for uniformity.
Table VII.2

Percentage Distribution of Income Before and After Income Tax
Puerto Rico 1955 and 1958

<table>
<thead>
<tr>
<th>Adjusted Gross Income Bracket</th>
<th>1955</th>
<th>1958</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Incomes Before Tax</td>
<td>Incomes After Tax</td>
</tr>
<tr>
<td></td>
<td>Returns</td>
<td>Tax</td>
</tr>
<tr>
<td>Under - 2000</td>
<td>16.3</td>
<td>3.8</td>
</tr>
<tr>
<td>2. - 3999</td>
<td>25.9</td>
<td>13.7</td>
</tr>
<tr>
<td>4. - 5999</td>
<td>27.7</td>
<td>23.7</td>
</tr>
<tr>
<td>6. - 7999</td>
<td>13.9</td>
<td>16.7</td>
</tr>
<tr>
<td>8. - 9999</td>
<td>6.2</td>
<td>9.7</td>
</tr>
<tr>
<td>10. - 11999</td>
<td>3.2</td>
<td>6.0</td>
</tr>
<tr>
<td>12. - 13999</td>
<td>1.9</td>
<td>4.2</td>
</tr>
<tr>
<td>14. - 15999</td>
<td>1.1</td>
<td>2.9</td>
</tr>
<tr>
<td>16. - 17999</td>
<td>0.8</td>
<td>2.3</td>
</tr>
<tr>
<td>18. - 19999</td>
<td>0.5</td>
<td>1.7</td>
</tr>
<tr>
<td>20. - 21999</td>
<td>0.4</td>
<td>1.5</td>
</tr>
<tr>
<td>22. - 25999</td>
<td>0.6</td>
<td>2.4</td>
</tr>
<tr>
<td>26. - 31999</td>
<td>0.5</td>
<td>2.6</td>
</tr>
<tr>
<td>32. - 37999</td>
<td>0.3</td>
<td>1.9</td>
</tr>
<tr>
<td>38. - 43999</td>
<td>0.2</td>
<td>1.2</td>
</tr>
<tr>
<td>44. - 49999</td>
<td>0.1</td>
<td>0.9</td>
</tr>
<tr>
<td>50000 &amp; over</td>
<td>0.3</td>
<td>4.9</td>
</tr>
</tbody>
</table>

TOTAL: 100.0 100.0 100.0 100.0 100.0 100.0
Chart VII.1

Distribution of Taxable Income Before and After Personal Income Tax

1955

1958
of and dealings in property, interest, rent, dividends, distributed partnership
profits, and gains, profits and income derived from any source whatsoever, unless
exempt from tax by law. Adjusted gross income is arrived at by deducting losses
and all the ordinary and necessary occupational expenses which are incurred
during the year. The statutory income concept does not include gifts, bequests,
benefits of social security, life insurance and workmen's compensation systems,
interest on tax exempt bonds. To arrive at net taxable income further deduc-
tions are made for the minimum exemption allowance. Hence, at our disposal we
have adjusted gross income, the number of individual income tax returns and the
tax liability according to income brackets.

Table VII.1 and VII.2 give the distribution of income before and after
personal income tax for the fiscal years 1955 and 1958.1 The study of these two
distributions indicates considerable equality when compared with the family
distributions discussed above, the concentration ratios being 0.41 and 0.37.
This is hardly surprising, taking into consideration the limitations mentioned
above. It appears, furthermore, from the Lorenz charts given in Diagram VII.1
and VII.2 that net income after tax is less unequally distributed than income
before tax. This is also indicated by the concentration ratios which are 0.36
and 0.33 for the respective two years. The reason can be traced to the progress-
iveness of the personal income tax. We have related tax liability per income
unit to average gross income per income unit at various levels of income and made
a rough estimate of the effective average and marginal tax rates for 1955. This
relationship is given in Table VII.3 and Diagram VII.2. The average rates are
obtained by dividing the change in mean tax liability by the change in mean gross
income.

---

1. 1958 is included for comparison.
Table VII.3
Average and Marginal Tax Rates at Different Levels of Income
Puerto Rico 1955

<table>
<thead>
<tr>
<th>Adjusted Gross Income Brackets (dollars)</th>
<th>Average Income (dollars)</th>
<th>Average Tax Liability (dollars)</th>
<th>Average Tax Rate %</th>
<th>Marginal Tax Rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under - 2000</td>
<td>1.337</td>
<td>46</td>
<td>3.4</td>
<td>-</td>
</tr>
<tr>
<td>2. - 3999</td>
<td>3.016</td>
<td>91</td>
<td>3.0</td>
<td>2.7</td>
</tr>
<tr>
<td>4. - 5999</td>
<td>4.816</td>
<td>155</td>
<td>3.2</td>
<td>3.5</td>
</tr>
<tr>
<td>6. - 7999</td>
<td>6.815</td>
<td>340</td>
<td>5.0</td>
<td>9.5</td>
</tr>
<tr>
<td>8. - 9999</td>
<td>8.838</td>
<td>649</td>
<td>7.3</td>
<td>15.3</td>
</tr>
<tr>
<td>10. - 11999</td>
<td>10.807</td>
<td>1,015</td>
<td>9.4</td>
<td>18.6</td>
</tr>
<tr>
<td>12. - 13999</td>
<td>12.833</td>
<td>1,470</td>
<td>11.5</td>
<td>22.5</td>
</tr>
<tr>
<td>14. - 15999</td>
<td>14.893</td>
<td>1,960</td>
<td>13.2</td>
<td>23.8</td>
</tr>
<tr>
<td>16. - 19999</td>
<td>16.696</td>
<td>2,908</td>
<td>16.4</td>
<td>33.9</td>
</tr>
<tr>
<td>20. - 21999</td>
<td>24.740</td>
<td>5,633</td>
<td>22.8</td>
<td>38.7</td>
</tr>
<tr>
<td>32. - 49999</td>
<td>38.679</td>
<td>11,735</td>
<td>30.3</td>
<td>53.8</td>
</tr>
<tr>
<td>50. - 99999</td>
<td>65.270</td>
<td>26,352</td>
<td>40.4</td>
<td>55.0</td>
</tr>
<tr>
<td>100,000 &amp; over</td>
<td>194.235</td>
<td>103,470</td>
<td>53.3</td>
<td>59.8</td>
</tr>
</tbody>
</table>

All                                                 5,704  562  9.8
Chart VII.2

Average and Marginal Tax Rates at Different Levels of Income
1955

Tax Rate %

marginal tax rate

average tax rate

Income (000 dollars)
Table VII.4 illustrates the effect of the income tax, by comparing the share of each decile of income units in total gross income and in total tax liability for 1955.

Table VII.4

Percentage Distribution of Gross Income and Tax Liability, Puerto Rico 1955

<table>
<thead>
<tr>
<th>Income Units</th>
<th>Gross Income %</th>
<th>Tax Liability %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st ten per cent</td>
<td>2.0</td>
<td>0.5</td>
</tr>
<tr>
<td>2nd &quot;</td>
<td>3.0</td>
<td>1.0</td>
</tr>
<tr>
<td>3rd &quot;</td>
<td>5.0</td>
<td>1.5</td>
</tr>
<tr>
<td>4th &quot;</td>
<td>6.0</td>
<td>2.0</td>
</tr>
<tr>
<td>5th &quot;</td>
<td>7.5</td>
<td>2.0</td>
</tr>
<tr>
<td>6th &quot;</td>
<td>8.5</td>
<td>2.5</td>
</tr>
<tr>
<td>7th &quot;</td>
<td>9.0</td>
<td>4.5</td>
</tr>
<tr>
<td>8th &quot;</td>
<td>11.5</td>
<td>6.0</td>
</tr>
<tr>
<td>9th &quot;</td>
<td>16.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Top &quot;</td>
<td>31.5</td>
<td>71.0</td>
</tr>
<tr>
<td>Top 5 per cent</td>
<td>22.0</td>
<td>61.0</td>
</tr>
</tbody>
</table>

Thus it is seen that the first ten per cent of income recipients receive 2.0% of the gross income and pay 0.5% of the total income tax; the second ten per cent receive 3.0% of gross income but pay 1.0% of tax and so on, until the top decile receive 31.5% of gross income but pay 71% of the total tax. The proportion of the total tax is greater than the share in the gross income only in the top ten per cent of the income recipients; in all the other tenths it is less than their share in gross income. In fact, the situation of the top five per cent is even more striking in that they receive 22% of income but pay 61% of the total tax bill. Therefore, it is natural to expect that the disposable income would be more equally distributed than income before tax due to the progressive effect of the income tax.
2. Indirect Taxes.

To study the impact of the indirect taxes proved to be much more difficult than the direct taxes. Leaving aside the assumption which we had to make concerning incidence, a number of conceptual and statistical difficulties confronted us. In order to allocate taxes on consumption, some estimate of the distribution of personal expenditure by income brackets was necessary. The relative distribution of personal consumption expenditures was provided by survey data for one year. The disposable incomes are not given and we must know the distribution of disposable income by income brackets in order to be able to calculate their expenditures on various items and thereby to arrive at the burden of consumption taxes. We have tried to obtain the disposable income of the income groups by transplanting the information obtained from income tax data to the survey data. This, however, created difficulties.

First of all there were conceptual difficulties, i.e., the definition of income and income recipient in the two data were not identical. The income recipient most probably is narrower in the tax data and the income definition is definitely wider in the survey data, since it includes sources of income which are not subject to tax.¹

Secondly there were statistical difficulties. An adjustment of the income definition of the survey data would necessarily have to change the group classification of incomes. Technically speaking, such an adjustment would have been

¹. These sources amount to almost one half of the under 500 dollar group gradually losing their importance when moving up the income scale when in the highest income bracket they constitute 7% of the total income of the group.
possible by simply deducting incomes not subject to tax from the aggregate incomes of the appropriate brackets. By graphical methods, regrouping and allocation of personal income taxes on the basis of the average tax rates for each income group, could have been done. However, in order to be able to allocate indirect taxes we have to take the investigation a stage further back in adding the non-taxable money incomes, which are part of disposable income before regrouping the data once again. Considering the roughness of the graphical method and all the errors that would be incurred during the process, it seemed futile to attempt it.

Thirdly, the survey data indicated that the average spending of all families surpassed their average income, but no information was given as to which income groups debts were incurred and to what extent. There was also no information on the distribution of savings.

In view of all these difficulties we have decided to use personal income rather than disposable income as the basis of the calculation of the burden of indirect taxes. It should be borne in mind that the total income given in the tax data is only 20% of total personal income, and we have no clue as to where fraudulent under-reporting occurred, or into what groups the incomes fell which are exempt from tax due to the industrial development scheme. We know that incomes under $500 definitely, and those under $1000 probably, pay no personal income tax. The groups between 1000 - 10000 dollars contributed only 29% of the total tax - as calculated from tax data - and the rest fell on incomes of 10000 or above. Therefore, taking personal income rather than disposable income as a basis for the calculation of the relative burden of indirect taxes might create some bias especially in higher income groups.

1. This perhaps is the least difficult problem of all since personal savings are negligible on the whole. See Chapter V.
We must emphasize that these calculations are far from convincing statistically, even if our assumptions are granted. At this stage we must be satisfied by indicating only the general governmental intentions with respect to indirect taxes. The difficulties we have encountered may suggest further lines of investigation and the need for more extensive data.

Total indirect taxes in 1955 amounted to 74.7 million dollars. These are given in Table VII.5.

<table>
<thead>
<tr>
<th>Table VII.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indirect Taxes in 1955</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>Alcoholic beverages</td>
</tr>
<tr>
<td>Tobacco products</td>
</tr>
<tr>
<td>Petroleum products</td>
</tr>
<tr>
<td>Automotive vehicles, parts, licences</td>
</tr>
<tr>
<td>Electrical and gas appliances</td>
</tr>
<tr>
<td>Admissions</td>
</tr>
<tr>
<td>Sugar, molasses, and other</td>
</tr>
<tr>
<td>Customs</td>
</tr>
<tr>
<td>Permits, fees, business charges</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Source: Departamento de Hacienda, Informe Anual del Secretario 1955, p. 31

Taxes on tobacco products, alcoholic beverages, sugar, molasses and similar products, household equipment and entertainment were allocated simply according to the relative distribution of expenditures on these items. Taxes on motor vehicles, parts, tubes and licence fees raise a problem. Out of the total of 19,698,000 dollars we could allocate 8,800,000 dollars. This was obtained on
the basis of the ratio of expenditures on user-operated transportation to the total expenditures on transportation. This amount was then allocated to different income groups according to the percentage distribution of expenditure on transportation. The rest was ignored, since it constituted tax on inputs of business. Even under the assumption of complete shifting to the consumer it could not be determined statistically on which consumer items they would fall.¹

Customs duties also presented difficulties since their breakdown was not given. More than 90 per cent of the imports come from the United States on which no customs duties are paid. Articles imported from other countries are of varying nature, ranging from dried cod fish (a popular food among low income families) to French champagne and expensive German cameras. Two assumptions could be made in the allocation of these duties. They could be allocated by family or according to the percentage distribution of personal income. Under the first assumption, customs duties fell very heavily on low income groups. This is hard to conceive since the nature of the imports are very diverse. Hence we have accepted the second assumption as the basis of our allocation.

Table VII.6 shows the relative burden of the allocated indirect taxes which appears to be progressive up to incomes of $3000 and slightly regressive thereafter. Although our evidence should not be taken as absolutely conclusive, one factor stands out, namely that at least some of the indirect taxes fall progressively on items such as automobiles or household equipment. The only basic necessities

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¹ The relative distribution of expenditures are taken from Departamento del Trabajo, Ingresos y Costos de las Familias en Puerto Rico, Informe A-4, San Juan. The ratio of expenditures on user-operated transportation to the total expenditures on transportation is calculated from Junta de Planificación, Net Income and Gross Product Puerto Rico 1940 and 1947 - 1955. Table 21, p. 180, San Juan.
that are taxed are tobacco, alcoholic beverages - mostly rum - and sugar. Hence until further evidence is provided it can be concluded that indirect taxes do not appear to alter the income distribution drastically.

Table VII.6

<table>
<thead>
<tr>
<th>Income Group</th>
<th>Indirect Taxes %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 500</td>
<td>2.4</td>
</tr>
<tr>
<td>500 - 1000</td>
<td>3.6</td>
</tr>
<tr>
<td>1000 - 2000</td>
<td>6.0</td>
</tr>
<tr>
<td>2000 - 3000</td>
<td>7.0</td>
</tr>
<tr>
<td>3000 - 4000</td>
<td>6.8</td>
</tr>
<tr>
<td>4000 - 5000</td>
<td>6.5</td>
</tr>
<tr>
<td>5000 - 7500</td>
<td>6.1</td>
</tr>
<tr>
<td>7500 - 10000</td>
<td>6.0</td>
</tr>
<tr>
<td>10000 and above</td>
<td>5.6</td>
</tr>
</tbody>
</table>


Turning our attention to public expenditures in Puerto Rico, we can say in general that the government performs certain services with the specific aim of aiding the lower income groups. These are both in cash and in kind.

1. Direct Cash Benefits.

Direct cash benefits are the relief payments for public assistance. We have already referred to their inclusion in the income concept in our analysis of the personal income distribution in Chapter VI. No problem arises, therefore, in their assignment to specific income groups. It will suffice to indicate their relative importance in this connection. In 1955 they constituted 20.3% of the incomes below 500 dollars, 3% of incomes between 500 and 1000 dollars and 0.4% of
incomes between 1000 - 2000 dollars. There were no such incomes in higher income brackets. It is therefore unnecessary to show what the distribution of income would have been had they not been included.

2. **Benefits in Kind.**

Various services are provided by the government freely or at low prices. We can mention in this connection slum clearance and low rent housing for families with incomes of $100 per month or less, free hospitals, preventive medicine, curative health, nutrition and education. It can be said with confidence that all these expenditures, except those for hospitals and education, are made specifically for low income families.

Hospitals and educational services are probably used both by low and high income families. Relying on personal observation it can be said that high income families tend to use private hospitals and send their children to private schools and colleges for prestige purposes, if for no other reason. Hence, it can be assumed that low and middle income groups benefit more from these services. ¹

If it is assumed that all these services, which amounted to 95,952,000 (including cash benefits)² in 1955, have redistributive effects, in that the benefit accrues to low and middle income groups, the next step is to allocate them to the relevant income groups. However numerous difficulties arose within this connection, which were mainly statistical. Although the income groups benefitting from these

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1. This is probably less true for schools than for hospitals. All public education is free in Puerto Rico except for the University which is highly subsidized and where the tuition fee is approximately one-third of that of private colleges. On the other hand, the standard of the State university is believed to be much higher.

2. In 1955 expenditures on public health amounted to 17,891,000 dollars, on education to 22,418,000 dollars, on slum clearance 3,633,000 dollars, and on public welfare 52,005,000 dollars. See Junta de Planificación, Anuario Estadístico 1957, San Juan, Table 155, p. 307.
services could be identified roughly, a reliable identification was impossible, due to lack of statistical information. We have made two different assumptions. Under the first assumption we have allocated expenditures on public health and education equally to all families, expenditures on slum clearance to incomes less than $1000 on an equal per family basis, and public welfare expenditures other than cash payments according to the percentage distribution of cash benefits given in the distribution data. Under the second assumption it was assumed that only incomes below $7500 enjoyed the benefits from health and education expenditures, and the rest was allocated in the same manner as before. Table VII.7 gives the total benefit of each income group in percentages. We have made no attempt to allocate expenditures on maintenance of law and order, general administration, etc.

Our assumptions are not free of bias. In the process we might be allocating services to low income families, especially to those living in remote rural areas, who do not perhaps benefit from these services. We do not also know exactly the boundary between the income groups who do, or do not, benefit. Hence the choice of the boundary of incomes below $7500, for instance in the second assumption, is bound to be conjectural. There is another source of bias: the benefits from slum clearance and housing allocated to the incomes below $1000 are overestimated, because the nominal rent charged could not be deducted from these expenditures. Yet another source of bias is introduced to our analysis by the impossibility of distinguishing current from capital expenditures on the basis of published material. The outcome of such a rough comparison is not a definite and determinate indication of the gains made; it is only an indication of the intentions of the government to raise the levels of certain incomes.
Table VII.7
Percentage Distribution of Expenditures on Social Services

<table>
<thead>
<tr>
<th>Income Groups</th>
<th>First Assumption</th>
<th>Second Assumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 500</td>
<td>26.2</td>
<td>26.4</td>
</tr>
<tr>
<td>500 - 999</td>
<td>24.5</td>
<td>25.1</td>
</tr>
<tr>
<td>1000 - 1999</td>
<td>23.1</td>
<td>23.9</td>
</tr>
<tr>
<td>2000 - 2999</td>
<td>10.9</td>
<td>11.3</td>
</tr>
<tr>
<td>3000 - 3999</td>
<td>5.8</td>
<td>6.0</td>
</tr>
<tr>
<td>4000 - 4999</td>
<td>3.6</td>
<td>3.8</td>
</tr>
<tr>
<td>5000 - 7499</td>
<td>3.4</td>
<td>3.5</td>
</tr>
<tr>
<td>7500 - 9999</td>
<td>1.1</td>
<td>-</td>
</tr>
<tr>
<td>10000 and over</td>
<td>1.4</td>
<td>-</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Table VII.7 shows that approximately three-fourths of the benefits of total social expenditures accrue to the first three income groups, and that very little divergence exists between the results obtained under the two assumptions. This is due to the fact that one-fourth of the total social expenditures, i.e., those on public welfare and slum clearance fall to incomes below 2000 dollars, and that per family allocation of expenditures on health and education seems to favour lower income groups because of the higher number of families in these groups.

1. It may seem, in the first instance, that this method of allocation is biased in favour of lower income groups. However, other assumptions would not have given more satisfactory results. Allocation of expenditures on public health and education according to the relative expenditures of various income groups on medical care and schools would have favoured upper income groups, and falsely so, because these items would not appear in the expenditures of lower income groups, since they are provided freely or at very low cost by the government. Allocation according to the percentage distribution of personal income among income groups would have given similar erroneous results.
Nevertheless, this seems to be the most reasonable assumption even though it overestimates to a certain degree the benefits accruing to lower income groups. Families living in remote rural areas may not be benefiting from these services as much as urban families of the same group. Until further statistical material becomes available on the basis of which reliable allocations can be made, it would not be out of place to indicate the growth in the importance of these expenditures to emphasize the priority given to them by the Puerto Rican government. In 1955 such expenditures (the above mentioned expenditures plus direct cash payments) amounted to 95,952,000 dollars constituting 42.2% of total public expenditures, while in 1947 they amounted to 50,233,000 constituting 28.6% of total expenditures.\(^1\) Chart VII,3 also shows the index of growth of total expenditure on slum clearance, public health, public welfare and education, per head of population, between 1945 and 1957. If our assumptions are granted, the growth of the relative importance of these expenditures should be sufficiently indicative of the concern of the Puerto Rican government in redistributive aims. Needless to say, further field investigations and more elaborate statistical material are necessary before any reliable allocation can be made and a convincing result reached.

V. Conclusion.

We can conclude on the basis of the discussion above that the existence of a progressive income tax, of slightly regressive indirect taxes and of considerable

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1. These figures and the figures on which Chart VII,3 is based are calculated from statistics provided by Junta de Planificación in Anuario Estadístico, 1949/50, 1952 and 1957.
Chart VII.3
Indexes of Growth of Total Government Expenditure and Expenditure on Social Services per head at current prices

Index (1945=100) (ratio scale)

Expenditure on Social Services

Total Expenditure
growth of government expenditures aiming at low and middle income groups, suggests that personal income distribution after the effects of government finance are considered, will be altered so as to increase the share of the lower deciles.

One more point deserves attention before we end the discussion, namely, the grants-in-aid from the Federal Government to the Puerto Rican government which enable the island to maintain high expenditures on social services without burdening the Puerto Rican taxpayer. In 1955 Federal grants-in-aid were 10% of the total government revenue. Excise taxes collected by U.S. Customs and returned to the Puerto Rican Treasury constituted 11% of the total government revenue.¹

With this chapter we conclude the examination of the economic growth in Puerto Rico, the accompanying factors which have influenced its income distribution, and the actual measurement of the inequality of incomes. In the next chapter we will review our findings and compare Puerto Rico with some other countries for which measurements of inequality exist.

¹ Departamento de Hacienda, Informe Anual del Secretario, San Juan 1955.
CHAPTER VIII.
CHAPTER VIII.

CONCLUSION

The concluding pages of our study are intended to summarize our findings, to evaluate the fulfilment of our aims, compare the degree of inequality in Puerto Rico with those found in other countries, and to make suggestions for the improvement of the information which may become available in the future.

I. Summary of our Findings.

As explained in the Introduction, we had two related aims, one of providing an empirical test of the hypothesis that widening income equality occurs with economic development, and the other of filling the gap created by the lack of studies of size distribution of income in Puerto Rico. In fact, as we have stated, there has been no comparative study of income distribution in Puerto Rico.

Our major conclusion is not surprising. H. Perloff, on the basis of the information available for 1947, reached the conclusion that "even casual observation of the striking extremes of poverty and wealth in Puerto Rico would suggest that income in the island is very unequally distributed". 1 We find that this judgment, based on data available for one year no longer holds quite so vigorously as Perloff stated it. Economic and social conditions in the country have changed drastically, especially since the Second World War, and economic

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1. H. Perloff, op. cit., p. 164
development has brought a more equal distribution of income. Granted that income is less equally distributed in Puerto Rico than in many other countries of the world (See Table VIII. 2 below), inequality has definitely narrowed during the period under consideration. The factors which contribute to the narrowing of inequality have largely been in operation in Puerto Rico due to its economic development. We asserted in Chapter II that the factors which would tend to make the distribution of income more equal were:

1. The growing share of wages in the functional distribution of income and the declining importance of rent and interest;

2. The growing share of industry in the total product accompanied by greater and faster rising productivity in industry;

3. The decline in the importance of unskilled workers in the labour force;

4. The movement of low income rural families to urban areas where better paid jobs and higher average wages are to be found;

5. The reduction in unemployment;

6. The increase in the number of married women at work and hence greater family incomes, together with a decline in juvenile employment reducing the weight of low income groups;

7. The expansion of the government sector and of government services, provision of education, improvement of health in general, and aid to low income groups in particular.

In judging the case of Puerto Rico against this general framework we find that all of these changes, except for (6) which is subject to speculation, and for (5) have taken place and have contributed to the narrowing of income inequality
by swelling the middle income groups and reducing the share of higher income groups. The share of labour income increased while that of rent and interest declined; industry enjoyed rises in productivity and became a more important sector contributing to the total output of the economy. Changes in the structure of the labour force have been such as to increase the importance of the skilled workers. There has also been a significant movement of the population from rural to urban areas; and government, as we have seen in the previous chapter, extended its services considerably. The importance of the increase in the number of married women, however, cannot be seen directly from the statistics, but may be inferred from the relative increase in the number of women at work in the age group of 20 - 44 years. On the other hand, unemployment has not declined, in fact it persistently remained at a constant proportion of the total labour force. If unemployment had declined, a further increase in equality might have resulted.

1. It might be curious to know why unemployment is still persistent in spite of all the efforts towards economic development. The reasons may be, on the one hand, that unemployment in agriculture shows definitely a seasonal pattern, since both sugar cane cutting and coffee picking, the two main activities of the sector, by their nature provide only seasonal employment. On the other hand, construction industry, where one of the highest proportions of unemployment is observed, is also seasonal, for the climate of Puerto Rico with its rainy season causes the building industry to come to a virtual standstill for a number of months, or to offer short hours work. Nevertheless, 10% unemployment cannot be explained by seasonal factors only. Perhaps the main cause lies in the fact that the decline in the labour force in agriculture and also in the dying industries like needlecraft, has not yet been successfully absorbed by the growing sectors of the economy.
The degree of equality can be seen to have changed in quantitative terms. Our findings concerning this in Chapters VI and VII are summarized in Table VIII, 1

#### Table VIII, 1

**Degrees of Inequality of Incomes in Puerto Rico as Measured by the Concentration Ratio.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Income of Wage-Earner Families</th>
<th>Income of all Families</th>
<th>Income by Tax Returns Before Tax</th>
<th>Income by Tax Returns After Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1941</td>
<td>0.45</td>
<td></td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>1947</td>
<td></td>
<td></td>
<td>0.49</td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td>0.33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1952</td>
<td>0.33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1953</td>
<td>0.30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1955</td>
<td></td>
<td>0.46</td>
<td>0.41</td>
<td>0.36</td>
</tr>
<tr>
<td>1958</td>
<td></td>
<td></td>
<td>0.37</td>
<td>0.33</td>
</tr>
</tbody>
</table>

As can be seen from this table, (i.e. from the concentration ratios calculated from survey data for incomes of wage-earner families, survey data for incomes of all families, and also from data compiled from income tax returns), the distribution of income through time has become more equal in each case, though in varying degrees. The greatest change has been in the distribution of incomes of wage-earner families, covering a period of thirteen years.

The conclusion is that income distribution has been becoming more equal due to the economic development which we have discussed at length. This seems to suggest that a more equal distribution of income in under-developed countries can be achieved without the necessity of first going through a stage of widening income inequality, as was implied by Kuznets for under-developed countries in general. Our case is only one example. More investigations of this type are necessary.
before the Kuznets view can be thoroughly tested. It appears, nevertheless, that the distribution of income tends to become more equal the longer a country is exposed to economic development and its consequences.

II. The Reliability of our Findings.

It is appropriate to subject conclusions based largely on quantitative calculations to some kind of test, if only to see what margin of error there may have been in the calculations themselves. Furthermore, it is possible that while the calculations may have been correctly made, the original data may have been obtained in a way that deprives the measurements that we have made of positive value. These possibilities are fraught with serious consequences, and we must, therefore, weigh them most carefully in seeking to assess the dependability of our inquiry.

Two objections immediately spring to mind. Both affect the validity of our inference from the statistical information that the inequality of the distribution of income in Puerto Rico has diminished during the period under study. The former doubt arises from the possibility that a change in the concentration ratios is insufficiently great to be regarded as a significant or substantial movement during the period. Along with this goes the associated query whether or not the definitions of income and income recipient remained sufficiently constant throughout the period for comparison to remain valid. The other problem we are left with is quite simply that of emigration by Puerto Ricans during the period. Would we still have observed an apparent decrease in income inequality if Puerto Ricans had been unable to move freely to the United States? Or, could the apparent change in the income distribution stem solely from the well-known movement of Puerto Ricans to New York?
We will take these two questions in turn.

1. Comparability of Data and Definitions.

It is perhaps more convenient to dispose first of the question about definitions being comparable. The data made available on the distribution of the income of wage earners by the 1953 survey did not include the value of food produced for family use in its definition whereas the two previous ones did. Adjustments were necessary to make the data comparable. The definition of the income recipient was consistent throughout. Consequently, we had no other problem apart from the above adjustment. Hence, the wage earner distribution is comparable and definitely indicates a decrease in the degree of inequality. However, since the wage earner was defined as a person receiving wages and working thirteen weeks or more during the year, the survey must have excluded all the persons unemployed during the whole of the sample year and some of the seasonally unemployed. The result may suggest more equality than actually prevails.

The distribution of income among all families presents more difficult problems and some speculation is necessary, for we know very little about the definition of income and income recipient in 1946/47. If income recipient is not defined as in the subsequent surveys, as families living together in the same household, and pooling their incomes for major expenses, but rather as a much larger household including virtually more than one spending unit, then our concentration ratio for that year undervalues the degree of inequality. Moreover, from the point of view of the income definition the 1946/47 data are no more comforting, for there is very little information provided. If, therefore, the income concept of 1946/47 is consistent with that of the subsequent surveys, which are consistent among themselves, then the degrees of inequality are strictly comparable. If, on the other hand,
1946/47 income concept did not include income in kind, which is probable, our concentration ratio is overvalued, and shows greater income inequality than there actually was. With this limitation in mind, we would still say that income inequality among Puerto Rican families has narrowed between 1946/47 and 1955.

Finally, the tax data, which, as we have already indicated, has limited value, also shows a decrease in income inequality. The tax data covers only a small segment of the economy, and the period of coverage is extremely short, being only four years. Since it covers such a short period, it is more susceptible to changes in business conditions, and we should bear in mind that 1957/58 was a recession year. The main advantage of the tax data was to help us evaluate the progressive income tax structure. In fact, overall equality increased in both cases, i.e., when incomes before and after tax were compared.

It seems only common sense to expect that wage incomes would show less concentration than that of all incomes taken together, hence the lower values of the concentration ratios. But how can we explain the lower coefficients of inequality obtained from the tax data compared with those based on the incomes of all families? The main reason appears to us to lie in the fact that while in the lower end of the income scale the high level of minimum exemption excluded a number of families, in the upper end of the income scale, fraudulent reporting and tax evasion reduced the weight of the upper incomes, both factors causing a swelling in the middle incomes.

Turning to the other aspect of this question about comparability, we have to satisfy ourselves that the data are not subject to so wide an error margin that the apparent change in the concentration ratio during the period cannot logically
support our contention. That is to say, we ought in principle, to test the comparison we have made for its statistical reliability. We ought, therefore, to establish by the usual test of statistical significance that our hypothesis that income distribution has become more equal is at least not inconsistent with the calculated change in the concentration ratios. To be able to do this we would require the original sample data wherewith to calculate the standard error of the concentration ratio. Unfortunately, it has proved impossible to obtain the sample data, and we have had to rely upon the estimates therefrom by the Puerto Rican Authorities. As a consequence it may be objected that the change in the concentration ratios does not unambiguously point to a real reduction in income inequality in Puerto Rico for the period under consideration. Without a definitive measure of the standard error contained in the sample data upon which all subsequent calculations are based, we cannot absolutely dispel the doubt that our conclusion may not strictly follow from our statistical measurements.

Two things, however, substantiate our view that there has been a significant reduction in income inequality in Puerto Rico. The first is that the Lorenz curve ratio and the concentration/respond only to large changes in the income distribution and are somewhat insensitive to small variations. The second salutary consideration is that countries whose income distribution is authoritatively believed to have become less unequal show smaller changes in their concentration ratios than we have observed in those of Puerto Rico. For example, in the United Kingdom the concentration ratios have changed from 0.43 to 0.39 between 1938 and 1949, suggesting approximately a 10% improvement, while in our case the change was approximately 11% for the distribution of income of all families, and more than 30% for that of wage-earner families.
2. **Emigration to the United States.**

Due to their special status Puerto Ricans enjoy the freedom of emigrating to the United States. Net migration (excess of outflow over inflow) has always been positive. Total net migration between 1948 and 1955 can be said to be approximately 55,000 families.¹ Not all under-developed countries enjoy such an opportunity. Population of some other countries, such as that of the British West Indies also have the same possibility to migrate to Great Britain. However, this cannot be said for the majority of the developing countries. Therefore, the Puerto Rican case appears, in the first instance, to be a special one. The question then is: is the decline in inequality observed in Puerto Rico the result of the impact of economic development, as we have argued generally in our study, or is it only due to the lessening of population pressure due to emigration to the United States? In other words, what would the income distribution have been had there been no emigration? Would our conclusion of decreasing income inequality over this period still hold? The answer to these questions must necessarily be speculative, for it is very difficult to show quantitatively the effect of migration on income distribution, since no information is available as to which income groups these emigrant families belong. We believe, however, that some widening of equality would still be observed even without emigration. To illustrate this point we have constructed a hypothetical income distribution for which we have made two drastic assumptions:

1. that all families that moved annually from Puerto Rico to the United

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¹ This figure is obtained by simply dividing total net outgoing migration given in A. J. Jaffe, *op. cit.*, p. 64, by the average size of the family.
States between 1948 and 1955 had zero incomes; 1

ii. that these families would have continued to have zero incomes
over the total period under consideration, i.e., between 1948
and 1955, had they stayed in Puerto Rico.

All of the 55,800 families were, therefore, included in the lowest income
group of 0 - 500 dollars in the 1955 distribution. The concentration ratio
calculated on the basis of this hypothetical distribution has been found to be
0.50 which suggests that a movement towards equality emerges in spite of the
drastic assumptions made.

This finding, however, must be qualified. A total figure of 55,800 families
is probably an overestimation on our part, since it was obtained on the assumption
that every group of approximately 5 emigrants constituted a family unit. This may
not be the case, since members of families remaining on the island are also likely
to migrate. Hence the actual sum of emigrant families was probably less than

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1. The other extreme assumption of allocating all emigrant families into the
top income group would be completely unrealistic, since we know that families leave Puerto Rico for the States under the attraction of better employment opportunities and higher wages (See, Junta de Planificacion, Informe Economico al Gobernador, 1956, San Juan, p. 50). Existing wage differentials between the two countries may be taken as an indication of this tendency. For instance, in Puerto Rico in 1955 wages of non-farm labourers were 68%, those of service workers 80% of craftsmen and operatives 67%, and of clerical workers 78% of wages of similar workers in the United States, while the earnings of managers and professionals was at par. (These figures have been calculated from data given in A. J. Jaffe, op. cit., p. 133).
55,800 during this period. In other words, the lowest income group of the hypothetical distribution is artificially swollen as a result of our assumption, probably also causing double counting in the total number of families included in the hypothetical distribution. Moreover, had we allocated these emigrant families not to the lowest income group but to some of the lower income groups, which might have been a more realistic assumption, but which could not be carried out owing to lack of data, the concentration ratio obtained on the basis of such a distribution would have been less than the one obtained under our drastic assumption. Nevertheless, even under the most drastic assumptions it appears that the equalization of incomes cannot be attributed, ceteris paribus, to emigration alone.

III. Comparison of the Degree of Inequality in Puerto Rico with those in Selected Countries.

What is the place of Puerto Rico in an international setting? Are incomes more equally distributed in Puerto Rico than in some of the other under-developed countries of the world, and how would Puerto Rico fare in a comparison with some of the developed? We are only too aware of the difficulties, limitations and shortcomings of such comparisons. This subject has an economic literature of its own. We would, however, like to indicate roughly the relative position of Puerto Rico with respect to certain other countries, even though we do not have data for many countries for the same years. In doing so, we have kept in mind the extensiveness of the coverages of income and income recipient in different data. In other words, with the Puerto Rican tax data we have compared data pertaining to those countries where coverage was similar to that of Puerto Rico, i.e., where income represented in distribution data was 10% or less of the personal income according
to the national income accounts. Similarly, Puerto Rican survey data was compared with data pertaining to those countries where income coverage came close to personal income according to the national accounts, whether such data were obtained through surveys or tax returns. Specifically, the comparison between inequality in Puerto Rico and in the United States, the United Kingdom, Denmark and Sweden was made on the basis of Puerto Rican survey data where, however, distribution data for the other countries was obtained from tax returns.

Comparison with Brazil and India was made on the basis of Puerto Rican tax returns, since data for these two countries were also tax data with limited coverage.

Comparison with Ceylon, Mexico and Barbados was made on the basis of survey data, since similar surveys had also been conducted in these countries.

Table VIII. 2 shows the result of these comparisons in terms of indexes, the base for which is the Puerto Rican concentration ratios for survey and tax returns data in 1955. As it can be seen from this table, incomes are more unequally distributed in Puerto Rico than in developed countries, a situation which might be expected.\(^1\) It also appears that in the other developing countries there is more concentration of incomes in varying degrees. It should be borne in mind, nevertheless, that since data are not exactly comparable on the one hand, and do not relate to the same year on the other, it is rather difficult to pass any conclusive judgment.

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\(^1\) But not in an international setting. A recent study indicates that incomes are much more unequally distributed among countries than within countries. See, Suphan Andic and Alan T. Peacock, "The International Distribution of Income, 1949 and 1957", Journal of the Royal Statistical Society, No. 2, 1961 (in print).
Table VIII.2

Indexes of Concentration Ratios in Selected Countries.

(Concentration Ratio, Puerto Rico, 1955 = 100)

<table>
<thead>
<tr>
<th>Country</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbados (1952)</td>
<td>102.2</td>
</tr>
<tr>
<td>Brazil (1948)</td>
<td>114.6</td>
</tr>
<tr>
<td>Ceylon (1953)</td>
<td>106.5</td>
</tr>
<tr>
<td>Denmark (1952)</td>
<td>95.6</td>
</tr>
<tr>
<td>India (1953)</td>
<td>107.3</td>
</tr>
<tr>
<td>Mexico (1957)</td>
<td>113.0</td>
</tr>
<tr>
<td>Sweden (1954)</td>
<td>82.6</td>
</tr>
<tr>
<td>United Kingdom (1957)</td>
<td>78.3</td>
</tr>
<tr>
<td>United States (1950)</td>
<td>86.9</td>
</tr>
<tr>
<td>Puerto Rico (1955)</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Barbados - Calculated from data given by K. H. Straw, *op. cit.*

Brazil - J. Kingston, *op. cit.*

Ceylon - T. Morgan, *op. cit.*

Denmark, and Sweden - U.N., Economic Commission for Europe, *op. cit.*, Chapter IX.

India - Ministry of Finance, *op. cit.*

Mexico - Calculated from data given by I. de Navarrete, *op. cit.*


United States - T. Morgan, *op. cit.*
IV. Suggestions for Further Information on Income Distributions.

Can the inequality of incomes be expected to narrow further? If we assume that economic growth will continue - and there are global indications that it is doing so - the speculative answer is "yes". The definite answer will depend upon the availability of further information. It has been five years since the last survey was conducted, and it is high time for a new one to be made. There is no lack of interest in the subject on the part of the Puerto Rican government; in fact a number of high ranking planners have expressed the need for investigations of this kind. Therefore, it would not be surprising if a survey of family incomes were to be conducted once again in the near future.

We would like to take this opportunity to make a few suggestions for the improvement and the enlargement of the information to be provided by these surveys.

It is desirable to observe not only the change in the overall distribution of income, but also mobility between income groups. The number of families falling into different groups changes over the years. It is impossible to draw conclusions about the effects of economic conditions on particular families without a knowledge of this intergroup mobility. Information on intergroup mobility may be obtained through consecutive sample surveys covering the same families over the years. Such a study is not possible with the data at our disposal, and since the surveys were not solely designed for the purpose of studying income distribution, it would be over-optimistic to expect such information from them.

In many cases part of the results of the surveys concerning income distribution was given in percentage terms without providing absolute figures of the total number of the families, number of families in each income group, aggregate income of
families and income of each bracket. They had to be obtained privately from
the appropriate government agencies. Absolute figures are much more important,
since percentage figures can easily be calculated from them.

It would have been very desirable if the definition of income had been
kept consistent. The agencies conducting these surveys may have very justifiable
reasons from their point of view in omitting or including certain categories of
income. Yet for a student of income distribution and of its changes over time
the more consistent and complete the concept of income is the more reliable can
be the comparisons made over the years.

The published results of the surveys do not keep the same classifications
according to income brackets. A graphical manipulation to obtain a consistent
classification, such as we have done, may reduce the reliability of conclusions
somewhat. Furthermore, the number of brackets might influence the value of the
concentration ratio, for it should be noted that the reliability of the measures
of inequality is affected by the number of intervals of the distribution.

It would be very desirable to have successively the distribution of families
according to the sources of their income, presented in such a way as to enable us
to study the importance of the changes in relative shares of factors of production,
of transfers, and of social incomes in different income groups, and thereby to
judge their effects on changes on income inequality. This information was provided
for one year, and we hope that the practice will be continued. Moreover,
considering the difficulties we have encountered in the allocation of taxes,
information is also desirable on distribution of disposable incomes and the relative
importance of taxes in different income groups.
In order to be able to study changes in the distribution of real incomes, price indices are needed for different income groups with different expenditure patterns. To apply the general consumer price index may easily lead to erroneous conclusions. We have tried to construct such a price index for different groups. However, an agency, like the Bureau of Labour Statistics, would have all the means and facilities to construct more reliable ones.

We believe that, with these refinements, new surveys made at regular intervals would throw penetrating light on the long-term repercussions of economic development. We fully realize that at least some of the recommendations can only be fulfilled in a statistician's "best of all possible worlds". A small country like Puerto Rico might not be able to cope with all of the suggestions. Material already provided allows us to say only that the structural change in the last decade is toward more equal distribution of incomes.
APPENDIX
### Table A.1

**Population of Puerto Rico**  
**1910-1960**

<table>
<thead>
<tr>
<th>Year</th>
<th>Population (000)</th>
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<tbody>
<tr>
<td>1910</td>
<td>1118</td>
</tr>
<tr>
<td>1920</td>
<td>1299</td>
</tr>
<tr>
<td>1930</td>
<td>1543</td>
</tr>
<tr>
<td>1931</td>
<td>1580</td>
</tr>
<tr>
<td>1932</td>
<td>1616</td>
</tr>
<tr>
<td>1933</td>
<td>1652</td>
</tr>
<tr>
<td>1934</td>
<td>1688</td>
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<tr>
<td>1935</td>
<td>1723</td>
</tr>
<tr>
<td>1936</td>
<td>1754</td>
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<tr>
<td>1937</td>
<td>1785</td>
</tr>
<tr>
<td>1938</td>
<td>1816</td>
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<td>1939</td>
<td>1847</td>
</tr>
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<td>1940</td>
<td>1689</td>
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<td>1943</td>
<td>1979</td>
</tr>
<tr>
<td>1944</td>
<td>2012</td>
</tr>
<tr>
<td>1945</td>
<td>2046</td>
</tr>
<tr>
<td>1946</td>
<td>2079</td>
</tr>
<tr>
<td>1947</td>
<td>2113</td>
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<td>1955</td>
<td>2264</td>
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<td>1959</td>
<td>2321</td>
</tr>
<tr>
<td>1960</td>
<td>2353</td>
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## Table A.2
National Income of Puerto Rico, Total and Per Head, at Current Prices, 1930-1958

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<th>Year</th>
<th>National Income (million dollars)</th>
<th>National Income per head (dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930</td>
<td>189</td>
<td>122</td>
</tr>
<tr>
<td>1931</td>
<td>169</td>
<td>107</td>
</tr>
<tr>
<td>1932</td>
<td>156</td>
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<td>1933</td>
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<td>1935</td>
<td>177</td>
<td>103</td>
</tr>
<tr>
<td>1936</td>
<td>199</td>
<td>114</td>
</tr>
<tr>
<td>1937</td>
<td>210</td>
<td>118</td>
</tr>
<tr>
<td>1938</td>
<td>217</td>
<td>119</td>
</tr>
<tr>
<td>1939</td>
<td>207</td>
<td>112</td>
</tr>
<tr>
<td>1940</td>
<td>227.8</td>
<td>123</td>
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<tr>
<td>1941</td>
<td>278.2</td>
<td>147</td>
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<tr>
<td>1942</td>
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<tr>
<td>1943</td>
<td>434.5</td>
<td>221</td>
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<tr>
<td>1944</td>
<td>477.4</td>
<td>239</td>
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<td>1945</td>
<td>535.5</td>
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<td>1946</td>
<td>565.0</td>
<td>276</td>
</tr>
<tr>
<td>1947</td>
<td>545.6</td>
<td>250</td>
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<tr>
<td>1948</td>
<td>556.3</td>
<td>256</td>
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<td>1949</td>
<td>597.1</td>
<td>272</td>
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<td>276</td>
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<td>1951</td>
<td>705.7</td>
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<td>1952</td>
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<td>1953</td>
<td>887.2</td>
<td>400</td>
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<td>1954</td>
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<td>1955</td>
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<td>413</td>
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<td>1956</td>
<td>953.7</td>
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<td>1957</td>
<td>1014.2</td>
<td>446</td>
</tr>
<tr>
<td>1958</td>
<td>1079.0</td>
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</table>

**Source:**

Per head figures are obtained by dividing total national income by the corresponding population figures.
### Table A.3
National Income of Puerto Rico, Total and Per Head, at Constant (1940) Prices, 1940-1958

<table>
<thead>
<tr>
<th>Year</th>
<th>National Income (million dollars)</th>
<th>National Income per head (dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>227.8</td>
<td>123.0</td>
</tr>
<tr>
<td>1941</td>
<td>252.3</td>
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</tr>
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<td>138.0</td>
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<tr>
<td>1943</td>
<td>317.6</td>
<td>161.6</td>
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<tr>
<td>1944</td>
<td>335.7</td>
<td>168.1</td>
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<tr>
<td>1945</td>
<td>383.1</td>
<td>183.9</td>
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<tr>
<td>1946</td>
<td>379.7</td>
<td>184.1</td>
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<tr>
<td>1947</td>
<td>346.8</td>
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<td>1948</td>
<td>338.4</td>
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<td>372.7</td>
<td>170.0</td>
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<td>1951</td>
<td>442.4</td>
<td>199.4</td>
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<td>1952</td>
<td>485.5</td>
<td>217.6</td>
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<td>1953</td>
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<td>1954</td>
<td>512.3</td>
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<td>1957</td>
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Calculated from Tables A.2 and A.10
Table A.4

Indexes of Growth of National Income, Total and Per Head at Constant (1940) Prices, 1940-1957

(1940 = 100)

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<th>Year</th>
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<tr>
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<tr>
<td>1941</td>
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<td>164</td>
<td>138</td>
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<tr>
<td>1950</td>
<td>174</td>
<td>146</td>
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<tr>
<td>1951</td>
<td>194</td>
<td>167</td>
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<td>1952</td>
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<td>243</td>
<td>198</td>
</tr>
<tr>
<td>1958</td>
<td>247</td>
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</table>

Calculated from Table A.3
### TABLE A-5

**NATIONAL INCOME BY INDUSTRIAL ORIGIN, 1940-1957.**

(Thousand Dollars)

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<tbody>
<tr>
<td><strong>Agriculture</strong></td>
<td>70,468</td>
<td>70,476</td>
<td>106,076</td>
<td>120,334</td>
<td>109,019</td>
<td>123,292</td>
<td>143,678</td>
<td>142,969</td>
<td>157,072</td>
<td>151,620</td>
<td>149,595</td>
<td>157,726</td>
<td>136,669</td>
<td>126,938</td>
<td>131,516</td>
<td>120,972</td>
<td>105,055</td>
<td>124,946</td>
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<tr>
<td><strong>Sugar cane</strong></td>
<td>35,816</td>
<td>35,837</td>
<td>51,172</td>
<td>50,055</td>
<td>33,579</td>
<td>50,430</td>
<td>50,411</td>
<td>52,867</td>
<td>70,561</td>
<td>69,000</td>
<td>63,465</td>
<td>72,444</td>
<td>62,160</td>
<td>87,781</td>
<td>86,323</td>
<td>69,259</td>
<td>95,055</td>
<td>90,855</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>34,652</td>
<td>42,037</td>
<td>54,904</td>
<td>70,476</td>
<td>75,440</td>
<td>78,866</td>
<td>66,511</td>
<td>62,893</td>
<td>69,000</td>
<td>63,465</td>
<td>72,444</td>
<td>87,781</td>
<td>86,323</td>
<td>69,259</td>
<td>95,055</td>
<td>90,855</td>
<td>90,855</td>
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</tr>
<tr>
<td><strong>Mining</strong></td>
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<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td><strong>Manufacturing</strong></td>
<td>26,750</td>
<td>29,276</td>
<td>40,446</td>
<td>41,741</td>
<td>56,658</td>
<td>73,063</td>
<td>74,749</td>
<td>82,497</td>
<td>82,430</td>
<td>80,280</td>
<td>105,866</td>
<td>115,403</td>
<td>137,061</td>
<td>150,396</td>
<td>149,635</td>
<td>213,613</td>
<td></td>
<td></td>
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<tr>
<td><strong>Construction</strong></td>
<td>2,970</td>
<td>11,753</td>
<td>7,135</td>
<td>1,445</td>
<td>2,896</td>
<td>10,306</td>
<td>25,759</td>
<td>33,635</td>
<td>41,934</td>
<td>37,035</td>
<td>31,002</td>
<td>32,628</td>
<td>35,564</td>
<td>42,859</td>
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<tr>
<td><strong>Transportation and Public Utilities</strong></td>
<td>16,115</td>
<td>22,656</td>
<td>27,357</td>
<td>26,221</td>
<td>30,029</td>
<td>29,822</td>
<td>38,514</td>
<td>41,034</td>
<td>46,507</td>
<td>49,326</td>
<td>52,955</td>
<td>57,250</td>
<td>61,658</td>
<td>68,485</td>
<td>72,579</td>
<td>77,881</td>
<td>85,496</td>
<td></td>
</tr>
<tr>
<td><strong>Retail and Wholesale Trade</strong></td>
<td>20,330</td>
<td>29,314</td>
<td>38,505</td>
<td>44,404</td>
<td>53,996</td>
<td>57,002</td>
<td>57,447</td>
<td>94,353</td>
<td>95,153</td>
<td>101,710</td>
<td>120,873</td>
<td>123,206</td>
<td>130,175</td>
<td>145,600</td>
<td>153,518</td>
<td>165,259</td>
<td>179,470</td>
<td></td>
</tr>
<tr>
<td><strong>Finance, Insurance and Real Estate</strong></td>
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<td>26,293</td>
<td>23,377</td>
<td>30,470</td>
<td>33,400</td>
<td>37,034</td>
<td>39,719</td>
<td>36,037</td>
<td>40,170</td>
<td>42,411</td>
<td>51,019</td>
<td>59,033</td>
<td>65,100</td>
<td>70,173</td>
<td>76,462</td>
<td>80,276</td>
<td>86,945</td>
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<tr>
<td><strong>Services</strong></td>
<td>28,741</td>
<td>29,262</td>
<td>32,690</td>
<td>40,717</td>
<td>43,339</td>
<td>46,053</td>
<td>53,378</td>
<td>34,324</td>
<td>30,200</td>
<td>40,230</td>
<td>43,675</td>
<td>50,565</td>
<td>54,318</td>
<td>60,144</td>
<td>62,600</td>
<td>64,777</td>
<td>68,355</td>
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<tr>
<td><strong>Commonwealth Gvt.</strong></td>
<td>21,551</td>
<td>23,323</td>
<td>27,704</td>
<td>34,251</td>
<td>42,990</td>
<td>54,290</td>
<td>59,766</td>
<td>54,086</td>
<td>61,523</td>
<td>70,426</td>
<td>76,015</td>
<td>80,533</td>
<td>102,833</td>
<td>106,206</td>
<td>119,360</td>
<td>133,806</td>
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<td></td>
</tr>
<tr>
<td><strong>Rest of the World</strong></td>
<td>16,995</td>
<td>23,063</td>
<td>35,017</td>
<td>46,641</td>
<td>107,287</td>
<td>122,945</td>
<td>100,692</td>
<td>39,877</td>
<td>56,086</td>
<td>37,671</td>
<td>31,011</td>
<td>48,125</td>
<td>51,044</td>
<td>111,786</td>
<td>142,164</td>
<td>151,649</td>
<td>79,686</td>
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<tr>
<td><strong>Federal Gvt.</strong></td>
<td>20,523</td>
<td>33,320</td>
<td>34,764</td>
<td>101,269</td>
<td>117,695</td>
<td>135,586</td>
<td>107,958</td>
<td>52,266</td>
<td>42,340</td>
<td>45,095</td>
<td>45,704</td>
<td>60,617</td>
<td>107,005</td>
<td>135,963</td>
<td>171,493</td>
<td>213,185</td>
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</tr>
<tr>
<td><strong>Net International Flow of Capital</strong></td>
<td>8,112</td>
<td>6,882</td>
<td>6,977</td>
<td>6,868</td>
<td>10,408</td>
<td>10,408</td>
<td>7,222</td>
<td>12,469</td>
<td>5,520</td>
<td>5,224</td>
<td>14,729</td>
<td>35,581</td>
<td>35,581</td>
<td>48,125</td>
<td>51,044</td>
<td>111,786</td>
<td>142,164</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>227,780</td>
<td>278,239</td>
<td>355,039</td>
<td>434,514</td>
<td>547,820</td>
<td>553,528</td>
<td>565,028</td>
<td>545,547</td>
<td>566,322</td>
<td>577,127</td>
<td>613,930</td>
<td>705,691</td>
<td>832,221</td>
<td>837,200</td>
<td>909,073</td>
<td>943,047</td>
<td>953,666</td>
<td>1044,185</td>
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</table>

* Eating and drinking places are included under services for years 1940-46, and under trade for 1947 onwards.

Compiled from:

### Table A.6

**The Percentage Distribution of National Income by Industrial Origin, 1940-1958.**

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</tr>
</thead>
<tbody>
<tr>
<td>Agric.</td>
<td>30.9</td>
<td>30.2</td>
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</tr>
</thead>
<tbody>
<tr>
<td>Compensation of Employees</td>
<td>38.6</td>
<td>40.1</td>
<td>39.4</td>
<td>37.6</td>
<td>37.0</td>
<td>37.6</td>
<td>39.4</td>
<td>47.8</td>
<td>50.4</td>
<td>50.9</td>
<td>48.6</td>
<td>48.5</td>
<td>49.4</td>
<td>49.9</td>
<td>49.6</td>
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</tr>
<tr>
<td>Net Profits</td>
<td>36.0</td>
<td>38.4</td>
<td>40.4</td>
<td>42.6</td>
<td>42.9</td>
<td>43.3</td>
<td>42.2</td>
<td>38.8</td>
<td>35.7</td>
<td>34.5</td>
<td>34.3</td>
<td>34.7</td>
<td>33.8</td>
<td>33.7</td>
<td>33.7</td>
<td>33.5</td>
</tr>
<tr>
<td>Rent</td>
<td>22.3</td>
<td>18.9</td>
<td>17.6</td>
<td>16.5</td>
<td>16.4</td>
<td>16.5</td>
<td>15.8</td>
<td>12.1</td>
<td>12.6</td>
<td>15.2</td>
<td>15.2</td>
<td>14.0</td>
<td>13.9</td>
<td>13.5</td>
<td>13.5</td>
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</tr>
<tr>
<td>Interest</td>
<td>3.1</td>
<td>2.6</td>
<td>2.6</td>
<td>3.0</td>
<td>2.6</td>
<td>2.6</td>
<td>1.5</td>
<td>1.3</td>
<td>1.1</td>
<td>0.9</td>
<td>2.9</td>
<td>1.9</td>
<td>3.4</td>
<td>3.2</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
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<td>100.0</td>
<td>100.0</td>
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</table>

Table A.10

Implicit Price Deflator for National Income

<table>
<thead>
<tr>
<th>Year</th>
<th>Price Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>100.0</td>
</tr>
<tr>
<td>1941</td>
<td>110.3</td>
</tr>
<tr>
<td>1942</td>
<td>134.8</td>
</tr>
<tr>
<td>1943</td>
<td>136.8</td>
</tr>
<tr>
<td>1944</td>
<td>142.4</td>
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<td>1945</td>
<td>144.5</td>
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<tr>
<td>1946</td>
<td>148.8</td>
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<tr>
<td>1947</td>
<td>157.3</td>
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<tr>
<td>1948</td>
<td>164.4</td>
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<tr>
<td>1949</td>
<td>160.2</td>
</tr>
<tr>
<td>1950</td>
<td>154.8</td>
</tr>
<tr>
<td>1951</td>
<td>159.5</td>
</tr>
<tr>
<td>1952</td>
<td>171.4</td>
</tr>
<tr>
<td>1953</td>
<td>174.5</td>
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<tr>
<td>1954</td>
<td>177.6</td>
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<td>1955</td>
<td>177.9</td>
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<tr>
<td>1956</td>
<td>177.8</td>
</tr>
<tr>
<td>1957</td>
<td>182.9</td>
</tr>
<tr>
<td>1958</td>
<td>191.6</td>
</tr>
</tbody>
</table>

Source: 1940 and 1947-1955 figures are taken from Junta de Planificacion, Net Income and Gross Product of Puerto Rico, 1940 and 1947-1955, San Juan.

1941-1946 figures are from Junta de Planificacion, Annual Book of Statistics 1950. The base year has been shifted to 1940.
Table A.11

Implicit Price Deflators for Personal Consumption Expenditures, 1953 (1941=100) and 1955 (1947=100)

<table>
<thead>
<tr>
<th>Expenditure Groups</th>
<th>1953 (1941=100)</th>
<th>1955 (1947=100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and Tobacco</td>
<td>176.3</td>
<td>112.2</td>
</tr>
<tr>
<td>Clothing</td>
<td>187.4</td>
<td>96.4</td>
</tr>
<tr>
<td>Personal Care</td>
<td>162.9</td>
<td>124.7</td>
</tr>
<tr>
<td>Housing</td>
<td>130.9</td>
<td>127.5</td>
</tr>
<tr>
<td>Household Operations</td>
<td>158.3</td>
<td>112.7</td>
</tr>
<tr>
<td>Medical Care</td>
<td>159.9</td>
<td>127.2</td>
</tr>
<tr>
<td>Personal business</td>
<td>88.7</td>
<td>152.3</td>
</tr>
<tr>
<td>Transportation</td>
<td>110.8</td>
<td>101.7</td>
</tr>
<tr>
<td>Recreation</td>
<td>140.7</td>
<td>112.3</td>
</tr>
<tr>
<td>Education</td>
<td>120.5</td>
<td>133.1</td>
</tr>
<tr>
<td>Foreign Travel</td>
<td>171.2</td>
<td>133.7</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>219.2</td>
<td>127.6</td>
</tr>
</tbody>
</table>

The above indices have been constructed from information made available by the Junta de Planificació on the implicit price deflators for personal consumption expenditures, 1940 to 1955, 1954 being the base year (see Net Income and Gross Product, Puerto Rico 1940 and 1947-1955, Table 28). The Department of Labour, together with information on income distribution, provided the percentage distribution of expenditures on various items for each income group. On the basis of the percentage distribution of expenditures we were able to break down the total income of each group into the appropriate expenditure components. We then applied the price indices given above to obtain the amount of expenditures for each income group, in 1941 and 1947 prices, for the 1953 wage earner distribution and the 1955 all families distribution. By dividing nominal incomes into real incomes thus obtained, we have constructed the price indices for each income group which are given in Chapter VI, Tables VI.4 and VI.9. The results should be treated cautiously since our calculations have neglected, due to lack of information, savings and taxes.
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