

CRITICAL ANALYSIS OF THE STATISTICAL
AND ECONOMIC FACTORS IN THE GROWTH
RATES OF PUERTO RICO AND JAMAICA
1950-59

by Alfred P. Thorne

INTRODUCTION¹

THE picture of economic growth that is presented by the national income statistics of Puerto Rico and Jamaica for the period 1950-9 is as striking for the rapid, sustained annual increases in national aggregates as for the spectacular relative development of one or two sectors of these economies. On the basis in both cases of the most recently revised official figures, Puerto Rico's constant price gross domestic product increased annually by 5.3 per cent on the average, from \$844 million in 1950 to \$1,355 million in 1959. Over the same period Jamaica's grew by 9.9 per cent, from £83 million (about \$U.S. 232 million) to £194 million (\$U.S. 544 million). If we take G.N.P. deflated figures, the rates are very little lower: Puerto Rico's, 5.2 per cent and Jamaica's 8.4 per cent.

Although there were wide fluctuations in the annual rates of growth in each island, only once in each island was the rate below 3 per cent: that is, in Puerto Rico, 2 per cent for the 1953-4 growth; and in Jamaica, 1.9 per cent for 1957-8. On the other hand, Puerto Rico's highest rate was 10 per cent (1951-2), whilst Jamaica's was 16 per cent (1952-3). If we look back to the 1940s, we find that Puerto Rico's highest rate was attained in 1948-9 (11.2 per cent), when it was probably at a stage in its new

¹ *Acknowledgements.* Acknowledgement is gratefully made of the grant provided me by the Institute of Caribbean Studies of the University of Puerto Rico for an indispensable three-week research visit to Jamaica, and of the valuable research assistants assigned to me by the Department of Economics of the College of Social Sciences, University of Puerto Rico. I also received the ready co-operation of the Institute of Social and Economic Research, University of the West Indies.

A study of this sort depends greatly upon the co-operation of relevant Government department heads and other officials. I thank especially the Jamaican and Puerto Rican national income officials, particularly Mr. Dexter Rose, Mr. Eric Shaw and their assistants of the Department of Statistics of Jamaica, and Mr. Surliel Sanchez and his staff in the National Income Division of Puerto Rico's Planning Board.

Last, but no means least, I am indebted to Miss Phyllis Deane, who made a number of very valuable suggestions.

economic thrust comparable to Jamaica's now, almost a decade later. The 1950-9 growth in the island populations, much more rapid in Jamaica (over 3 per cent per year), owing mainly to very much greater Puerto Rican emigration, resulted in rates of increase in real product *per capita* that averaged 4.6 per cent in Puerto Rico and 6 per cent in Jamaica. These rates, also, are unusually high and long sustained.¹

In view of the fact that over the past fifty to one hundred years the developed countries experienced growth rates of more than 3 per cent a year for more than eight years only in periods when there were special explanations, as pointed out by Deborah Paige and others,² a critical examination of the growth rates of these two islands is justified. An attempt is made here to do this.

The principal matters discussed in explanation of the rapid rates of growth are:

A. Statistical distortions:

- (1) Techniques and processes of estimation, and possible bias.
- (2) Methods of deflation, and possible bias.

B. Non-statistical factors:

Major Governmental policy and other institutional changes.

Inflows of foreign capital, enterprise and technology.

Exploitation of new natural resources.

Shifts of labour from the traditional to the modern sectors.

Federal military and other expenditures.

Massive broadening of educational opportunities (in Puerto Rico).

A. STATISTICAL DISTORTIONS

It is to be expected that the current price gross product values of the two islands make their economic growth seem even more dramatic. This is particularly so in the case of Jamaica, where prices rose somewhat more rapidly; for Jamaica does not enjoy Puerto Rico's advantages of the great supply elasticities and resource mobilities of the developed U.S. economy (of which

¹ Aggregate and *per capita* figures are given in Appendix I.

² In the *National Institute Economic Review*, July 1961.

Puerto Rico is in many respects a part). On the basis of the undeflated product estimates, the rates of increase (1950-9) averaged 8 per cent for Puerto Rico and 12.7 per cent for Jamaica. Two major questions, then, are, first, did the methods of estimation distort the annual values with an upward bias; and, second, did the methods of deflation of the current price values leave any of this bias, or themselves give an upward bias to the constant price estimates? Were the indices used as deflators so affected by limitations in their coverage of items and incompleteness of price data as to lead to too slow a rise in the indices, and therefore to an upward bias in the 'real' values of the aggregates? Or was the base year chosen a recent year? Did the weighting system used in making the indices take adequate account of the large shifts in population from rural to urban areas? I shall try to answer these questions.

1. *Methods used to estimate current price values and probable direction and extent of bias in these values*

Puerto Rico

Puerto Rico's official national income statistics go back to 1940, and are built on the foundations laid by the Social Science Research Centre of the University of Puerto Rico. In the mid-fifties a thorough revision in the light of improved data was carried out under the direction of Mr. Robert L. Sammons, an expert from the United States (and at present a senior member of the staff of the Federal Reserve Board, Washington, D.C.). The work of revision of sources and methods extended over a period of several years; and though the overall picture of growth of the Puerto Rican economy remained on the whole unchanged, there were several item alterations, some of them large (for example, construction expenditures).

Since the sources and estimating techniques of the revised estimates have continued to be used, all the series are now on the same bases. It is not feasible, and probably would not be desirable, to give a full description here of sources and techniques. But it must be emphasized at the outset that two independent sets of estimates have been made annually: one, estimates of gross national product, made by summing estimates of the final purchases of private consumers, Government, business, and rest

of the world; the other, estimates of net income made by summing estimates of wages and salaries and of net profits. Each total is then reconciled with the other in the usual way, by taking account of depreciation, indirect business taxes, subsidies and business transfer payments.

Expenditures on G.N.P. The methods of estimating final *personal consumption* purchases of goods fall into two broad classes: the 'commodity flow method' and the 'retail valuation method'. In the case of purchases of services, the estimates are based mainly on calculations of the gross receipts of the firms or organizations providing the services.

The commodity flow method consists essentially of estimating the following data for each group of items:

(a) Imports from all sources – data from the U.S. Department of Commerce trade statistics.

(b) Freight and other transportation costs – using the lists of rates of charge supplied by the U.S. Maritime Commission.

(c) Producers' sales of local production – using the Puerto Rico censuses of manufactures (one every other year), and the censuses of wholesale and retail trade and services (1949, 1954 and 1958). Sales estimates for non-census years are made by using link relatives of gross receipts of firms reporting to the income tax bureau.

(d) Exports (U.S. Department of Commerce Statistics).

(e) Sales for investment or intermediate use.

(f) Goods acquired by wholesalers (the algebraic sum of (a) + (b) + (c) – (d) – (e)).

(g) Change in wholesalers' inventories, calculated from income-tax returns.

(h) Wholesalers' mark-ups (same source as (g)).

(i) Goods acquired by retailers ((f) + (g) + (h)).

(j) Change in retailers' inventories (as for wholesalers).

(k) Retailers' mark-ups (as for wholesalers).

(l) Sales to consumers ((i) + (j) + (k)).

Commonwealth of Puerto Rico *Government expenditures*, current and capital separately, are easily estimated from annual reports and from data available in Government files. Municipal government expenditures are less readily broken down into capital and current.

The estimates of *private construction* are based on data of building permits. For permits of under \$100,000 the method has

been to extrapolate estimates over a period of time, on the basis of the average length of time elapsing between the time the building permits are issued and the time occupancy permits are requested. A large number of cases were studied in 1952 to determine this time factor. An additional study was made in 1954 to determine to what extent the estimated value placed on a project of under \$100,000, at the time the building permit was requested, corresponded with the final value of the project. For permits of more than \$100,000, figures of actual monthly values are obtained direct from the contractors or owners of building projects.

Purchases of machinery and equipment, most of which is imported, are estimated by the commodity flow method.

Changes in inventories are estimated as follows: for manufacturing industries, from the bi-annual censuses; for wholesale and retail trade inventories, as a percentage of sales, based on income-tax samples weighted for the various size groups according to business census data; for sugar and tobacco (both subject to excise taxes), from official quantity data multiplied by their average export prices; for livestock, from the Department of Agriculture.

As regards *purchases by rest of the world*, the only observation worth making here is that these include payments by the U.S. Federal Government to Federal employees in Puerto Rico, of whom more than 80 per cent are non-Puerto Rican members of the armed forces. Federal capital expenditures are also included as exports from Puerto Rico (and do not get included in the estimates of domestic capital formation).

The net income estimates. These are made separately for each industry, but the basic methods of estimating the various components – wages and salaries, supplements, profits and net interest – are really similar for most industries. The data on wages and salaries are mainly from three sources:

- (1) The records of the State (Puerto Rican) Insurance Fund (S.I.F.), which covers wages and salaries paid by employers of three or more persons up to 1957, and one or more persons since then, in almost all lines of business, including agriculture;
- (2) the censuses of business and manufactures from 1949;
- (3) income-tax returns and other financial reports of private

business; reports of public corporations; of the Puerto Rican Commonwealth and municipal governments; and of non-profit organizations;

- (4) the Puerto Rico Bureau of Labour Quarterly (now monthly) Statistics of production worker payrolls.

Total *wages and salaries* paid by an industry as reported in the censuses are taken as benchmarks and interpolated on the basis of the wages and salaries reported to the S.I.F. In the case of many industries not covered by the censuses, the firms that report to the S.I.F. are taken as representing the universe. Since wages in excess of \$100 a week are not required to be reported to the State Insurance Fund, the wages reported to the Fund are adjusted upward by the ratio of wages reported on the income-tax returns of a sample of firms to wages reported to the S.I.F. by the same firms. For firms reporting to the census and not to the S.I.F., the wages reported in the census are moved to correspond with the movement in the wages reported to the S.I.F. by other firms in the same industry.

Data on *supplements to wages and salaries* are for the most part obtained from the records of the agencies receiving the premiums (S.I.F.), the records of the sugar industry unemployment insurance tax, and the statements of employer contributions to the Federal Social Security and the Federal and Island Government retirement systems.

Business profits. In the case of unincorporated businesses, a sample of income-tax returns is used to estimate average ratios between net profit as reported for income-tax purposes and total wages as reported to the State Insurance Fund by the same firms. These profits are then inflated by the ratio of total wages reported to the S.I.F. by all unincorporated firms in the industry, to the wages reported to the S.I.F. by the sample firms.

An allowance is made for profits reported to the economic censuses and not to the State Insurance Fund. In making this adjustment it is assumed that the ratio of profits to wages reported to the census by these firms is the same as the ratio of profits to total wages paid by the remaining firms – that is, to their wages after the adjustment, if any, to reflect the excess of wages reported to the census or on income-tax returns over the wages reported to the Fund. This adjustment is made for years

in which census data are available. Equal percentage adjustments are made for other years; or, when applicable, percentages are interpolated between two census years.

For some industries the method of estimating net profits is based on ratios of profits to gross sales or gross receipts as reported in income-tax returns. A similar method is applied in certain industries where there is a substantial number of businesses with no employees; that is, the profits of the establishments with no employees are estimated by the method of ratio of profits to gross sales rather than the method of ratio of profits to wages paid.

From the early 'fifties profits of corporations and partnerships have been based on tabulations of all returns filed with the Income Tax Bureau.

Net profits as reported on income-tax returns are always adjusted to exclude capital gains or losses, dividends received and previous-year losses. In addition, in the case of individuals, all rent and interest, except for individuals whose business is classified in the real-estate or money-lending industries, is omitted. Rent and interest received by individuals are thus considered to have been received by them in their capacity as individuals and not in their capacity as businessmen, with the two exceptions just mentioned. Other minor adjustments to the net profit of individuals as reported on income-tax returns are made to exclude non-operating income or expenses.

The method of estimating net profits in agriculture, however, is different. In general, the gross receipts from production are estimated, and from this total are subtracted all the costs incurred. Gross farm income is estimated from the figures regularly published in mimeographed releases by the Department of Agriculture. Important examples of how the expenses are estimated are as follows:

Cash wages – from the 1950 census of agriculture and various cost studies made by the University of Puerto Rico's Agricultural Experiment Station in Rio Piedras, and the wages reported to the State Insurance Fund.

Feed for livestock and poultry – from import statistics (an addition being made for mark-up, based on information from importers) and data from the new local mill.

Seeds, insecticides and weedkillers – from import statistics and data from local producers.

Fertilizer – from data from the few local producers and mixers.

Other materials – from the cost studies of the University's Agricultural Experiment Station and the Department of Agriculture.

Reconciliation between gross product and income. It remains now to describe briefly the method used in arriving at the various items that are necessary to effect the reconciliation.

Depreciation is the first of these. In general, depreciation is estimated for almost all industries by the same method used to estimate net profits; that is, the ratio of depreciation charges to S.I.F. wages as shown by the sample firms covered by the income-tax sample is applied to the total S.I.F. wages for the industry to arrive at the estimate of total depreciation.

In some instances, the most important of which is trade, the depreciation is calculated from the income-tax samples as a ratio of gross receipts rather than of wages paid. In the case of taxis, the average depreciation per car is estimated from a small sample of income-tax returns.

Subsidies. Practically the only subsidies included are those paid by the Federal Government, primarily for the production of sugar cane. However, certain Commonwealth Government subsidies, primarily deficits of Government enterprises, such as the Communications Authority, are also included. In all cases the data are based on information received from the Government agencies, Federal or Commonwealth.

Indirect business taxes. These taxes include practically all taxes paid to the State and municipal government except income taxes, and are based on the financial reports for the various years as published by the Treasury Department (previously by the Auditor). They also include certain taxes paid to the Federal Government, principally the sugar-processing tax and that portion of the customs duties which is retained by the Federal Government to cover the cost of collection. (These latter taxes appear also in the balance of payments as transfer payments to the Federal Government.)

Business transfer payments. The items included are corporate and partnership gifts to non-profit institutions and allowances for consumers' bad debts. The method used to compute both items is the same as that used to estimate profits. Consumer's bad debts are estimated only in retail trade. It is assumed that they did not originate in any other industry.

Statistical discrepancy, main sources of errors, and nature of bias. If there were no errors in the estimates of gross product and national income, there would, of course, be no 'statistical discrepancy' after the usual reconciliatory subtractions and additions (of depreciation, indirect taxes, subsidies and business transfer payments). But it does not necessarily follow that a statistical discrepancy of zero (or one of small value) is an assurance that there are no errors (or only small ones) in the estimates. There might be compensating errors, even large ones.

In the case of the Puerto Rican estimates, the statistical discrepancy has been in each year a relatively small one. It was greatest in 1950, at 5.4 per cent of the G.N.P., and smallest in 1956, at 0.125 per cent. In the period we have under review in this paper the discrepancy has been negative (adjusting from G.N.P. to national income) except in two years, 1951 and 1959. That is, the discrepancy has been in the direction of indicating either that the G.N.P. has been overestimated or that the net income has been underestimated, or that there is some combination of the two. The estimators are of the opinion that the income estimates are on the conservative side. The fact remains, however, that the estimates of income are based on more accurate records, and are made by methods that are likely to involve a smaller degree of error, than is the case with the G.N.P. estimates.

The main sources of error in the G.N.P. estimates are associated with the following circumstances and facts:

(1) There must obviously be difficulties in allocating commodities between intermediate and final product (consumers, Government and business often buy the same type of product); there must be some arbitrary allocations.

(2) In the import statistics, some categories include a number of different articles, some of which are for consumption, others for intermediate or for investment use; there must be arbitrary allocations of these items.

(3) It is impossible to obtain accurate data on mark-ups for each and every one of the commodities for which separate estimates of final consumption or investment are made.

(4) The channels of distribution of some items are not known with certainty, so that the mark-up to be applied is uncertainly chosen and must sometimes be inappropriate.

(5) The mark-ups used are in general based on data obtained

from income-tax returns, and are therefore by line of business, not by commodity.

(6) The estimates of inventory change reflect price changes that occur during the year, since, as in many countries, the theoretical requirement that the change should be calculated in quantity terms, and the quantity be multiplied by the average value for the year, is not met, through lack of data.

(7) No business census data are available for the important industries of finance, transportation and contract construction.

The important consideration here is not whether the number or magnitude of errors from the different sources is large, but whether the net magnitude of the errors is, in each year, likely to be (1) the same, not in absolute value but relatively to the 'true' value of the G.N.P., and (2) on the same side of this 'true' G.N.P. value. If the *net* relative value of the errors has been increasing (or decreasing) on the average over the years, then there is upward (or downward) bias in the growth rate of the reported estimates over the period. And if the net error is of the same relative value, but is in alternative years positive and negative, then the direction of the bias would obviously depend on the number of years for which the growth rates were averaged.

The effect of error-source number (6) above (inventory valuation) is the easiest to deal with. Since prices in Puerto Rico have risen in each of the years, the consequence of the method used is to overstate the G.N.P. (and the national income also, since the estimates of profits are overstated by the same amount) in any given year. But the rate of growth of Puerto Rico's gross product (and net income) would be exaggerated only if the inventory change valuation error were positive and increasing at least on the average, in relation to the gross product. In Puerto Rico prices rose very moderately in the period, about 12 percentage points from 1952. There was, however a 10 point rise between 1950 and 1952. Moreover, the inventory changes were small – less than 2 per cent of G.N.P. in all years apart from 1952 (4.2 per cent). Therefore, even if the inventory change errors of estimate were large relatively to the true inventory change values, the effect on the average growth rate would be insignificant.

In respect of the error-sources numbered (1) and (2), that is the allocation of commodities between intermediate and final purchases, the estimating procedures have been well on the

conservative side. But, again, the question is, has the tendency been for the estimators to become less conservative over the years, causing the error to add relatively more to estimated G.N.P. year by year, or on the average? There is no clear evidence that this is so. My own impression is that there may have been some slight upward bias under this head in the second half of the 'fifties. But when I make the most generous allowance for this the effect (5 per cent on total) is to add only 0.6 per cent to the average growth rate of current price G.N.P.

Error-sources (3), (4) and (5), relating to estimating mark-ups, may be considered together. Here, the error is in the direction of underestimation, on account of the heavy reliance upon the trading and profit and loss accounts accompanying income-tax returns. It is well known that many taxpayers tend to understate their sales and overstate the cost of purchases. This narrows the margins from which the estimates of mark-ups are derived.

As Puerto Rican incomes have risen an increasing proportion of merchants and other businessmen have come to be taxable. Many who formerly submitted 'undoctored' returns, because they were below the tax level or paid little tax, seem no longer to do so. This tends to give a downward bias to the estimates of mark-up, gross product and the rate of growth.

There has, however, been a marked tendency for huge supermarkets from the United States to become responsible for increasing proportions of the supplies of groceries, liquor and the requirements for household operation. Though less marked, there is a similar trend with respect to department stores (selling clothing, furniture, hardware, drugs, toilet requisites and so on). The policy of these is to aim for a large turnover and smaller mark-up. The larger corporate firms (including the supermarkets and department stores) submit accounts that are more competently, impersonally and objectively prepared. There would be little or no downward bias from the source of these firms' income-tax returns in regard to mark-up (though there might be a little as regards the (net) profit and loss account, as distinct from the trading account showing gross profit). Since the weight of these firms in the averaging has been increasing greatly, the effect has been to reduce the downward bias given by the factor discussed in the preceding paragraph, while at the same time improving the reliability of the mark-up estimates, since these larger firms do not indulge 'bargaining' by customers,

usually have their sales prices for each commodity marked plain, and are less reluctant to supply cost-price data for a commodity. The growing importance in the economy of branded goods, the prices of which are set by their manufacturers and vary only little, also improves the accuracy of mark-up estimates.

The margins of error vary widely in respect of the estimates of expenditure on particular groups of commodities. In several cases the margin could exceed ± 15 per cent, judging by the results of a check I made in a drug store and in a hardware store (using each store's average gross trading profit margin for raising the cost price of some commodities to estimated sales prices in the same store and comparing with the actual sales prices). In a few cases the error margin is probably over ± 20 per cent. But the error is most likely less than both of these in respect of the majority of commodity expenditure estimates. There has also been consistency in the sources of the mark-up estimates, as has been pointed out.

If there have been changes in the errors, they have not been large, on available evidence. The errors are naturally much smaller for the aggregates than for the commodity groups individually. And changes in these errors apparently gave a downward bias in the early 'fifties (enlargement of mark-up errors through progressive understatement of gross profits before the advent of the supermarkets and the increases in the number and share of trade of incorporated businesses in all fields) and an upward bias in the later 'fifties (reduction in understatement and size of error).

The principal sources of errors in the estimates of income are as follows:

(1) In regard to the estimates of wages and salaries, the derivation of these from returns made to the State Insurance Fund undoubtedly led to some underestimation up to 1957. The S.I.F. did not cover wages and salaries paid by firms with less than three employees except in truck transportation. It is true that adjustments for this fact were made. But the adjustments were made by reference to the bi-annual and other census returns, which themselves usually err on the side of under-coverage.

(2) The estimates of net profits, based on income-tax returns, are also no doubt underestimated, due to under-reporting of profits. Further, since the samples of income-tax returns used,

especially for unincorporated businesses, contain mainly the larger firms, it is probable that, on this account also, the ratio of profits to wages-salaries, used as described on p. 286 above, should be larger than it is; because the smaller businesses rely more on the services of their owners than the larger ones. But they do not usually estimate the value of these services to include them with their reported wages and salaries in their tax returns.

It was stated (see p. 287 above) that for some industries the estimates of profits are based on ratios of profits to gross sales or gross receipts as reported in income-tax returns. The error here, too, is likely to be in the direction of underestimation.

Error changes and bias. In regard to the estimates of wages and salaries and supplements thereto, there were five factors making for greater accuracy (i.e. less underestimation in this case), and therefore contributing to some upward bias in the calculated rate of growth. First, there were, through failures and expansions (both due to the new overall development), increases in the proportion of businesses with three or more employees. Second, the S.I.F. coverage increased from '3 or more' to '1 or more' employees. Third, increased checking of employers' reports to the State Insurance Fund are reported to have had significant effects on under-reporting (and under-payment of the employers' contributions). Fourth, the number of full-time jobs increased substantially in the period 1950-9, whilst the number of casual jobs (not within the S.I.F.) decreased not only relatively but absolutely. Finally, own-account employment, much of it disguised unemployment, has been outside the S.I.F. and has decreased absolutely (a part shifting to covered employment and a part to open unemployment).

As for the profit estimates, there was evidently a downward bias given by the increased under-reporting of growing small and medium-size unincorporated firms (see above). But this was offset by three factors: first, larger and larger proportions of total profits were attributable to corporate enterprises, which, as pointed out above, usually are guilty of proportionally smaller understatements of their profits; second, the tax-exempt profits of the new industries gained more and more weight in the averaging, were not understated (presumably), and were the most dynamic part of total profits; third, the Income Tax Bureau increased its auditing activities significantly from the middle 'fifties, and knowledge of this presumably

induced more caution among under-reporters. Finally, farm profits were not dynamic except in the livestock (large and small stock) segments of agriculture. There is much official supervision of the livestock and dairying industry (by the Office of Price Stabilization). These farm profit estimate errors did not change, as far as I can judge.

The considerations of the groups of factors affecting both of the main categories of income, namely, compensation of employees and profits, lead to the conclusion that there was some upward bias given to the growth rate on the basis of the current price estimates. Quantitative data are not available to measure this. My own view, on the basis of some rough assumptions, is that the overall effect amounted to about 0.6 per cent.

Reliability. Those responsible for Puerto Rico's estimates are confident that the income estimates are more reliable than the gross product ones, and all the evidence points to support this. In fact, subject to what has been said about the underestimation of profits (which can be said of the estimates of several advanced countries, the extent of underestimation depending partly on a country's tax morality), I consider that Puerto Rico's income estimates rate quite high in reliability among the estimates of all countries, including developed ones. There are many reasons why this is so. Perhaps first in importance is the existence of institutions, Federal U.S. and Puerto Rican local, which regularly collect, under legal requirements, a vast amount of data needed or useful for computing income statistics.

In the discussion on sources, the major institutions (Income Tax, Puerto Rico Department of Labor, State Insurance Fund, annual Agricultural Department farm production reports, manufactures' censuses every other year, Federal general and agricultural censuses) were mentioned. In addition, there are the annual reporting requirements of the Economic Development Administration of Puerto Rico. This public corporation is responsible for inducing investment in manufacturing and for supervising the tax-exempt industries. In connection with the latter function, it requires and obtains annual profit and loss statements and balance sheets. Being tax exempt, these 600 or so industrial firms have no need to under-report their profits. This is important. For, as will be shown in more detail later, these are by far the most rapidly growing firms in Puerto Rico in terms of production and income, wages and salaries and

profits. There are also frequent cost studies made by the Puerto Rican Minimum Wages Boards. There is the U.S. Federal Social Security System, extended to Puerto Rico in 1951. There are the annual bank reports to the Federal Deposit Insurance Corporation covering 1950-4, and to the Treasury of Puerto Rico thereafter. In addition, there are the several occasional and *ad hoc* studies and reports, such as the University of Puerto Rico's agricultural cost studies, and the U.S. Federal Department of Labor's *Wholesaling, Warehousing and other Distributive Industries in Puerto Rico, 1955*. All of this, in a small area of less than 4,000 square miles (greatest length 100 miles) and criss-crossed with roads that are never deserted in the densely populated island. Communication is easy by public and private conveyance - there are no longer animal-drawn vehicles. The final influence on my opinion is the size and quality of Puerto Rico's national income staff - twenty, all of whom are graduates of universities and several of whom have done post-graduate work.

Jamaica

We turn now to the sources and methods that yield the Jamaican current price estimates, and then go on to a discussion of the probable sources of error and probable direction of bias in these. Here we get into a completely different statistical environment. There is *no* State Insurance Fund, no Social Security System, no Department of Labour quarterly or monthly employment and wage report, no periodic manufactures' census. Even relevant *ad hoc* studies and reports have been rare *recently*. The result is that estimating *total* salaries and wages with reasonable accuracy is as impossible today as it was when the writer made his Jamaican national income estimates some years ago, covering the years 1950-2.¹ One can obtain accurate salary and wage statistics for the few large industries, especially the sugar and bauxite industries. The degree of accuracy then rapidly declines, until for most of non-sugarcane agriculture, and for most private, non-manufacturing sectors, there are no statistical data on total wages and salaries. The Survey of Business Establishments 1954, a sample census made by the Department of Statistics and published in 1956, made it possible

¹ A. P. Thorne, *Size, Structure and Growth of the Economy of Jamaica*, Institute of Economic Research, University of the West Indies, 1955.

to obtain rough estimates of totals for the majority of non-agricultural enterprises. (But the main source of income was agriculture.)

Again, although income tax has been levied in Jamaica for a generation, incomes are so low (about £130, or \$350, *per capita*) that only about 15,000 persons out of an estimated labour force of 770,000 submit returns of their income. The law requires returns from a person only if his or her income exceeds \$300 per year.

In these statistical circumstances, which have, for lack of adequate resources in the Department of Statistics, improved only moderately in so far as national income data are concerned, direct income measurement or estimation, such as is feasible in Puerto Rico, is not yet possible in Jamaica (despite specific suggestions offered several years ago for improvement of the situation).¹

The Jamaican estimates are therefore arrived at principally (to the extent of more than 75 per cent) by the *net output approach*. Estimates of the total value of production (sales plus inventory change) are made for each of the various industries (not firms) and sectors, and from these estimated values there are deducted estimates of purchases from other industries. This is the way in which by far the greater part of gross domestic product by industrial origin has been estimated throughout the period of annual estimates in Jamaica, from 1950. The government sector, professional services and domestic services are the main exceptions.

Jamaica being an open economy, the statistics of exports and imports are important sources for estimating both output and input values and quantities. There are, however, a number of additional trustworthy sources. These include especially all-island industry associations, such as the Sugar Manufacturers (Jamaica) Association Ltd.; the All-Island Banana Growers' Association Ltd.; the Citrus Growers' Association Ltd.; the Canefarmers' Association; the Livestock Clearing House; the Bee Farmers Association. There are also Government boards and Government marketing agencies which monopolize export trade and sometimes domestic trade in particular commodities: for example, the Coconut Industry Board; the Cocoa Marketing Board; the Coffee Board. These associations' and boards' out-

¹ *Ibid.*, pp. 106-8.

put data range from almost 100 per cent coverage and accuracy, as in the case of the Sugar Manufacturers Association, to coverage (with accuracy) of less than half of total output. In addition, there are the co-operatives, especially in cocoa and coffee. It should be mentioned also that many agricultural prices are legally or contractually fixed. For others there are minimum prices to farmers which frequently are also actual prices.

The estimates of inputs, also, are in some cases greatly aided by the data supplied by the associations and boards. But the use of income-tax returns for deriving average ratios of 'purchases from other industries' to 'total sales plus inventory change' becomes more important for estimating this side of the production accounts. In the case of the two leading industries, sugar and rum manufacture and bauxite, there is a 100 per cent sample of returns, since the number of firms is small – less than twenty in the one case and three in the other. They account for more than 10 per cent of gross product (and, as we shall see, are responsible for most of the real growth in the island). In some cases estimates of input values for industries or whole sectors are based on the tax returns (for total value), and direct enquiries (for ratios of sales to different industries) from the one or two import firms or manufacturing enterprises that import or produce the inputs. Fertilizers and metal cans are examples.

As has been pointed out, industry sample surveys and censuses have not been frequent or regular. But the Jamaican estimates have derived much production and cost data from the Sample Survey of Business Establishments, 1954; the Sample Survey of Condensery Suppliers, 1951–2; the Report of the Cattle Industry Enquiry Board, 1952; the Agricultural Sample Census (1950); and the Maunder Report: Expenditure on Internal Transport in Jamaica, 1950–1. In recent years agricultural production data, and some agricultural cost data, have become available less infrequently. Many manufacturers and some other producers also now make in the last four years quarterly returns of output and some other data.

The actual total values (and often volumes) of output and input are, of course, available for the public utilities, Government enterprises, the single cement manufacturer, the milk condensery, the banks and insurance companies and other

industries in which, in the small Jamaican economy, only one or two enterprises are involved. No sampling is necessary for these industries – either of income-tax returns or by census surveys.

Estimates for parts of the services sector, for example, legal, medical, dental and other professional and trade services are made by blowing up samples of the income-tax returns of those in private practice to the numbers of practitioners listed in the annual registers or directories. The estimates of the contribution to gross product made by households (domestic servants and gardeners) are based on extrapolations of population census figures of these servants (in proportion to urban population changes), and their wages, on the working-class urban cost-of-living index.

It is hoped that the preceding summary paragraphs have conveyed a sufficient impression of the methods and sources used in making Jamaican gross domestic product estimates. *Estimates of Jamaica's national income are derived from the total of the G.D.P.* by the usual adjustments for depreciation (no value adjustment made), indirect taxes and subsidies, and factor income to and from rest of the world. But these income estimates obviously afford *no independent* check of the product estimates.

What are the main sources of error and bias? The use of the net output method results in two streams of errors in connection with the gross product estimate for each industry or sector: errors related to the estimation of the value of the gross output, and those related to estimating the value of the deductible inputs. These two sets of errors may sometimes be of similar magnitude and direction, in which case the final error is not enlarged. In other cases, the reverse may occur, contributing to a wider error margin in the net figure. For yet other net output values, the outcome may be smaller final errors.

The main sources of error are as follows:

(1) All the estimates in connection with the production of root crops, the main staple food of the rural and much of the urban labouring class. Data are extremely weak still with respect to the quantity of production, the price of the output, and the production costs of this important segment of non-export agriculture. This is a serious weakness, as these crops were estimated to have been directly responsible for about 5 per cent

of total gross product in the middle 'fifties. Owing to the rapid expansion of other industries, their contribution is now much smaller relatively to the total. A justifiably cautious, subjective estimate given me on my request is that the margin of error of these G.D.P. current price estimates may be about + 21 to 40 per cent.

(2) Next in importance are the measures of the production of other agricultural crops (excluding sugarcane), which have error margins (all purely subjective) of ± 11 to 20 per cent, and of most of the product arising in the services sector (± 11 to 20 per cent, also), but excluding education, medical and legal (± 5 to 10 per cent).

(3) There are a few other estimates to which quite large error margins are attached; in two cases over + 40 per cent ('furniture and fixtures' and 'wood and woodproduct manufactures'). But these account for insignificant proportions of the gross product (furniture and wood products and sawmilling together less than 1 per cent of total G.D.P.).

It is, again, not the size of the relative errors but changes in them (and in their weight) that affect calculations of the rate of growth of the total product. And for our purposes it does not matter whether a given error percentage changed in one year or in another. The effect upon the average growth rate for a given number of years would be the same.

There have been substantial improvements in the data available for eleven categories of industries, namely, the growing of sugarcane (improvements in cost data on non-plantation cane farmers), the error margin range now being assessed as ± 5 per cent as against ± 11 to 20 per cent for the middle 'fifties; non-export agriculture (other than rootcrops, error unchanged), down from ± 21 to 40 per cent to ± 11 to 20 per cent; livestock, down from ± 11 to 20 to ± 5 to 10; food manufactures now under ± 5 per cent, instead of ± 5 to 10 per cent; alcoholic beverages; non-alcoholic beverages; footwear; construction and the printing, publishing and paper group. Some of these are now estimated to have an error margin of less than ± 5 per cent. Public utilities, transportation and communication, ownership of dwellings, and general Government having remained unchanged, with low error margins. There has been no improvement in the estimates for the services sector as a whole.

If we use the contributions to G.D.P. made by the sectors as

weights, taking the year before most of the improvements and the next year, and apply these to the mid-points of the error ranges, we get an error margin of ± 15 per cent for the pre-improvement G.D.P. totals, and ± 9 per cent for the post-improvement estimates. This is, it is again emphasized, not a statistically objective error estimate, but a subjective one – the only one possible in the circumstances, considering the methodology used to make the estimates.

The error changes occurred mainly in the middle 'fifties. If the true values were at the upper limits rather than the lower, and the improvements affected the 1955 figures first, the growth in current price G.D.P. would be 8 per cent instead of 14 per cent between 1954 and 1955. This is the lowest probable increase (on our error margins). The effect would have been to reduce the average current price G.D.P. growth rate by 0.7 per cent over the nine-year period. Conversely, if the true values were at the lower limits, the increase would be 22 per cent for the year, adding 0.9 per cent to the average current price G.D.P. rate of growth.

It is likely that Jamaica's statistical growth rate has been affected by changes in the direction of the errors. A couple of years after making my own estimates for 1950–2, I was persuaded that I had been a bit too conservative with regard to the most doubtful sectors – non-export parts of the agricultural sector, and parts of the manufacturing and services sectors for which data were extremely weak. Some of these were important contributors to G.D.P. Others were insignificant. I eventually revised the weak estimates upwards in the light of the slightly improved data that had become available. The net result was approximately 3 per cent increase in the total G.D.P.¹ Perhaps these estimates are still on the low side. On the other hand, the later estimates were put at a somewhat higher level by the estimators who followed. According to the existing series, the constant price gross domestic product rose extraordinarily by 16 per cent from 1952 to 1953. Until then the largest increase in any year had been 11 per cent. There was indeed in 1953 substantial expansion in bauxite mining operations. On the other hand, there was also a significant contraction in this in-

¹ A. P. Thorne, 'Revisions, and Suggestions for Deflating Gross Product Estimates', *Social and Economic Studies*, Vol. 9, No. 1, March 1960, Institute of Social and Economic Research, University of the West Indies.

dustry's capital outlays in that year, the main installations having been completed in 1952.

The effect of the tendency toward underestimation in the early 'fifties and overestimation in the later 'fifties is estimated to account for an upward bias of 1.5 per cent in the average growth rate for 1950-9.¹

2. Omissions

The estimated rates of growth of the Puerto Rican and Jamaican economies are probably affected by two classes of omissions from the national income estimates: omissions of some of the economic activities of the money or exchange sector, and omissions of some of the activities of the subsistence sector. The principal omissions from the former were probably: in Puerto Rico, (a) some of the self-employed persons engaged mainly in the services sector (for example, in dressmaking, shoe repairing and peddling homemade products, and in beauty culture and prostitution); and (b) the occasionally employed in domestic service, garden work and the like.

The effect of the omissions of these exchange activities would logically be greatest when the rate of change of the extent and value of these is highest. With modernisation and the availability of a greater number of full-time jobs, the relative value of the omitted activities has been declining, except that of prostitution, which has increased apparently. In Puerto Rico the period of greatest change in regard to these omissions was evidently between 1948 and 1953 - at the outset of the vigorous thrust of the Industrial Promotion, or Fomento, Programme. There was probably, therefore, a greater upward bias in the estimates of product and income in those years than in the later 1950s. The overall effect seems to have been a small upward bias in Puerto Rico's growth rates (see p. 293 above on income estimate error changes). The bias would have been greater if the averaging had embraced also the figures of the late 1940s.

In Jamaica, the principal exchange activities omitted are of the same kinds as those indicated for Puerto Rico; and, in addition, some of the petty trade and huckstering of numerous

¹ My original rough estimate was that the bias was about 2 per cent. There was a large jump in the estimates again later, the 1957 figure for constant price G.D.P. being 14.6 per cent greater than that for 1956. Further investigation on another visit to Jamaica has, however, led to the lower estimate of bias.

home-made and imported low-price articles is excluded. In the nineteen-fifties the omissions were considerably greater in Jamaica than in Puerto Rico, both because the activities were relatively more extensive and because the methods of estimation imposed by the less advantageous statistical environment (see pp. 295-6) made omissions more difficult to avoid.

The acceleration of Jamaica's formerly very slow rate of economic development began only in the 1950s, several years later than Puerto Rico's acceleration. Unlike Puerto Rico, however, Jamaica received its main economic stimulus not through industrial development, though there was a significant amount of that also, but through the establishment and phenomenal expansion of a mining industry, the bauxite-aluminium industry. The direct employment given by this industry was small, especially compared with what a similar investment in manufacturing industry would have created (and did create in Puerto Rico). After the phase of construction, little more than 2,000 new jobs were available in the bauxite-aluminium industry in the middle 'fifties. Jamaica's industrial promotion added directly 4,100 new factory jobs between the years 1952 and 1958. This contrasts with 23,000 new industrial jobs created in that period directly by Puerto Rico's corresponding programme, which is greatly favoured by, and in fact rests mainly on, tariff-free access to the world's largest and richest market. The consequence was that in Jamaica there was no dramatic, large-scale abandonment of own-account economic activities and casual and part-time employment, such as had occurred in Puerto Rico.¹ There was nevertheless, some movement of this sort in Jamaica - just as there has continued to be such in Puerto Rico. The consequent upward bias in the statistical average rate of growth has therefore been small.

Omissions of subsistence output in Puerto Rico were mainly within manufacturing or processing: for example, starch (from bitter cassava), coffee (roasting, and milling), and cigars, and house building (in cases where no official permits are obtained). The omission of the manufactures has tended to bias the rate of growth upwards only very slightly, whilst the omission of unauthorized home building has had an opposite and far more

¹ Jamaica's hucksters, car watchmen and car wipers, occasional and part-time garden boys and house cleaners and the like seem to be much larger even absolutely than Puerto Rico's, despite its smaller population. Jamaica has no general social insurance, and public assistance is meagre.

important effect. The latter is discussed more fully in the next section.

In Jamaica, the principal omissions of subsistence production affect not only manufacturing or processing and home building, but also some agricultural activities (for example, maize, coconut, goat and pig rearing). The development of the exchange economy, and migration from the rural areas, led to a greater upward bias than would have been the case if there were not these omissions. In the next section, the effect of shifts from subsistence production, both that included in the estimates and that omitted, is discussed.

3. *Shifts (a) from subsistence to exchange production, and (b) vice versa*

Significant shifts from and to subsistence production would, of course, lead respectively to higher, and lower, money values for estimates of gross product and aggregate income in respect of a given quantity of output. In places like Puerto Rico and Jamaica these shifts are important with respect not only to the agricultural sector but also to personal and domestic services, manufacturing and construction.

Puerto Rico

Unfortunately, there are not even unpublished estimates of subsistence production in Puerto Rico. Even for the agricultural sector, in which the subsistence part of production is included in the national income estimates, figures are not brought together to show subsistence values separately. To find these now for a few past years would require, I have been informed, months of special tabulations from questionnaires answered regularly by tens of thousands of farmers.

There are, however, some observations that one can safely make to indicate very roughly (a) significance and (b) general trends. First, Puerto Rico has for generations produced mainly for export. More than 40 per cent of its gross product is exported. Sugar used to be the only important export. Now it is still the dominant single export product, but modern manufactures in the aggregate have surpassed it. Correspondingly, about 70 per cent, for some upper income classes almost all, of the food consumed has been imported. Even in the rural areas rice

has been the principal carbohydrate food, and all of it has been imported always. Beans, the main protein food, are also obtained mainly from abroad. The fish of the poorest is imported codfish. For these reasons among others the contributions of the distributive and transportation sectors were relatively large even before Puerto Rico entered its modern period of development.

Mixed farming in the European sense is almost unknown in Puerto Rico. The consumption of milk, butter and cheese produced by the household for itself is rare. Consequently, the enlargement of money consumption at the expense of subsistence consumption could have been significant only in a few segments of agriculture: the cultivation of root crops or ground provisions; poultry and pig production; and coffee, fruit and tobacco growing. These taken together have, however, accounted for somewhat less than 10 per cent of total national income. Moreover, except for the poultry and pig output, there has been a decline not only relatively but absolutely over the period. Finally, despite Puerto Rico's rapid industrialization in the period (1950-9), there was no change in the proportion of urban to rural population - 40.5 and 59.5 per cent respectively at the 1950 and 1960 censuses. Although the capital city and principal industrial centre, San Juan, grew in population by 100 per cent, this was at the expense of the smaller towns, several of which showed absolute declines. The rural population in census year 1960 was 6.5 per cent greater than it was in census year 1950, and so was the urban population. The big movements from rural to urban places took place before 1950. In so far as food is considered, therefore, our conclusion is that shifts from subsistence output of these kinds did not contribute any significant upward bias to the growth rate in 1950-9 (as they obviously did in 1940-9).

As far as personal services and domestic service are concerned, we can discern two opposite tendencies. The increases in specialization and in family income have led to some shifting of production from households to such businesses as laundries and beauty parlours. But in addition to the rise in the quality of service accompanying the shifts, an important offset has been the steep decline in the number, and even in the number of hours of work per person per week, of domestic servants and garden 'boys'. Householders are now doing much more of their housework themselves, and, as is conventional, no imputation is made for

this. Here we have a shift from exchange to subsistence production. But the offset is only partial. (The contribution by domestic servants to total net income and gross product at current prices declined relatively as well as absolutely between 1952 and 1959. The number of domestic servants decreased by one-third from 31,000 in 1950. Households increased in number by 12.8 per cent meanwhile, and total population by 6.5 per cent. The experiences of Europe and North America are at once recalled.)

In the manufacturing sector, much clothing, especially women's and children's clothing, that was formerly made in the home is now purchased ready made. For lack of quantitative data on home-made clothing (other than that made under the commercial-industrial 'putting out' system), for an earlier period and for our period of study, no measure of the extent of the upward bias is possible. It is held, however, to have been significant. But it must be pointed out also that there was never the domestic spinning of yarn and weaving of cloth that characterized Europe's early manufacturing activity. In Puerto Rico, the raw material was all imported, and then bought by the domestic subsistence garment-makers at the retail level, in the days of large subsistence clothing production. It follows that the upward bias on account of this shift from subsistence is not as great as it was in Europe's transition to factory output.

Home-made ice cream, fruit preserves, jams and the like have been largely displaced by the purchased products which introduces another, but smaller, upward bias.

There has been in Puerto Rico considerable construction by owners for their own use. Some of the value of this has been included in the national income statistics: that is, the value of that part of it that has been sanctioned officially under the system of building permits (which, as pointed out on p. 285 above, are the foundations of the estimated values of the construction sector). During the years 1950-9, however, a large part of this own-account building (thousands of small wooden houses) took place clandestinely, and has never been included in the estimates. Most of this construction has been in the peripheral areas of the capital city and of the second largest city, Ponce. Migrants from smaller towns rushed to be nearer to these areas, especially the area of San Juan, that began to offer much enlarged full-employment opportunities, at earnings far in excess of small-town earnings.

If the values of these dwelling units had been included in the national income estimates, the growth rate of the first half of the 'fifties would have been even higher. On the other hand, in order to reduce the rate of growth of the slums, the Government of Puerto Rico, with U.S. Federal aid, accelerated its programme of house building for the needy (with subsidized rentals for the Government's houses). The value of the Government's construction was included in the national income estimates.

By the later 'fifties some of those who had originally squatted in their clandestinely built homes became able to afford to rent a home or make the small initial payment for the instalment purchases of little houses constructed mainly in San Juan by private real-estate development corporations. (The U.S. Federal Mortgage Insurance System made these instalment purchases possible.) Additional incoming migrants from the small towns now more frequently moved into ready-made, clandestinely built houses vacated by their original owner-builders. (Many of these houses, however, were razed to the ground by the Government.) To the extent that there was an increase in the clandestine subsistence building in the first part of the period, there was a downward bias in the statistical growth rate – the growth has in reality been greater than has been represented by the statistics. And to the extent that there was later a reduction in the building of clandestine houses and a destruction of some of them by the Government, the net output of housing was reduced, and this was not reflected in lower product estimates. The former influence was the stronger. Our conclusion is that the statistical average growth rate is lower than it would have been if the estimates had included subsistence construction.

Jamaica

During the last ten years there have been relatively large migratory movements of Jamaica's population both to the United Kingdom and from rural to urban places within the island. Between 1953 and 1959 nearly 45,000 people moved from rural to urban areas. This naturally had the effect of reducing the subsistence consumption of staple foods, the most important of which are root crops or ground provisions. Although Jamaica is also an export economy and importer of most of its food, it produces a much larger proportion of its food requirements than Puerto Rico produces. On the basis of the estimate of

9 lb. *per capita* consumption per week made by the Director of Statistics in 1954, £20.6 million were transferred from subsistence to money consumption in the period. This had the effect of making the current price G.D.P. greater in 1959 than it would have been had there not been the shift in population and transfer from subsistence to money consumption. Rough estimates for the effect of the transfer of the root crops and of peas, beans (main source of protein), miscellaneous vegetables, bananas, cocoa, eggs, coconuts and fish give the figure of £582,000 (\$1,630,000). That is, the movement of these foods through the transportation, wholesale and retail sectors added this sum to the gross product of 1959. If we double this to allow generally for other items of food not included above, the addition to the G.D.P. is 0.56 per cent. The effect on the statistical average rate of growth for the 1950-9 period is therefore no more than about +0.06 per cent.

Manufacturing. With regard to the manufacturing sector, there has not yet occurred in Jamaica the pronounced shift from home-made garments (especially women's and children's) to ready-made ones, such as I have reported above for Puerto Rico. But the change has begun, in this and other segments of manufacturing, and some very small upward distortion in the growth rate on this account is present.

Personal services. Incomes are evidently still too low for any significant shift among women from fixing their hair themselves. Men continue to shave their own faces, though they still buy haircuts. Shoeshine boys are still rare. In short, the personal services have not had their aggregate value significantly increased because of the enlargement of the money economy.

Domestic service. Owing to its relatively large population in relation to the available cultivable land, and to the insufficient industrial employment, Jamaica has for decades had a large part of its labour force engaged in services sectors - self-employment and part-time work being prominent features. One of the most important of these sectors from the points of view of both employment (including part-time employment) and aggregate income generated has been that of domestic service. The census for 1943 indicated there were 72,000 domestic servants. In 1950 the Department of Statistics thought that the number was about the same. Domestic service contributed nearly 5 per cent of the G.D.P. in the early 'fifties.

Jamaica's population in 1959 was (at 1.55 million) 325,000 greater than it was in 1950, in spite of a net emigration of 96,000. The explanation is, of course, an extremely high birth-rate (40.4 in 1959) and a low death-rate (10.4 in 1959). The official estimate of the unemployed is 120,000 even now. In these circumstances, and with no national social security system (other than dependence upon relatives in Jamaica or abroad), Jamaican working-class women and garden boys are almost as willing now to do domestic work for little more than food as they were in 1950. There is therefore no significant shift of household service from the money to the subsistence sector, as there has been in Puerto Rico. Consequently, there is no offset under this head to the upward biases attributable to the factors discussed in the preceding paragraphs.

Construction. Jamaica's subsistence output in this sector, in contrast with Puerto Rico's, has not been omitted so extensively from its estimates. No attempt has been made to value this output specially, or separately from total construction; but the method of estimation, which calculates gross output on the basis of imported and locally produced building materials, ensures inclusion of that part of own-account building which involves the use of these materials. It is, however, impossible to estimate without a detailed survey of the structures, and without questioning at least a sample of the occupants as to time of construction, how large a part of the construction was made of regular or conventional building materials, and to what extent packing-cases, automobile chassis and the like were used.

Both private and Government money construction increased greatly in the period 1950-9. Incomes rose, and the number of squatters' huts undoubtedly declined in several areas (as a quick tour made obvious to me), whilst some squatters' huts were clearly made more substantial, and were even painted, thus absorbing larger proportions of conventional materials. I am convinced that in the later 1950s there was a significant shift from subsistence construction to exchange construction. On the other hand, the proportions of subsistence building had grown in the early 1950s, though there had been extensive construction of this sort before that. On balance, there has probably been an upward bias in the statistics for 1950-9.

It should be expected that there will be further changes in the margin of error of the estimates for Jamaica when the present,

far too small, competent staff is suitably enlarged, and especially when the quality of the statistics in the fields indicated is improved.

A summary of the net effect of the various influences discussed is as follows:

PUERTO RICO

<i>Gross Product</i>	<i>Bias on Growth Rate</i>
Statistical distortions	
(a) from changes in errors of allocations between final and intermediate products	Not more than + 0.55
(b) from changes in mark-up errors	Not more than + 0.22
Omissions and double counting	
from reductions in omissions	positive, small (say + 0.03)
Other distortions	
from shifts from subsistence	positive, small (say + 0.02)
Total	Not more than + 0.82 per cent
<i>Income</i>	
Statistical distortions	about .. + 0.6 per cent

JAMAICA

Gross product	
Statistical distortions	+ 1.5
Omissions and double counting	+ 0.01
Other distortions	+ 0.07
	Not more than + 1.58 per cent

4. *Methods of deflation used*

Puerto Rico

Puerto Rico's gross product is not deflated by a single series of price indices. In fact, not even food, or household operation, or any other major sub-component of personal consumption expenditure, is deflated by a single series of price indices. For example, expenditure on milk and related products is deflated by a consumer price index for milk and an index of imported dairy products (of which there was no significant output in Puerto Rico during the period). Separate indices are applied to expenditure on meat and meat products; alcoholic drinks, and other categories of food expenditure. Clothing expenditure is similarly deflated, category by category, by distinct indices. Household operation expenditure is divided into some twenty-one categories for this purpose.

Moreover, the method of deflation is not always to apply a price index. In some twenty-three cases there is a quantum approach: the base-year average expenditure on the item (say doctors' services) is multiplied by the number (say, of doctors) in the year. Altogether, more than eighty different indices (explicit and implicit) are involved, in addition to the cost-of-living index (used to deflate only expenditures on education and on fraternal associations).

There is no doubt about the adequacy of the coverage of items by the deflators, and the quantity and quality of the price data, which were collected quarterly at first, and later monthly. And the Department of Labour and the Office of Price Stabilization have, like the National Income Division of the Planning Board, staffs that are adequate in training and numbers.

The base year used is 1954. But even if the earliest or latest year had been selected to be the base year, there would have been no significant difference, owing to the shortness of the entire period.

The weights used in making the price indices, however, have not been changed to recognize the shifts in population. Although, as pointed out in a previous paragraph, Puerto Rico's internal migration was predominantly from small towns to the capital, San Juan, and to a smaller extent to the second largest city, Ponce, rather than from rural to urban areas, there were for some products significant differences in prices between small towns and the cities. The difference is marked, for example, between house rent, and increases in rent, in San Juan and rent increases in an interior, hill town, in spite of the rent control legislation and its application. On the other hand, there are some items whose prices rise less slowly in smaller towns – mainly some of the many imported commodities, including items of food. On balance, it seems that there are only very small downward biases in the price indices, producing a small upward bias in the real product. It must be emphasized that this is necessarily unimportant in explaining the high average growth rate of the real product. An earlier paragraph indicated how relatively slowly prices have risen in Puerto Rico.

Jamaica

In *Size, Structure and Growth of the Economy of Jamaica*¹ it was argued that in an open economy like Jamaica's it was

¹ Op. cit., pp. 87–90.

particularly likely that serious distortions would result from using the available cost-of-living index as a general deflator of the values of gross domestic product. It was suggested that quantum indices be used as far as possible. Accordingly, several such indices were used to deflate the original 1950-2 estimates as well as the revised ones made in 'Revisions and Suggestions for Deflating Gross Product Estimates'.¹ In the latter, the cost-of-living index also was applied to the same estimates, and attention was called to the significant divergences (pp. 50-53) in the constant price values obtained. Additional quantum indices have subsequently been developed in the Department of Statistics, especially by Mrs. M. Bethel. As a result, the forty-two G.D.P. series by industrial origin have been deflated for the period 1950-9 as follows:

- 25 by quantity indices;
- 9 by special price indices made for the purpose;
- 8 by cost-of-living indices.

The bases of the quantity indices vary from tons of sugar and stems of bananas to number of cable and wireless messages received and despatched; from entertainment tax collected (rates unchanged) to number of passengers and tonnage of goods carried (for the rail transportation sector); from enrolment in grant-aided secondary schools to water and electric energy consumption and to number of commercial bank cheques stamped and issued. In the case, however, of construction and seven manufacturing sectors (textiles and garments, furniture and fixtures, wood products, printing and publishing, metal products, leather, cement and clay products), the indices are based on inputs of materials rather than on output of goods, for want of measures of output. For the professional service sectors the measures are number of practitioners in private practice - inputs also.

Some quantities and prices are known with almost 100 per cent accuracy, and others are likely to be extremely inaccurate, especially in some segments of non-export agriculture. But we have already disposed of the questions of estimate reliability and effects of error changes in preceding paragraphs. What are the main sources of distortion of the deflated values? It would seem that they would lie in the use of inputs to measure output.

¹ *Op cit.*, pp. 43-50.

If productivity increased in 1950-9, there would clearly be a downward bias in the size of the real product. And there is no doubt that productivity rose significantly in the construction sector in the later 'fifties owing to the introduction of modern equipment and mass-production methods, and the building of relatively large numbers of middle- and low-price dwellings in new 'urbanizations' or 'projects' mainly in Kingston by single constructing corporations of professional architects and engineers and trained managers. The constant price G.D.P. from construction per man per year increased from £530 in 1953 to £563 in 1957. These are the only years in the period for which employment figures are available. However, if we assume that output per unit of input increased at some constant rate throughout the period, the average growth rate would be unaffected. There may, on the other hand, have been acceleration in productivity rises in the construction sector and in the seven manufacturing industries. There is no firm information. If there was acceleration, then the average growth rate is biased downwards. This is likely, though the rate of acceleration was probably small. The construction sector contributed 7 per cent of the current price G.D.P. in 1950, 9 per cent in the middle 'fifties, and 12 per cent in the later 'fifties. The contribution of the seven manufacturing industries rose from 3 per cent in the early 'fifties to 6 per cent by 1959. The bias could hardly therefore amount to the loss of more than 0.25 per cent in the average growth rate over the nine-year period, on the assumption that the shares of the construction sector and the seven manufacturing industries should in 1959 have been 10 per cent greater than they were estimated to have been.

The special price indices need no extended comment. They were made because data were available and reliable and coverage adequate. No significant distortion arises through the use of these.

The eight cases where a cost-of-living index was used are as follows:

<i>Sector</i>	<i>Average per cent</i>	
	<i>G.D.P. share</i>	<i>Index used</i>
Food manufacturing	3.4	Kingston C.O.L. food index
Miscellaneous manufacturing	0.2	Kingston C.O.L. charcoal index
Distribution	16.8	Kingston C.O.L. all items
Road, water, air transportation	4.5	Kingston C.O.L. all items

<i>Sector</i>	<i>G.D.P. share</i>	<i>Index used</i>
Ownership of dwellings	4.0	Kingston C.O.L. rent index
Domestic services	4.6	Kingston C.O.L. index for all items
Laundering and personal services	2.5	Kingston C.O.L. index for all items
Religious, welfare and trade associations	1.6	Kingston C.O.L. index for all items

As regards the food manufactures (which exclude sugar, rum and molasses), these were sold mainly in Kingston and abroad. Export prices declined by one-third and by one-half for processed coffee and cocoa between 1954 and 1959, and, on the whole, domestic prices were firmer. Moreover, imported foods have more weight in the index than domestically manufactured foods, and the prices of the former rose more quickly on the domestic market. The effect of using the cost-of-living index as deflator for this industry has been to bias the growth rate downwards, not upwards. Again, the effect must be small, not more than 0.25 per cent.

The deflation of Miscellaneous Manufacturing by the use of the Kingston C.O.L. charcoal index, which rose twice as rapidly as the overall Kingston C.O.L. index, has undoubtedly given a downward rather than an upward bias. But the sector contributed only 0.2 per cent to total G.D.P. in any year.

There is no doubt that middle- and upper-class house rents rose somewhat more rapidly than indicated by the Kingston rent index. On the other hand, the rural rent index rose much more slowly than the Kingston one, representing fairly well the trend for the vast majority of rural houses. Since Jamaica has still only very small middle- and upper-classes, about 15 per cent of the total population, the net upward bias, if any, introduced by applying the Kingston index to the whole sector is insignificant.

More significant has been some upward bias given to the deflated values of the product of the distribution, transportation and laundering sectors by the use of the Kingston index as deflator. Although imported cloth and footwear faced new competition from the nascent and developing local manufacturers, so that smaller distributors' margins on costs had apparently to be taken on these items, the increased local demand for a large number of imported income-elastic consumer durables and other goods led in the later 'fifties to increases in prices that exceeded rises in the index used. Many of these

commodities are excluded from the cost-of-living index. It has not been possible to obtain information on price increases for these commodities for the earlier years, and there has been no opportunity to construct a sound alternative index. A rough estimate based on a small non-random sample is that such an index would probably have risen from 100 in 1956 to about 115 in 1959 rather than to 110.8. On similar rough bases, a road, water and air transportation index would probably have moved from 100 in 1956 to 118 in 1959, and a laundering and personal services index from 100 to 120.

In view of the manner in which the estimates for domestic services were made as already explained, there is no bias introduced by deflation with the C.O.L. index.

The base for all indices used was 1956. No bias results from this selection for the short period 1950-9.

There were no changes in the domicile of large firms during the period under review.

Conclusion on net statistical influence on the growth rates

Bringing together the estimated distorting effects of the factors that have been discussed in all the preceding sections and evaluated sometimes on the basis of slender information, we arrive at the following conclusions:

Puerto Rico's current price G.N.P. may be taken to have grown at an average of 7.3 instead of 8 per cent between 1950 and 1959, and its constant price product at 4.5 per cent instead of 5.2 per cent.

Jamaica's adjusted rates differ from the original ones more significantly, the current price rate being 11.1 per cent, rather than 12.7 per cent, and the deflated product rate 8.9 per cent instead of 9.9 per cent.

These adjusted rates of real growth will be compared now with other indicators of economic growth.

5. Miscellaneous other indicators of economic development

Puerto Rico's fairly well-developed statistical services make it possible to view economic trends with the help of a number of

different series. Individually, these cannot be substitutes for the national income and product series as indicators. But combinations of them may be close rivals. It is hoped that the group selected for inclusion in Appendix I will be an aid in appraising the value and reliability of the income and product statistics.

It would be tedious to comment on the increases of each of the selected series. But if Puerto Rico's real *per capita* income has not really grown as greatly and rapidly as has been represented, that is, by more than 50 per cent in the nine years, it is difficult to understand how and why the average Puerto Rican consumption of locally produced milk expanded 80 per cent in the period (while the consumption of imported milk also rose by more than 50 per cent); why *per capita* local beef and pork production and consumption and imported meat consumption rose by 50 to 75 per cent; why enrolment in all schools went up by 50 per cent and enrolment in private schools almost trebled itself; and why the consumption of electric energy, the number of motor vehicles and the number of telephones increased by more than 100 per cent (electric energy by more than 200 per cent). Finally, the reality of the growth is attested, it seems, by the increase in the number of Government-induced and assisted plants in operation from 98 in 1950 to 629 in 1959, with employment in them also six times greater in the latter year.

Jamaica's statistical story is not as well documented; but available series are many, and their trends are as impressive as Puerto Rico's. The *per capita* consumption of imported meat more than trebled (though the rise was not steady), while that of locally produced fish almost doubled (imports changed little), and that of locally produced poultry meat increased tenfold. People consumed on the average five times as much imported milk, without a reduction in local supplies.

In addition to the evidence of the phenomenal increase in the consumption of meat protein, which is generally assumed to be income elastic, at least for changes in low levels of income, there are the following significant items where physical or quantity increases have been large:

TABLE I

	Quantity relatives			
	1950	1952	1956	1959
Local cement production	nil	100	178	266
Total cement supplies	100	120	240	345
Consumption of electric energy	100	132	210	330
Railway (tons carried)	100	124	224	275
Textiles manufactured	nil	100	204	285
Footwear manufactured	100		810	1,190
Motor vehicles licensed	100	112	165	262
Telephones in service	n.a.	100	155	208
Government-induced factories	100	250	1,050	2,550
Persons employed in the government-induced factories	n.a.	n.a.	100	810

n.a. = not available.

Since the bauxite and alumina industry's expansion was the most important dynamic factor, it is necessary to note the export relatives:

Year	Export value ¹	Export quantity
1950	nil	nil
1952	100	100
1956	2,476	1,158
1959	4,857	1,911

¹ It must be remembered that prices and values in this industry are really quite nominal.

A revision of the agreement between the Government of Jamaica and the companies during 1957 resulted in increases in their tax and royalty payments from £0.3 million in 1956-7 to £1 million the next year, £4 million in 1958-9, and to £7 million in 1960-1.

It is hoped that the foregoing series for Puerto Rico and Jamaica will help to indicate that these islands have undoubtedly been experiencing exceedingly high rates of growth in the last decade or so. Starting the period of their more rapid development from relatively humble economic positions, and therefore with very small statistical quantities, values and averages as bases, the islands were also, naturally, to attain very high percentage rates early in the process of change. We still do not know these rates with exactitude, and probably never shall. But perhaps this paper has succeeded, as it set out to try to do, in giving some idea of the probable rates of growth, and the probable margins of error and directions of errors. The principal

factors causing the rapid growth will now be pointed out briefly.

B. THE PRINCIPAL ECONOMIC FACTORS

In view of the length this paper has already acquired, only the briefest notes will be made on what I suggest are the principal causes of the rapid economic development of the two islands.

Large inflows from abroad of investment resources, entrepreneurship, technology and management, mainly into one sector, producing for the external market. There is no doubt that in both islands the main economic thrust has been provided by one sector: the new manufacturing sector in Puerto Rico, and the mining sector in Jamaica; and in both cases it was principally expectations of sales abroad that induced the investments—in fact, exclusively so in Jamaica. Tables II and III present data to show the importance of foreign investment and foreign trade to the islands, and Tables IV and VI show relative rates of growth of these dominant contributors. In each island a growing tourist industry contributed to this trend.

TABLE II

Puerto Rico: Selected series to show the importance of the foreign sector to the general economic trend

Millions of dollars

	Total exports including services	Exports from new manufacturing sector	Total G.D.P. at market prices	Total gross domestic capital formation	Gross domestic capital formation externally financed	Total national income	Income from new manufacturing
1950	345	54	724	111	44	614	55
1951	401	60	768	145	88	705	67
1952	455	79	877	193	75	831	75
1953	564	105	934	157	40	886	98
1954	577	113	1,006	186	63	934	116
1955	584	142	1,062	217	96	960	131
1956	636	390	1,149	230	79	1,004	157
1957	691	295	1,241	275	123	1,053	174
1958	712	292	1,351	302	156	1,135	101
1959	782	343	1,463	332	193	1,241	203
1960	900	369	1,650	392	214	1,362	n.a.

Source: Planning Board and Economic Development Administration of Puerto Rico.

Using the ordinary commercial definition of investment, that is not excluding asset transfers, the Economic Development Administration reported in *Industrial Development Program 1960* that in 1956 foreign investment in the new manufactures was \$198 million as against \$35 million by local investors in these manufactures. In 1959 the figures were \$420 million and \$53 million respectively.

TABLE III

Jamaica: Selected series to show the importance of the foreign sector to the general economic trend

Millions of pounds

	Total exports including services	Exports of bauxite and alumina	Total G.D.P. at market prices	Total domestic capital formation	Domestic capital externally financed	Domestic capital formation bauxite and aluminium	G.D.P. from bauxite and alumina
1950	19	nil	72	7.9	neg.	} 36.0	neg.
1951	21	nil	84	12.6	4.4		neg.
1952	24	0.4	97	14.5	5.2		neg.
1953	31	2.8	107	15.2	4.7		2.0
1954	37	6.0	120	18.8	4.8		4.9
1955	41	9.0	136	24.6	9.3	6.5	
1956	46	10.4	158	41.6	16.9	11.6	8.1
1957	60	21.5	192	57.3	16.4	10.7	13.7
1958	61	21.7	199	50.9	14.0	3.2	13.7
1959	64	20.4	211	50.8	15.2	1.2	13.3

Source: Department of Statistics, Jamaica. neg. means negligible.

In the case of Jamaica it will be observed that the foreign sector is not as large in relation to gross product and domestic capital formation as in Puerto Rico.

Puerto Rico. As shown in Tables II and IV, the new manufacturing sector's direct income contribution increased almost fourfold within the 'fifties, as total national income doubled. Strengthened by the tax-exemption laws, the main stimuli have been: (i) the certainty of tariff-free and quota-free sales of manufactures to the large and wealthy United States mainland market; (ii) the ready availability from the mainland of all the required productive inputs - investment resources; actual physical capital goods and equipment; raw materials; entrepreneurial, managerial and technical personnel; (iii) the familiarity of the basic civil and commercial laws and practices

to the businessmen on the U.S. mainland who were responsible for making the decisions to locate branches and subsidiaries in Puerto Rico; (iv) the agreeableness of climatic and social conditions, especially in the capital, to the needed expatriate personnel; (v) the availability of low-level labour as well as of a sufficient number of middle-level personnel¹ of adequate educational standards – unlike all other Caribbean Islands (British, Spanish and other), Puerto Rico had, under the United States influence, greatly enlarged, many years before, both its high school and university enrolment (though at some cost to standards), and had introduced many of the modern subjects at the university level; (vi) stability of the value of currency notes and other media of exchange, which are the same as those on the U.S. mainland, and are subject to the monetary policy of the Federal Reserve Board; and (vii), of recognized importance, the atmosphere of political liberalism and tolerance and of Governmental honesty.

It must be emphasized, however, that although the new manufacturing sector has been of such great importance for the island's growth, and although such growth could not have been achieved without the stimulus of tariff-free and quota-free access of the new industries to the mainland market, the process would evidently not have commenced had not the Government of Puerto Rico taken the initiative. Tariff-free and quota-free access for the manufactures had been available to Puerto Rico since its annexation by the United States in 1898. Evidently, industrial private enterprise was not readily aware of the investment and production opportunities available to it in Puerto Rico. There was not the mobility of entrepreneurship, of managerial and technical personnel, and of private capital that has recently been witnessed. It required Government initiative in research and promotional and communicating activities to bring the reality of the situation closer to the assumptions of much of economic theory.

Although the contribution of the Government of Puerto Rico cannot, therefore, be assigned its relative importance on the basis of the statistically measured, direct share of the general Government sector in national income, this share and that of the construction sector, were also significant, and expanded

¹ Several of these persons have become top business and Government executives.

TABLE IV

Puerto Rico: Selected relatives to indicate comparative rates of growth

	Total domestic exports	Exports of non-traditional manufacturing	Traditional manufacturing exports	Total G.D.P. at market prices	Total domestic capital formation	Domestic capital externally financed	Total national income	Income from non-traditional manufacturing	Income from traditional manufacturing
1950	100	100	100	100	100	100	100	100	100
1951	116	111	115	106	130	200	116	122	116
1952	132	146	100	121	173	170	135	136	120
1953	164	195	119	129	141	91	145	178	114
1954	167	209	116	138	167	143	152	210	116
1955	169	263	118	139	195	218	157	238	116
1956	189	720	110	155	206	179	164	286	119
1957	200	545	110	167	248	280	172	316	121
1958	206	540	100	182	272	354	185	330	123
1959	226	635	91	197	288	436	202	370	132

greatly. The contribution of general Government almost quadrupled between 1940 and 1950, and was two and a half times greater in 1960 than in 1950. The construction sector, starting with a contribution equal to only one-eighth of that of the Government sector in 1940, increased tenfold by 1950. The larger figure was more than trebled by 1960. And so, while total national income in 1960 was six times greater than in 1940, general Government was nine times as large as it had been, and the construction sector was thirty-three times as large as in 1940.

But even the direct, statistical, quantitative contribution of the Government of Puerto Rico was somewhat larger than has so far been indicated. The construction sector was greatly stimulated by contracts awarded by the Government and by Government corporations for the construction of roads, schools, port facilities, utilities for much-expanded water and electricity services, and for other recognized items of prerequisite social capital. In addition, the Government awarded substantial contracts for the construction of factory buildings. Accordingly, in 1947, the combined gross domestic investment made by the island and municipal Governments and the Government corporations and enterprises was more than one-third of total gross domestic investment. This high proportion was increased to one-half of the total island investment for a few of the years of the later 'forties and early 'fifties. In fact, Government investment exceeded private domestic investment in 1953, when the total investment was over \$150 million, and was already nearly twice the 1947 figure. This was, of course, the period of heavy outlays in social overhead. The Government's participation in total investment fell to only one-third by 1960, though its outlays were still rising in absolute terms. In most years general Government's savings or surplus on current account has financed a half or more of Government domestic investment.

Income from agriculture rose only 17 per cent in the period. Income from all sectors not included in the above table rose by 118 per cent.

In consequence of the differential sector rates of growth, the structure of the economy changed as shown in Table V.

It is observed that the manufacturing sector grew to become the most important single sector in the middle 'fifties. This was due almost entirely to the new manufactures. In fact, some

TABLE V

Puerto Rico: Percentage sector contributions to gross national product

	1950	1952	1954	1956	1958	1959
Agriculture and fishing	17.5	18.4	13.9	13.3	10.5	10.9
Manufacture of sugar and drink	6.9	6.5	6.0	5.8	5.3	5.3
Other manufacture	7.7	8.1	11.1	14.0	14.0	14.6
Contract construction	3.9	4.8	4.1	4.2	5.2	6.2
Government	9.9	9.6	9.9	10.4	11.4	11.7
All other	54.2	48.6	55.0	52.5	47.7	48.2
Total	100.0	100.0	100.0	100.0	100.0	100.0

traditional non-sugar manufactures declined. The relative decline of agriculture is equally remarkable. Within the latter sector, however, there was a growing dairy industry, based on domestic consumption generated by higher incomes. Sugar-cane growing and the production of starchy vegetables declined absolutely, to a large extent as a direct result of the development of the other sectors. The higher wages paid in the new sectors of greater productivity made it difficult for sugarcane to retain or attract younger and better workers; and higher incomes have meant a fall in demand for income-inelastic starchy foods. Contract construction, much of it for the Government, and the Government sector itself are seen to have become relatively larger.

Jamaica. In Jamaica the performance of the traditional manufacturing sector, mainly sugar and related products, was better than it was in Puerto Rico, and contributed to growth; but the new bauxite sector was far more important in providing the impetus. The island's total exports more than trebled in value, although prices moved downwards on the whole after 1954; but bauxite and alumina exports value increased by more than six times. However, whilst manufactures of new products increased significantly, they were mainly for the domestic market, substituting partially, in a few cases wholly, for imports. Local capital, entrepreneurship and management played a relatively larger role in these new manufactures than we found to have been the case in Puerto Rico. But the scale of manufacturing was on a much lower level in terms of value and volume. Nevertheless, Jamaican manufacturing development also helped to lessen the effects of the adverse movements in the terms of trade during a part of the 'fifties.

TABLE VI

Jamaica: Selected relatives of aggregate values

	Total domestic exports	Bauxite and alumina exports	Traditional sugar etc. exports	Total G.D.P. at market prices	Total domestic capital formation	Domestic capital externally financed	Factor cost G.D.P. bauxite and alumina	Factor cost G.D.P. from non-sugar manufacturing
1950	100	nil	100	100	100	neg.	nil	100
1951	111	nil		115	159	100	nil	120
1952	127	neg.	120	134	184	118	neg.	153
1953	163	100	149	150	192	107	100	189
1954	195	214	156	168	238	109	245	221
1955	216	322	160	192	312	214	324	250
1956	242	372	185	222	525	384	405	291
1957	316	768	185	268	725	374	685	337
1958	320	775	156	276	645	320	685	368
1959	338	730	174	290	642	346	665	398

neg. means negligible.

Jamaica's agricultural sector lagged also, but less so than Puerto Rico's, perhaps because, among other reasons, it was more diversified, and because it was more necessary to the economy in the absence of the larger-scale manufacturing that Puerto Rico enjoyed. The sectors not included in Table VI almost quadrupled their income collectively.

The change in Jamaica's economic structure is shown by Table VII, below.

TABLE VII

Jamaica: Percentage sector contributions to gross domestic product

	1950	1952	1954	1956	1958	1959
Agriculture, forestry and fishing	30.8	27.1	20.1	16.2	13.5	13.5
Mining and refining	nil	neg.	4.0	5.5	8.8	8.1
Manufacture of sugar, etc.	3.1	3.1	3.5	2.6	2.0	2.2
Other manufacturing	8.2	9.0	10.6	10.6	10.5	10.9
Construction	7.6	10.8	8.7	12.7	12.3	11.3
Government	6.1	6.3	6.3	7.1	6.5	7.0
All other	45.1	43.8	47.7	45.3	47.3	47.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Just as it was only after the Fomento (at the end of the 'forties) launched its systematic programme of communicating the facts to North American potential investors in industry that the

investments began to flow into the Puerto Rican economy, so it was with Jamaica later. The profits tax exemption laws of Puerto Rico were first made in 1947. But the existence of these and other advantages had to be communicated for them to become effective causes of greater mobility of capital, enterprise and management towards Puerto Rico. Similarly, Jamaica had tax incentive legislation passed in 1949, but there was little inflow until advertisement and direct contact began in the 'fifties. In each island, also, but first and more importantly in Puerto Rico, the Government spent a great deal more than formerly on creating social capital – roads, water supply, technical and general schools and the like, almost according to textbook. The Governments also constructed factory buildings in order to reduce investors' risks. These activities stimulated also the non-leader sectors. But, naturally for these small economies of relatively low domestic demand, the external market was the principal determinant of the effectiveness of the inducement measures. In these economies it is $Y = f(v_x, i_x)$ that is most realistic, where v_x and i_x are income arising in the export sector, and investment made by the export sector, respectively.¹

Miscellaneous other relevant factors are: the growth of depreciation allowances relatively to gross product in both islands, as capital stock increased, from 5 per cent to 7 per cent of G.N.P. in Puerto Rico and from 5.4 to 7.5 per cent of G.D.P. in Jamaica; the adequacy of foreign exchange needed for food, capital equipment and, in Puerto Rico's case, for most industrial raw materials. Puerto Rico imported and exported almost entirely from and to the United States, with which it is in a common monetary system also, and Jamaica's bauxite was sold mainly in North America, from which its equipment largely came. Finally, Federal Government (U.S.) payments were not responsible for the growth of Puerto Rico, as these payments actually declined from 1954 by 25 per cent. They were, nevertheless, helpful, being about 7 per cent of gross product, when at their highest.

Non-recurrent factors. Such high rates of growth as have obtained in Puerto Rico and Jamaica naturally raise questions as to whether the rates are temporary, and how much longer are they likely to prevail.

¹ In both Puerto Rico and Jamaica exports have become larger in relation to gross product.

The average annual rate of increase in Jamaica's real product for the last five years is considerably lower than that for the preceding five years. And the *per capita* real income did not increase at all in 1960-2, according to the tentative estimates available. On the other hand, Puerto Rico's rate of growth was higher for 1960-2 than for 1950-60, although there was a decline in the rate during the middle 'fifties. The highest Puerto Rican average rate had been for the years 1947-53. Its spurt in the early 'sixties is probably due to an improvement in the conditions in the United States, its main market. These figures for the two islands do not support the view that the rapid rates of growth are temporary. Jamaica's rate might accelerate again after the brief two-year deceleration, as Puerto Rico's did. It seems, however, that it would have to be some factor other than bauxite production that produced the next spurt. It is unlikely that the bauxite industry will be, in the near future, a source of expansions in construction and in exports comparable with those of the 'fifties. But if, by some stroke of luck, Jamaica were to gain access to a large, low-tariff market, for its manufactures, there would undoubtedly be another great acceleration - and, as in Puerto Rico, it would be sustained.

C. EMPLOYMENT IN THE TWO ISLANDS

In Appendix I there are figures showing the rapid increase in employment in Government-induced factories in Puerto Rico. Despite the increase, total employment did not increase, but actually declined from 601,000 in 1950 to 539,000 in 1954-5. It did not during the period get back even to 560,000. Yet not only the average income of employed persons but also *per capita* real national income rose greatly. The explanation is that (i) the new export sector (and new parts of older sectors stimulated by the new sector) employed labour resources more fully over time, and (ii) supplied its labour with more, and more modern and efficient, complementary resources of capital and (iii) managed its labour more efficiently and economically than the traditional sectors did. In other words, there were both quantitative (more full-time employment and more capital and entrepreneurship) and qualitative factors that made for rapid increases in product and productivity. The gains from these far outweighed income losses that occurred from reductions in employment in the traditional sectors, where there had

also been much (unmeasured) disguised unemployment and part-time employment, and where marginal labour productivity must sometimes have been close to zero. Domestic service and agriculture were examples. These lost labour heavily, as will be seen from the table below, Table VIII. They could not compete for labour with the new and other higher productivity sectors. Agriculture lost 35 per cent of its labour, hand needlework manufacturing employment declined by 80 per cent, domestic servants by 33 per cent, other personal service workers by 20 per cent, and sugar-manufacturing employment by 20 per cent.

TABLE VIII

Puerto Rico: Selected employment series
Thousands of persons – annual averages

	1950	1951	1953	1955	1957	1959
Total employment ¹	569	604	550	539	552	546
Employment in new manufacturing	6	8	17	31	32	37
Agricultural and fishing employment	216	203	172	164	153	137
Employment in sugar etc. manufacturing	100	103	81	64	67	52
Employment in construction	27	27	39	32	40	37
Domestic and personal service	55	60	44	39	35	39
Government employment	45	50	50	50	57	65
All other employment	147	153	146	159	168	179

Source: Department of Labour, Puerto Rico.

¹ The labour force also decreased at almost similar rates, so that unemployment rates changed only little, by one or two percentage points around 12 per cent.

In Jamaica the bauxite-alumina sector provided only 2,000 jobs in ordinary production. At peak times of capital outlays it supplied an additional 2,000. Its agricultural activities added another 2,000. The new manufactures also added only about 4,000 jobs, including those in Government-induced factories. In view of the small number of new jobs added, old occupations did not come to be despised as in Puerto Rico, at least not on a large scale. Unfortunately, Jamaica does not yet have employment statistics of the kind produced above for Puerto Rico. However, it can be said with certainty that it is mainly in its

direct contribution to Jamaica's Government revenues, and so to Government outlays, that the mining sector has been important. It grew in the period to contribute 25 per cent of all tax and royalty revenues, and 16 per cent of total ordinary revenue.

APPENDIX I

Puerto Rico: Selected Series, 1950-9

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
<i>National income and population</i>										
Gross national product, current prices ¹ (\$ million)	754	815	968	1,048	1,104	1,142	1,199	1,271	1,384	1,482
National income, current prices ¹ (\$ million)	614	705	831	886	934	960	1,004	1,053	1,135	1,241
G.N.P., constant prices (1954) ¹ (\$ million)	879	924	1,016	1,081	1,104	1,142	1,183	1,226	1,307	1,372
National income, real ¹ (\$ million)	717	794	873	912	934	959	998	1,027	1,083	1,156
Population, average ³ (thousands)	2,202	2,218	2,224	2,209	2,205	2,226	2,240	2,246	2,269	2,296
<i>Per capita figures</i>										
G.N.P., constant prices ¹ (dollars)	399	417	457	489	501	513	528	546	576	597
National income, real ¹ (dollars)	326	358	393	413	423	432	446	457	477	503
Increase over previous year in real <i>per capita</i> income (%)		10	10	5.4	2.5	2.5	3.2	2.6	4.5	5.4
Consumption of locally produced milk ² (quarts)	74.5	68.5	70.2	85.0	90.4	101.2	120.0	122.5	127.4	134.0
Consumption of imported milk ³ (pounds)	17.3	16.2	17.3	17.4	18.7	20.6	23.0	24.0	n.a.	26.0
Consumption of locally produced eggs ⁴ (dozens)	4.1	4.5	4.5	4.5	4.0	4.4	4.8	4.7	5.1	5.4
Consumption of imported eggs ⁴ (dozens)	1.8	1.9	2.1	2.5	2.7	3.1	2.9	n.a.	n.a.	2.9

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Consumption of local beef ² (pounds)	7.4	8.8	9.4	7.2	7.7	8.6	10.1	10.6	11.7	12.8
Consumption of local poultry ² (pounds)	5.8	6.4	7.1	5.8	5.9	6.1	6.0	5.9	6.2	6.6
Consumption of local pork ² (pounds)	5.4	5.4	6.3	6.4	7.7	7.7	7.7	7.7	7.9	8.5
Consumption of imported meat ² (pounds)	28.0	24.2	24.0	31.2	32.4	34.4	37.8	37.3	n.a.	43.0
<i>Miscellaneous totals</i>										
Enrolment in all schools (thousands)	475.5	514.6	532.4	555.6	610.9	661.8	700.4	998.4	717.9	722.2
Enrolment in private schools (thousands)	22.6	23.5	25.5	30.8	34.6	39.0	42.8	44.9	48.8	58.0
Per cent of school-age popula- tion enrolled ³ (%)	60.4	64.5	66.0	70.1	73.6	74.4	78.6	81.8	84.3	84.7
Number of physicians ³ (No.)	937	1,032	1,062	1,154	1,252	1,419	1,510	1,744	1,804	1,644
Number of registered motor vehicles ³ (thousands)	60.7	70.7	76.7	86.7	95.0	105.4	116.3	127.9	140.2	156.6
Number of telephones in service ³ (thousands)	34.5	37.1	39.3	42.2	47.1	52.2	58.2	58.4	63.6	68.4
Electric energy consumed ³ (million kWh.)	411.7	488.2	565.1	625.3	699.9	774.9	933.7	1,078.4	1,299	1,422
Government-induced and assisted factories in operation at year-end ⁴ (No.)	98	130	191	261	296	379	467	488	548	629
Persons employed in Govern- ment-induced factories ⁴ (thousands)	5.8	7.9	11.2	17.5	20.6	30.9	22.1	31.9	31.3	37.2

APPENDIX I—*continued*
Jamaica: Selected Series, 1950-9

330

INCOME AND WEALTH: SERIES XI

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
<i>National income and population</i>										
Gross national product, current market prices ⁵ (£ million)	77.3 ⁶	89.8 ⁶	103.8 ⁷	114.6	127.7	145.3	166.7	199.6	207.0	221.8
National income, current prices ⁵ (£ million)	68.5 ⁷	79.5 ⁷	92.4 ⁸	99.0	109.9	125.1	143.2	171.0	177.3	189.2
Gross domestic product (at factor cost) current prices ⁵ (£ million)	72.5 ⁸	84.1 ⁷	96.8 ⁹	106.7	119.7	136.4	158.5	191.9	198.7	212.1
Gross domestic product (factor cost) at constant prices ⁵ (£ million)	83.0	91 ⁷	101.0	117.2	130.4	143.5	158.5	181.5	184.0	194.5
Population, average ⁹ (thousands)	1,380	1,389	1,398	1,408	1,419	1,442	1,475	1,506	1,543	1,582
<i>Per capita figures</i>										
G.D.P., constant prices (£)	62.0	65.5	71.7	83.0	92.0	99.5	107.0	120.5	119.5	123.0
Annual increases in <i>per capita</i> constant price G.D.P.		6%	10%	15%	5%	8%	7.5%	10.1%	0.7%	3%
Consumption of locally produced fresh milk (b) (gallons)	5.1	5.4	5.4	5.8	5.8	5.9	5.8	5.5	5.3	5.7
Consumption of imported milk (pounds)	0.7	1.7	1.7	1.6	1.7	n.a.	n.a.	n.a.	n.a.	7.0
Consumption of locally produced eggs (dozen)	1.3	1.3	1.3	n.a.	n.a.	n.a.	n.a.	3.2	4.9	5.3
Consumption of locally produced fish (pounds)	8.0	8.3	8.6	9.3	10.0	10.1	11.4	13.3	14.7	13.8
Consumption of imported fish and fish products (pounds)	16.2	16.2	14.8	18.2	19.4	19.5	19.1	22.0	18.9	18.0
Consumption of locally produced poultry (pounds)	0.4	0.4	0.4	0.6	0.9	1.2	1.3	2.0	3.5	4.8
Consumption of locally produced pigs (No. head)	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5
Consumption of imported meat (pounds)	3.1	2.1	1.3	1.9	n.a.	n.a.	n.a.	n.a.	10.1	11.0

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
<i>Miscellaneous</i>										
Volume indices of exports ¹⁰	n.a.	n.a.	n.a.	n.a.	100	107.2	118.8	134.2	129.9	131.6
Value of domestic exports (f.o.b.) ¹⁰ (£ million)	14.8	16.6	17.3	24.5	29.9	32.7	36.9	49.5	46.8	45.3
Bauxite and alumina exports ¹⁰ (£ million)	nil	nil	0.4	2.8	6.0	9.0	10.4	21.5	21.7	20.4
Cement produced ¹¹ (thousand tons)	nil	nil	73	99	96	107	130	142	175	194
Textiles produced ¹¹ (thousand yards)	nil	n.a.	2.6	4.9	4.1	4.6	5.3	7.1	7.1	7.4
Motor vehicles licensed ¹¹ (thousands)	16	18	18	19	20	24	26	30	36	42
Tonnage of goods carried by rail ¹¹ (thousands)	327	333	406	409	570	625	733	764	1,079	900
Telephones ¹¹ (thousands)	n.a.	n.a.	16.1	18.0	20.1	22.9	25.0	27.8	30.2	33.6
Tourist bed capacity ¹¹ (number)	n.a.	n.a.	n.a.	n.a.	n.a.	3,300	3,600	4,200	4,700	5,800
Consumption of electric energy ¹⁰ (a) (million kWh.)	62.6	73.5	82.7	91.4	99.1	112.2	131.7	159.7	173.4	207.9
Government-induced plants (number)	2	4	5	n.a.	n.a.	18	21	28	41	51
Persons employed in Government-induced plants	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	275	1,240	1,690	2,210
Footwear produced locally (doz. prs.)	8,465	n.a.	n.a.	n.a.	34,413	52,500	68,750	69,000	83,000	101,000
Cement supplies, imports plus local production minus exports (000 tons)	55	78	66	84	96	114	132	164	174	190

¹ Source: Government of Puerto Rico, Planning Board, Statistical Section, *Income and Product, 1962*.

² Based on total figures for fiscal years in: Government of Puerto Rico, Department of Agriculture, *Facts and Figures on Puerto Rico's Agriculture, 1961*.

³ Source: Government of Puerto Rico, Planning Board, *Statistical Yearbooks*.

⁴ Government of Puerto Rico, Economic Development Administration *Annual Reports*.

⁵ Government of Jamaica, Department of Statistics, *National Accounts, 1958, 1959* and revised constant price G.D.P. estimates to be published soon.

⁶ A. P. Thorne, *Size, Growth and Structure of the Economy of Jamaica*, Institute of Social and Economic Studies, University of the West Indies, 1955.

⁷ A. P. Thorne, unpublished revised estimates.

⁸ A. P. Thorne, 'Revisions, and Suggestions for Deflating Gross Product Estimates for Jamaican Type Economies' in *Social and Economic Studies*, Vol. 9, No. 1, Institute of Social and Economic Research, University of the West Indies, March 1960.

⁹ Revised on the basis of the 1960 population census.

¹⁰ Government of Jamaica, Central Planning Unit, *Economic Survey*, annual reports.

¹¹ Government of Jamaica, Department of Statistics, *Annual Abstracts and Digests of Statistics*.

(a) Excludes power generated for private use.

(b) The condensery output figures are not to hand. Output increased substantially.

(c) The 1959 figures likely to be revised and reduced.

n.a. = not available.