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The *Economic Bulletin for Latin America*, published by the Secretariat of the Economic Commission for Latin America, appears twice yearly. The essential purpose of this periodical is to provide a résumé of the economic situation of the region designed to supplement and bring up to date the information published in the Commission's annual economic surveys. Apart from this summary, which is to appear in every issue, special articles on different subjects related to the economy of Latin America are also included.

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EXPLANATION OF SYMBOLS

Three dots (...) indicate that data are not available or are not separately reported.

A dash (—) indicates that the amount is nil or negligible.

A minus sign (—300) indicates a deficit or a decrease.

A space is used to separate thousands and millions (3 123 425).

A stroke (/) indicates a crop year or a fiscal year, e.g., 1954/55.

An asterisk (*) is used to indicate partially or totally estimated figures.

"Tons" and "dollars" are metric tons and United States dollars, respectively, unless otherwise stated.

Minor discrepancies in totals and percentages are due to rounding.

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THE ECONOMIC DEVELOPMENT OF LATIN AMERICA AND ITS PRINCIPAL PROBLEMS

by *Raúl Prebisch*

I. Introduction

In Latin America, reality is undermining the out-dated schema of the international division of labour, which achieved great importance in the nineteenth century and, as a theoretical concept, continued to exert considerable influence until very recently.

Under that schema, the specific task that fell to Latin America, as part of the periphery of the world economic system, was that of producing food and raw materials for the great industrial centres.

There was no place within it for the industrialization of the new countries. It is nevertheless being forced upon them by events. Two world wars in a single generation and a great economic crisis between them have shown the Latin-American countries their opportunities, clearly pointing the way to industrial activity.

The academic discussion, however, is far from ended. In economics, ideologies usually tend either to lag behind events or to outlive them. It is true that the reasoning on the economic advantages of the international division of labour is theoretically sound, but it is usually forgotten that it is based upon an assumption which has been conclusively proved false by facts. According to this assumption, the benefits of technical progress tend to be distributed alike over the whole community, either by the lowering of prices or the corresponding raising of incomes. The countries producing raw materials obtain their share of these benefits through international exchange, and therefore have no need to industrialize. If they were to do so, their lesser efficiency would result in their losing the conventional advantages of such exchange.

The flaw in this asumption is that of generalizing from the particular. If by "the community" only the great industrial countries are meant, it is indeed true that the benefits of technical progress are gradually distributed among all social groups and classes. If, however, the concept of the community is extended to include the periphery of the world economy, a serious error is implicit in the generalization. The enormous benefits that derive from increased productivity have not reached the periphery in a measure comparable to that obtained by the peoples of the great industrial countries. Hence, the outstanding differences between the standards of living of the masses of the former and the latter and the manifest discrepancies between their respective abilities to accumulate capital, since the margin of saving depends primarily on increased productivity.

Thus there exists an obvious disequilibrium, a fact which, whatever its explanation or justification, destroys the basic premise underlying the schema of the international division of labour.

Hence, the fundamental significance of the industrialization of the new countries. Industrialization is not an end in itself, but the principal means at the disposal of those countries of obtaining a share of the benefits of technical progress and of progressively raising the standard of living of the masses.

The Latin-American countries are thus faced with an immense general problem, embracing a series of minor ones which must be defined before embarking on the long task of research and practical measures which will be necessary if there is a firm intention to solve the problems.

It would be premature, in this initial report, to draw conclusions that would have only the doubtful value of an improvisation. Admittedly much remains to be done in the Latin-American countries, both in learning the facts and in their proper theoretical interpretation. Though many of the problems of these countries are similar, no common effort has ever been made even to examine and elucidate them. It is not surprising, therefore, that the studies published on the economy of Latin-American countries often reflect the points of view or the experience of the great centres of world economy. Those studies cannot be expected to solve problems of direct concern to Latin America. The case of the Latin-American countries must therefore be presented clearly, so that their interests, aspirations and opportunities, bearing in mind, of course, the individual differences and characteristics, may be adequately integrated within the general framework of international economic co-operation.

The task ahead is thus considerable and the responsibility heavy. To deal with it methodically, it would be necessary to begin with a preliminary examination of the principal problems as a whole, at the same time bringing out certain general considerations suggested by direct contact with the economic life of Latin America. Such is the purpose of this report.

Editorial note: The present study, an English translation of which was printed in May 1950, but which was distributed in Spanish only in mimeographed form, is now being reproduced in the *Bulletin*, in view of the great demand for it in university circles and among economists. The author has introduced no change in the original text.

The industrialization of Latin America is not incompatible with the efficient development of primary production. On the contrary, the availability of the best capital equipment and the prompt adoption of new techniques are essential if the development of industry is to fulfil the social objective of raising the standard of living. The same is true of the mechanization of agriculture. Primary products must be exported to allow for the importation of the considerable quantity of capital goods needed.

The more active Latin America's foreign trade, the greater the possibility of increasing productivity by means of intensive capital formation. The solution does not lie in growth at the expense of foreign trade, but in knowing how to extract, from continually growing foreign trade, the elements that will promote economic development.

If reasoning does not suffice to convince us of the close tie between economic development and foreign trade, a few facts relating to the situation today will make it evident. The economic activity and level of employment in the majority of the Latin-American countries are considerably higher than before the war. This high level of employment entails increased imports of consumer goods, both non-durable and durable, besides those of raw materials and capital goods, and very often exports are insufficient to provide for them.

This is evident in the case of imports and other items payable in dollars. There are already well-known cases of scarcity of that currency in certain countries, despite the fact that the amount of dollars supplied by the United States to the rest of the world in payment of its own imports was considerable. In relation to its national income, however, the import coefficient of the United States has, after a persistent decline, arrived at a very low level (not over 3 per cent). It is, therefore, not surprising that, notwithstanding the high income level of the United States, the dollar resources thus made available to the Latin-American countries seem insufficient to pay for the imports needed for their intensive development.

It is true that as European economy recovers, trade with that continent can profitably be increased, but Europe will not supply Latin America with more dollars unless the United States increases its import coefficient for European goods.

This, then, is the core of the problem. It is obvious that if the abovementioned coefficient is not raised, Latin America will be compelled to divert its purchases from the United States to those countries which provide the exchange to pay for them. Such a solution is certainly very dubious, since it often means the purchase of more expensive or unsuitable goods.

It would be deplorable to fall back on measures of that kind when a basic solution might be found. It is sometimes thought that, by reason of the enormous productive capacity of the United States, that country could not increase its import coefficient for the purpose of providing the basic solution to this world problem. Such a conclusion cannot be substantiated without a prior analysis of the factors that have caused the United States steadily to reduce its import coefficient. These factors are aggravated by unemployment, but can be overcome when it does not exist. One can understand that it is of vital importance, both to Latin America and the rest of the world, that the United States achieve its aim of maintaining a high level of employment.

It cannot be denied that the economic development of certain Latin-American countries and their rapid assimilation of modern technology, in so far as they can utilize it, depend to a very large extent upon foreign investment. The implications involved render the problem far from simple. The negative factors include the failure to meet foreign financial commitments during the great depression of the nineteen thirties, a failure which, it is generally agreed, must not be allowed to happen again. Fundamentally the problem is the same as that referred to in the preceding paragraph. The servicing of these foreign investments, unless new investments are made, must be paid for by means of exports in the same currency and, if these do not show a corresponding increase, in time the same difficulties will arise again. They will be the greater if exports fall violently. The question thus arises, whether, pending that basic solution, it would not be wiser to direct investments toward such productive activities as would, through direct or indirect reduction of dollar imports, permit the regular servicing of foreign obligations.

Here one must beware of dogmatic generalizations. To assume that the meeting of foreign commitments and the proper functioning of the monetary system depend upon nothing more than a decision to obey certain rules of the game is to fall into an error involving serious consequences. Even when the gold standard was in operation in the great centres, the countries of the Latin-American periphery had great difficulty in maintaining it, and their monetary troubles frequently provoked condemnation from abroad. The more recent experiences of the large countries have brought a better understanding of some aspects of the situation. Great Britain, between the two wars, encountered difficulties somewhat similar to those which arose and continue to arise in the Latin-American countries, which have never taken kindly to the rigidity of the gold standard. That experience doubtless helps to bring about a better understanding of the phenomena of the periphery.

The gold standard has ceased to function, as in the past, and the management of currency has become even more complex in the periphery. Can all these complications be overcome by a strict application of sound rules of monetary behaviour? Sound rules for these countries are still in the making. Here there arises another vital problem; that of utilizing individual and collective experience to find a means of harmoniously fitting monetary action into a policy of regular and intensive economic development.

Let this not be interpreted as meaning that the classic teachings are of no value. If they do not provide positive rules, they at least show what cannot be done without impairing the stability of the currency. The extremes to which inflation has gone in Latin America show that monetary policy was not based upon these teachings, since some of the larger Latin-American countries increased circulation to a greater extent than did those countries which had to meet enormous war expenditure.

There is yet another aspect of the problem of dollar shortage. It is true that, as already stated, a high level of employment increases imports. But it is also a fact that an excessive monetary expansion has often unduly increased the pressure on the balance of payments, thus leading to the use of foreign exchange for purposes not always compatible with economic development.

These facts must be taken into account in an objective analysis of the effects of the inflationary increase on the process of capitalization. It must, however, be admitted that, in most of the Latin-American countries, voluntary

savings are not sufficient to cover the most urgent capital needs. In any case, monetary expansion does not bring about an increase in the foreign exchange reserves necessary for the importation of capital goods; it merely redistributes income. It must now be determined whether it has led to a more active capital formation.

The point is a decisive one. The raising of the standard of living of the masses ultimately depends on the existence of a considerable amount of capital per man employed in industry, transport and primary production, and on the ability to use it well.

Consequently, the Latin-American countries need to accumulate an enormous amount of capital. Several have already shown their capacity to save to the extent of being able to finance a large part of their industrial investments through their own efforts. Even in this case, which is exceptional, capital formation has to overcome a strong tendency towards certain types of consumption which are often incompatible with intensive capitalization.

Nevertheless, it does not appear essential to restrict the individual consumption of the bulk of the population, which, on the whole, is too low, in order to accumulate the capital required for industrialization and for the technical improvement of agriculture. An immediate increase in productivity per man could be brought about by well-directed foreign investments added to present savings. Once this initial improvement has been accomplished, a considerable part of the increased production can be devoted to capital formation rather than to inopportune consumption.

How are sufficient increases in productivity to be achieved? The experience of recent years is instructive. With some exceptions, the rise in employment necessitated by industrial development was made possible by the use of men whom technical progress had displaced from primary production and other ocupations, especially certain comparatively poorly paid types of personal services, and by the employment of women. The industrial employment of the unemployed, or ill-employed, has thus meant a considerable improvement in productivity and, consequently, where other factors have not brought about a general lowering of productive efficiency, a net increase in national income.

The great scope for technical progress in the field of primary production, even in those countries where it has already been considerable, together with the perfecting of existing industries, could contribute, to national income, a net increase that would provide an ever-increasing margin of saving.

All this, however, especially in so far as it is desired to reduce the need for foreign investments, presupposes a far greater initial capitalization than is usually possible with the type of consumption of certain sectors of the community, or the high proportion of national income absorbed, in some countries, by fiscal expenditure, which makes no direct or indirect contribution to national productivity.

It is, in fact, a demonstration of the latent conflict existing in these countries between the desire to assimilate, quickly, ways of life which the technically more advanced countries adopted step by step as their productivity increased, and the need for capitalization without which this increase in productivity could not be achieved.

For the very reason that capital is scarce, and the need for it great, its use should be subjected to a strict standard of efficacy which has not been easy to maintain, especially where industries have developed to meet an emergency. There is, however, still time to correct certain deviations and, above all, to avoid them in the future.

In order to achieve this, the purpose of industrialization must be clearly defined. If industrialization is considered to be the means of attaining an autarchic ideal in which economic considerations are of secondary importance, any industry that can produce substitutes for imports is justifiable. If, however, the aim is to increase the measurable well-being of the masses, the limits beyond which more intensive industrialization might mean a decrease in productivity must be borne in mind.

Formerly, before the great depression, development in the Latin-American countries was stimulated from abroad by the constant increase of exports. There is no reason to suppose, at least at present, that this will again occur to the same extent, except under very exceptional circumstances. These countries no longer have an alternative between vigorous growth along those lines and internal expansion through industrialization. Industrialization has become the most important means of expansion.

This does not mean, however, that primary exports must be sacrificed to further industrial development. Exports not only provide the foreign exchange with which to buy the imports necessary for economic development, but their value usually includes a high proportion of land rent, which does not involve any collective cost. If productivity in agriculture can be increased by technical progress and if, at the same time, real wages can be raised by industrialization and adequate social legislation, the disequilibrium between incomes at the centres and the periphery can gradually be corrected without detriment to that essential economic activity.

This is one of the limits of industrialization which must be carefully considered in plans of development. Another concerns the optimum size of industrial enterprises. It is generally found in Latin-American countries that the same industries are being attempted on both sides of the same frontier. This tends to diminish productive efficiency and so militates against fulfilling the social task to be accomplished. The defect is a serious one, which the nineteenth century was able to attenuate considerably. When Great Britain proved, with facts, the advantages of industry, other countries followed suit. Industrial development, however, spurred by active competition, tended towards certain characteristic types of specialization which encouraged profitable trade between the various countries. Specialization furthered technical progress and the latter made possible higher incomes. Here, unlike the case of industrial countries by comparison with those producing primary products, the classic advantages of the division of labour between countries that are equal, or nearly so, followed.

The possibility of losing a considerable proportion of the benefits of technical progress through an excessive division of markets thus constitutes another factor limiting the industrial expansion of these countries. Far from being unsurmountable, however, it is a factor which could be removed with mutual benefit by a wise policy of economic interdependence.

Anti-cyclical policies must be included in any programmes of economic development if there is to be an attempt, from a social point of view, to raise real income. The spread of the cyclical fluctuations of the large centres to the Latin-American periphery means a considerable loss of income to these countries. If this could be avoided, it

would simplify the problem of capital formation. Attempts have been made to evolve an anti-cyclical policy, but it must be admitted that, as yet, but little light has been thrown on this subject. Furthermore, the present dwindling of metallic reserves of several countries means that, in the event of a recession originating abroad, they would not only be without a plan of defense but would lack means of their own to carry out the measures demanded by the circumstances.

The principal problems having been set forth in this first part of the report, the following sections will be devoted to some of their outstanding aspects, which must be discussed both on account of their intrinsic importance and of the need for carrying out systematic research on them.[1]

II. The advantage of technical progress and the countries of the periphery

It was stated in the preceding section that the advantages of technical progress have been mainly concentrated in the industrial centres and have not directly extended to the countries making up the periphery of the world's economic system. The increased productivity of the industrial countries certainly stimulated the demand for primary products and thus constituted a dynamic factor of the utmost importance in the development of Latin America. That, however, is distinct from the question discussed below.

Speaking generally, technical progress seems to have been greater in industry than in the primary production of peripheral countries, as was pointed out in a recent study on price relations.[2] Consequently, if prices had been reduced in proportion to increasing productivity, the reduction should have been less in the case of primary products than in that of manufactures, so that as the disparity between productivites increased, the price relationship between the two should have shown a steady improvement in favour of the countries of the periphery.

Had this happened, the phenomenon would have been of profound significance. The countries of the periphery would have benefited from the fall in price of finished industrial products to the same extent as the countries of the centre. The benefits of technical progress would thus have been distributed alike throughout the world, in accordance with the implicit premise of the schema of the international division of labour, and Latin America would have had no economic advantage in industrializing. On the contrary, the region would have suffered a definite loss, until it had achieved the same productive efficiency as the industrial countries.

The above supposition is not borne out by the facts. As can be seen in the indexes of table 1, the price relation turned steadily against primary production from the 1870's until the Second World War. It is regrettable that the price indexes do not reflect the differences in quality of finished products. For this reason, it was not possible to take them into account in these considerations. With the same amount of primary products, only 63 per cent of the finished manufactures which could be bought in the 1860's were to be had in the 1930's; in other words, an average of 58.6 per cent more primary products was needed to buy the same amount of finished manufactures.[3] The price relation, therefore, moved against the periphery, contrary to what should have happened had prices fallen as costs decreased as a result of higher productivity.

During the expansion of the last war, as in the case of all cyclical expansions, the relation moved in favour of primary products. Now, however, although there has not been a recession, a typical readjustment is taking place, with the result that prices of primary products are losing their former advantage.

The pointing out of this disparity between prices does not imply passing judgment regarding its significance from other points of view. It could be argued, on grounds

[1] The obstacles in the way of carrying out such a task in Latin America are well known. The greatest difficulty is perhaps the small number of economists capable of an original approach to the specific problems of these countries. For various reasons, it has not been possible to supply the lack by training an adequate number of young men of high intellectual calibre. Considerable progress has been made by sending them to the great European and American universities, but this is not sufficient. One of the most conspicuous deficiencies of general economic theory, from the point of view of the periphery, is its false sense of universality.

It could hardly be expected that the economists of the great countries, absorbed by serious problems of their own, should devote preferential attention to a study of those of Latin America. The study of Latin America's economic life is primarily the concern of its own economists. Only if this regional economy can be explained rationally and with scientific objectivity, can effective proposals for practical action be achieved.

It must no be thought, however, that this desire springs from an exclusive individualism. On the contrary, Latin-American economists can only accomplish it on the basis of a sound knowledge of the theories expounded in the great countries with their wealth of universal truths. An intelligent knowledge of the ideas of others must not be confused with that mental subjection to them from which we are slowly learning to free ourselves.

[2] "Post War Price Relations in Trade Between Under-developed and Industrialized Countries", document E/CN.1/Sub.3/W.5.

[3] According to the report already quoted. The figures for the thirties go only as far as 1938 inclusive. The data given are the Board of Trade's average price indexes for British imports and exports representative of world prices for raw materials and manufactured goods respectively.

Table 1

RATIO OF PRICES OF PRIMARY COMMODITIES TO THOSE OF MANUFACTURED GOODS (AVERAGE IMPORT AND EXPORT PRICES, ACCORDING TO DATA OF THE BOARD OF TRADE)

(1876-80 = 100)

Periods	*Amount of finished products obtainable for a given quantity of primary commodities*
1876-80	100
1881-85	102.4
1886-90	96.3
1891-95	90.1
1896-1900	87.1
1901-05	84.6
1906-10	85.8
1911-13	85.8
— —	—
1921-25	67.3
1926-30	73.3
1931-35	62.0
1936-38	64.1
— —	—
1946-47	68.7

SOURCE: "Post War Price Relations in Trade Between Under-developed and Industrialized Countries", document E/CN.1/Sub.3/W.5, 23 February 1949.

of equity, that the countries which strove to achieve a high degree of technical efficiency were in no way obliged to share its fruits with the rest of the world. Had they done so, they would not have reached their enormous capacity to save, without which it might well be asked whether technical progress would have achieved the intense rhythm which characterizes capitalist development. In any case the productive technique exists and is at the disposal of those with the capacity and perseverance to assimilate it and increase their own productivity. All that, however, is outside the scope of this report. The purpose is to emphasize a fact which, despite its many implications, is not usually given the importance it deserves when the significance of the industrialization of the peripheral countries is discussed.

Simple reasoning on the phenomenon in question brings us to the following considerations:

First. Prices have not fallen concomitantly with technical progress, since, while on the one hand, costs tended to decrease as a result of higher productivity, on the other, the income of entrepreneurs and productive factors increased. When income increased more than productivity, prices rose instead of falling.

Second. Had the rise in income, in the industrial centres and the periphery, been proportionate to the increase in their respective productivity, the price relation between primary and manufactured products would have been the same as if prices had fallen in strict proportion to productivity. Given the higher productivity of industry, the price relation would have moved in favour of the primary products.

Third. Since, as we have seen, the ratio actually moved against primary products in the period between the 1870's and the 1930's, it is evident that in the centre the income of entrepreneurs and of productive factors increased relatively more than productivity, whereas in the periphery the increase in income was less than that in productivity.

In other words, while the centres kept the whole benefit of the technical development of their industries, the peripheral countries transferred to them a share of the fruits of their own technical progress.[4]

Before explaining the reason for this phenomenon, which is so important to Latin America, it would be well to consider how the effects of increased productivity are transmitted.

Table 2

ILLUSTRATION OF THE DISTRIBUTION OF THE BENEFITS OF TECHNICAL PROGRESS BETWEEN THE CENTRE AND THE PERIPHERY

Primary production (1)	*Industrial production* (2)	*Total production*[a] (3)	*Ratio*	
			⅓ × 100	*⅔ × 100*
Assumption:				
	Productivity increases in accordance with the following indexes:			
100	100	100	—	—
120	160	140	—	—
First case:				
	Costs decrease as productivity rises and prices decrease with costs, without any rise in income:			
100	100[b]	100	100	100
83.3	62.5[b]	71.4	116.7	87.5
Second case:				
	Costs decrease as in the first case, but income increases as follows:			
100	100	100	100	100
120	180	150	80	120
Changes in prices following the increase in income:				
100	100[b]	100	100	100
99.9	112.5[b]	107.1	93.3	105

[a] Figures relate to the finished products. See explanation on page 8.

[b] Part of the price representing value added by the manufacturing process.

For this purpose, an illustrative example is presented in table 2, in which it is assumed that the indexes of productivity, per man, are greater in industry than in primary production. For the sake of simplification, both are supposed to make an equal contribution to the finished product.

It has been assumed in the first case that, with an increase in productivity, from 100 to 120 in agriculture and from 100 to 160 in industry, incomes of entrepreneurs and productive factors do not rise, but costs fall. If prices are reduced *pari passu* with costs, the decline in the price of primary products is less than that in the case of manufactured goods, as is shown by the corresponding indexes. Consequently, the ratio between the two moves, in favour of the primary products, from 100 to 116.7.

This is precisely the ratio that would have allowed the increase in final production to be shared equally by the primary producers and the industrial centres. In fact, if there is an increase in primary productivity from 100 to 120, and if, as has just been seen, 100 primary products can now be exchanged for 116.7 manufactured articles, it means that primary producers can now obtain 140 instead of 100 of those products, or, in other words, that the increase has been the same as in the case of final production, an increase obviously obtained by the industrial producers also.

[4] "Post War Price Relations in Trade between Under-developed and Industrialized Countries", document E/CN.1/Sub.3/W.5, pp. 115-116:

"A long-term deterioration in terms of trade, such as has been found to obtain for primary producers over a long period, may be an effect of differences in the rate of increase in productivity in the production of primary commodities and manufactured articles, respectively. If we can assume that the deteriorating terms of trade for under-developed countries reflect a more rapid increase of productivity in primary commodities than of manufactured goods, the effect of worsened terms of trade would, of course, be less serious. It would merely mean that, to the extent that primary commodities are being exported, the effects of increased productivity are being passed on to the buyers of primary articles in the more industrialized countries. Although statistical data on differential rates of increase in productivity of primary production in under-developed countries, and production of manufactured articles in industrialized countries, are almost entirely lacking, this explanation of the long-term changes in terms of trade which were observed in this study may be dismissed. There is little doubt that productivity increased faster in the industrialized countries than primary production in under-developed countries. This is evidenced by the more rapid rise in standards of living in industrialized countries during the long period covered, from 1870 to the present day. Hence, the changes observed in terms of trade do not mean that increased productivity in primary production was passed on to industrialized countries; on the contrary, they mean that the under-developed countries maintained, in the prices which they paid for their imported manufactures relative to those which they obtained for their own primary products, a rising standard of living in the industrialized countries, without receiving, in the price of their own products, a corresponding equivalent contribution towards their own standards of living."

There is a marked difference in these results when, in the second case, incomes are altered. It is assumed that, in industry, the increase in income is greater than the increase in productivity and that, in primary production, both increases are equal. As a result, the price ratio moves against primary production, from 100 to 93.3, so that primary products, despite the increase in productivity from 100 to 120, can buy only 112.0 final products, as against 100 previously. On the other hand, a similar calculation shows that industrial producers can now obtain 168 final products, as compared with the 100 they bought before.

It should be noted that, whereas the primary producers can increase their acquisitions of final products less than they increase productivity, industrial producers benefit more than they should in relation to the increase in their productivity.

It follows, logically, that if the increase in income in primary production had been assumed to be less than, instead of equal to, the increase in productivity, the price ratio would have dropped still further against the primary producers.

The deterioration of 36.5 per cent in the price ratio between the eighteen seventies and the nineteen thirties suggests the possibility of a phenomenon of that kind.

In short, if, in spite of greater technical progress in industry than in primary production, the price relation has moved against the latter instead of in its favour, it would seem that the average income, *per capita*, has risen more in industrial centres than in the producer countries of the periphery.

The existence of this phenomenon cannot be understood, except in relation to trade cycles and the way in which they occur in the centres and at the periphery, since the cycle is the characteristic form of growth of capitalist economy, and increased productivity is one of the main factors of that growth.

In the cyclical process of the centres, there is a continuous inequality between the aggregate damand and supply of finished consumer goods. The former is greater than the latter in the upswing and lower in the downswing.

The magnitude of profits and their variations are closely bound up with this disparity. Profits rise during the upswing, thus tending to curtail excess demand by raising prices; they fall during the downswing, in that case, to counteract the effect of excess supply by lowering prices.

As prices rise, profits are transferred from the entrepreneurs at the centre to the primary producers of the periphery. The greater the competition and the longer the time required to increase primary production in relation to the time needed for the other stages of production, and the smaller the stocks, the greater the proportion of profits transferred to the periphery. Hence follows a typical characteristic of the cyclical upswing; prices of primary products tend to rise more sharply than those of finished goods, by reason of the high proportion of profits transferred to the periphery.

If this be so, what is the explanation of the fact that, with the passage of time and throughout the cycles, income has increased more at the centre than at the periphery?

There is no contradiction whatsoever between the two phenomena. The prices of primary products rise more rapidly than industrial prices in the upswing, but also they fall more in the downswing, so that in the course of the cycles the gap between prices of the two is progressively widened.

Let us now look at the explanations of this inequality in the cyclical movement of prices. It was seen that profits rise in the upswing and decrease in the downswing, thus tending to offset the disparity between demand and supply. If profits could fall in the same way in which they rose, there would be no reason whatsoever for this unequal movement. It occurs precisely because they cannot fall in that way.

The reason is very simple. During the upswing, part of the profits are absorbed by an increase in wages, occasioned by competition between entrepreneurs and by the pressure of trade unions. When profits have to be reduced during the downswing, the part that had been absorbed by wage increases loses its fluidity, at the centre, by reason of the well-known resistance to a lowering of wages. The pressure then moves toward the periphery, with greater force than would be the case if, by reason of the limitations of competition, wages and profits in the centre were not rigid. The less that income can contract at the centre, the more it must do so at the periphery. [4]

The characteristic lack of organization among the workers employed in primary production prevents them from obtaining wage increases comparable to those of the industrial countries and from maintaining the increases to the same extent. The reduction of income — whether profits or wages — is therefore less difficult at the periphery.

Even if there existed as great a rigidity at the periphery as at the centre, it would merely increase the pressure of the latter on the former, since, when profits in the periphery did not decrease sufficiently to offset the inequality between supply and demand in the cyclical centres, stocks would accumulate in the latter, industrial production contract, and with it the demand for primary products. Demand would then fall to the extent required to achieve the necessary reduction in income in the primary producing sector. The forced readjustment of costs of primary production during the world crisis illustrates the intensity that this movement can attain.

The greater ability of the masses in the cyclical centres to obtain rises in wages during the upswing and to maintain the higher level during the downswing and the ability of these centres, by virtue of the role they play in production, to divert cyclical pressure to the periphery (causing a greater reduction of income of the latter than in that of the centres) explain why income at the centres persistently tends to rise more than in the countries of the periphery, as happened in the case of Latin America.

That is the clue to the phenomenon whereby the great industrial centres not only keep for themselves the benefit of the use of new techniques in their own economy, but are in a favourable position to obtain a share of that deriving from the technical progress of the periphery.

III. Latin America and the high productivity of the United States

The United States is now the principal cyclical centre of the world, as was formerly Great Britain, Its economic influence over other countries is obvious, and in that influence, its enormous increase in productivity has played a vital part. It has profoundly affected foreign trade and, through its variations, the rate of economic development

of the rest of the world and the international distribution of gold.

The Latin-American countries, with their high coefficient of foreign trade, are extremely sensitive to such economic repercussions. An examination of the implications of the phenomenon and the problems it presents is therefore opportune.

It is a well-known fact that, in the United States, prices have not fallen in proportion to the increase in productivity as the recent research of Mr. Fabricant has clearly shown. During the period covered by that research — the forty years preceding the Second World War — manufacturing production costs declined regularly and persistently. The movement of prices did not follow this pattern at all. The increase in productivity was not reflected in prices but in income. Wages and salaries rose as real costs fell. This did not account, however, for all the benefits of productivity, as an appreciable part of it was passed on in the form of a shorter working day.

The increase in income arising out of higher productivity sooner or later extends to all phases of economic life through the well-known process, which need not be recalled here. By virtue of that same process income has also increased in activities in which technical progress has been insignificant or non-existent, as in certain types of services. In some social groups the increase was very slow; meanwhile the rest of the community enjoyed advantages which, as the necessary adjustment took place, had to be yielded to the former. This transfer, however, was usually offset by new increases in wages resulting from still higher productivity.

This fact is pointed out as a good example of the type of adjustment to which the gradual industrialization of Latin America will necessarily give rise. As productivity increases with industrialization, wages will rise, thus causing a comparative increase in the prices of primary products. In this way, as its income rises, primary production will gradually obtain that share of the benefits of technical progress which it would have enjoyed had prices declined. As in the case of the lagging social groups mentioned above, it is evident that such adjustment will mean a loss of real income in the industrial sectors, which will, however, be limited by the import coefficient; but in the long run, that loss can be well compensated by the benefit of subsequent technical developments.

As mentioned before, since prices do not keep pace with productivity, industrialization is the only means by which the Latin-American countries may fully obtain the advantages of technical progress.

Another solution had, nevertheless, been found by the classical theory. If the advantages of technique were not passed on through prices, they would be extended to the same degree by the raising of income. We have just seen that this is precisely what happened in the United States, as well as in the other great industrial centres. It did not, however, occur in the rest of the world. It would have required, throughout the world, the same mobility of factors of production as that which characterized the broad field of the internal economy of the United States. That mobility is one of the essential assumptions of the theory. In fact, however, a series of obstacles hampered the easy movement of productive factors. Doubtless the high wages paid in the United States, as compared with those in the rest of the world, would have attracted large masses to that country, with a very adverse effect upon wages, tending to reduce the difference between them and those in the rest of the world.

Thus the observance of one of the essential rules of the classic game would have resulted in a considerable lowering of the standard of living of the United States, as compared with the levels actually achieved.

It is easily understandable that the protection of this standard of living, attained by great effort, should have prevailed over the uncertain advantages of an academic concept. But the classic rules of the game form an indivisible whole and, if one is eliminated, the others cannot logically serve as absolute standards governing relations between the centres and the periphery.

This point is the more worthy of consideration in that one of the consequences of the technical progress of the United States, so much greater than that of the rest of the world, has been another important departure from the rules.

As previously stated, the import coefficient of the United States has become extremely low, not more than 3 per cent. In 1929 it was 5 per cent. The decline is not new, but one of long standing. During the last hundred years, national income increased about two and a half times more than imports.

This phenomenon is largely explained by technical progress. Paradoxical as it may seem, increased productivity contributed to the strengthening of the United States' protective tariff policy, after that country had reached the stage of economic maturity. The explanation is simple. Over a given period of time, technical progress does not affect all industries equally. When higher wages resulting from the increased productivity of the more advanced industries are extended to the less advanced, the latter lose the advantage which had enabled them to compete with foreign industries paying lower wages. The significance of this factor will be appreciated from the fact that wages are twice or two and a half times as high in the United States as in Great Britain. Thus, tariff protection has been necessary for industries more efficient than their foreign competitors, but whose level of productivity is lower than the average for their own country. For instance, despite the great improvement of agricultural technique, some of the important branches of agriculture needed protection as a result of their relatively high incomes as compared with those of foreign competitors.

England, when it was the economic dynamic centre, followed a diametrically opposed policy. If, however, the clock could be put back, it is by no means certain that it would abide by the same policy and disrupt its economy. The United States is a powerful and well-integrated economic entity and has become so largely through its own deliberate effort, the great significance of which is recognized. One cannot overlook, however, the fact that this brought about, for the rest of the world, conditions incompatible with the functioning of international economy in the same way as before the First World War, when the British centre strictly observed the rules of the game in the fields of monetary policy and foreign trade.

It is under these new conditions of international economy, that the process of industrialization has begun to develop in Latin America. The fundamental problem lies in adaptation to these conditions — in so far as they cannot be altered — while seeking new rules in keeping with the new circumstances.

Until that happens, and possibly with slight intervals, a persistent tendency toward disequilibrium will prevail.

It is due, fundamentally, to the following fact; while, as we have seen, the import coefficient of the United States has been declining, the dollar imports of the Latin-American countries are tending to increase, thus compelling, them to take defensive measures to lessen the effects. There are several reasons for this:

First: since technical progress has been greater in the United States than anywhere else, the demand for the capital goods necessary for industrialization is preferentially made upon that country.

Second: technical development continuously manifests itself in the form of new products which, by modifying existing ways of life, assume the character of new necessities, of new ways of spending the income of Latin America, generally substituting them for the previous forms of domestic expenditure.

Third: in addition to those products which have undeniable technical advantages, there are others toward which demand is diverted by the considerable persuasive power of advertising. New tastes are created which must be satisfied by imports, to the prejudice of those which could be satisfied locally.

That it is not possible to reduce the import coefficient at the centre on the one hand, and to allow it to increase freely in the periphery on the other, under the influence of the above factors, was fully proved by the serious events of the nineteen thirties. We now have sufficient perspective to understand their significance and to learn the lesson that they teach. One other fact must first be mentioned.

It has already been stated that the industrialization of Latin America, if wisely carried out, will open the way to a considerable increase in national income, by giving more productive employment to vast numbers of the population at present engaged in occupations of low productivity.

It can now be seen that the rise in income so far achieved has accentuated the influence of those factors on the demand for dollar imports. The greater the rise in income in these countries, therefore, the greater their need to import. This brings us once again to the problem of dollar shortage, which demands special attention.

IV. The problem of the dollar shortage and its repercussions in Latin America

As soon as the symptoms of a dollar shortage begin to appear, the natural reaction is to look back at the not very distant past when, as shown in charts 1 and 2, increasingly large quantities of gold were being concentrated in the vaults of the United States. Before the First World War, that country held 26.5 per cent of the world reserves; by the beginning of the Second World War, this figure had increased to 50.9 per cent; and though at the end of hostilities it had fallen to 36.5 per cent, the United States again increased its share, which in 1948 comprised about half the world reserves.

The dollar shortage means that the United States does not purchase merchandise and services, or lend money, in an amount sufficient to cover the needs, justified or not, of other countries. This entails recourse to monetary reserves: dollars must be sold or gold sent to the United States.

Though this dwindling of reserves is not slow to give rise to monetary disturbances, the attraction of gold toward the main cyclical centre, if persistent, is not simply a monetary problem; it is the manifestation of a much deeper dynamic phenomenon related to the rhythm of economic growth of the various countries and the way in which it occurs.

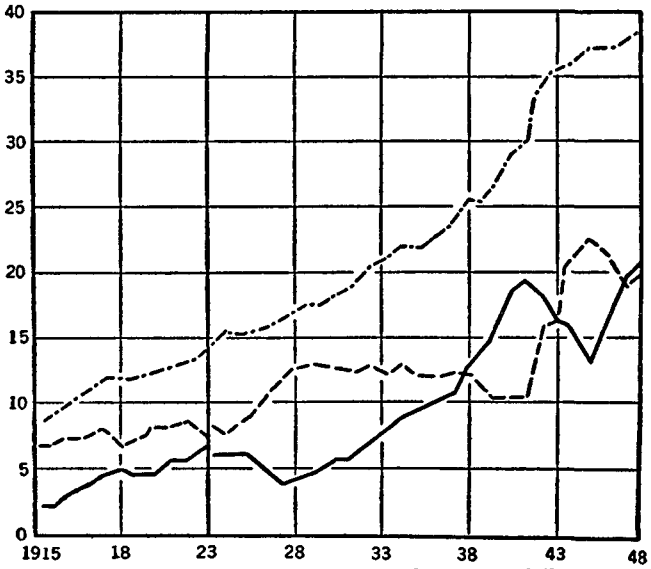
Depending on the type of its own growth, the action of the principal centre may, through cyclical fluctuations, take the form either of a persistent tendency to expel gold that flows to it, and thus stimulate the economic development of the rest of the world, or that of a tenacious retention of gold, to the detriment of the dynamic forces of the rest of the world. The British cyclical centre was of the first type. So was the new principal cyclical centre before 1929. In the nineteen thirties, however, the second type prevailed, and the countries of the rest of the world were obliged to adjust their relationship with that centre

Chart 1

GOLD RESERVES OF THE UNITED STATES AND THE REST OF THE WORLD

(Thousand millions of dollars)

-·-·-· World total.
- - - - - - Rest of the world.
——— United States.



NOTE: The amounts representing net short-term dollar assets belonging to the countries of the rest of the world have been deducted from the gold holdings of the United States, since they represent monetary assets belonging to these countries and not to the United States. In view of the size of these assets at certain times, the effects of the adjustment are considerable. In 1947, for instance, the United States would have held 60 per cent of the world's gold, had not the exclusion of the above mentioned dollar assets reduced the figure to 48.6 per cent.

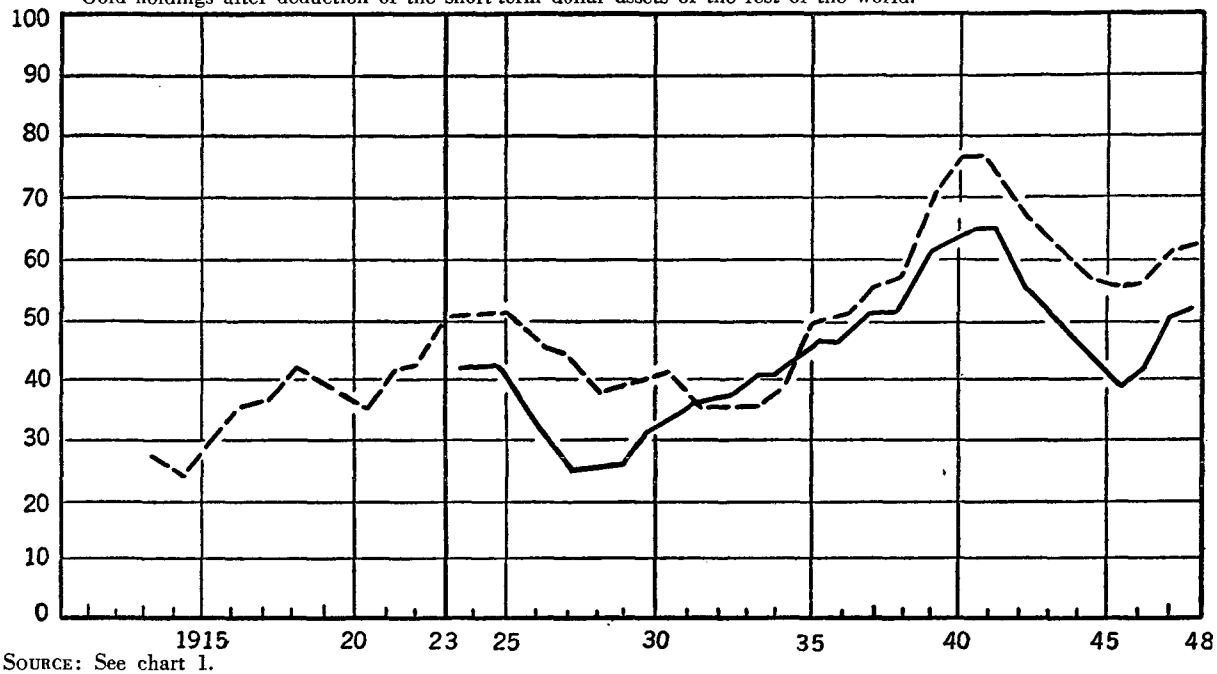
SOURCES: The following procedure has been adopted in making this adjustment: (*a*) Data for the years 1931-1936, both inclusive, have been taken from *Banking and Monetary Statistics*, Washington, 1943, pages 574-589, and after 1937 from the *International Financial Statistics* of the International Monetary Fund, Washington, January 1949, page 130. (*b*) The figures for the years before 1931 have been calculated by taking the net balances of the short-term capital movement according to the data for the United States balance of payments published in *The United States in the World Economy*, United States Department of Commerce, Bureau of Foreign and Domestic Commerce, Economic Series No. 23—Appendix B. In charts 1 and 2 parts of the curve have not been adjusted, owing to lack of data. The world total has been obtained from the *Federal Reserve Bulletin* for the years before 1940, and from the *Annual Reports* of the Bank for International Settlements, Basle, for the later years. Data for 1948 are preliminary. All calculations have been made at a rate of $35 per fine ounce.

Chart 2

UNITED STATES' SHARE OF THE WORLD'S GOLD RESERVES

Per cent

..... Total gold holdings, unadjusted.
——— Gold holdings after deduction of the short-term dollar assets of the rest of the world.



SOURCE: See chart 1.

in order that they might be able to continue developing, in spite of the unfavourable influence of the centre and its great absorption of metal.

The Latin-American countries shared, with the others, the hardships of the nineteen thirties. It is understandable, therefore, that, faced with the symptoms of another dollar shortage, they should examine the past, as they can now do in clearer perspective, to discover whether the same factors which were at work then are again coming into force.

Those factors relate, on the one hand, to the repercussions on the rest of the world of the contraction and expansion of the principal cyclical centre and, on the other, to the marked reduction of its import coefficient and other foreign payments.

When income falls in the principal centre during the cyclical downswing, the fall tends to spread to the rest of the world. If the latter's income does not fall simultaneously and correspondingly, but with a certain lag a disequilibrium arises in the balance of payments. Since the fall in income is more rapid at the centre, the decrease in imports and other foreign payments is sharper there than in the rest of the world, with the result that the latter is forced to send gold to the centre. If equilibrium were possible — in the presence of cycles it is not — balance would be achieved when the respective incomes fell at the same rate.

The cyclical contraction that occurred in the United States after 1929 would have been sufficient to attract a great part of the gold it had lost during the previous expansion, as usually happened in the cycles of the old principal centre. In this case, however, there appeared a new factor which had not been an element of the British influence, namely, the decline of the import coefficient. This decline was chiefly the result of two events: the raising of tariffs in 1929, on the one hand, and, on the other, a greater decline in the prices of imported primary products than in those of finished products (which have the most influence on national income). Chart 3 illustrates the intensity of this phenomenon.

The decline of the import coefficient in the principal cyclical centre strengthens the tendency to accumulate gold, resulting from the contraction of income. In fact, imports in the centre fall even more sharply than in the rest of the world and the disequilibrium turns still further against the latter. To restore the balance, it would not only be necessary, as in the previous case, for the income of the rest of the world to contract as sharply as that of the principal cyclical centre, but much more sharply. The greater the decline in the import coefficient and in other external payments of the principal cyclical centre, the more must the income of the rest of the world fall below the level of that centre. It must be remenbered that, in addition to imports, these other external payments were also considerably reduced, by the cessation of the foreign loans made by the United States.

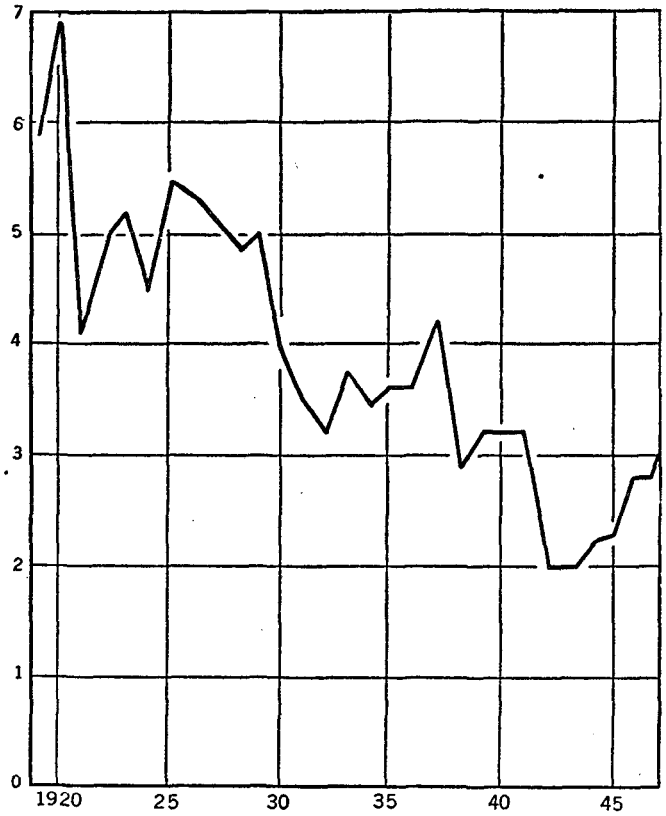
After the trough of the depression had been reached, in 1933, another expansion took place. According to British cyclical experience, the principal cyclical centre should have lost gold, as in fact it did during the expansion of the nineteen twenties. In the thirties, however, the opposite occurred; the monetary reserves of the United States attained extraordinary proportions, even discounting, as has been done in all the charts, the large quantity of foreign funds which, for other reasons, were deposited in dollars in the United States.

The decline of the import coefficient played a part in this. The income of the centre would have had to increase much more than that of the rest of the world for the former to cease attracting gold after the contraction and subsequently to begin losing it. The increase would have

Chart 3

IMPORT COEFFICIENT OF THE UNITED STATES

Imports in relation to income



SOURCE: The data for income have been obtained from *National Income and its Composition*, by S. Kusnetz, New York, 1941 for the years 1919-1928; from the *Statistical Abstract of the United States, 1948* for the years 1929-1947, and from *Economic Indicators*, February 1949, U. S. Government Printing Office, Washington, D. C., for 1948. The data on imports were obtained from the *Statistical Abstract of the United States and Economic Indicators.*

had to be great enough, first to compensate the effects of the decline in the coefficient, and then to surpass them. For instance, if the coefficient is halved, the income of the principal centre must increase to twice as much as that of the rest of the world, barely to offset the effects of such reduction.

The income of the United States, far from achieving this relatively high increase, took longer than that of the rest of the world to reach the level it had attained in 1929, judging from what took place in an important group of countries (see chart 4).

It is thus not surprising that gold should have been steadily accumulating in the principal cyclical centre. The concentration of metal in the United States was, in fact, enormous. Practically all the new production of monetary gold in the world, which was certainly considerable after 1933, collected in that country. The reserves of the rest of the world fell slightly, as may be seen in table 1.[5]

If, in the nineteen thirties, the rest of the world had relied for its economic development solely upon the stimulus deriving from imports and other payments made by the United States, the increase of its income would have been much less than that country's. As already pointed out, this is due to the depressive effect of the decline of the import coefficient of the United States. However, this did not actually happen since, in the countries shown in chart 4, income increased to a greater extent than in the United States.

If these countries, like the rest of the world, had increased their income without changing their import coefficient, it can be safely assumed that they would not have been able to do so for long without seriously impairing their monetary reserves. If this did not happen, it was simply because they had already reduced their coefficient of imports and other payments, especially of imports from the United States, which fell more than those from other sources, in order to attenuate the contraction originating in the United States.[6] This enabled the rest of the world not only to develop in the way already described, but in several instances, to use part of its dollar exports to reduce its debt to the United States.

Why was the coefficient of imports from the United States reduced more sharply in the rest of the world than the latter's total coefficient? Obviously because the deficit in the balance of payments was more acute in terms of dollars. Had imports in other currencies been reduced to the same extent as those in dollars, the damage suffered by international trade in the nineteen thirties would have been even more severe, with consequent additional loss of its classical advantages.

What were the reactions of Latin America when faced with the phenomena occurring in those years in the principal cyclical centres? It is needless to repeat the story of the well-known way in which such events were reflected in this part of the continent, but they should serve to clarify and define the best interests of Latin America.

The reaction in Latin America was similar to that of other countries in the rest of the world, namely, a reduction of the import coefficient through depreciation of the currency, higher tariffs, import quotas and exchange controls.

Such measures had never been applied as widely as in those days, since there had never been a shortage of pounds sterling under the monetary hegemony of London.

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[5] An examination has been made in the text of the factors which caused the United States to attract gold in the nineteen thirties. There were also factors operating in the rest of the world which caused the expulsion of gold. Outstanding among them were those which appeared during the two world wars. The United States acquired large quantities of gold in return for supplies furnished to the Allies. It could only have lost this gold through a much greater inflationary expansion of income than that which actually took place, a possibility which need not, therefore, be considered. This was not the only phenomenon in the redistribution of gold brought about by the two wars. Part of the gold received by the United States was transferred to neutral countries or non-belligerents, to cover their favourable balance of payments. This is a normal phenomenon in the expansion of a cyclical centre, which was reflected in Latin America by a large increase in its metallic reserves. But it is also natural that a large part of the gold should return to the cyclical centre. This is what happened during the recession which took place in the United States after the First World War, and the cyclical movements of the British centre were also marked by fluctuations of gold. The present return of gold from the Latin-American countries to the United States, however, is different, in that the movement has begun before a contraction in that country has taken place. This is due, as already stated, to the rise in imports, occasioned by the high level of employment and accentuated by inflationary phenomena.

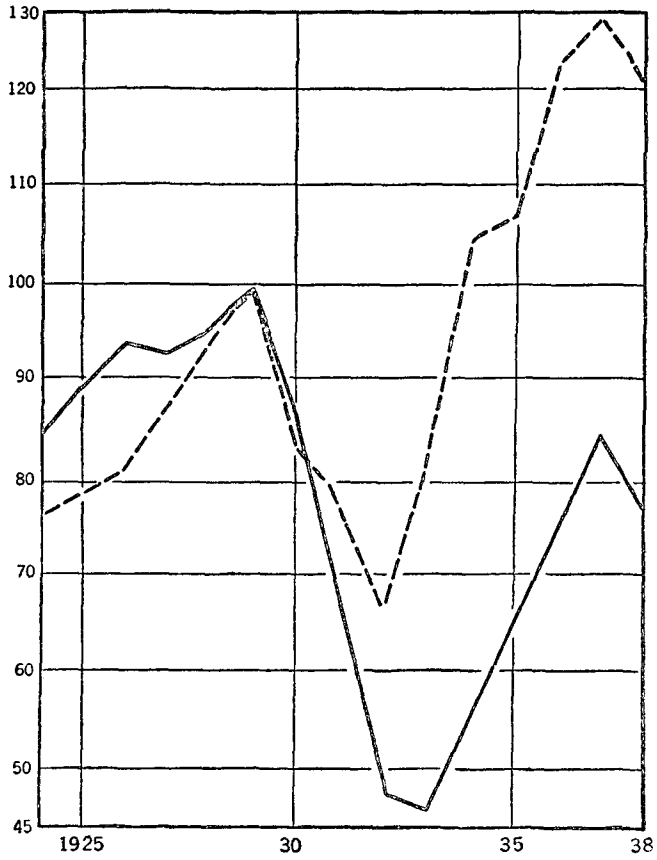
[6] See charts published for various countries in *The United States in the World Economy*, United States Department of Commerce, Bureau of Foreign and Domestic Commerce, Economic Series No. 23, pages 67, 68 and 69.

Chart 4

NATIONAL INCOME OF THE UNITED STATES AND OF ELEVEN OTHER COUNTRIES
(Australia, Canada, Denmark, France, Germany, Holland, Japan, New Zealand, Norway, Sweden and United Kingdom)

Index numbers: Base: 1929 = 100

------ Eleven countries.
——— United States.



SOURCE: Data for the national income of the United States have been obtained from *National Income and its Composition*, by S. Kusnetz, New York, 1941, pages 310-311, for the years 1924-1928, both inclusive; and from the *Statistical Abstract of the United States, 1948*, for the years 1929-1938. Those for the income of the eleven countries were obtained from *World Economic Development, Effects on Advanced Industrial Countries*, by Eugene Staley, Montreal, 1945, page 144, chart 13.

The rapid extension of exchange controls is explained by the pressing need to reduce imports immediately and to stem the flight of capital. However, exchange controls were a means not only of reducing the volume of imports, but also of diverting to other countries, mainly those of Europe, demand for imports which, because of their low cost and suitability to Latin America's needs, it had formerly been preferable to bring from the United States. Notwithstanding its implications, it would be difficult to deny the obvious fact that exchange control has, in many instances, been used as an instrument of discrimination in international trade, contrary to the sound practices established with great effort through the general application of the most-favoured-nation clause. It must, nevertheless, be recognized that, when a country lacked the dollars necessary to pay for its essential imports, the only way out of so critical a situation seemed to be to import goods payable in currencies received in payment of exports.

Had these other currencies been convertible into dollars, the situation would have been very different. However, the dollar shortage affected all the rest of the world, and multilateral compensation could not be achieved when the total balance due in dollars exceeded available supplies.

Exchange control was not the result of a theory but was imposed by circumstances. None who had first-hand knowledge of the complications of every kind that it involved would have adopted such a measure, had there been other alternatives available or had it been within the power of the Latin-American countries to eliminate the fundamental causes of the evil.

Unfortunately these causes persisted too long. The abandonment of exchange control might have been considered when the worst of the world crisis was past and economic recovery in full swing, but the way in which the principal cyclical centre functioned made such a possibility remote.

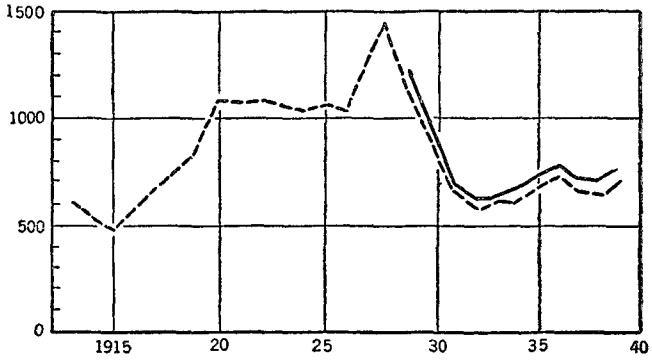
Chart 5, showing the monetary reserves of Latin America, reveals the nature of the difficulties. Imports and other payments usually absorbed all the dollars newly added to the reserves and even a part of the reserves themselves. Exchange control, as already stated, served the purpose of diverting the demand for imports that could not be so financed. Even so, in the nineteen thirties it could not prevent total monetary reserves from remaining at a level considerably lower than that maintained in the nineteen twenties.

Such was the significance of exchange control in those days. Whether handled well or badly, it was the means of mitigating the serious repercussions of events abroad on the internal activity of the Latin-American countries. Later, however, its functions changed considerably. Exchange control has been, and still is, used to check the effects of internal inflationary expansion on imports and other liability items in the balance of payments. It is evident that in this instance exchange control, instead of

Chart 5

GOLD RESERVES OF LATIN AMERICA
Millions of dollars

------ Includes seven countries.
——— Includes twelve countries.



NOTE: As data for the earlier years of this period, 1913-1939, were available for only seven countries (Argentina, Bolivia, Brazil, Chile, Peru, Uruguay and Venezuela) the appropriate curve including them is shown until 1939. Five additional countries (Colombia, Ecuador, El Salvador, Guatemala, and Mexico) are included in the second curve covering the years 1929-1939. These figures refer only to gold reserves and were calculated at the rate of $35 per fine ounce.

SOURCES: *Monetary and Banking Statistics*, Washington, 1943, for the years 1913-1936; and *International Financial Statistics*, Washington, 1949, for the years 1937-1939.

counteracting the effects of inflation, diverts the inflationary pressure toward internal activity, thus accentuating the rise in prices.

The same considerations thus do not apply in both cases. Latin-American countries had no influence over the external factors that imposed exchange control in the nineteen thirties. On the other hand, the factors operating today are dependent upon their own decisions, as Latin-American governments, concerned as they are at the gravity of this problem, have more than once admitted.

It is difficult, if not impossible, to determine to what extent the scarcity of dollars, which once more faces several Latin-American countries, is the result of the low import coefficient of the United States and to what extent it is the result of the inflationary pressure referred to above.

It has already been explained that the high level of employment attained in Latin America entails a considerable volume of dollar imports. Meanwhile, as its national income had reached an extremely high level, the United States also increased its imports from Latin America and other countries of the world. In 1948, its total imports amounted to 6,900 million dollars, with a coefficient of only 3 per cent. Had the coefficient been 5 per cent, as in 1929, imports would have totalled 11,500 million. These figures show the magnitude of the effects produced by the decline of the import coefficient.

It is still too early to say whether or not the Latin-American countries' share of these imports will provide them with sufficient means of covering their import needs in addition to the other payments they have to make to the United States. A considered opinion cannot yet be given. Information is still very inadequate and does not permit an examination of the composition of imports for the purpose of determining with sufficient accuracy how much of the increase has been due to the redistribution of income typical of inflation. There are instances of considerable dollar payments for imports wholly unrelated to industrialization or the mechanization of agriculture, but it is difficult to say to what extent such cases can be considered general.

In any case, very special attention should be paid to the events now taking place. For instance, the recommendations recently made by the Joint Brazil-United States Technical Commission in its interesting report on Brazil are decidedly symptomatic.

There is great similarity between the measures envisaged by the Commission in connexion with imports and those which, as recalled above, several Latin-American countries were compelled to take in the nineteen thirties.

Despite the great increase in Brazil's dollar exports, the Commission has shown that they are not sufficient to cover its imports in that currency. It therefore approves the restriction of non-essential imports through a more effective application of the system of exchange control and recognized that "it would be necessary for Brazil to obtain its essential imports, as far as possible, from soft-currency countries with which it has had a 'favourable' balance of trade in recent years", and adds that "one measure which might assist in reducing the total of hard currency imports, would be to require a review by the control authorities of all purchases in the dollar area proposed to be made by Brazilian government departments and 'autarquias' ".[7]

[7] *Report of the Joint Brazil-United States Technical Commission*, Rio de Janeiro, 1949, pages 32-33.

It is remarkable that a report of this nature should envisage not only the restriction of imports through exchange control, but also the application of discriminatory measures.

The case would be of no great significance if it were merely a recognition of the temporary need for relieving pressure on the balance of payments. If, however, it is the expression of something more fundamental and persistent, the Latin-American countries would have serious cause for concern.

Experience has shown that multilateral trade is the best suited to the economic development of Latin America. The ideal would be to be able to buy and sell in the best, though perhaps different, markets, without dividing foreign trade into water-tight compartments. The situation in which sales to Europe must be strictly counterbalanced by purchases from that continent, or even from each European country, with no possibility of using the balances for purchasing from the United States the goods which best satisfy the needs of Latin-American economic development, is not a solution that offers the undeniable advantages of multilateral trade.

It is essential, if multilateral compensation is to be practicable, that Europe have a dollar surplus with which to pay for its excess purchases from Latin America, after having satisfied its own import requirements from the United States.

This is, without doubt, the difficulty encountered by the Joint Brazil-United States Technical Commission. In the face of it, the Commission had only two alternative courses of action: either to propose the measures it actually recommended to Brazil or to suggest application of restrictions to all the countries equally, to the detriment not only of the exports of those countries with which Brazil has a favourable balance, but also to the rate of its economic growth.

The events of the nineteen thirties seem to have left the conviction that no fundamental solution can be expected from trade with the United States. Indeed, if the present extremely low import coefficient is maintained, its imports might be insufficient to solve the latent problem of a dollar shortage, even on the favourable assumption that maximum employment in that country would last. If, with maximum employment, income were to rise in the future at a rate unlikely to prove much more than 3 per cent a year, a corresponding increase in imports from the rest of the world would not do much to relieve the dollar pressure.

Is there, however, no possibility of an increase in the import coefficient of that country, whereby its imports would increase more rapidly than national income?

The possibility does exist. The persistent attraction of gold toward a principal cyclical centre is only conceivable theoretically when there is a considerable margin of unemployed factors of production.

There could be no repetition of the phenomena of the nineten thirties if the United States were able to maintain maximum employment and if the rest of the world, thus stimulated by the principal centre, were able to carry out a similar policy of full utilization of its growing productive factors.

As explained in connexion with the adverse experience of those years, since there was unemployment in the United States, the rest of the world could not maintain its import coefficient with respect to that country without adjusting it to that of the United States with respect to

the rest of the world, as no country can carry a permanent deficit in its balance of payments. Maximum employment, however, can alter the situation very much, as a brief reasoning will show.

Let us assume that a relatively high coefficient of the rest of the world, or better still a coefficient increased by the industrialization of Latin America, causes a sharp rise in the demand for exports from the United States. Let us further assume that, through the growth of productive factors, income increases annually by, say, 6,000, of which 4,000 represents factors employed in the export industry to satisfy the great demand and the remaining 2,000, industries supplying domestic needs, with an equivalent volume of production.

It is obvious that this volume of 2,000 will be insufficient to satisfy the internal demand created by the expenditure of the 6,000 income. Demand will then exceed supply, and since internal factors are fully employed, the deficit of production for internal requirements will have to be covered by imports.

If the productive factors were not fully employed, the excess of demand over supply would tend rather to stimulate internal production, and imports, far from rising in proportion to excess demand, would show only a slight increase, representing that part of the excess which is barely reflected in a demand for foreign goods, owing to the low import coefficient.

The nature of this report precludes more detailed development of the argument. It should be pointed out, however, that for such machinery to function, it is essential that the rest of the world be able to satisfy the United States' increased demand for imports, since the process would otherwise be inflationary. At the same time, the countries increasing their coefficient or their real income should be assured of sufficient resources to face a temporary disequilibrium in their balance of payments, pending the reaction of the principal cyclical centre.

In short, with full employment at the cyclical centre, any increase in its exports to the rest of the world, brought about by the action of the latter, would tend to be accompanied by a corresponding increase in imports (or other payments abroad) and gold would not tend to concentrate at the centre, to the detriment of the other countries.

It is clear that if this is to be achieved, the centre must not lower its import coefficient. In any case, what purpose would be served by such a measure if all productive factors are already fully employed? It is understandable that internal production should be substituted for imports in order to increase employment when there are unemployed factors. It is also understandable that, even when there is full employment, a country should avoid the sacrifice, through foreign competition, of industries supplying domestic consumption to favour those producing for export, as happened in the case of the British cyclical centre during the nineteenth century. Where full employment exists, however, it would show a lack of economic sense to lower the import coefficient generally while at the same time encouraging the development of certain industries producing for domestic consumption, at the expense of international trade.

Consequently, if nothing should hamper the natural play of economic forces, where there is full and growing employment at the principal cyclical centre, the way should be clear for the solution of that fundamental problem which is of such concern to the countries of Latin-America and the rest of the world. The import coefficient of the United States would certainly increase, even if existing tariffs were left unaltered, and its interdependence with the rest of the world would be strengthened. Thus it could be demonstrated that, in addition to full employment, the United States could achieve two other fundamental objetives of its economic policy: the active promotion of foreign trade and the furthering of Latin-American industrialization.

Another theoretical consideration closely related to the foregoing questions should be noted before closing this section. As yet nothing positive has been achieved in the attempt to explain, with the help of the classical theory, the fluctuations of the balances of payments and the international movements of gold in the nineteen thirties. Such an attempt could hardly have been successful, since, as is well known, the classical theory is based on the assumption of full employment. If this assumption were to take place in reality, the essential soundness of the classical reasoning regarding gold movements could be proved, allowing, of course, for the partial modifications which the theory demands. As Lord Keynes pointed out in his *General Theory*, with full employment we are safely ensconced in a Ricardian world. The opinion expressed on this, in his posthumous article published in the *Economic Journal*, is, therefore, not surprising: "I find myself moved, not for the first time, to remind contemporary economists that the classical teaching embodied some permanent truths of great significance, which we are liable today to overlook because we associate them with other doctrines which we cannot now accept without much qualification. There are in these matters deep undercurrents at work, natural forces, one can call them, or even the invisible hand, which are operating towards equilibrium..." [8] Admittedly, if the classical medicine is to work, it is essential that import tariffs and export subsidies should not progressively offset its influence. It is for this reason that one is entitled to draw some provisional comfort from the present mood of the American Administration and, as I judge it, of the American people also, as embodied, in the Proposals for Consideration by an International Conference on Trade and Employment. We have here sincere and thoroughgoing proposals, advanced on behalf of the United States, expressly directed towards creating a system which allows the classical medicine to do its work.

V. Capital formation in Latin America and the inflationary process

The margin of savings depends ultimately upon the progressive increase of labour productivity. Though the level of productivity achieved by some Latin-American countries is such that, by means of a judicious policy, they would be able to reduce the amount of foreign capital needed to supplement national savings to moderate proportions, in the majority of them this capital is admittedly indispensable.

In actual fact, productivity in these countries is very low owing to lack of capital; and the lack of capital is due to the narrow margin of savings resulting from this low productivity. The temporary help of foreign capital

[8] Lord Keynes, "The Balance of Payments of the United States", *The Economic Journal*, June 1946, pages 185 and 186.

is necessary if this vicious circle is to be broken without unduly restricting the present consumption of the masses, which, generally speaking, is very low. If this capital is effectively used, the increase in productivity will, in time, allow savings to accumulate which could be substituted for foreign capital in the new investments necessitated by new technical processes and the growth of the population.

Throughout most of Latin America, the characteristic lack of savings is the result, not only of this narrow margin, but, in many cases, of its improper use. Saving means refraining from consumption and is thus incompatible with certain types of consumption peculiar to relatively high income groups.

Great disparities in the distribution of income may be, as they have been in the past, a factor favourable to the accumulation of capital and technical progress. Although the influences of that factor in the Latin-American countries should not be overlooked, there are many well-known examples of how such distributive inequalities have fostered types of consumption peculiar to countries of high productivity. Considerable opportunities for saving and effectively employing monetary reserves for productive imports are thus frequently lost.

It is the increase in productivity that has enabled the United States, and to a lesser degree other industrial countries, to shorten the working day, raise the real income and standard of living of the masses, and considerably increase public expenditure, without impeding a huge accumulation of capital.

It is a well-known fact that fiscal expenditure, which, in the middle of the last century, formed a relatively small part of national income in the great industrial countries, today represents a large portion of it. This has become possible only as a result of increased productivity.

The Latin-American countries have also followed this general tendency. If, where productivity is high and the accumulation of capital considerable, the increase in the proportions of public expenditure is cause for concern, it must be even more so in countries where a considerable part of the national income must be devoted to saving, since saving is necessary to attain that increase in productivity without which the aim of raising the standard of living of the masses would be a mere illusion.

The problem is essentially one of estimating needs. The resources available to satisfy the enormous individual and collective needs of the Latin-American countries are relatively small, and the possible contribution of foreign capital is also limited. Those needs must therefore be evaluated from the standpoint of the aim in view, in order that the limited resources may be most advantageously distributed. If the aim is to increase the measurable well-being of the community, the increase of capital per man must take very high priority. There are various types of public and private investment which are indisputably useful for this purpose, but since they do not increase productivity, they cannot bring about the increase in saving necessary for new investments. On the other hand, those same investments, if put into efficient capital goods, will immediately increase productivity and so develop a margin of saving which, transformed into new investments, will give rise to yet further increases in productivity.

For these and many other reasons, the problem of capital formation is of the utmost importance.

The considerable pressure of those individual and collective needs on comparatively scanty resources usually provokes inflationary processes such as those with which the governments are now so rightly preoccupied. At the same time there has grown up a belief, not only among the privileged, but also among those whose only concern is the general welfare, that inflation is an unavoidable means of forced capitalization where voluntary saving is evidently insufficient.

It is a thesis worthy of careful examination. Since the process is widespread, there is a wealth of data available for fruitful investigation which will later permit an appreciation of its value and range. Meanwhile, some comments may contribute to define this problem.

One indisputable fact stands out: the stimulus of monetary expansion has led to a high level of employment and thereby to a real increase in income. It appears, however, that a large part of that effect had already been achieved during a phase of moderate credit expansion which preceded the acute inflationary process. As that process developed, the increase in employment and real income became less and less marked, and that of prices more so, with consequent disturbances in the distribution of total income.

This experience provides both positive and negative lessons.[9] The positive lesson is pertinent to the subject since the growth of employment brought about an increase in the potential margin of savings. The negative lesson is also concerned with it. The exaggeration of the stimulus necessary for the achievement of maximum employment led internally to excessive inflationary pressure, which, with the rise in imports consequent upon the resumption of foreign trade after war-time restrictions, absorbed a large part of the gold and dollars which had been accumulated.

The fragmentary information available raises more than one doubt as to whether those reserves have been used in strict accordance with the needs of the economic development of Latin America. In order to throw light upon those doubts, it would be interesting to discover to what extent the aforesaid reserves have been used to import the most essential capital equipment, how far they have been spent on non-essential articles or those related only to the mode of living of high-income groups, and to what extent they have served to cover the capital outflow caused by the process of inflation.[10]

These different uses of foreign exchange are closely linked with the internal effects of inflation. The rise in prices, by creating exceptional profits, places in the hands of a comparatively small group great opportunities for saving, as always happens when income distribution is altered in such a way. It would be extremely interesting to ascertain to what extent these opportunities have been translated into collective savings and whether those savings

[9] The possibility of a rational policy of employment of idle or ill-employed resources has been shown by experience. At one time exports had constituted the chief dynamic factor. After the world crisis, however, they proved insufficient to fulfil adequately their role of stimulating development. In the nineteen thirties, the weakness of the external dynamic factor had already been counteracted in some of the Latin-American countries by a policy of internal stimulation. In order to do so, as was explained elsewhere, it was necessary to reduce the import coefficient. The events of the Second World War showed how much further this policy could be carried. The war brought about a drastic reduction of the coefficient, while at the same time increasing the force of the external stimulus.

[10] It is interesting to note that Latin-American private deposits in the United States amounted to $729 million on 30 June 1947.

have been put to the most productive use from the standpoint of the community.

If a large part of the profits arising out of inflation had actually been saved and efficiently invested, those who expound the foregoing thesis would have a strong point in their favour. Unfortunately isolated figures do not provide sufficient reliable evidence to justify any generalization. None the less, the information on Brazil presented by the Joint Brazil-United States Technical Commision is illuminating. In 1946 the large corporations reinvested 30 to 40 per cent of their profits and distributed the rest among the shareholders. The amount distributed by all the corporations is believed to have amounted to 12,000 million cruzeiros, of which one fourth, or barely 3,000 million, represented various forms of saving.[11] Taking the figures as a whole, only about 50 per cent of total profits would represent direct or indirect investments.

That being so, the proportion consumed would have been considerable. Since, moreover, the high-income groups have a high import coefficient, it is not surprising that a large part of the foreign exchange accumulated should have been spent on products not essential to economic development, as may be inferred from other information from the same source.

There is yet another aspect of the question to be clarified. Assuming that under given circumstances a certain amount of inflationary expansion is considered the most practical expedient, in view of the scarcity of savings, there would be ways of best achieving that purpose, at the same time mitigating the serious consequences of the inflation. The State has means of stimulating the investment of a large portion of profits and inflationary incomes through progressive taxation of the part spent and consumed, while lowering the tax or granting exemption on the part invested; furthermore, through exchange control or taxation, it can divert the part which tends to be used for imports incompatible with strong economic growth. Such means may, of course, also serve to increase unproductive public expenditure instead of savings, to the detriment of an increase in national productivity.

Logically, if some groups have benefited considerably from inflation, others must have suffered. Conclusive studies have not yet been made, but it would seem that there is no essential difference between inflation today and in the past. The middle class and the fixed-income groups have generally been those to bear the brunt of the transference of real income to entrepreneurs and other beneficiaries. The better organized labour unions have through wage increases managed to overtake, and at times surpass, the price rise, although usually with a lag. There are not enough reliable data, however, to ascertain to what extent the whole group has benefited and not merely certain sectors. Nevertheless, it should not be forgotten that the increase in employment during the first stage of the expansionary process has usually meant an increase in the real income of the working-class family, even when wages have not been adjusted to rising prices.

All this redistribution of income brought about by inflation creates in the sectors that benefit the illusion that the total wealth of the community is increasing, even though real income ceased to rise to any extent, once the initial stage of moderate expansion was passed. It is an illusion peculiar to the stage of euphoria and prodigality; during that time capital equipment is not renewed, as in the case of transport and other public and private investments, and a large part of the previous increase in monetary reserves is spent in a short while. This means the consumption of accumulated capital and so must not be mistaken for a real increase in income. The illusion begins to fade during the second phase—that of increasing tension—and finally disappears during the third—that of painful readjustment.

The first stage seems to be over in Latin America, and as the second develops, acute social antagonisms are appearing, which threaten the efficacy of the existing economic system. An atmosphere unfavourable to the smooth development of that system is being created, and with it certain kinds of governmental intervention and fiscal measures prejudicial to private initiative and undermining the sense of individual responsibility. Thus the inflation that has greatly increased the remuneration of the entrepreneur ends by impairing his efficiency—a factor of vital importance for the growth of the Latin-American countries.

The State soon takes a substantial share of the entrepreneur's inflationary gains in the form of taxes. The increase in public expenditure resulting from that participation will present a problem no less serious than the others, when inflationary profits disappear and it becomes necessary to bring State wages and salaries into line with the cost of living, with the obvious risk that the proportion of national income represented by public expenditure will again rise, to the detriment of capital formation.

Sound conclusions regarding the value of inflation as an instrument for collective saving can be drawn only after an objective analysis of the above facts and of others arising out of it. Whatever the final figures, it will have to be admitted that inflation has tended to discourage typical forms of voluntary saving which had acquired growing importance in some Latin-American countries. Here may be found the source of future savings for industrialization, when monetary stability can be restored in accordance with the new rules of the game imposed by new conditions. In short, if the forced savings which accumulate through inflation are furnished by many sections of the community whereas the benefits thereof are passed on to favoured groups only, the question arises whether it is not possible to devise other forms of saving (either voluntary or collective) by which resources could be better devoted to productive ends, without the serious social disadvantages of forced saving.

Meanwhile an appeal to foreign savings appears inevitable. Unfortunately, in this connexion the problem inherited from the disastrous experience of the nineteen thirties is still far from solution. While the default of the debtor is still fresh in the memory of the creditor countries, there is a tendency both to forget the circumstances in which default occurred and to spread the mistaken belief that a recurrence of past events could be avoided by the observance of certain rules of procedure. At the root of this we find the same fundamental problem as was mentioned in connexion with foreign trade trends. This was pointed out by the United States Department of Commerce in a study published some years ago.[12]

In 1929 the United States supplied the rest of the world with $7,400 million in payment of imports, investments and other items; hence the rest of the world could easily

[11] Report of the Joint Brazil-United States Technical Commission, Part III.

[12] *The United States in the World Economy*, Economic Series No. 23, Washington, D. C., 1943, page 6.

pay the $900 million due in fixed financial services on capital invested by the United States, apart from remittances of profits. In 1932, however, the supply of dollars was reduced to $2,400 million, while the services, had they been paid, would still have amounted to $900 million. The rest of the world would thus have had barely $1,500 million to cover its imports and other payments to the United States, as against $6,500 million in 1929.

In the light of these figures, it is not surprising that default was more or less general throughout Latin America. The few countries that continued to meet their obligations did so at great sacrifice, at the cost of a severe contraction of their internal economy and to the detriment of their monetary reserves. It is only natural that, after such an experience, they should be reluctant to find themselves once more in a position in which they must either fail to meet their obligations or sacrifice their economy.

Until a solution to the fundamental problem of foreign trade is found, care must be taken that dollar investments, where they cannot be used to further dollar exports, shall contribute, directly or indirectly, to the reduction of imports in that currency, in order to facilitate future payment of services.

From this and other points of view, it would seem imprudent to renew the active flow of investments of the nineteen twenties without adopting a plan to deal with the series of concrete problems which arise in this connexion. The existence of international credit institutions could be a very effective factor in the drafting of such a plan, in which the types of investment best suited to the development of Latin-American economy through their contribution to productivity and to the development of the necessary capacity for repayment may be considered in co-operation with the individual countries concerned.

There seems no reason why this plan should not include the field of private investment. Much is heard about the need for establishing a system of guarantees or regulations in order to promote it. All this is worthy of further consideration. New measures must, however, be developed in the light of past experience. There were many other difficulties besides the fundamental ones of the nineteen thirties, and the abuses on both sides should be fully admitted in order to prevent a repetition of the evil. In this way, and with effective technical assistance, it should be possible to develop an investment policy that would be welcomed by all concerned because of its reciprocal advantages.

VI. The limits of industrialization

It is obvious that the economic growth of Latin America depends on the increase of the average income per inhabitant (which in most countries is extremely low) and on an increase in population.

An increase in the average income per inhabitant could be achieved in only two ways: first, through an increase in productivity; and second, assuming a certain level of productivity, through an increase in income per man engaged in primary production, in relation to the income of the industrial countries which import part of that production. This readjustment, as already explained, tends to correct the disparity in income brought about by the way in which the benefits of technical progress are distributed between the centres and the periphery.

We shall now consider the increase in productivity in relation to the existing population. There are two aspects of the question. On the one hand, the adoption of modern technique will allow production per man to increase, making labour available to increase production in the same activities in which it was already employed, or directing it to others. On the other, the index of productivity will also be raised by the diversion of persons ill-employed in activities where the very low productivity cannot be increased to any notable extent, to others where technical progress makes such improvement possible.

Agriculture offers a typical example of the influence of technical progress. In some of its important branches, technical development has made possible a steady increase in production with a proportionally lower increase in employment. In other words, agriculture absorbs a decreasing proportion of the increase in the population of working age, with the result that industry and other activities have been able to increase their employment more. This is not a case of diverting, to other work, people already employed, but of offering a different form of employment to people reaching working age. There have, however, been instances in which the rapid growth of industry during recent years has brought about an actual transference of workers, with unfavourable consequences for agriculture.

Furthermore, the increase in foreign demand for agricultural products after the great depression was, in general, relatively slow, by comparison with the rate in previous years. Taking this fact in conjunction with the consequences mentioned above, it would be difficult to say what productive activities, other than industry, could have absorbed the increase in population of the Latin-American countries which export such products.

It is quite possible that technical progress in other activities will bring consequences similar to those just pointed out. That, too, will mean an important source of man-power for industrial development.

This is not the only possible source. The low level of productivity in industry itself represents a wastage of man-power which, given the proper use of modern technique, can be employed to great general advantage in expanding existing industries or in developing new ones.

Finally, there is another possibility which the recent experience of some countries has shown to be worthy of consideration. The low income level prevailing among the masses has made it possible for the higher income-groups to enjoy hand-made goods and certain types of personal services at comparatively low prices. This is due to what we have termed ill-employed man-power. As productivity in industry increases and real income, *per capita*, rises, there is a natural tendency for the ill-employed to move towards industry. However disturbing this trend may be to some sectors of society, it is the usual way in which the benefits of technical progress are passed on to all social groups within a country, as the experience of the great industrial countries has shown. The solution does not lie wholly in an increase in productivity, however. The social aim of industrialization might well be jeopardized if too large a part of the increase were to be devoted to increasing consumption or to a premature slackening of productive effort.

It has been emphasized that, to achieve this increase in productivity, capital, *per capita*, must be considerably increased and the technique for its effective use acquired. The need is progressive. In fact, a general increase in wages resulting from greater productivity in industry gradually spreads to other activities, which are thereby obliged to use more capital, *per capita*, in order to achieve

the increase in productivity without which they would be unable to pay higher wages. Thus many activities in which human labour is now more profitable, because it is cheaper, will tend to become mechanized; the same will happen to a certain degree in household economy.

It is not possible to estimate, even approximately, the extent of these potential capital requirements and thus of the resources that will be needed to satisfy them, since even present capital, *per capita,* employed in the principal Latin-American countries cannot be determined with any satisfactory degree of accuracy. However, to judge from the needs which have already arisen during the initial stage of the industrialization process, the resources made available by exports—at least by dollar exports—do not appear adequate to meet those requirements after other imports and foreign payments have been met.

As already explained, the possibility must be faced that a reduction in the import coefficient may be necessary. This may apply to either the general coefficient or the dollar coefficient and may be brought about by decreasing or eliminating non-essential goods, in order to allow increased imports of capital goods. A change in the composition of imports would in any case appear essential to the development of industrialization.

It should be clearly understood what this means. It is merely the adaptation of imports to the resources made available by exports. If the latter were to rise sufficiently, it would not be necessary to restrict imports, except as a further means of intensifying industrialization. Exports from Latin America, however, are largely dependent on fluctuations in income in the United States and Europe and on their respective import coefficients for Latin-American products. Consequently they cannot be controlled directly by Latin America, and the situation can be changed only by the decision of the other countries.

It would be a different matter if Latin America intended to carry industrialization to the point of directing certain factors away from primary production to industry in order to increase the output of the latter to the detriment of the former: in other words, if Latin America, being in a position to maintain exports and imports at a specified level, were deliberately to lower it, sacrificing part of its exports in order to increase industrial production as a substitute for imports.

Would there in that case be an increase in productivity? At this point the question would be defined in classical terms. It would be a matter of discovering whether the increase in industrial production brought about by the factors diverted from primary production was or was not greater than the amount of goods formerly obtained in exchange for the exports. Only if it were greater, could it be said that there was an increase in productivity, from the standpoint of the community; if it were not, there would be a loss of real income.

This then is one of the most important limits of industrialization, one of a dynamic nature which might become less restrictive as the economy developed but which should be constantly borne in mind, however, if the primary objective is to increase the real welfare of the masses.

There is no sign that Latin America is approaching this limit. It is in the initial stage of the industrialization process and in most cases the man-power available as a result of increased productivity is still amply sufficient for industrial growth. Moreover, it does not seem that the countries in which this process of industrialization has reached a more advanced stage have yet been driven to choose between an actual increase in exports and industrial development.

Nevertheless, exports can be sacrificed to an illusory increase in real income long before the possibilities of intensifying productivity or of utilizing all the man-power available have been exhausted.

An increase in productivity requires a considerable increase in capital, and before this can be achieved, a long time will elapse and new techniques will appear which may call for further increases in capital, in addition to that necessitated by the growth of population. At the same time, savings are scarce. It is necessary, therefore, to use them in such a way as to obtain the maximum increase in output. However, a mistaken policy could cause deficient use of these savings, as can be easily demonstrated.

It has been said that technical progress in agriculture and the comparatively slow foreign demand for its products have, in many cases, allowed industry to absorb a larger part of the increase in population of working age than agriculture. Let us assume that year after year this increase in hands is required in agriculture in order to meet rising foreign demands in addition to the increase in domestic consumption, but that, as a result of various measures, industrial development is expanded to such an extent that agriculture is deprived of the hands it needs in order to continue increasing exports.

The reasons why the substitution of industrial production for exports may represent a loss of real income have already been explained. There would, however, be also another loss. Land is a very valuable factor of production, which costs nothing. By comparison with industry, the amount of capital that must be added to it is relatively small. Consequently, the men who could have worked efficiently in agriculture occasion a demand for more capital when employed in industry. That increased capital could, however, have been put to more productive use if, instead of being diluted in the total annual increase in population, it had been confined to a part of that increase: the higher capital per man would have resulted in greater productivity. Hence, the dilution of capital would not have allowed the increase in productivity that otherwise might have been obtained. Thus to the direct loss would be added another, which, although less tangible, would be nonetheless real.

Furthermore, if productivity did not increase, there would be less incentive for ill-employed persons to go into industry, with the result that, instead of man-power being used to the best advantage, it would be disadvantageously diverted away from highly productive occupations.

This is not a remote possibility, but a danger to which Latin America is continually exposed and into which it may sometimes have fallen for lack of economic development programmes with specific aims and clearly defined means to achieve them. Capital is scarce and it would indeed be deplorable to invest it where it would lessen total productivity rather than where it could increase it.

It should therefore not be forgotten that the greater the exports from Latin America the greater may be the rate of its economic development. We should not, however, lose sight of the possibility that a recrudescence of protectionist policy in countries that import from Latin America might lead to the replacement of those imports with goods produced locally.

Such a turn of events would be highly regrettable, but should it occur, the only solution would appear to lie in limiting the growth of imports or even reducing them in absolute terms, in order to adjust them to exports. In such a contingency, the increase in real *per capita* income would be less than it might have been, and it is conceivable that it might decline if the phenomenon became acute.

In this connexion it is necessary to take into consideration one elementary fact. Europe has lost a large part of its investments in other parts of the world and, from the point of view of the availability of dollars, cannot be expected, even when the process of reconstruction is complete, to be in a position to supply dollars to Latin America. On the contrary, it will need to take great care to balance its own trade. Consequently, even if one individual country were able for a time to reduce its imports to Europe without perceptible loss in its exports to that area, it is obvious that Latin America as a whole could not do so.

In discussing the increase in capital, *per capita*, we have implicitly assumed that industrial establishments would be able to attain a satisfactory size, for which a minimum of production is required. What is this size in the Latin-American countries? The variety of conditions obtaining in the different countries makes it difficult to generalize in this case, as in others. Moreover, no systematic study of productivity and its relation to the optimum size of the establishment and the industry has yet been made in these countries. Depressive examples are quoted, however, of the sub-division of industry into an excessive number of inefficient undertakings within one country or of the multiplication of comparatively small enterprises in countries which, by combining their markets for a number of products, could reach a higher degree of productivity. The present division of markets, with its consequent inefficiency, constitutes another limitation of industrial growth, in this case one which could be overcome by the combined efforts of countries which, by reason of their geographical position and economic features, would be able to undertake it to their general advantage.

It was pointed out at the beginning of this section that there are two ways of increasing real income. One is through an increase in productivity and the other through a readjustment of income from primary production so as to lessen the disparity between it and income of the great industrial countries.

The second result can be achieved only in so far as the first is accomplished. As productivity and the average real income from industry increase in the Latin-American countries, wages in agriculture and primary production in general will have to rise, as they have in other countries.

The effect will be gradual and if there is not some relationship between all the respective increases in average income of the principal countries exporting primary products, unavoidable difficulties may arise in readjustments of the kind just mentioned, whether they be internal or international.

The possibility of gaining ground in this sphere depends also on the ability of Latin America to maintain the prices of primary products in the cyclical downswing, the point at which it has frequently lost all or a part of the share of the benefits of technical progress that the periphery usually receives in the upswing. There is room here for international economic co-operation.

VII. Bases for the discussion of an anti-cyclical policy in Latin America

The cycle is the typical form of economic growth under our present system, and, although it is a general phenomenon which must be explained by a single theory, it manifests itself in a different way at the cyclical centres and at the periphery.

Notwithstanding these differences, much has been written about the cycle at the centres, but very little regarding the periphery. The brief comments which follow are not an attempt to fill the gap, but an outline of some ideas on anti-cyclical policy which, if accepted in principle, could constitute a suitable basis for the discussion of the problem. If the discussion is not to take place on an abstract plane, the particular case of each country must be examined in order to determine whether its economic structure and existing conditions make those ideas practicable or whether other ways of dealing with the cycle must be found.

The firm intention of the United States Government to follow an anti-cyclical policy is well known. It does not seem advisable, however, to rely exclusively upon measures taken by the principal cyclical centre, since in the case of a contraction in that country, firm action on the part of the peripheral countries could be very opportune. The Latin-American countries should, therefore, prepare to play their part in the common task.

At the centres the policy resulting from this aim attempts to influence the volume of investments, which are considered the dynamic factor in economic fluctuations. This is not the case at the periphery. There exports are the dynamic factor, which is not surprising, since their fluctuations reflect those in income at the centres, which in turn are closely linked with investment.

It is not, of course, within the power of the periphery to regulate exports in the same way that the centres propose to regulate investments.[13]

Other means must therefore be sought for averting the more serious consequences of cycles on the internal activity of the Latin-American countries. In the first place, the idea that industrial development will in itself make them less vulnerable to these phenomena should be dismissed. For this to happen, exports would have to become a very small proportion of national income. In that case, a country would have already left the periphery and become a cyclical centre, and though it might thus have lessened its vulnerability to external influences, it would have developed those inherent characteristics of the system which give rise to the cyclical fluctuations of the centres.

We are rather of the opinion that industrial development will bring out the consequences of the cycle more clearly, by accentuating fluctuations in urban employment. In a country that is essentially agricultural, depressions manifest themselves more in the fall of rural income than in unemployment; indeed in many Latin-American countries during the great world depression, people who had previously gone to the cities to find work returned to the land. Unemployment was, so to speak, diluted, this cannot be expected when relatively large industrial masses are concentrated in the cities: in that case the cyclical unemployment problem would assume serious social complications.

[13] This refers to the impossibility of the Latin-American countries changing the pattern of export fluctuations by their own actions, and not to the results that could be achieved through regulating export surpluses, to which reference is made at the end of this chapter.

Does this lead to the conclusion that, from the cyclical point of view, industrialization has this disadvantage? It might be so if economic activity were left free to operate under its own forces. If it is not, however, industrial development could be one of the most effective elements of an anti-cyclical policy.

Let us briefly examine the various possibilities: in one of them, perhaps the most widespread, an attempt is made to lessen or counteract the effects of export fluctuations on internal activity by means of a compensatory policy in which investments, chiefly in public works, are made to vary in adverse ratio to the fluctuation in exports. This policy demands certain conditions. During the cyclical upswing, tax revenue increases and the market is favourable to the sale of public bonds. Nevertheless, the State should not only abstain from using these additional resources to increase public investments, but should restrict them in proportion to the increase in private employment. Thus during the upswing resources would be accumulated in anticipation of bad times or used to repay bank credit extended during the preceding contraction. At the mere mention of these requirements the difficulty of fulfilling them is apparent. For the very reason that the Latin-American countries are in full process of development, their investment projects are always larger than can be carried out with the limited means available. To maintain that, when those means increase and the opportunity of carrying out such projects presents itself, the authorities instead of seizing it should accumulate resources for the future, which may be enjoyed by their successors, would mean making the success of anti-cyclical action depend on attitudes not always compatible with sound political interest.

There are yet other difficulties, among them the flexibility of plans. Investments must be alternately increased and restricted according to the cycle, and that is not an easy thing to do. Moreover, there would have to be a rapid transfer of people from the activities most affected by the depression to those created by the new public investments. All this, if it does not lead to the exclusion of the possibility of anti-cyclical action, at least suggests the exploration of other means more suited to Latin America's individual characteristics.

It is important that internal activity should develop at a high level of employment, despite the cyclical movement of exports. The way in which that movement causes internal activity to rise and fall is well known. When exports increase, so does internal demand, and with it employment and income; the rise in income brings about in turn a rise in imports, which thus tend, although with some lag, to adjust themselves to exports. This is the way the cyclical upswing develops in Latin America. The opposite occurs in the downswing: the fall of exports brings about a drop in income and employment, with a consequent reduction of imports.

Let us now assume that in the course of these phenomena, internal activity has reached its lowest point. Employment has fallen with a corresponding reduction of income from a maximum of let us say, 10,000 to a minimum of 7,500. Of this 7,500, twenty per cent, or 1,500, is spent on imports required in addition to local production to satisfy the current needs of the population, and the very low level to which exports were reduced barely suffices to pay for these imports.

If, in order to increase employment and income to a maximum, a policy of expansion similar to that recommended in the great centres were followed, there would be an immediate increase in imports, providing the coefficient had not changed. Thus when income reached 10,000, imports would be at least 2,000, and if exports were maintained at a level close to 1,500, there would ensue a disequilibrium which would reduce monetary reserves to a very small amount in a relatively short time.

It should be pointed out incidentally that similar difficulties are not likely to occur at the centre during the downswing, since that is precisely when they receive the inflow of gold from the peripheral countries.

Without exceptional resources, it would not seem possible, therefore, to develop in these countries a policy of expansion tending to increase employment, and at the same time not reduce the import coefficient.

The possibility of doing so is limited by obstacles which vary in importance from one country to another. Let us assume, for the sake of simplifying the argument, that they have been overcome and that the coefficient has gradually been reduced from 20 to 15 per cent through tariff changes. This has enabled employment and income to expand without an increase in imports above the minimum of 1,500, the level at which exports are also maintained: in other words maximum employment has been achieved without disturbing the equilibrium of the balance of payments.

Thus, owing to the reduction of the coefficient, the current needs of the population at this maximum level of employment can now be satisfied with 500 less in imports. The problem has therefore been that of producing the difference internally, whether they were finished consumer goods or the raw materials essential to their manufacture.

Not all consumption, however, can be satisfied by articles of immediate consumption or of comparatively short duration. As pointed out elsewhere, technical progress in the great industrial countries has steadily created new needs for durable consumer goods which must be imported. These goods become indispensable as the standard of living rises. This does not mean, however, that the importation of such articles cannot be drastically reduced when the fall in exports hardly allows payment for essential imports. For the very reason that the goods are durable, it would seem possible to restrict importation of them to the extent required by the intensity of the downswing, if they have been freely imported in the preceding upswing.

The same applies to capital goods. If it has been possible to meet requirements during the upswing, it will be possible to restrict temporarily their import during the downswing. In this connexion, it should be taken into account that with the reduction of the coefficient for articles and materials intended directly or indirectly to satisfy current needs, there will be a greater margin than before for the importation of both durable capital goods and durable consumer goods.

Finally, there are non-essential goods satisfying current needs, which are imported in comparatively large quantities in times of prosperity; it is obvious that when foreign exchange is scarce importation of these can be reduced without serious consequences.

In short, for the purposes of this policy, imports are divided into two categories. One covers those that cannot be deferred, and includes the articles and materials indispensable for achieving maximum employment with a

minimum of exports and at the same time ensuring the satisfaction of current needs. The other includes imports of durable consumer or capital goods which are by nature deferable, as well as unessential goods for current consumption.

Let us now continue with our example. The policy adopted had succeeded in bringing about maximum employment, but meanwhile exports had again increased under the influence of a new upswing. At the same time, the demand of primary products which had also fallen to its cyclical minimum, rose again in proportion to the rise in income caused by the increase in the value of exports. It is evident that where there is maximum employment, this increase in demand will inevitably cause a corresponding increase in imports. Prices will also rise, with a consequent increase in the profits of entrepreneurs, which in turn increases their demand and, through it, imports.

Consequently the increase in income that ordinarily results from a rise in exports above the cyclical minimum will soon be transformed, in one way or another, into an increase in imports, without affecting the level of internal employment.

It must be remembered that the readjustment of the coefficient does not mean a reduction in imports. They will be of the same magnitude whether or not this anti-cyclical policy is followed, since they depend ultimately on exports and foreign investments. To reach the goal desired, it is only necessary to alter their composition.

In other words, this change is as follows. When exports are at the cyclical minimum, a peripheral country can pay for only a comparatively small quantity of imports. That quantity is not sufficient to cover the imports required to maintain maximum employment. Hence it is necessary to change the composition of imports and, with it, the structure and volume of internal production, in order to satisfy the current needs of the population while maintaining maximum employment.

While exports remain at their minimum level, only goods essential for maintaining employment and current consumption can be imported. When, however, exports again increase with the upswing, the time will have come for the importation of the additional goods necessitated by the increase in demand.

Thus while the imports essential to the satisfaction of the current needs of the population will follow the relatively slow rate of the organic growth of the country, deferable imports will remain subject to the fluctuation in exports.

When it was explained above that a reduction in the coefficient of imports for current consumption was indispensable for the carrying out of an anti-cyclical policy, reference was made to the obstacles which would have to be overcome. These obstacles are of various types.

In the first place, the substitution of internal production for imports usually requires the raising of tariffs, owing to the higher cost of internal production. From this point of view, there would be a loss in real income, but on the other hand, the loss in income resulting from cyclical fluctuations in employment is usually very great. It is very probable that in most cases the collective gain from employment stability is much greater than the loss resulting from the higher cost of internal production. It is conceivable, however, that the precariousness of natural resources and the inefficiency of workers or management might be such that the loss through increased costs would absorb an excessively large part of the increase in real income gained through greater employment. The seriousness of this difficulty cannot be denied.

At the same time, the substitution of internal production for imports requires the importation of capital goods, and consequently the necessity of saving during the process of reducing the coefficient. Even if saving could be achieved internally, to import the capital goods it would be necessary to reduce still further the coefficient of imports for current consumption, thus bringing about a further rise in the cost of living. Therein lies the second obstacle, one which could doubtless be partly removed with the co-operation of international financial institutions, which would thus be able to show that their anti-cyclical measures while aiding the peripheral countries, also help to maintain the demand for capital goods at the centres.

Finally, an anti-cyclical policy of this kind might require transfers of productive factors that are not always easily carried out. However, as explained in another chapter, these difficulties could be lessened to a large extent by the increase of the population of working age and by the better utilization of the ill-employed.

In Latin America, the lowest point on the curve of exports and foreign investments has been rising in succeeding cycles. This does not mean, however, that they may not fall to a level lower than in the preceding cycle; the phenomenon is unusual, but has been known to occur, as, for instance, during the great world depression. If it should happen again, a high level of employment could be maintained only to the extent to which monetary reserves were sufficient to cover the excess of essential imports over minimum exports or in so far as the international lending agencies were able to achieve their anti-cyclical purpose.[14]

The need for reducing imports of durable goods during the cyclical downswing has already been pointed out. Is exchange control indispensable to achieve this? As has been seen, the increase in demand for such goods is chiefly the result of new income from increased exports; hence if there is no undue increase in that demand as a result of credit expansion, there will be no need for restrictions, unless there should be a sharp drop in export prices in the cyclical downswing. Restrictive measures would be necessary only if the expansion were very great, or if minimum exports fell below the level of essential imports and there were no extraordinary resources to pay for them.

In such a case, the alternatives are clear: either to reduce even more the coefficient for essential imports (the increase in protective tariffs implied placing an additional burden on the consumers), or deliberately to restrict imports of deferable articles by means of exchange control.

It is easy to picture a country where a marked propensity to import non-essential articles might be incompatible with the high level of imports of capital goods needed for intensive economic development. Exchange control could then be an effective instrument of selection, without precluding other measures.

For such special cases, one can envisage simple measures of control by which the distribution of import permits would be left to the free play of supply and demand, within the limits of the amount of exchange to be made available for such imports.

On the other hand, it is obvious that if a country were to embark on a very easy credit policy, it would be

[14] In this connexion see the remarks of Dr. Hermann Max in *Significado de un Plan Marshall para América Latina.*

compelled to choose between devaluation or a system of exchange control which, while masking that devaluation, diverts it with an inflationary influence towards internal activity. An effective instrument of anti-cyclical policy would then become an instrument of inflationary policy. Actually, all measures of monetary policy may equally well be put to good or bad use. There would not even be the excuse of unemployment since, as maximum employment would have been already achieved, there would be no valid reason to continue the credit expansion.

Mention has already been made of the extreme case in which the cyclical minimum of exports is insufficient to cover essential imports. This is where monetary reserves can fulfil their specific function. It is therefore an appropriate point at which to examine the matter.

Reserves increase in the upswing and, in the downswing, lose a large part of that increase; the greater the previous credit expansion, the greater the loss incurred. This is easily comprehensible if it is remembered that in the peripheral countries imports generally lag behind exports. This, and the similar movement of other items in the balance of payments, causes receipts to exceed payments during the upswing, with a consequent inflow of gold and foreign exchange, while, in the downswing, the opposite occurs.

The theoretical explanation of this interesting process can be briefly recalled. The gold and foreign exchange that flowed in during the upswing tend to flow out again through the circulatory movement of the corresponding income. The foreign exchange that flows in as a result of an increase in exports, for instance, is closely related to an equivalent increase in income; this increase in income circulates internally and is transformed into other increases in income; but in each stage of this circulatory process part of the increase becomes an additional demand for imports, so that the original amount is progressively reduced. Thus the inflowing foreign exchange tends to flow out again. The time lag before it flows out depends, among other things, on the magnitude of the import coefficient and other liability items.

Other things being equal, the higher this coefficient, the sooner will exchange flow out.

It should not be surprising that the outflow of foreign exchange from the Latin-American countries is imperceptible during the cyclical upswings, since the new exchange then flowing in exceeds, in the international accounts of a country, the exchange that flows out, and there is a net gold balance in favour of the country. In the downswing, when exports and other asset items decrease, the outflowing foreign exchange exceeds the inflowing, and monetary reserves thus lose part of the gold gained before.

At the end of each cycle there is thus a net increase in gold which represents the share of the country in the world distribution of new monetary metal production. The net increase is comparatively small and depends in the long run on the rate of economic growth of the country and on its coefficient of imports and other liability items in relation to the rest of the world.

If the coefficients do not change, the country which has a higher rate of increase than most will tend to lose a part of the net increase in gold which it would otherwise have had; the more marked the difference in the rates of growth throughout cyclical fluctuations, the greater will be the loss in the net increase of gold.

It could well happen that the gold added, in course of time, to the monetary reserves of a country would not be sufficient to offset the consequences of a reduction in exports during an unusually deep depression. Clearly a reduction in the total import coefficient would help to retain a greater amount of gold in periods of prosperity, and the country would be better able to face such an eventuality.

Additional monetary reserves could also be built up by means of savings; in so far as savings are not invested, a part of income in circulation is not transformed into imports and consequently does not give rise to an outflow of gold. The quantity of gold retained is equal to that of savings. This could be achieved, for instance, if the central bank were to issue bonds during the upswing and cancel the corresponding amount of money, which would again be put into circulation in the downswing; there would be an additional reserve equivalent to the money cancelled which, together with the existing reserves and the share in the world distribution of gold, could relieve monetary pressure if minimum exports should not be sufficient to cover essential imports.

We realize that the building up of additional reserves by means of savings is not a very attractive solution to countries that need to import large quantities of capital goods. It is clear, however, that if a country were able to obtain international credit during a period of acute depression, it could use more gold during the upswing to import capital goods instead of retaining it as envisaged above. Such a possibility is, in fact, conceivable if a general anti-cyclical programme could be drawn up for the periphery whereby a country which had followed a sound policy could rely upon sufficient co-operation on the part of international institutions during the downswing.

It is very understandable that while an inflationary process was developing at the principal centre, it was not considered advisable to aggravate it by granting international credit in excess of that required for the urgent needs of Europe. If, however, there were to be a contraction, the case would be different, and it would be the right moment to adopt a general anti-cyclical policy without the contradictions that would result from unilateral action by each one of the Latin-American countries.

International action need not be limited to the field of credit. There are other effective ways of combating depression in the peripheral countries. There has been much discussion of the possibility of purchasing the surpluses of primary production. It is well known that in the downswing agricultural production falls far less than that of industry. It is in the interest of both the centres and the periphery that it should not decline very much, since that would delay the recovery of the centres. It follows that a judicious policy of purchasing surpluses could be highly beneficial; the reduction in imports of primary producer countries would be less, in so far as the cyclical fall in exports could be checked and, consequently, the reduction of demand in the industrial countries would also be smaller.

This regulatory measure would have another advantage. The prevention of an unduly large drop in the prices of primary products through such purchases would help to keep the relation between those of primary and finished products from continually turning against the peripheral countries in the way described earlier.

The aforementioned tendency of agricultural production to decline far less than that of industry, or to decline hardly at all, was taken into consideration earlier, when

the bases for a discussion of an anti-cyclical policy were outlined. It was then assumed that the reduction of exports would cause a decline in income in primary production, but no reference was made to the possibility of rural unemployment. The downswing is reflected in a drop in prices rather than in a contraction of production, but as rural profits fall with the prices, so likewise do investments in agriculture, thus causing a certain amount of unemployment.

Though, for the reasons given at the beginning of this chapter, a general compensatory policy is not deemed practicable, this does not mean that there is no need for partial compensatory measures. Even with the effective application of an anti-cyclical policy fluctuation in some types of investments is inevitable. In fact, we have seen that an increase in the profits of entrepreneurs causes an increase in their imports of capital goods. The new equipment, however, calls for the construction of buildings and other improvements that absorb man-power during the upswing and release it in the downswing, just as happens in the case of rural investments.

This is not an unsurmountable obstacle. One of the specific advantages of not being obliged to follow a compensatory policy of public works and general investment is that of being able to plan steady development in accordance with the growing needs of the country and the amount of savings that can be used to satisfy them. The total amount of construction can thus increase from year to year without the acute fluctuations entailed by a compensatory policy. Partial readjustments would fit into this progressive development very well. For instance, mortgage loans for private construction could be reduced during the upswing, in order to make available man-power for industrial construction, and during the downswing additional loans could be granted for construction and rural investments in general.

The ideas expressed in this chapter are far from constituting a programme of anti-cyclical policy. They are intended only to present the main aspects of the problem and to arouse discussion, while at the same time pointing out certain differences between cyclical behaviour at the centres and at the periphery which oblige the Latin-American countries to work out their own programme.

Moreover, the exposition of the principal problems relating to the economic development of Latin America would not have been complete without a consideration of anti-cyclical policy. It is an indispensable complement of a long-term economic development policy. As mentioned before, industry will bring out the vulnerability of the periphery to the fluctuations of the centre. It is not enough to increase productivity and thus absorb unemployed or ill-employed factors. Once productive employment has been achieved, steps must be taken to prevent a return of unemployment as a result of cyclical fluctuations.

The two policies are compatible, however, not only as regards their ultimate aim, but also the means of achieving them. Both require a readjustment of the import coefficient. The anti-cyclical policy calls for it so that a country may continue to satisfy its current needs and to maintain maximum employment in spite of fluctuating exports. The industries and activities which satisfy those needs are precisely those which the Latin-American countries can establish with least difficulty, thanks to a market which expands as the rise in productivity increases consumption. If a country could achieve this objective, it would be in a position to endure bad times without detriment to current consumption and employment. It is not necessary for this purpose to force the creation of capital goods industries. If it could be accomplished by a high level of industrial development, technical skill and the accumulation of savings, it would certainly be an encouraging proof of maturity. There is no sound economic reason for setting up capital goods industries, however, since there is still ample room for increasing the productivity of those producing for current consumption.

From the standpoint of economic development, the maximum rise in the standard of living depends on productivity and this in turn depends to a great extent on the most efficient machines. At the same time, it is in durable consumer goods that technical progress continually offers new or improved articles. It would seem advisable, therefore, to import such articles as can be paid for by means of exports or, in the case of capital goods, by foreign investments, within a general programme of economic development.

Moreover, from the anti-cyclical viewpoint, the consequences of export fluctuations could be diverted to fall entirely upon the importation of these imports.

All these are general considerations. which, by their very nature, cannot be applied to particular cases. A country might undertake the establishment of durable goods industries during the initial stage of its industrial development for special reasons, which would have to be carefully analysed.

Here as in many other cases, our knowledge of the economic structure of the Latin-American countries, their cyclical form of growth and their possibilities is limited. If a scientifically impartial investigation of such questions could be carried out and the training encouraged of economists capable of grasping new economic phenomena, foreseeing the problems involved and co-operating in the search for solutions, a service of incalculable value would be rendered to the economic development of Latin America.

INFLATION AND GROWTH: A SUMMARY OF EXPERIENCE IN LATIN AMERICA*

FOREWORD

In accordance with ECLA resolutions 81 (VI) and 1 and 8 (VIII), the Secretariat of the Commission is in the course of preparing a study of inflation in Latin America and of its relation to economic growth.

Inflation is a highly controversial subject. For one thing, it is complex and has many facets: movements in prices are associated in various ways with changes in wages, in exchange rates, in the output of various sectors, in investment, in foreign trade, in the supply of money, and so on. In this profusion of cross-correlations, it is easy to interpret any one as a complete explanation, and such over-simplified views are widespread. Even at the professional level there are sharp differences of opinion.

Secondly, the matter is far from being a merely academic one. It affects the daily lives of everyone in each country concerned. The question of what causes inflation is inseparably linked with another question, how it should be cured, and the policies of stabilization which have been adopted in many countries are hotly debated, because they raise far-reaching social and political issues.

When a subject is simultaneously complicated and political, debates over policy tend to be strident and somewhat unfruitful. Partisans of different viewpoints lose sight of the historical background and of the experience in other countries. It may therefore be useful to take stock of the whole problem, and look for the antecedents of today's difficulties by studying what has happened in a number of Latin American countries over the past two or three decades. The aforesaid study attempts to assess some of the main forces at work, to examine their interaction and to make a critical appraisal of the policies followed by the authorities. Thus the basis is provided for indicating the principles on which policy should be based.

The study deals with the relevant features of Latin America's economic structure, with external and internal trends since 1929 and with experience in various fields of policy; and it also includes more detailed analyses of four of the countries in the region. This will be published later this year. In the meantime, for the benefit of delegations attending the ninth session of the Commission, some of the interim results are sumarized in this paper.

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* This article will be included in the study under the above title to be published by ECLA in 1962 in which will be compiled the results of research carried out at the regional level and in some Latin American countries during the past several years by a group of economists brought together by the ECLA secretariat. Each chapter of the future publication will bear the author's signature since in most cases it reflects his personal views. The secretariat will draft a general introduction to the publication setting forth its position on the subject. The author of the present article is Mr. Dudley Seers, an economist who until a few months ago was a member of the ECLA secretariat and under whose direction the studies were carried out.

I. PRELIMINARY CONCEPTS

1. The definition of "inflation"

The confused discussion of the subject is partly due to the fact that there is no widely agreed definition of the term "inflation". In everyday language "inflation" means a rapid rise in the general level of prices. It is, however, also used in senses rather different from this. For example, "inflation" is sometimes said to exist when demand tends to exceed supply, even though prices are not actually rising, for example because of controls. Again, some people use "inflation" to describe an increase in the amount of money in circulation, or even simply as the printing of money, and this too may not be closely associated with rising prices.

Each of these last meanings implies a view about the direct cause of price increases, and it will therefore be more objective as well as simpler to keep to the common usage, namely that "inflation" means a rapid and general rise in prices, whatever the reason for it. But this usage is a little imprecise and a price rise will only be termed an "inflation" for the purposes of this study, provided it continues for some years and continues at a significant pace.

But what constitutes a significant pace? The answer given to this reflects national experience. Those who have lived in countries where violent inflation has been the rule might consider that a price rise averaging 10 per cent *per annum* for some years would amount almost to stability. On the other hand, in a country which has experienced little price change for a long time, an increase of 2 or 3 per cent a year may appear inflationary. Partly because of this inevitably subjective approach, and partly because the price indices available lack both a full coverage and also accuracy, no attempt will be made here to say that some particular percentage rise in prices would constitute the borderline between relative stability and inflation. The essential characteristic of inflation is, in any case, not so much the rise in prices itself, as the chronic and recurrent nature of the increase.

2. Failures in the process of development

The repeated waves of price rises in a number of Latin American countries are significative of economic and financial maladjustments. In order to see the likely nature of these maladjustments, the most important economic problems of a Latin American economy and the nature of the process of development, should be briefly examined.

The main typical weaknesses are that *per capita* income is low; that the distribution of income is very un-

equal, as between different areas and different social classes; that the level of activity depends on a few export commodities; and that many goods, including most forms of machinery and equipment, have to be imported. There are three reasons why these problems have become much more dangerous in the past few years. Firstly, the increase in the population, already fast, is accelerating in nearly every country. Secondly, people in Latin America are growing more aware of the contrast between conditions in their own countries and those overseas, and also of the contrasts *within* each country in the region, and they are becoming increasingly unwilling to tolerate living in, or on the brink of, acute poverty. Thirdly, the markets for the major exports of the region are showing not merely their customary instability, but also severe oversupply, despite the general prosperity in the industrial countries; even in "boom" years, commodity markets are far from buoyant.

The general line of development that the region needs is obvious: economies have to be diversified so that they can continue to grow, regardless of trends or fluctuations in world commodity markets. But while this is obvious, it is far from simple. The time factor is crucial, and rapid industrialization imposes great strains, not merely economic strains but also tensions in the social structure and administrative system. The socio-economic system and the bureaucracy of many countries have defects which are exposed under these pressures, and the process of adjustment may fail to be carried through successfully.

This failure can take various forms. One possibility is that no progress is made with the work of diversification, so that growth continues to depend very heavily on the performance of traditional exports. If these are sluggish, the consequence is economic stagnation, in the sense of constant or falling *per capita* incomes, accompanied by increasing unemployment and perhaps political instability. The results of failing to diversify the economy are not apparent so long as exports are rising rapidly. It is in fact tempting to forget the need for economic reform under these circumstances. But commodity booms, however vigorous they seem, do not last for ever. When they end, the threat of stagnation materializes, perhaps all the more dangerously if a high proportion of essential supplies is still imported.

The progress of growth cannot be considered successful —even though it is both rapid and accompanied by industrialization—if it is achieved without a definite improvement in the conditions of the poorest sections of the community. The burden of economic transformation has at times been thrown on them by suppressing increases, or even inducing declines, in their real income. It may be possible by such means to release resources for investment and to keep prices steady, even despite the shortages of one type or another that inevitably appear in the course of growth. But relief is only obtained at the cost of aggravating distortions in the income structure. Sooner or later the political opposition mounts, so this way forward cannot be followed indefinitely. Besides, the growing inequality of income distribution would inhibit the appearance of mass production industries, an essential step in the process of development.

Moreover, as demand grows, it may outstrip the rise in output in some or all of the sectors of the economy. The pattern of investment may not be right, or technical progress may be uneven, or management in some industries may be unenlightened. (These possibilities are not of course mutually exclusive). Agriculture is an obvious illustration in a region where both the person in charge and the size of the productive unit are determined by inheritance more often than by the play of economic forces. One possibility is to ease the consequent shortages by increasing imports. But the normal supply of foreign exchange, i.e. income from exports and from long-term capital, may not be rising fast enough for this. Then special methods of financing the deficit have to be used: for instance, running down reserves of foreign exchange or accumulating short-term debts. These devices cannot of course be used indefinitely, and persistent recourse to them is a sign that the economy is failing to carry out its adjustment satisfactorily.

Inflation is another such sign. This may be attributable to monetary or fiscal policies that raise demand too quickly. It may be due to wage increases greater than the economy can bear. Or the problem may not be so much one of general excess demand or general rises in costs as one of particular bottlenecks in supply. Perhaps some shortages, e.g., of food, cannot be relieved by imports because of transport and marketing difficulties, or because of a lack of foreign exchange. Alternatively, or concurrently, the pressure of demand for imports may, if it is not being met by sufficiently rapid production of local substitutes, lead to devaluation, which also lifts the level of costs. These upward pressures on prices may arise in the course of industrialization, or alternatively, they may be associated with economic stagnation and the failure to develop key sectors of the economy.

The process of growth could of course, at least in principle, take place without these deficiencies. Output could grow sufficiently fast in all sectors so that, despite the population increase, average incomes rose without a deterioration in income distribution or a chronic payments deficit or inflation. This would then be a process of dynamic equilibrium. Inflation should be viewed as one possible deviation from that dynamic equilibrium.

3. Monetary and real factors

Inflation is invariably accompanied by some increase in the supply of money, so the former can always be imputed to the latter. It is therefore tempting to say that bad monetary policy is "responsible" for inflation and that there is no need to look further than this. This simple chain of deduction is all the more attractive because it dispenses with the need for analysis of economic trends.

But it is essential to probe deeper. The question necessarily arises during the examination of any particular situation: why did the supply of money increase? Was there a budget deficit? Did the Central Bank expand its loans to the commercial banks? But these questions in turn immediately suggest others. What influences were causing tax receipts to lag, or public expenditures to climb? What forces in the private sector were raising costs and increasing the demand for bank credit? And a look at regional experience reveals that some questions are continually recurring: why are the pressures so great on Governments to increase social services and to start public works projects? Why has credit restriction so often threatened to bring with it heavy unemployment?

To answer these questions, account must be taken of the rate of population growth, trends and fluctuations in the supply of foreign exchange, the movement in real wages, and so on. It is hard to explain what has happened in the monetary sphere, without invoking the fundamental

economic factors. Changes in the supply of money are, generally speaking, the expression of real forces acting in the economy. Conversely, monetary developments are important to the extent that they influence—as they certainly do—real economic factors such as the level and composition of investment; and monetary analysis is a useful adjunct to economic analysis. But it is no substitute. The problem of inflation cannot be examined in isolation from the central economic problems.

4. The aims of economic policy

This approach guards against framing questions of economic policy in the wrong terms. To ask: what should a policy of stabilization consist of? would be to assume that stability is something that can be pursued in isolation from the main economic objectives. Such a formulation could lead to policies which were seriously wrong. The fundamental aims of economic policy, outlined above, can be phrased as follows: to make the national income grow as quickly as possible; to distribute it more equally; and to dampen its short-period fluctuations. At times of course there may be conflicts between these three aims, but in the long run they are not inconsistent, indeed it is difficult to imagine how economies could grow rapidly for a long period without inequality of income and vulnerability being reduced.

In the last resort, nearly all objectives can be expressed in these terms. Economic objectives as they appear to politicians—for example, the need to provide sufficient employment or to improve living conditions—are really the same, for only if these central aims are achieved is there hope of eliminating unemployment and poverty.

There are other important objectives, but on careful scrutiny one sees they are not really ends in themselves but rather the means of achieving one or more of the ends already listed. For example, diversification of the economy, through industrialization, is pursued not so much for its own sake, but because it appears to be the only way in which the economy can be developed to a stage at which it would be able to continue to grow without a chronic tendency to deficit in international payments; or because a diversified economy is better able to withstand fluctuations in commodity markets; or because industrialization will break down rigid social barriers that cannot be destroyed in any other way.

5. The drawbacks of inflation

Price stabilization is also in the category of means rather than ends. The first reason for avoiding a persistent price rise is that inflation hampers growth. Uncertainties about price movements greatly complicate rational anticipation and planning, for the Government and private citizen alike; and inflation also discourages saving and distorts the pattern of investment. Secondly, it inhibits policies designed to compensate for fluctuations in exports. Thirdly, it is associated with a shift to profits in the distribution of income.

Unfortunately, the word "inflation" has acquired, over the long years of controversy, certain non-objective connotations. It is no longer used simply to describe a movement in economic indicators Weaknesses are often ascribed to inflation, although they are in fact due to more fundamental defects in the socio-economic structure. Thus although economic stagnation has been associated with inflation during part of the 1950's in Chile, it has also been observed in countries with stable price levels, such as Cuba and Haiti. Similarly low rates of personal savings, heavy investment in luxury flats or high profit margins, which are typical symptoms of persistent inflation, can also be found in economies which have never known a serious degree of inflation.

In any case, price movements cannot all be condemned out of hand. Except in the most strictly regimented economy, prices of various goods move from time to time upward or downward. The main ultimate justification put forward for the price system is that it is intended to achieve the necessary shifts in the factors of production by variations in prices. A process of growth, when substitutes are being developed for imports, involves productive factor movements on a massive scale. In some types of economy, these movements are achieved by administrative decree or political pressure. In countries of Latin America, however, an important role in transforming the economy is played by price changes. Yet because of rigidities in various prices, reflecting a widespread reluctance to accept the corresponding drop in income, and because of supply inelasticities, due to the lack of factor mobility which will be discussed below, the working of the price mechanism may well produce more price rises than falls, lifting the average level of prices. Indeed, rising prices have traditionally accompanied processes of rapid industrialization. Thus, in Japan prices rose by more than 80 per cent during the decade and a half of intensive growth from 1888/92 to 1903/07, despite near stability in world prices at that time.[1] But inflation has, of course, not normally been of the speed experienced in Latin America in the past decade.

It is always necessary to go back to the basic aims of policy; a policy that avoided inflation but did not convey a firm expectation of growth, or of a more equal income distribution, or of reduced vulnerability to export fluctuations, could hardly be considered well conceived. On the other hand, it is a mistake to go to the other extreme and conclude that inflation does not matter. Fulfilment of the main objectives, particularly economic growth, is easier if chronic inflation can be avoided.

6. The alleged conflict between development and stability

Putting the matter in this way shows that it is misleading to ask questions such as: are price stability and development incompatible objectives? And it is still more misleading to ask: which is preferable?

Posing a choice between development and stability is to fall into a logical fallacy. The choice is only between various objectives, not between an objective and something which, though it helps achieve a number of objectives, is itself a means rather than an end. The damage done by inflation has to be judged in terms of its effects on growth, equality and vulnerability; this has to be worked out through economic analysis. The question for policy-makers is whether the total effects of one policy on the level, distribution and variability of income are better than those of another policy—allowing for the prospect, *inter alia*, that inflation may be involved in one case but not in the other, or in one more than the other.

In the longer run, the antithesis is even more obviously

[1] K. Ohkawa and H. Rosovsky, "Role of agriculture in Japanese Economic Development" *(Economic Development and Cultural Change,* Vol. IX, No. 1). Part II.

fallacious. Only through economic development can the economy be made more flexible and strengthened, so that it becomes less prone to inflation. If growth were slowed down in the attempt to avoid inflation, the day would be postponed when the economy could be developed with less strain and thus less danger of inflation. A country that pursues stability at the expense of growth, may find it ends up with neither.

II. THE PROCESS OF INFLATION IN LATIN AMERICA: THEORETICAL CONSIDERATIONS

1. The conditions for dynamic equilibrium

There is no simple and self-evident causal nexus between development, on the one hand, and inflation, on the other, in either direction. Yet they are obviously not completely unconnected phenomena either. An under-developed country that attempts to change and to grow rapidly faces certain tensions which may result in inflation. Whether this happens or not depends on the following factors:

(*a*) the pace at which economic change occurs;
(*b*) whether external developments are favourable or otherwise;
(*c*) the flexibility of the internal economy (reflecting not merely the productive structure but also a wide range of institutional, social and cultural characteristics);
(*d*) the extent to which the policies followed by Governments ease or aggravate the process of transformation.

(*a*) Suppose, for example, that the national product is growing quickly, as it may have to if the rate of increase of the population is high. This implies a fast expansion in demand, especially for some types of goods and services, because, *inter alia*, growth will be accompanied by urbanization. Examples of items of consumption which typically expand quickly in a growing economy are consumer durables, household electricity and passenger transport.

(*b*) For under-developed economies such as those in Latin America, these rises in demand may create problems. Of course they can be accommodated, if exports are rising fast enough. Foreign exchange supplies will then permit imports of durables—to continue with the previous examples—to increase, and also allow equipment for electricity generation and for transport services to be purchased overseas. It will similarly be possible to ease other shortages that arise during the inevitably somewhat uneven process of growth.

It should be borne in mind that imports will have to grow at least as quickly as income if this room to manœuvre is to be maintained. If, however, export markets are weak, the domestic economy will itself have to satisfy these types of expanding demand. Some sectors, such as the engineering industry, will have to grow particularly fast. The agricultural sector will also have to expand its output because of the increasing need for food to feed city populations. Not only industries producing "final" products will be affected but also—and more especially—those producing "intermediate" goods and services, such as steel, energy of various kinds, and freight transport.

(*c*) Those brought up in the classical tradition of economics might expect that declines in the sales of export products would induce labour and capital to shift readily into secondary industries of their own accord, because of the more attractive wages and profits to be found there. For this to happen, two conditions must be fulfilled. In the first place, prices must act as signals to show what changes in the channelling of resources are necessary. Secondly, factors of production must move readily and easily in response to such signals.

The first conditions will be met if there are no monopolistic elements which affect the levels of wages or of profits in particular industries, or trends of prices. More important, prices need to be such that profits reflect the social benefit to the economy as a whole of acts of investment.

The second condition is that labour must be mobile enough in all senses (geographically, industrially and occupationally) to flow in response to wage changes, and that capital should also move into the most profitable openings irrespective of where it arises. ("Profitable" here refers of course to the long term.) This mobility is greatest if the export sector can sell its surplus output in the home market, or if its resources can be used where they are, without much adaptation, to produce other goods. In addition, and perhaps more crucially, entrepreneurs must emerge to take advantage of the possibilities of profits and to combine labour and capital efficiently.

There are certain financial corollaries of this physical transformation. The flow of saving has to be high enough to finance the capital requirements, and has to increase when a rising yield signals that import substitution has to be accelerated. This problem is easier to solve to the extent that capital is available from overseas, and conversely more difficult to the extent that capital is absorbed in the purchase of foreign securities, United States dollars, or gold.

Apart from the physical and financial conditions for dynamic equilibrium, there are also social ones. The purpose of economic growth is, in the final analysis, to solve social problems by providing better nourishment, housing, etc. This implies that it is more successful to the extent that inequalities of income are reduced. Indeed, since the manufacturing industries mostly require large markets, increasing equality could in any case hardly be avoided in the long run.

(*d*) Merely to state these conditions indicates that economic transformation may not come about automatically, through the normal interplay of economic forces. Yet dynamic equilibrium can still be achieved if Government policy is far-sighted and firm enough to ensure that the necessary substitutes for imports are produced and also to curb inessential consumption and investment by fiscal and monetary policy. This in turn implies the need for efficient and honest public servants.

These last two conditions—(*c*) and (*d*)—are of course themselves interrelated. Structural obstacles to growth also affect the distribution of political power and the context within which it is wielded.

The question of whether inflation is inevitable in the process of rapid development therefore resolves itself into three subsidiary questions: are markets for the country's exports buoyant?; is the internal economy flexible?; and is government policy efficient?

If exports rise rapidly enough, as they did in Venezuela for many years, the economy can grow quickly without

serious danger of inflation, even though labour and capital are immobile, enterprise is deficient, and the Government lacks an adequate development policy. In that case, however, the economy will *grow* rather than *develop:* it will not achieve enough import substitution to enable it to weather comfortably a subsequent weakening of export markets. On the other hand, if exports are stagnant, or even more if they fall back, then the pace of price rises will depend on structural factors and on Government policy. The greater is the weakness in exports and the more intractable are structural obstacles to development, the less easy is it for a Government to avoid inflation and still to maintain a satisfactory economic expansion.

2. The mechanisms of the inflationary process

This brief review of ideal conditions points to the ways in which inflation can emerge and propagate itself—the plural is used because there are, in theory at least, several possible processes of inflation. For the sake of exposition, let us suppose that an economy has been growing in dynamic equilibrium, as has been defined above, and that something happens to divert it from this path.

A convenient first hypothesis is that the rise in exports slows down or stops. If growth is to continue undiminished, this must mean an acceleration of the rate of import substitution, i.e. of industrialization. Some local industries will have to expand particularly quickly. Imports of capital equipment, and of raw materials unavailable locally, will not fall. They will increase, because of the very need for industrialization, so imports of consumer goods will tend to be reduced, probably sharply.

This need to expand certain industries rapidly will have a direct impact on the price level, because goods produced for the first time domestically will almost certainly be more expensive than the imports they replace. Otherwise they would have been produced before. The new substitutes will be produced under the protection of tariffs or import controls; they will be marketed in monopolistic conditions; they will usually be manufactured in rather small quantities because of the limited size of local markets, and in any case the techniques used may be relatively inefficient.

But what is of greater significance for the economy is that the expansion of these industries means a big increase in the demand for certain inputs. To attract workers into the new industries, for example—especially skilled workers—higher wages have to be offered. This creates shortages of certain types of workers elsewhere, raising costs in other industries, and it affects the general wage level. The increased demand for electricity aggravates problems of lack of energy that exist, and the increased need for transport facilities will add to the strain on that sector. The accelerated pace of urbanization associated with this economic development implies that passenger transport facilities, urban social services and food supplies will also have to grow more quickly.

Import substitution thus changes consumption functions throughout the economy. It requires from the productive sectors a flexible response which is difficult to achieve in an economy where the markets for labour and capital are imperfect. Failure to make the needed spurt in output means rising prices. Moreover, to the extent that the economic transformation is not adequate, the pressure of demand for imports will not be relieved. The exchange rate will thus be devalued, which will also raise costs. Once prices rise, for whatever reason, this affects the levels of living of various sections of the community, and leads to attempts to raise wages and other forms of income —attempts which are more or less successful according to the power of the sections concerned. Then, in time, thrift is discouraged, and capital is diverted away from the types of long-term investment which are needed. So inflation gains momentum. Moreover, as prices rise deficits appear in government accounts because of the inflexibility of taxes.

An alternative possibility is that the growth rate of population may accelerate, making it necessary for that of national income to accelerate too. The rate of growth of exports, although previously satisfactory, will then prove too slow, and the same problem of an import "bottleneck" will arise.

So far it has been assumed that the pressure of excess demand appears because imports of some types cannot keep climbing fast enough. It may also make itself felt if supply lags for different reasons. For example, agricultural output may cease to expand at a satisfactory pace. This will mean rising food prices, or, alternatively, increasing imports of food, a state of affairs which aggravates any foreign exchange shortage. And, moreover, it immediately stimulates pressure for wage increases. On the other hand, failure of the output of steel or of petroleum to grow in line with demand will create the need for rapid import substitution in other sectors, even if exports are rising reasonably fast.

The acceleration of demand for particular goods will pose formally similar problems. This might happen as the result of "autonomous" changes in the pace of urbanization, or in the distribution of income, or in the coverage of consumer credit, or in taste (for example, as a result of the "demonstration effect"). In any of these ways a price inflation can develop, and, once it starts, it develops cumulative features.

Apart from long-term models, such as have been outlined here, inflation might emerge because of fluctuations in exports, even if these fluctuations were to take place around a rising trend. Over the short run, capacity to produce substitutes for imports cannot be increased, so there is an immediate danger of devaluation if the growth of income (and the demand for imports) continues while exports fall back. This is especially likely to occur if there is a chronic long-term tendency to inflation.

Moreover, when exports recover, the process is not necessarily reversed. By that time rises in internal prices and incomes will have occurred, and it will seem unrealistic to consider going back to the old exchange rate. Incomes will also be rising in the export sector, and so will prices of imported manufactures (particularly if the recovery of the country's exports is part of a world boom). So both in a slump and in a boom prices tend to move upward, and the long-term pace of inflation depends in part on the violence and frequency of short-term fluctuations in commodity markets.

Similarly, a budget deficit might grow because of the decline in revenue from exports, or indeed for any other reason, such as quite irresponsible increases in public outlays. Then again, demand may rise because an expansion of monetary policy causes private investment to outrun private savings. Whatever the cause, an excess of total demand means rising prices. This discourages exports, while it stimulates imports, thus inducing devaluation, and causing a shortage of foreign exchange for certain types of imports.

Again, wage rises may be greater than productivity increases. This at once results in rising prices, especially if the organization of industry is monopolistic. It also unbalances the budget, and increases the costs of basic activities such as electricity production and transport. Either their prices will be adjusted, in which case the upward trend in prices is strengthened, or they will be held constant, in which case the enterprises will lack short-term financing for investment. Since consumption will at the same time be stimulated, familiar problems of shortage of capacity will appear.

While, therefore, there are many ways in which the process may begin, it will in time, however it started, show certain predictable symptoms, including a strained foreign balance, and shortages of particular types of goods.

It should be noted that a different theory is required to explain inflation in semi-industrialized countries like Brazil or Chile and in fully developed countries. In the former case, the model has to allow for the changing patterns of demand, due to urbanization, for the high share of food in workers' expenditure, for hindrances to the mobility of labour and of capital, for the general impossibility of selling export products in the home markets, for the chronic shortage of productive capacity, for the lack of certain industries (notably those producing capital equipment), for the inflexibility of the fiscal mechanism and so on. These are features which do not have to be given the same weight (or, in some cases, any weight at all) in the analysis of inflation in developed economies.

Besides, a general theoretical explanation of Latin American experience has to take account of dynamic factors such as population growth. This compels government initiative in providing social and economic capital, and in creating employment opportunities if these do not emerge. Analysis of trends in this region also has to allow for adverse secular trends in markets for primary commodities, and an income-elasticity of demand for imports greater than unity.

The process which has been described cannot be classified as one of "cost" inflation or of "demand" inflation, in the manner customary in professional discussion in Western Europe and North America. It has elements of both, but also structural features and trends which are peculiar to less developed economies.

The importance of various aspects of this process varies from country to country, according to the rate at which each grows, its experience with foreign trade, its economic and social structure, and the policies which its Government puts into effect. In some cases the external and internal obstacles to growth make it difficult for Governments intent on economic development to avoid inflation, at least in the short run (i.e. until they can make structural improvements). In others, due advantage may not be taken of a favourable structural situation and possibilities of expanding trade. Perhaps the need to develop basic sectors is ignored, or export markets are lost because of ill-conceived policies in the spheres of public investment, or irresponsible fiscal, monetary or wages policy. Developments in Argentina in the years after the last war illustrate these points.

In the remainder of the present paper the experience of Latin America in the past three decades is summarized with special attention to these questions. First the situation in 1929 is described, with some reference to the inherited obstacles to structural transformation; then the same section III deals with the decline in exports during the depression, the wartime shortages, the postwar boom and the problems raised by the attempts to pursue development policies in the past decade despite recurrent weaknesses in commodity markets. Section IV discusses some features of the policies which have been followed in the attempt to cope with these problems.

III. A SUMMARY OF THE RELATION BETWEEN GROWTH AND INFLATION, 1929 TO 1959

1. The position in 1929[2]

During the nineteenth century, the economy of every country in the region had become organized very largely around its export industries. By the time of the First World War, the main features of economic structure could be summarized as follows. A substantial part of the proceeds of exports was earned by plantations, large cattle farms or mines. Much of this income flowed straight out again. Some of it was remitted as profits to foreign companies or absentee landowners; the rent and profits received by local property owners were mostly spent on imports. The remainder entered the local economy by two main channels, namely, taxes on foreign trade and profits of export and import merchants. These sustained civil service bureaucracies and commercial life in the large cities, where some manufacturing activities could be found, such as food processing and the clothing industry. A considerable fraction of the population, often those of Indian or Negro stock, worked on estates, plantations or on smallholdings, or on communal land, for little or no remuneration, so they hardly counted as part of the consumer market. They were also cut off from the city labour markets, not merely by distance and bad transport, but also by illiteracy, lack of technical skill, and quasi-feudal obligations to their employers and landlords.

It must not be inferred from these generalizations that all economies were at the same level in the early decades of this century. The scale of manufacturing, the extent of commercial agriculture, and the degree of urbanization varied greatly. Broadly speaking, they were all much more in evidence in the Southern Zone of the region, where the original pattern of colonization had been modified by the extensive immigration of artisans, entrepreneurs and working farmers. In Argentina, particularly, the economy had become quite highly unified geographically and socially, at least by comparison with that of other countries in the region.

Where the process of industrialization had already got under way, it received a vigorous impulse from the conditions produced by the war of 1914-18. Imports became hard to get. Shipping grew scarce; blockades were maintained by the belligerent powers; and both European and, eventually, North American industries were diverted to the manufacture of armaments and munitions. By the 1920's, Chile, Mexico, Uruguay and (especially) the south

[2] The reader should bear in mind that because not a great deal of research has been done on the economic development of Latin America, not enough is known of the structure of most countries, even in a period as recent as the 1920's.

of Brazil, were well on the same road that had been taken earlier by Argentina. Substantial proportions of the population were living in urban areas, and local industries could by now satisfy a significant fraction of local demand. The same signs of progress were also appearing in Colombia, Cuba, Peru, and Venezuela, although the degree of self-sufficiency they showed was lower, and typical of an earlier stage of development. Meanwhile, Argentine industry was expanding into new fields, such as engineering.

Yet all the Latin American economies were still vulnerable to fluctuations in foreign trade. Their exports, which provided a high proportion of income, consisted of a few important products, perhaps only a single item, and were sold to a limited number of buyer countries. The sectors producing for export had, except in the cases of Argentina and Uruguay, very limited possibilities of selling their output inside the economy. Even those countries which were becoming industrialized, and thus growing less dependent on the income generated by exports, were vulnerable to the vicissitudes of external trade, though in a different way. Certain types of goods, not only advanced consumer goods, but also nearly all capital goods and intermediate products had to be imported. The more advanced economies were coming to rely heavily on receipts of foreign exchange to provide the materials and equipment for their industrial sectors.

Despite the progress that had been made, internal developments continued to be hampered by the lack of economic integration. Some improvement had been made in the cultivation of export crops, but little technical progress could be seen in agricultural production for the home market. While owners of large estates still used the major part of their land, even when arable, as unorganized cattle grazing, the peasants on smallholdings or communal land were employing techniques which were decades or even centuries out of date. Industrial firms, lacking the domestic hinterland they needed for large-scale production, were often inefficient and/or monopolistic.

Nevertheless, as long as world trade was buoyant, as it was in most of the 1920's, economies did continue to grow. Exports expanded, private investment by foreigners was heavy, and Governments could raise considerable finance overseas for public works. Incomes rose, and with them consumption and tax revenues. The cities were able to absorb a continuous flow of migrants from the country districts, attracted not merely by higher incomes, but also by amenities and services such as electricity, water supplies and schools, and in some cases by greater safety.

These physical changes in Latin American economies had been accompanied by others of a financial nature. In the nineteenth century, a number of countries had still used dollars for local currency, while those with their own money had kept it tied to gold; foreign banks had provided most of the financial services. The countries of the Southern Zone which had made most progress economically had begun to show greater financial independence. In an attempt to alleviate the consequences of slumps in world trade, they devalued their currencies, on occasion, and often suspended convertibility into gold. In addition, locally-owned commercial banks played a growing part in the financial life of the more industrialized countries, and during the 1920's several central banks were established.

These moves towards monetary independence had, however, met with setbacks from time to time. There had already been bouts of inflation, especially in Chile, and on occasion local banks had been forced to close their doors. Sometimes devaluation could be ascribed to plain mismanagement of national finance. After the severe financial crises of 1921, when commodity markets had collapsed, there was a general attempt to return to the gold standard. Latin America was in this matter following the example of European countries which were trying to re-establish the international monetary system that had broken down in the First World War.[3]

One of the consequences was that economic policy, in its present form and scope, was not applied in 1929 in any part of the region. Observance of the rules of the gold standard meant that certain problems never arose. A shortage of foreign reserves could hardly occur, and any incipient price inflation would be braked by shortage of money before it could gather momentum. Among the virtues of the gold standard was that it achieved these ends almost automatically, and problems requiring political decision and administrative action were less acute.

Few instruments for policy had as yet been created. Taxation was relatively low, being based mainly on import duties, and since a chronic budget deficit would have been hard to finance, expenditure was also limited. Despite the moves towards financial independence, monetary systems were still hardly developed enough to give much scope for deliberate policy. Exchange controls and multiple rates were as yet unknown. In any case, the material basis for a more active and independent policy hardly existed in most countries, at least in the short run, if the lack of local capacity for producing manufactures is taken into account. Monetary expansion would have led quickly to an increase in imports and an unacceptable loss of foreign reserves. Furthermore, the political pressures for such policies were limited, since power was effectively in the hands of those not entirely dissatisfied with developments, and even the discontented could still find some scope for the improvement of their conditions so long as national products were rising and it was possible for them to move out of backward sectors of the economy.

But the almost complete absence of conscious economic strategy proved a serious handicap in the years that followed. Administrations were not gaining experience in formulating policy and carrying it out; statistics were not being demanded because they were not needed, so they remained almost non-existent; and political leaders had become accustomed to thinking that economic developments were, broadly speaking, outside their control and therefore not their responsibility.

2. The consequences of the depression: new alternatives for economic policy emerge

Great though its merits were, in retrospect it is hard to believe that this time the larger economies of the region would have been prepared, or indeed able, to maintain the rules of the gold standard indefinitely, even if fluctuations in foreign trade had been avoided. These rules implied an overriding priority for balancing payments

[3] In one respect most Latin American countries departed from strict gold standard conventions; holdings of the currencies of the industrial countries were treated as if they were gold for the purposes of currency regulations and conventions. It was convenient to hold the currencies of trading partners, and, since they were in fact fully convertible into gold, a "gold exchange standard", as it has been called, was for countries of the region a natural departure from practices followed overseas.

and for stabilizing the domestic price level. Income and employment could grow and recessions could be avoided, but only if foreign trade continued to expand. Thus the rate of expansion depended in the last resort on the pace at which national products were growing in the leading industrial countries of North America and Western Europe, a pace which might prove too slow for an area with low *per capita* incomes and a fast rate of population increase.

However, the question was never put to the test. The depression which started in 1929 was so harsh that the gold standard was discarded as unworkable by the whole world, including the industrial countries themselves. World trade plunged sharply and speculative movements of capital were heavy. The leading industrial countries abandoned convertibility into gold one after another and devalued their currencies. Those that retained the gold standard, as France did, found their exports more and more difficult to market; they had to bring imports down by inducing a fall in activity, and therefore in employment, of a magnitude that in the end proved to be intolerable. The abandonment of the gold standard was the necessary condition for the adoption of anti-cyclical programmes, such as public works schemes, which became increasingly necessary.

The slump came as a particularly severe shock to Latin America. Public revenues depended heavily on the taxation of foreign trade; and investment was being largely financed by foreign companies in export industries or in sectors which were linked with them. So the decline in exports, which was in any case relatively much sharper than in the industrial countries, meant reductions in income throughout the economy. At the same time, the foreign exchange shortage was aggravated by the drying up of the inflow of short-term capital, even in some cases by its reversal. Countries which were accustomed to relying on foreign sources for much of their supplies found it hard to make the necessary cut in their imports.

Governments revoked convertibility, not only into gold, but also into foreign currencies. This led to the appearance of free markets in which exchange rates were at a discount compared with official quotations and fluctuated from day to day. These were not the only breaches that occurred in the old economic order. Like many other countries, industrial or primary producer, those in Latin America introduced import quotas in an attempt to correct the deficit in foreign payments and increased duties on imports. (The United States had raised its tariff walls in 1930, under the Smoot-Hawley Act.) Many of them also defaulted on foreign debts, as a number of European countries were doing. Furthermore, several attempts were made, not very successfully, to stabilize commodity prices by international measures to control output.

Apart from these steps, which were common to almost the whole region, one group of countries took additional measures, whereas the remainder did not, and there has been a clear distinction between these two groups ever since. The additional measures can be summed up as autonomous monetary expansion, autonomous in the sense that it was much greater than would have been justified by movements in reserves. This was accompanied by legal and institutional changes such as the establishment of new central banks, or an increase in the power of those that already existed.

The countries which did take such autonomous action were, broadly speaking, the largest and those already partially industrialized—Argentina, Brazil, Chile, Colombia and Mexico. They had the greatest incentive to attempt some form of compensation. Unemployment was a severe problem for their large city populations, which were not by any means powerless politically, and domestic bankers were threatened by the inability to meet current obligations. These countries had, moreover, the greatest scope for action: they had industries which could supply some at least of the needs of the local consumer and absorb some of the unemployment (see table 1).

It must not be thought that compensatory action was in all cases deliberately chosen as an economic strategy and that exchange control was imposed to stop the consequent loss of reserves. The crisis developed so quickly that administrations improvised as best they could. Budget deficits appeared because revenues were falling fast, and the expansion of credit was often decided on at a few hours' notice to save banks from having to close their doors.

Although it was some time before the gold standard was consciously and finally rejected, each step represented a further break with conventional monetary standards. Backing for the currency fell; further devaluation occurred *vis-à-vis* not merely gold, but also the United States dollar; and more controls were imposed on purchases of foreign exchange. But the depression was gradually changing attitudes as to what constituted permissible policy. Overseas, both professional and political opinion was swinging round in favour of the conscious use of fiscal and monetary policy, backed where necessary by direct controls, to prevent or cure cyclical depressions. The practical example of the "New Deal" in the United States was a particularly powerful stimulus to those Latin Americans who were urging a different and more autonomous approach.

Although a number of Latin American economies had already been in some degree diversified by the end of the previous decade, the depression demonstrated how far this process was from being complete by revealing how much they still depended on imports. Because of the shortage of foreign exchange, the imports of Argentina, Brazil and Mexico shrank in volume by more than one half between 1929 and 1932, and those of Chile fell by more than three quarters. Indeed, according to the League of Nations *World Economic Report*, 1932-33, Chilean exports and imports fell more than any other of the thirty-nine countries covered. The problem of maintaining living standards and limiting unemployment was in part one of adapting financial policy to the new circumstances, but in real terms it was a question of replacing imports with domestic products on a big scale and at short notice—particulary imports of manufacture.

A strong impetus was given to industrialization by the measures taken to protect reserves of foreign exchange. Devaluation, import quotas, higher tariffs—all these had the incidental effect of opening up new markets for the domestic producer, or strengthening his position against foreign competition. The sudden expansion of manufacturing was not, however, easy. One obstacle was the difficulty of financing it. Investment by foreigners was now small; private savings had been depressed by the decline in incomes; and equipment had become expensive to import, because of devaluation. There were also more deeply-rooted handicaps to be overcome. The labour force lacked the range of skills needed; the land-owning class

Table 1

LATIN AMERICA: INDICATORS OF ECONOMIC SIZE AND STRUCTURAL CHARACTERISTICS

(Average 1950-1952)

Country	Approximate gross domestic product ($US millions) (1)	City[a] population as % of total population[b] (2)	Manufacturing output as % of G.D.P. (3)	Exports as % of G.D.P.[c] (4)
Group U *Countries which have experienced rapid inflation*				
(a) *Semi-industrial economies*				
Brazil	11 000	13	21	12
Argentina	10 000	37	23	9
Mexico	6 000	15	21	14[e]
Colombia	3 000	15	18	14
Chile	2 000	29	17	11
Peru	1 000	8[d]	16	16
Uruguay		33[e]	...	18
(b) *Non-industrialized economies*				
Bolivia	Under 500	11	...	18
Paraguay		15	...	9
Group total	33 000	18	21[f]	12
Group O *Countries which have experienced only moderate inflation*				
Venezuela	4 000	17	8	35
Cuba	2 000	22	...	32
Costa Rica	Under 500	18	...	17
Dominican Republic		9	...	26
Ecuador		15	14	13
El Salvador		9	12	20
Guatemala		10	...	18
Haiti		4	...	15
Honduras		—	9	24
Nicaragua		10	...	18
Panama		16	11	34[e]
Group total	10 000	13	9[f]	29

SOURCES: (1), (3) and (4), ECLA, on the basis of national statistics.
(2) *Demographic Aspects of Urbanization* (Population Branch, United Nations, E/CN.12/URB. 18).

[a] "City" population is defined as the population in urban centres of more than 100 thousand. It should be borne in mind that the definition of an "urban centre" varies from country to country.
[b] The year is 1950 or the nearest census.
[c] Exports of goods, except for Mexico and Panama (goods and services).
[d] 1940.
[e] Estimated by Kingsley Davis and Hilda Hertz (*Bulletin of International Statistical Institute*, Vol. XXXIII, Part IV, p. 237), since no census has been taken since 1908.
[f] Average of countries for which data are available.

was often unwilling to invest time and energy in new tasks to which, whatever their economic rationale, the traditional social prestige of agricultural activity did not attach; and those in trade and commerce usually preferred to follow in their customary family business, rather than undertake the risky and exacting work of founding industrial enterprises.

As regards physical inputs, the new industries' needs in respect of fuel, materials and semi-manufactures were heavy. Moreover, industrialization induced an increased demand for foodstuffs in the cities. What was required, and what was indeed imposed by the circumstances, was a wholesale transformation of the economy. This placed novel demands on a transport system which had been designed mainly as an ancillary to foreign trade.

The official bureaucracy was also hardly capable of meeting the administrative requirements of the new situation. There was, as in many other parts of the world, a severe shortage of public servants capable of framing economic strategy and administering import controls in such a way as to minimize the tensions of the process. Statistics were still, in any case, of such a low quality that policy was inevitably based on "hunches" or biased information.

Although the industrial sector did, in general, grow in response to this stimulus, the products of the new industries were usually expensive. New factories, like the old, were often very small and inefficient and competition was still far from perfect. The response of agriculture was even more inadequate to the demands of the new

situation. If allowance is made for the imported fuel and equipment needed by the new industries and for heavy consumer demand, in part stimulated by excessively expansionist policies, it is not surprising that the demand for foreign exchange did not abate; exchange rates were under continuous pressure.

In Brazil, Chile and Mexico, price levels tended to rise after 1932 (see figure I). This was not true of Argentina and Uruguay. One reason was that the failure of their export markets released foodstuffs which could be consumed at home. Secondly, Argentina had made most progress in industrialization previously: a sizable industrial sector was already in existence at the start of the slump, with some surplus capacity, so substitution for imports involved a less radical departure from previous economic patterns. Thirdly, both countries were reasonably supplied with basic social capital like transport and electricity which facilitated the establishment of new industries; and the social environment itself made it easier than elsewhere to find entrepreneurs and suitable workers. Fourthly, Argentina's fiscal and monetary policy was managed in such a way as to offset the effects of fluctuations in foreign trade; and, finally, industrialization there was relatively well balanced.

This experience is an interesting illustration of the relative significance of monetary and real factors, which was discussed above. It is possible to attribute currency devaluation and price rises to the laxness of the authorities, who expanded the supply of money, thus permitting Government deficits to occur and also the extension of more credit to the private sector. If this monetary expansion had not occurred, prices and exchange rates would probably have changed but little on balance over this decade. But we must take account of the context of monetary policy. Faced with a catastrophic fall in exports, which was the original cause of the trouble, those responsible for policy had to make a series of choices between unpleasant alternatives. When revenue fell off, for example, Governments were presented with a dilemma. On the one hand, they could make equally drastic reductions in expenditure and face the social implications of this, at a time when unemployment was already rising to dangerous levels. Alternatively, they could resort to deficit finance. Similarly, the monetary authorities had to decide whether to contract credit, when their foreign reserves declined, and they had to make this decision at a time when commercial banks and business houses were already under severe financial stress. In many cases, the strain on the balance of payments and price inflation would have been much less if policy had been carefully framed, but the authorities ran risks either way, whether their policy was expansionist or restrictive. In several large economies, they chose rising prices and devaluation rather than falling incomes and unemployment.

In view of the political circumstances of the times in these countries, which included civil disturbance, it is doubtful whether any other choice was possible. Authorities who tried to adhere to strictly orthodox policies were usually removed from office.

Most of the remaining countries of the region either refrained from carrying out autonomous monetary policies, or at any rate did less in this direction and stopped them sooner. Both the need and the opportunity in the small economies of Central America and the Caribbean were limited. For one thing, urban proletariats were relatively smaller. While the depression meant severe hardship, a great part of the population worked in subsistence sectors only remotely affected by fluctuations in the commercial part of the economy. Political pressure from this quarter to maintain incomes was therefore not very strong. The banking systems were, moreover, largely in foreign hands and there was opposition to measures which might lead to devaluation of the currency.

In any event, the scope for expansionist policies was quite limited in economies which were still essentially dependent on exports and with relatively small manufacturing sectors. A country which has experienced only a little industrialization is particulary deficient in the economic, social and political conditions for further progress in this direction.

Three such countries did attempt unorthodox financial policies at this time and in each case prices rose sharply during the 1930's though the evidence of this is partly the indirect one of exchange devaluation (see table 2). Bolivia suffered from a severe decline in tin exports, which immediately unbalanced the budget, and on top of this came the Chaco war, fought in the midst of the

Table 2

LATIN AMERICA: CURRENCY UNITS[a] PER UNITED STATES DOLLAR,[b] 1929 TO 1959

	1929 (ave.)	*1940 (end)*	*1945 (end)*	*1951 (end)*	*1959 (end)*
Group U					
(a)					
Brazil (Cr.) . .	9	20	20	20	202
Argentina (Peso)	2	4	5	14	83
Mexico (Peso) .	2	5	5	9	12
Colombia (Peso)	1	2	2	3	7
Chile (Peso) . .	8	34	32	93	1 052
Peru (Sol) . . .	2	7	7	15	28
Uruguay (Peso).	1	3	2	2	11
(b)					
Bolivia (Bol.) . .	3	61	64	247[c]	11 885
Paraguay (Guaraní)	...	4	3	32	128
Group O					
Venezuela (Bol.)	5	3	3	3	3
Cuba (Peso) . .	1	1	1	1	1
Costa Rica (Colon)	4	6	6	7	7
Dominican Republic (Peso)[d]	1	1	1	1	1
Ecuador (Sucre)	5	15	14	17	17
El Salvador (Colon)	2	3	3	3	3
Guatemala (Quetzal)	1	1	1	1	1
Haiti (Gourde) .	5	5	5	5	5
Honduras (Lempira)	...	2	2	2	2
Nicaragua (Cond.)	...	6	6	7	7
Panama (Balboa)[e]	1	1	1	1	1

SOURCES: League of Nations *Statistical Yearbook*, and International Monetary Fund *International Financial Statistics*.

[a] Free market rates, where applicable and available. This table is only designed to give a general indication of movements in exchange rates. For details refer to sources.

[b] It should be noted that the dollar was itself devalued by 41 per cent in terms of its gold parity in January 1934.

[c] August 1952.

[d] Prior to October 1947, the dollar was legal currency.

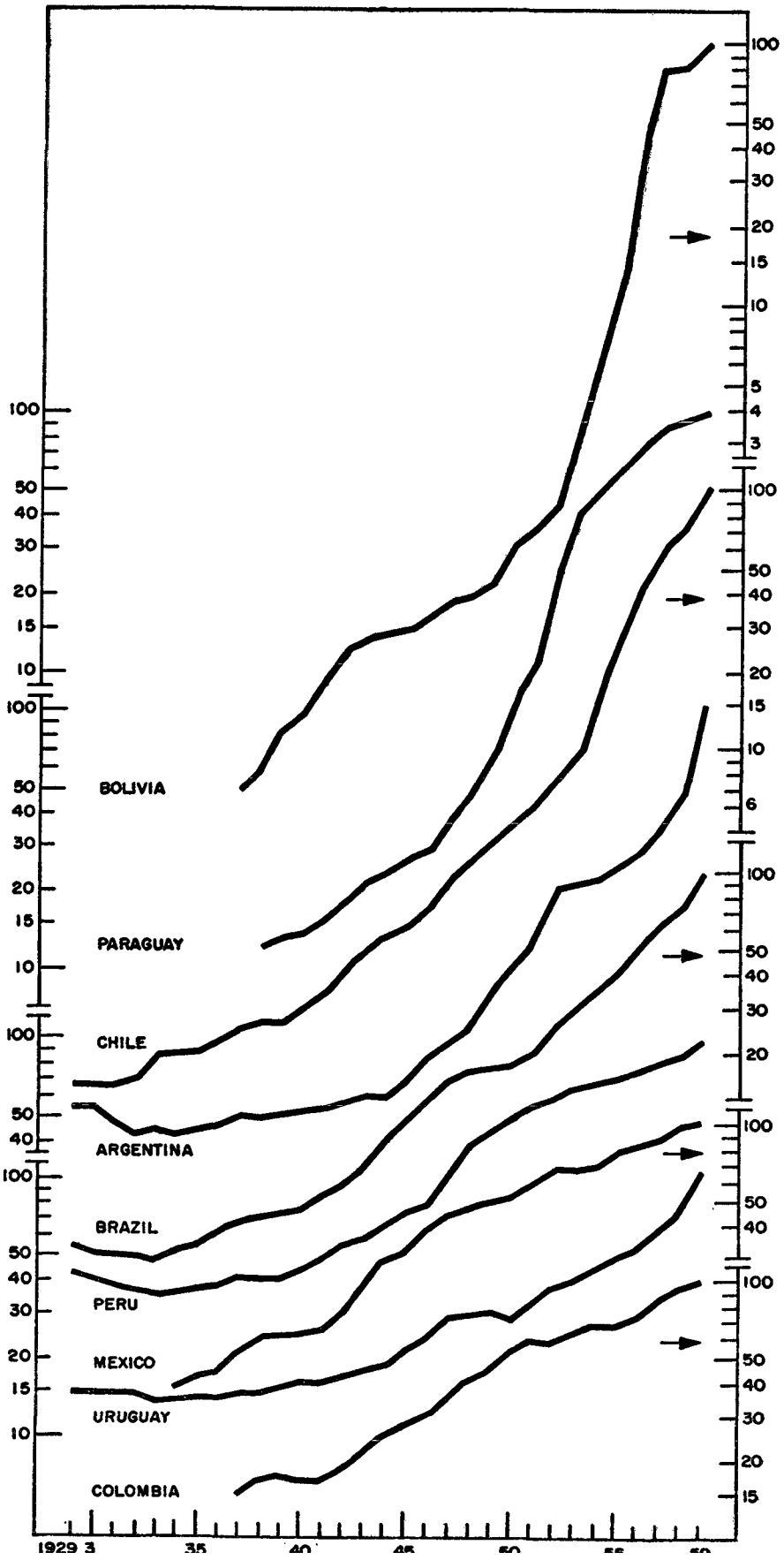
[e] Currency consists of United States notes and currency together with the balboa and subsidiary coins.

Figure I

COST OF LIVING

(Indices 1959 = 100)

SEMI-LOGARITHMIC SCALE



depression. The consequence could only be an unmanageable demand for imports, leading to successive devaluations and internal price rises.[4] In Ecuador and Nicaragua, also, monetary expansion led to steep price rises, without alleviating internal conditions appreciably.

The countries of the region are usually divided into two groups. Exchange rates of countries in the Caribbean area and Central America which had suffered *de facto* devaluation nearly all regained the former parity with the United States dollar, or something close to it, as the depression came to an end and made their currencies once more convertible into dollars. They were in effect now on a dollar standard and they continued to maintain orthodox financial practices in the following decades as well. These countries experienced only moderate price rises over the three past decades. Nicaragua has reverted to more conservative practices in the past decade and price rises have slowed down there; Ecuador can also be included in the group, taking the period as a whole.

Venezuela falls into this class too. It possessed in petroleum an export which has proved easy to market until quite recently, and earnings of foreign exchange have climbed very rapidly. Even in the depression, the upward trend was halted, rather than reversed. The need for compensatory policy did not therefore arise in the 1930's and the Venezuelan bolivar was so strong that it appreciated *vis-à-vis* the United States dollar. (See again table 2.)

There are therefore eleven countries which have followed, in general, orthodox policies in the matter of reserves (see table 3) for most of the past thirty years and which have, on the whole, experienced only moderate increases in prices (see figure II). These countries will be known as Group O. They are mostly small economies, unindustrialized and heavily dependent on foreign trade (see table 1). Even Cuba and Venezuela, although much larger, had in 1950 only narrow manufacturing sectors by comparison with their export industries. This type of economic structure tended to be preserved, as in certain other countries, by reciprocal trade agreements with the United States, which offered special marketing advantages for sugar and petroleum respectively, in return for undertakings to restrict the protection of local industries.

The other nine countries of Latin America have mostly followed less orthodox financial policies and have experienced, particularly in the past decade, steady-to-fast price inflation and a series of devalutions. Seven of these are the more industrialized economies of the region, most of which are also large and highly urbanized. As a general rule, exports account for a smaller proportion of output (see again table 1).[5] Bolivia and Paraguay are the other two countries which have followed unorthodox financial policies. Paraguay began to do so after the war. Structurally and in size they belong to the former group. But precisely because they lacked the industrial capacity needed for an expansionist policy, they experienced particularly violent bouts of inflation. So they form a special class.

[4] Paraguay, Bolivia's protagonist in the war, financed its military expenditures by means which were financially more orthodox and did not, at this time, experience inflation.

[5] The figures shown for Brazil in table 1 may be slightly misleading, since the country includes a large, backward, rural area in the North-East. Thus about 20 per cent of the population in the Centre and South lived in cities.

Table 3

LATIN AMERICA: BACKING FOR LOCAL CURRENCIES, 1937, 1940, 1945, 1950 AND 1958

(Central Bank foreign assets as percentage of currency issue[a] end-year)

Country	*1937*	*1940*	*1945*	*1950*	*1958*
Group U					
(a)					
Brazil	23[c]	24[c]	89[c]	51	9
Argentina[b]	158	134	220	23	— 8
Mexico	37[c]	42[c]	95[c]	87	70
Colombia	54	55	142	42	29
Chile	25	15	55	28	7
Peru	62	41	35	55	12
Uruguay	...	131	261	124	27
(b)					
Bolivia	60	62	98	60	33
Paraguay	...	18	133	12[d]	44
Group O					
Venezuela	116[c]	112[c]	84[c]	144	239
Cuba	31[c]	32[c]	139[c]	138	83
Costa Rica	29	21	61	22	61
Dominican Republic	122	210[c]	259	99	89
Ecuador	81	120	139	118	67
El Salvador	113	115	147	134	95
Guatemala	90	126	152	96	88
Haiti[b] [e]	...	...	...	96	— 17
Honduras	70[c]	49[c]	129[c]	108	44
Nicaragua	25	91	74	29	43
Panama[f]	...	...	...	...	...

SOURCE: International Monetary Fund, *International Financial Statistics.*

[a] Gross foreign assets of Central Bank except where otherwise indicated, and currency in circulation, as shown in the "monetary survey" section of *International Financial Statistics.*

[b] Net assets.

[c] For 1937, 1940 and 1945 *Banco do Brasil* only for both foreign assets and currency liabilities. Subsequently the foreign assets of "other monetary authorities" were included, and the currency was the net total as for other countries.

[d] 1952. The Central Bank was formed that year, and the figures for 1952 and 1958 refer to its reserves and currency liabilities. For 1937, 1940 and 1945 foreign assets are those of the *Banco del Paraguay* but currency is the net total in circulation.

[e] Reserves of the whole banking system.

[f] Currency consists of United States coins and notes, and a limited number of silver balboas. There are also substantial holdings of dollar assets by the Government, banks and private individuals. So the backing is much more than 100 per cent.

3. THE COMMON PROBLEMS OF THE WAR YEARS

The fundamental contrast between these types of economy was for a time not very obvious. When the world pulled out of the depression, Latin American imports rose and local price inflations slowed down to a halt. Accordingly, by the end of the 1930's movements in prices appeared to be once more in step. During the war they accelerated again in almost every country.

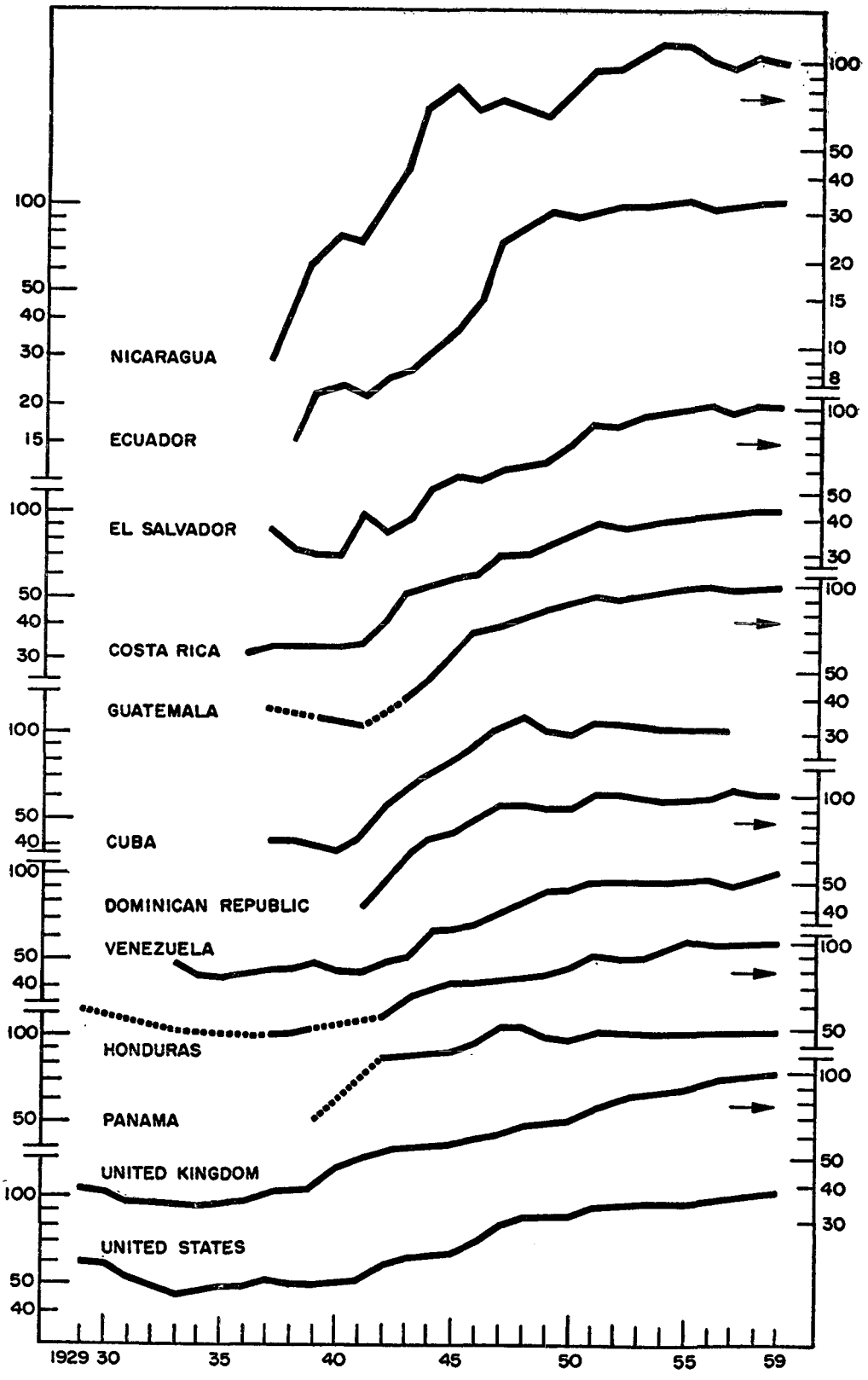
This even occurred in economies of Group O. Their exports rose in nearly every case. The entire crops of the sugar-producing countries were purchased, usually by the United States; and firm contracts were offered by the same country for supplies of certain minerals, cereals and agricultural materials. Some countries, for example Haiti, were provided with financial and technical assistance for

Figure II

COST OF LIVING

(Indices 1959 = 100)

SEMI-LOGARITHMIC SCALE



SOURCE: National statistics.

the development of new products. Even non-essentials like cacao and coffee profited from high prices. An exception was banana exports, which fell to very low levels; because of the need for special shipping facilities, bananas did not have much priority in the supply programmes of belligerent countries.

But imports were prevented from rising in step with exports. Goods from Western Europe became increasingly difficult to obtain. These could largely be replaced by purchases from the United States up to the time of the attack on Pearl Harbor; thenceforward the conversion of industry to war purposes in the United States, the shortage of shipping space, and submarine warfare in the Caribbean area severely limited supplies to Latin America. In some cases, the landed cost of imports rose, but the rise was limited because of price controls in the United States.

The expansion of incomes in export industries was therefore much bigger than the rise in the value of imports, and the automatic brake on inflation in dollar-standard countries ceased to function. Increases in foreign reserves induced an expansion of credit and thus stimulated investment in other sectors, so that the total expansion in demand was big. But these economies were quite unable to satisfy certain types of demands themselves. The net result was a moderate-to-fast rise in prices. Figure II shows the price increases in these countries during this period.

The situation was not, in broad outline, very different in the countries which had been following more expansive monetary policies in the 1930's. Heavy exports were expanding demand, and internal activity was not only stimulated by an export surplus but also by a great increase in the liquidity of the banking systems of several countries owing to the arrival of foreign capital seeking refuge from the war. In some cases, the authorities tried to dampen the effect on credit of the growth of reserves. In Colombia, increases in deposits had to be invested in non-negotiable bonds, which businesses were also compelled to buy, and in Mexico the authorities sold gold to absorb currency, as well as taking measures to limit credit. Authorities in other countries, however, followed less strict policies: now that the rules of the gold standard had been abandoned, there were no generally accepted set of principles for policy.

A further fillip was given to import substitution, although the reason was no longer the shortage of foreign exchange. The nine countries of Group U were beset not merely by the same supply problems as the other group, but also, excepting Mexico and Colombia, with the additional difficulty of long hauls from the United States to their ports. Yet the very circumstances that made it difficult to import finished products also discouraged purchases of the machinery, materials and fuel which were needed to manufacture them domestically.

Demand for the products of local secondary industry was so high that it stretched capacity to the limit. The war revealed weaknesses in other sectors too. In Peru, for example, food imports were cut by five sixths between 1940 and 1942; and while local production was stimulated, areas of chronic shortage emerged, because of the poor communications inside the country. In Brazil, fuel was a serious problem. Wood and coffee were widely used as sources of energy; coal and gasoline were rationed; petrol was increasingly adulterated with alcohol, and by 1942 cars and lorries were running on gas generated from alcohol and lignite. In Argentina, too, there was an acute shortage of energy supplies. In 1943 alone, 1.7 million tons of wheat, 1.5 million tons of flax and linseed and 0.1 million tons of maize were burned as fuel.[6] Another general weakness in the region was in basic metals; big efforts were made to develop local resources of iron ore, and such furnaces that existed were used intensively. The shortage of equipment was possibly most severe in transport. The railway from São Paulo to Rio de Janeiro, for example, was at times only allowed to carry foodstuffs and fuels.[7]

These structural weaknesses did not check the rate of growth. Despite difficulties, important acts of investment were carried out. For example, construction of the Volta Redonda steel plant was started in Brazil, and industries for making simple types of capital goods were established there. The consequence for many countries was a tendency for prices to rise, rather than stagnation. In the effort to avoid the dangers of inflation, Governments once more followed the example of the industrial countries. Although some excess demand was considered inevitable in the United Kingdom and the United States because of the heavy burden of war finance, a big attempt was made to control prices in both these countries on the grounds that inflation would hamper the war effort. Price control plans were also drawn up in Latin America, in some cases with the assistance of United States experts. In a number of countries, these were highly detailed: local price committees were set up in every Paraguayan town, for example: the Peruvian Government controlled food distribution; and in Brazil and Colombia, price controls were backed by elaborate systems of checking inventories and licensing production and imports. In practice, Latin American schemes seem to have had very much less success, judging by index numbers of prices, than those of the developed countries.

The smallest price increases for this group occurred in Argentina. Rents were frozen there, but the main explanation, as in the depression, was a better fit between the patterns of supply and demand than in other countries. Supplies of foodstuffs that could not be delivered to overseas customers were diverted into the home market. Government controls were actually used at times to prevent food prices falling severely. Manufacturing industry was better placed to cope with the situation. It was able, for example, to keep much of the existing equipment in service by repairing or reconditioning it locally.

The degree of inflation in various countries could again be explained by referring to changes in the means of payment. But this is not particularly enlightening. The origin of the problem was that imports were being reduced while exports were rising. It was this that led to a general expansion of credit and incomes in the countries where special steps were not taken to prevent it. Moreover, the shortage of imports was simultaneously creating supply bottlenecks which could not be relieved until more food, fuel, materials and equipment could be ordered from overseas. Consequently, price increases in particular com-

[6] ECLA, *Economic Survey of Latin America, 1949* (E/CN.12/164/Rev.1), citing the *Comité Argentino de Energía.*

[7] One effect of the shortages of supplies was a vigorous increase in trade among Latin American countries. This more than doubled between 1939 and 1943. The industries of Argentina, Brazil and Mexico were in the best position to meet this challenge and their exports of semi-manufactures and manufactures rose to several times the pre-war levels.

modities, notably food, led to wage demands. A purely monetary approach might lead to the conclusion that financial policy would have dealt with the whole problem successfully; certainly a firmer fiscal and monetary policy by the authorities in many countries would have checked the general excess demand and reduced the pace of inflation. But supply problems in certain sectors could hardly be eased by global policies.

4. The immediate post-war period: the re-emergence of economic policy alternatives

The years following the armistice were, like the middle of the 1920's, a period of prosperity in primary-producing countries. Reserves were high and exports rose rapidly as transport difficulties were eased.[8] The industrial countries required big increases in supplies of primary commodities to enable them to reconvert their industries to peace-time needs and to build up their inventories at all stages from goods-in-transit to final products.

Banking systems in Latin America were very liquid and sections of the public held big bank deposits, so demand was buoyant. All types of imports rose rapidly. The rise in imports of fuel and materials eased the restraints on domestic production. It took, however, a certain time to make up for the years in which investment had lagged and no equipment had been bought for transport and electric power and to re-equip local industries, for one reason because there were long delays before orders for capital goods could be filled. So certain shortages still lingered on.

Price structures were quite distorted by the time the war came to an end. As international trade was resumed, it became clear that many Latin American currencies were now overvalued, and shortages and controls had produced internal price relationships which were not likely to endure. It is theoretically possible for such distortions to be corrected by rises in some prices and falls in others. But under the booming conditions of trade, with rising export and import prices and some persistent shortages, the general movement was upwards.

In different parts of the region experience once again started to diverge. In the countries of Group O, currencies remained fully convertible, and these became known, together with Canada and the United States, as the "dollar area", or the "hard currency area".[9] Here the rise in prices was limited. As imports climbed and reserves were run down—if not in absolute terms, at least relative to the national product—the mechanism of a conventional monetary system, which equilibrates the balance of payments and checks price inflation, gradually took charge once more. The price rises which did occur in these countries after the war were mainly the reflection of developments abroad. Many of them import not merely manufactures but also staple foods, materials and fuels, so increases in import prices spread throughout the whole economy. Moreover, since export prices were also climbing and volumes increasing, the money supply could be expanded sufficiently to accomodate a general rise in the price level. This was a pure case of "imported inflation".

The countries in this group, which had experienced the biggest price rise during the war, ended it with their banking system rather less liquid and with exchange rates which were more obviously overvalued. So the operation of the dollar standard mechanism was quicker and more drastic. Thus in Nicaragua, where prices trebled between 1940 and 1945, they subsequently became stabilized at a lower level and in Cuba, the not-quite-so-fast rise went on until 1948, before tapering off. For most members of the group, the trend in prices was always upwards but it slowed down after the middle of 1948. This reflected the deceleration of price increases in the United States, which went through a brief recession in 1949.

In the group of countries which were following more flexible monetary policies, developments were different. The exchange position at the end of the war gave a rather illusory impression of strength, since part of the reserves represented capital which had fled from the vicissitudes of war and which was now due for repatriation. Moreover, the rise in world prices was steadily reducing the real value of these reserves. Nevertheless, for some years, the foreign balance did not appear a very urgent matter in most of these countries. Consequently, there was some room for choice in policy. The growing acceptance of Keynesian doctrines overseas was having an impression on Latin American authorities after being improperly used to justify inflation. So were measures in Western Europe to redistribute income, such as the "Welfare State" in the United Kingdom. In the generally expansionist atmosphere, budget deficits and rapidly rising imports were common, while the possibilities of expanding export industries and seeking new ones were not widely explored.

The most vivid example of this was the case of Argentina. We have seen that since this country exports staple foods, it can absorb what it cannot sell abroad. For the same reason, the level of exports depends to a considerable degree on how much is left over from domestic consumption. Price and wage policies after 1945 had the effect of raising the purchasing power of wages in terms of traditional export products. Real wages in Argentina rose by 50 per cent between 1944 and 1947, while domestic prices of traditional exports (though not other farm products) were prevented from following the upward trends in overseas prices. Argentina therefore never fully recovered its pre-war markets for agricultural commodities, especially grains. Imports, on the other hand, rose to a high level, and there was a swift decline in foreign reserves (from 1,700 million dollars at the end of 1946 to 700 million at the end of 1949).[10] This increase in imports relieved the wartime shortages mentioned above, but nevertheless the increases in wages were greater than those in productivity, so the costs of production rose. Moreover, other forces were at work promoting inflation. A good deal of equipment was worn out and much economic and social capital was below the levels appropriate to post-war incomes. Public investment was heavy but, being badly planned, it widened the budget deficit without curing these shortages. Despite the import surplus and the use of controls from 1947 onwards, price rises averaged over 20 per cent a year in the period 1945-50.

Chile was a different case again. Foreign reserves had not been built up so much during the war; exports fell slightly in volume after it ended; and the terms of trade only improved moderately. Consequently, the volume of

[8] Trade in manufactures within the region fell back however to very low levels, once normal channels were reopened.

[9] Bolivia, Colombia and Mexico were also usually considered members of this area.

[10] The imports came mainly from Western Europe after 1947 through the use of blocked sterling and prices there were generally higher than in the United States.

imports could hardly be expanded at all and supply problems continued to hem in the Government's room to manœuvre. Investment was only moderate and the increase in the national product was slow. Although imported foods were subsidized, prices continued to rise at much the same rate as in the war years. In the cases of Bolivia and Paraguay, too, near-stagnation was associated with inflation. Apart from supply problems, cumulative forces had now emerged in these three countries because of the duration and pace of inflation and these forces in turn propelled it further forward. Savings propensities were low, budgets were difficult to balance and investment tended to be directed to projects yielding high and quick returns rather than to developing the basic industries and services which were needed.

Some other countries in this group did much better. In the first place, their exports expanded more quickly; and, secondly, they made use of the opportunity thus provided. Investment was high in Brazil, Mexico and Uruguay, and better balanced; and national products grew at about 5 or 6 per cent a year. In these cases, now that imports could be obtained in sufficient quantities and internal supply problems were eased, price rises became more moderate (5 per cent to 11 per cent a year).

Still, in retrospect, it seems that the region failed to profit fully by the opportunity presented by the export boom of 1945-50. A large fraction of reserves was spent on consumer durables, such as motor vehicles, instead of being used to strengthen economies against the lean period that obviously lay ahead in the not-so-distant future after the reconstruction period, when the industrial countries would have built up their inventories to normal peacetime levels.

5. The position at the start of the 1950's

Despite the developments of the 1930's and the 1940's, the structure of Latin American economies still showed many of the shortcomings of the pre-depression period. Capital was lacking in basic sectors of the economy (see table 4). The inadequacies of the educational system are shown by the low number of teachers relative to the child-

Table 4

LATIN AMERICA: INDICATORS OF ADEQUACY OF CAPITAL IN VARIOUS FIELDS FOR ECONOMIC DEVELOPMENT

Country	*Improved roads and railways (kilometres per 10 000 ha of arable land)*[a] *1954 or 1955* (1)	*Electric power capacity (watts per capita) 1958* (2)	*Primary school enrolment (as percentage of population aged 5-14) 1953, 1954 or 1955* (3)	*Farm tractors (per 10 000 ha of arable land) Early 1950's* (4)
Group U				
(a)				
Brazil	67	63	32	15
Argentina	33	118	70	10
Mexico	44	79	42	26
Colombia	43	44	35	26
Chile	137	142	69	36
Peru	165	64	44	24
Uruguay	61	124	57	76
(b)				
Bolivia	34	34	31[b]	21
Paraguay	14	40	60	3
Group O				
Venezuela	38	94	44	15
Cuba	41	115	49	48
Costa Rica	61	106	59	13
Dominican Republic	42	51	42	9
Ecuador	25	24	45	3
El Salvador	68	34	41	9
Guatemala	80	16	26	6[c]
Haiti	72	12	23	1
Honduras	35	15	33	3[c]
Nicaragua	16	34	35	52
Panama	41	47	58	9
United States	207	920	96	222

Sources: Columns (1), (2) and (4): International Bank, *Comparative Data on Latin American countries* based on United States Department of Commerce, *Comparative Statistics on the American Republics*, where original sources are listed in full.
Column (3): United Nations, *Report on the World Social Situation* Appendix A. Middle of range taken for population.

[a] Estimate for arable land is closest available year. Roads include those unsurfaced but graded and drained. Railways exclude light railways.
[b] 1952. Public schools only.
[c] All types of tractors.

Table 5

LATIN AMERICA: SOME INDICATORS OF ADEQUACY OF PROFESSIONAL PERSONNEL IN VARIOUS FIELDS FOR ECONOMIC DEVELOPMENT

	Elementary school teachers (Per thousand of those aged 5-14) 1953, 1954 or 1955 (1)	*Graduates of higher education in agriculture (Per millions in habitants) 1957* (2)
Group U		
(a)		
Brazil	11	75
Argentina	30	130
Mexico	11	115
Colombia	9	54
Chile	...	248
Peru	12	52
Uruguay	17	228
(b)		
Bolivia	12	52
Paraguay	19	3
Group O		
Venezuela	12	50
Cuba	16	112
Costa Rica	24	567
Dominican Republic	7	1
Ecuador	11	28
El Salvador	12	6
Guatemala	10	3
Haiti	5	66
Honduras	12	7
Nicaragua	13	21
Panama	18	26
United States	30	...

SOURCES: Column (1) Calculated from United Nations, *Report on the World Social Situation.*
Column (2) *Un Estudio de la Educación Agrícola en América Latina* by Alvaro Chaparro.

ren of school age (see table 5), and their consquences in one sector can be inferred from the very low figures, particularly in certain countries, for professionally trained personnel in agriculture (also shown in table 5). The level of training of the labour force is indicated by the low level of literacy, especially in the rural areas (see table 6).

The distribution of income continued to be highly unequal, because of concentration of property in a few hands, as well as monopolistic profit margins and the incomplete provision of educational opportunity. A large proportion of personal income still accrued to those with habits of heavy personal spending on foreign travel or imported luxuries.[11] The internal market for domestic industries was correspondingly limited and it was broken up because different qualities were demanded by the various social groups. Mass-production techniques which are needed, especially in the metal-using industries, could therefore hardly be established.

The same contrast can be looked at on another plane,

[11] In 1950, the richest 5 per cent of Mexican families received 40 per cent of the total income, whereas the corresponding families in the United States received 21 per cent *(La Distribución del Ingreso y el Desarrollo Económico de México* by Ifigenia M. de Navarrete). If taxation were taken into account, the contrast would be even more striking.

Table 6

LITERACY: URBAN AND RURAL,[a] 1950 OR NEAREST CENSUS

(Percentage of those aged 15 and over[b])

	Urban	*Rural*
Group U		
Brazil	80	42
Argentina	93	80
Mexico	82	49
Colombia	80	51
Chile	92	71
Peru	89	35
Paraguay	86	62
Group O		
Venezuela	76	40
Cuba	90	72
Costa Rica	93	76
Dominican Republic	76	39
Ecuador	86	49
El Salvador	77	34
Guatemala	75	22
Haiti	57	8
Honduras	78	34
Nicaragua	77	31
Panama	95	65

SOURCE: Derived from United Nations, *Demographic Aspects of Urbanization in Latin America,* table 23.
[a] "Urban" is defined as those living in centres with more than 20 thousand inhabitants. "Rural" is the remainder. Sometimes the definition is slightly different: see original source.
[b] Lower age limit is 20 for Cuba, 14 for Argentina, 10 for Honduras and Panama, 7 for Colombia and Guatemala, 6 for Mexico.

as the difference between urban and rural incomes. In the cities incomes were still very much higher and consumption patterns were distinctly different.[12] City dwellers ate different foods,[13] were more accustomed to wearing shoes,[14] and used far more electricity.[15]

Apart from the inflexibility of an economy fissured in this way, the pattern of demand would change rapidly during the coming wave of migration to the cities.

Despite the degree of industrialization already achieved, economic structures were still unable to cope with various forms of rising demand. Conspicuous gaps could be found in even the more developed countries, such as industries for making equipment and heavy chemicals.[16] Markets

[12] Data are only available for later years, but the position did not change greatly. In Mexico City in 1956, average family incomes were nearly 2,000 pesos a month; in the State of Oaxaca they were just over 500 *(Ingresos y Egresos de la Población de México,* Sample Survey Dept. Mexico, 1958). In Venezuela, income in the capital averaged ten times as much as rural income in 1957 *(The Fiscal System of Venezuela,* p. 32).

[13] In Oaxaca, more than half of the income was devoted in 1956 to maize and maize products; in Mexico City, the proportion was small, less in fact than what was spent on other cereals *(Ingresos y Egresos de la Población México, op. cit.).*

[14] In rural areas of Mexico, the proportion of the population in 1950 wearing no footwear of any kind ran as high as 60 per cent; in cities it was 2 or 3 per cent *(El Nivel de la Vida en México* by M. Huerta Maldonado, based on the 1950 census of population).

[15] *Per capita* consumption of electricity in 1950 (excluding manufacturing industry) was about ten times as high in the larger cities of Latin America as in the remainder of each country (ECLA *Energy in Latin America,* E/CN.12/384/Rev.1).

[16] In 1948, finished consumer goods accounted for over 50 per cent of secondary industry in Argentina, Brazil and Chile. In Canada, however, the corresponding figure was 28 per cent, less than the output of either the capital goods sector or the group of industries manufacturing intermediate products (United Nations *Processes and problems of industrialization,* Appendix A, table 6).

were highly imperfect, as was shown by a wide range of different prices in various parts of the same country.[17] Mining sectors, usually dominated by foreign capital, formed what amounted to separate enclaves within the economies concerned.

Table 7 indicates the degree of fragmentation in the region's economies. If mobility were perfect in labour and capital markets, one would expect marginal productivities and thus average productivities in various sectors to be more or less equal (as they are in industrialized countries). For Latin America as a whole, there were still great differences between output per head, and data for individual countries would show even more striking contrasts.

Socio-economic structures of this type were obviously not well suited to cope with the strains—sometimes severe—of the new stages in which the process of import substitution entered.

6. The stagnation of exports in the 1950's: the acute economic policy dilemma

These strains, however, were late in making themselves felt. The post-war commodity boom continued into the early 1950's. The United States economy rebounded from the recession of 1949, and the recovery in the Federal Republic of Germany was gathering speed. Then the Korean hostilities led to the adoption of armament programmes in the industrial countries and had a more immediate impact on commodity prices. But in 1951, as fears of a general war diminished, prices of primary commodities fell back. In some cases they recovered again for a while later. There was a boom in non-ferrous metals in 1955 and 1956; and petroleum and free-market sugar prices rose during the Suez crisis. Coffee prices rose to a peak in 1954 and remained relatively high until 1957. But, broadly speaking, there was no further sustained rise in commodity prices after early 1951. Volumes of exports did usually continue to expand, though in most cases the rise was only moderate. On the other hand, although the upward trend in import prices slowed down, reflecting an increased emphasis on price stabilization overseas and the slowing down in the rate of growth of the world economy, it did not stop. So the terms of trade of Latin America started to deteriorate.

In the countries of Group O (i.e. the countries of the Caribbean area and Central America following conservative financial practices), price rises levelled off almost completely, in the sense that any further rises were in the margin of statistical error, owing to the unreliability of price indices. This can be seen from figure II. Figure III brings out more clearly the closeness with which price changes followed those in the United States, the main customer and supplier of these countries. It does this by comparing the movement of consumer prices in the United States with the median consumer price rise each year for this group. After the war-time discrepancy, attributable to the reasons explained above, both series moved almost in step and both virtually ceased rising from 1951 on. Inflation has continued to be discussed as a problem in the United States, but it has in fact been insignificant in the past decade.

Appreciation of the success enjoyed by these economies in holding inflation in check and then eliminating it must be tempered by the consideration that the closer the adherence to the dollar standard, the more do not only price movements, but also economic growth, depend on external developments. An upward trend in the value of exports raises incomes and reserves, increases the demand for locally-produced goods and also leads to rising imports. The whole set of variables can keep moving upward. But, because of the preponderance of manufactures in imports, the income-elasticity of demand for imports tends to be greater than unity, despite attempts to protect local industries. So the rate of expansion of the value of exports tends to limit the rate of growth of the gross product. Account must also be taken of import prices, since, if they rise, this will tend to depress the rate of growth even more by absorbing foreign exchange.[18] Thus, "the purchasing power of exports", i.e. the value of exports deflated by an index of import prices, is likely to be the main determinant of changes in the domestic product of a dollar-standard country.

The inflow of capital would also of course stimulate growth just as an outflow would depress it. But, data on

[17] Thus in Valdivia, Chile, the same items of clothing cost in 1950 45 per cent more than in Santiago, while food products cost considerably less *(Estadistica Chilena)*.

Table 7

LATIN AMERICA: OUTPUT PER WORKER BY SECTOR IN 1955

Sector	*Dollars at 1950 prices*
Agriculture	382
Mining	3 667
Manufacturing	1 057
Building	955
Services	1 313
All sectors	816

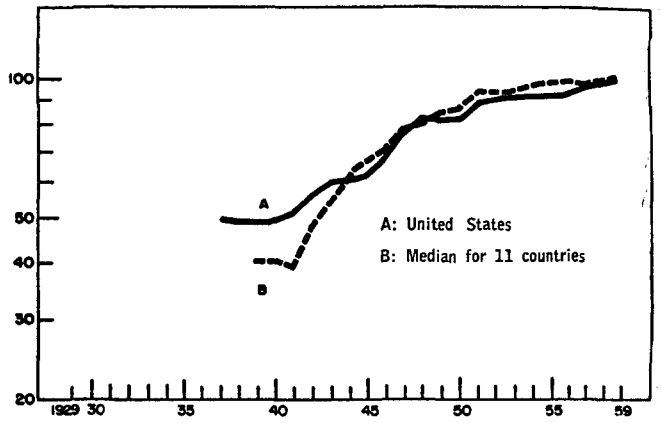
Sources: United States, Department of Commerce, *Comparative Statistics on the American Republics*, based on ECLA, *Economic Survey of Latin America 1956* and United Nations, *Estudio sobre la mano de obra en América Latina.*

Figure III

COST OF LIVING

(Indices 1959 = 100)

SEMI-LOGARITHMIC SCALE



Source: See figure II.

[18] In Venezuela, where there is competition between imports and domestic output over quite a wide range of articles, a relative rise in import prices may stimulate local production.

Table 8

LATIN AMERICA: CHANGES IN THE PURCHASING POWER OF EXPORTS AND IN DOMESTIC INCOME BETWEEN 1950-52 AND 1956-58

(Percentage changes, at 1950 prices)

Country	*Purchasing power of exports*[a]	*Domestic income*[b]
Group U		
(a)		
Brazil	−13	+32
Argentina	− 9	+12
Mexico	+46	+40
Chile	+21	+24
Colombia	+ 8	+32
Peru	+30	+25
Uruguay	−36	Moderate rise
(b)		
Bolivia	−33	Little change
Paraguay	− 4	Moderate rise
Group total	+ 1	+28
Group O		
Venezuela	+64	+64
Cuba	+ 2	Moderate rise
Costa Rica	+21	+43
Dominican Republic	+25	Large rise
Ecuador	+36	+25
El Salvador	+46	+45
Guatemala	+27	Large rise
Haiti	−22	Moderate rise
Honduras	+11	Moderate rise
Nicaragua	+70	Large rise
Panama	+39	+34
Group total	+40	+44

SOURCE: ECLA, on the basis of national statistics.

[a] Exports relate to goods only, except for Mexico and Panama (goods and services). The purchasing power has been obtained by deflating the current values of exports of individual countries by the total unit value index of imports into the whole of Latin America. This has been done because in several cases national trade statistics do not yield unit value series for imports which can be used. The main underlying assumption is that for each year the deflation between the national and regional weighting systems is uncorrelated with price movements. This assumption clearly may lead to error in individual cases. Since manufactures have risen more in price than primary commodities over this period, the import prices of Group O may have risen more than the regional average, so that the rise in the purchasing power of exports of this group may be somewhat exaggerated here.

[b] Allowing for changes in the terms of trade. These have been estimated by using the regional price index for the reasons given in the previous footnote, and with similar implications. It should be borne in mind that it is impossible to exclude, as is theoretically desirable, subsistence production from the correction made for the terms-of-trade effect.

capital movements are particularly weak, so this is difficult to allow for statistically. In any case, the effect of trends in capital inflows is not comparable with that of trends in exports, especially if allowance is made for the rising expenditure of foreign exchange in the form of profits and interest, associated with growing foreign investment. Moreover, the progress of exports very much determines the extent of foreign investment even in industries producing for the home market. So the purchasing power of exports can still be considered the main determinant.

There are not many reliable macroeconomic estimates for the countries of Group O. It is possible to make approximate estimates of changes in the purchasing power of exports (see table 8), and in some cases it is also possible to indicate roughly what has happened to domestic income. However, the estimates of domestic income refer mainly to changes in the monetary sectors of the economy. Since subsistence sectors have mostly stagnated or declined, these indices probably have an upward bias.

There was evidently some association between exports and income in the 1950's (see table 8 and figure IV). The dispersion around the diagonal line corresponding to equal changes in both variables shows that, in so far as this was not due to purely statistical errors, there were other influences at work, though of comparatively limited strength.

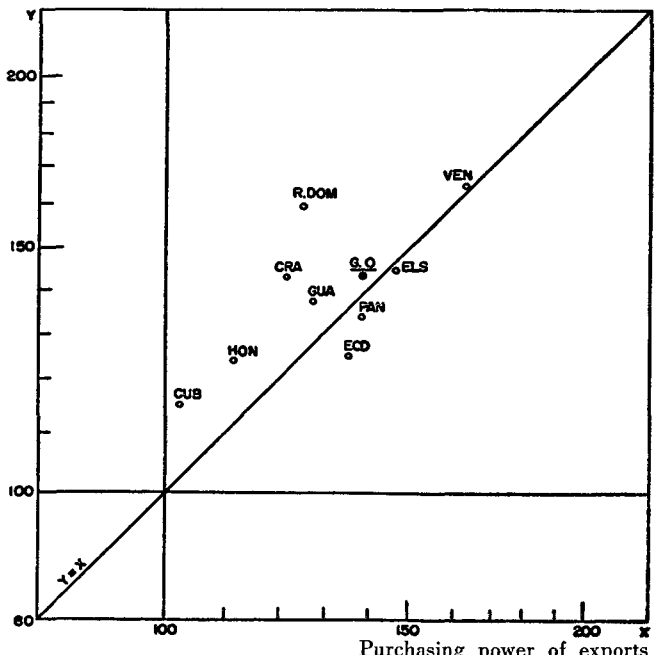
For Venezuela, a big rise in domestic income was associated with a more or less equivalent rise in exports, although, with the heavy investment in the Venezuelan petroleum industry in 1956 and 1957, a bigger rise in the former variable might have been expected. Similarly, large increases in both income and exports occurred in El Salvador, Guatemala, Nicaragua and Panama. In other cases, the extent of import substitution appears to have caused a faster (or slower) growth in income than in exports. In Costa Rica and the Dominican Republic, the growth in income appears to have substantially exceeded that in exports, while the reverse was true in Ecuador. In Cuba, Haiti and Honduras, the purchasing power of exports hardly changed and may have fallen; total real incomes nevertheless rose somewhat in these cases, but the substantial reduction in the backing for their currencies

Figure IV

GROUP O: RELATION BETWEEN INCREASES IN GROSS DOMESTIC INCOME (Y) AND IN PURCHASING POWER OF EXPORTS (X)

(Index numbers for 1956-58; 1950-52 = 100)

LOGARITHMIC SCALE



Purchasing power of exports

SOURCE: See table 4.

(see table 3) indicates again that the temptation to relax monetary practices is strong when exports stagnate. Despite these signs of some monetary expansion, the increase in the total product was so small in these three countries that there was little change, perhaps even a fall, in *per capita* terms. Since there was quite a close relation between changes in income and in the purchasing power of exports for the largest economy (Venezuela) and for most countries of the group, this was also true for the group as a whole.

After the middle of 1957, the exports of several of these countries fared badly. Prices of petroleum and free-market sugar fell back from the peaks attained in the Suez crisis; coffee markets weakened as the world glut grew and volumes of exports were restricted by international agreement; cotton prices declined; and among tropical commodities only bananas continued to be moderately strong. The penalty for failing to diversify the economy now became apparent in terms of economic stagnation and social unrest. It appears from preliminary figures that, in most of the countries of this group, the rate of growth of income slowed down considerably.

Its biggest members, Cuba and Venezuela, have in fact taken autonomous action to stimulate an expansion of internal activity. In these two cases, political and economic developments have been intermixed, and it cannot be said that it is purely for economic reasons that the dollar standard has been relaxed. Moreover, in the case of Venezuela, the measures taken have not so far been incompatible with the principles of this standard. The budget has been unbalanced, but the deficit was partly attributable to the repayment of debt. Import controls have been tightened, tariffs raised and exchange control introduced, but the import surplus, like the budget deficit, has been covered by running down reserves and borrowing. Although prices started to rise in 1958, the rise has been moderate. However, banking legislation has been reformed to allow a lower ratio of reserves to central bank liabilities (33 per cent instead of 50 per cent) and to permit lending by the Central Bank to the Government.

The experience of Group U was very different. Prices continued to rise and, in several cases, the pace of inflation accelerated (see again figure I). There was quite a different relationship between the growth of income and exports. Industrialization was a more deliberate policy, even in the face of difficulties in marketing exports. Governments refrained from taking steps to reduce internal activity when exports fell back from their peaks, so that a policy of compensation was in fact practised. Budgets slipped into deficit, or deficits grew, particularly in Chile where taxes on profits of export companies form a big source of revenue. Moreover the basis of the monetary structure was further attenuated by allowing credit to increase when reserves fell.

The main problem was not however that exports slipped back from time to time, but rather that the trend was no longer definitely upward. Taking this group as a whole, the change in the purchasing power of exports over this period was virtually zero (see table 8). Yet, population increases were accelerating, except in Argentina and Uruguay, as death rates were driven further down by improvements in health services. The growth of cities, once it is under way, gains a certain momentum and a check to industrialization soon leads to serious social problems. Consequently, Governments had little option but to promote development and further diversification, and import substitution became an increasingly deliberate aim. Brazil in particular established a programme of priority targets for the basic sectors of the economy (steel, petroleum, transport, etc.).

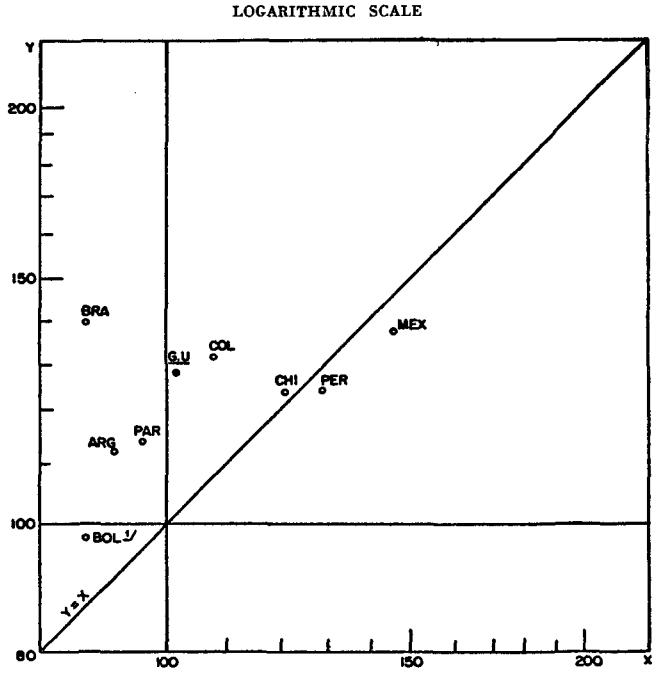
The consequence can be seen in figure V, which is strikingly different from figure IV. It shows that, for most of these countries, the growth of income has borne little relation to exports. Indeed, the purchasing power of exports did not rise greatly for any member of this group, except Mexico, and in this case it is partly due to the fact that the tourist industry has been included in exports. In Chile and Peru, moderate rises in exports were paralleled by similar increases in income. The exports of other countries showed only small rises or actually fell, but experience with income was much better. Brazil and Colombia, especially the former, achieved the most significant increases in their domestic incomes, in view of the poor performance of their exports which actually declined in Brazil. (Note how far the points for these countries lie from the diagonal line which represents the same proportionate increases in both variables.) Uruguay would doubtless show a similar contrast, if data were available. Argentina achieved some increase in income, and in Bolivia the economy was stagnant, although exports fell somewhat in both cases.

The total product of this group rose about 28 per cent (or over 4 per cent a year) even though the purchasing power of exports was unchanged. Much of this total economic growth was due to progress in Brazil.

Figure V

GROUP U: RELATION BETWEEN INCREASES IN GROSS DOMESTIC INCOME (Y) AND IN PURCHASING POWER OF EXPORTS (X)

(Index numbers for 1956-58; 1950-52 = 100)



SOURCE: See table 4.

[1] Index number for 1954-55; 1950-51 = 100.

7. A SUMMARY OF EXTERNAL AND INTERNAL TRENDS IN THE MAIN ECONOMIC INDICATORS, 1929-59

It was not until after the Second World War that the purchasing power of Latin American exports recovered the levels at the end of the 1930's and only because it was helped by the improvement in the terms of trade, and since these swung back against Latin America in the 1950's, there was no great further increase in the purchasing power of the region's exports. In fact, if Venezuela is excluded, there was little change over the whole thirty years (see table 9). Some countries were particularly severely affected. In Argentina, the purchasing power of exports in 1958 was only half what it had been thirty years earlier; and in Chile, too, exports—in this sense—never recovered their pre-depression level (see table 10).

Much the same long-term trends are shown by the volume of imports, since this depends very largely on exports and the terms of trade. The total of imports for the region was in 1958 not very much greater in quantity than it had been in 1928, if Venezuela is excluded. In Argentina and Chile, the volume of imports actually fell over the three decades, and in Brazil the rise was limited (see table 11).

This tendency of imports must be contrasted with the expansion of the region's gross product, which more than trebled in the same period (see table 12). This was accompanied by a rapid growth of cities,[19] and it meant not merely a fast rise in total demand but a very fast expansion in the demand for manufactures (especially equipment), for processed foodstuffs and for professional services.

[19] In nearly every country, the city population grew faster than the rural population. For example, the number living in cities of more than 100,000 population grew at over 4 per cent *per annum* in Brazil and Mexico between 1940 and 1950, and the rate was nearly 7 per cent in Venezuela.

Table 9

LATIN AMERICA: PURCHASING POWER OF EXPORTS, 1928/29-1958

(1955 = 100)

Year	*Including Venezuela*			*Excluding Venezuela*
	Purchasing power of exports	*Quantum of exports*	*Terms of trade*	*Purchasing power of exports*
1928-29	71	83	86	87
1932	39	64	60	46
1940	45	67	67	53
1945	56	82	69	64
1950	97	88	109	105
1951	98	86	114	106
1952	85	86	99	88
1953	98	95	103	105
1954	101	93	108	105
1955	100	100	100	100
1956	105	109	97	105
1957	107	110	97	107
1958	102	111	92	101

SOURCES: ECLA, *Economic Survey of Latin America 1949* and *Economic Bulletin for Latin America*, Vol. V, No. 2.

Table 10

SELECTED LATIN AMERICAN COUNTRIES OF GROUP U: PURCHASING POWER OF EXPORTS, 1928-1929 TO 1958

(Index: 1955 = 100)

Year	*Argentina*	*Brazil*	*Chile*	*Mexico*
1928-29	242	78	123	75
1932	148	44	23	24
1940	112	42	64	39
1945	118	70	75	48
1950	154	113	76	81
1951	124	121	86	87
1952	68	93	94	89
1953	129	113	89	77
1954	114	114	87	85
1955	100	100	100	100
1956	102	109	115	100
1957	111	103	99	87
1958	120	96	84	86

SOURCES: ECLA, *Economic Survey of Latin America 1949* and *Economic Bulletin for Latin America*, Vol. V, No. 2.

Table 13 shows that, in the "open economies" of Group O, rising demand was accommodated by imports increasing more quickly than the output of goods for internal consumption. So imports formed a growing proportion of total supply though data only permit a comparison to be made for the period after 1950-1. No doubt a similar tendency would have been observed in Group U, if foreign exchange supplies had permitted, but in all members of this group, except Peru which was in fact an "open economy" for much of the 1950's, the opposite happened. The import coefficient, defined in this way, fell almost throughout the period, altogether by about a half from 1928-29 to 1957-58. Only in Mexico did the coefficient cease falling after 1938-39.

Table 11

LATIN AMERICA: QUANTUM OF IMPORTS OF GOODS INTO THE REGION, TOTAL AND *PER CAPITA*, 1928-1958

(Index: 1955 = 100)

Year	*Latin America*		*Latin America excluding Venezuela*	
	Total	*Per capita*	*Total*	*Per capita*
1928	72	127	82	144
1932	29	47	33	54
1940	47	67	52	73
1945	49	61	52	66
1950	84	95	87	97
1951	104	114	109	120
1952	98	106	102	109
1953	90	94	90	95
1954	101	103	102	104
1955	100	100	100	100
1956	104	101	103	101
1957	122	116	118	112
1958	113	105	111	103

SOURCES: Figures worked out by ECLA on the basis of data extracted from the annual statistical publications of each country.

Table 12

LATIN AMERICA AND COUNTRIES OF GROUP U: DOMESTIC PRODUCTS, 1928-29 TO 1959

(Indices: 1955 = 100)

Year	*Latin America*[a]	*Brazil*	*Argentina*	*Mexico*	*Colombia*	*Chile*	*Peru*
1928-29	38	38	53	21	34	45	...
1932	35	37	46	21	36	34	...
1940	50	52	62	36	52	56	...
1945	61	60	71	55	62	72	61
1950	80	78	90	74	77	84	75
1951	85	83	93	81	79	86	82
1952	86	86	87	80	85	91	85
1953	89	89	92	84	90	95	92
1954	95	96	95	91	96	96	97
1955	100	100	100	100	100	100	100
1956	105	105	100	108	103	101	103
1957	111	115	104	111	106	104	104
1958	116	125	107	116	109	106	107
1959	119	134	101	121	115	108	105

SOURCE: For the years up to 1945, estimates were taken from ECLA, *Economic Survey of Latin America*, 1949 in the cases of Argentina, Brazil, Chile and Mexico (linked to estimates in *Producto e Ingreso de la República Argentina, 1935-54* for the first-named country), and from ECLA, *Economic Development of Colombia* for this country. For sources or estimates of subsequent years, see ECLA *Economic Bulletin for Latin America* Vol. V, No. 2, Statistical Appendix.

[a] Weighted by products of individual countries in 1955 (expressed in dollars). For 1929 and 1932, the regional index is based on 7 countries, representing 85 per cent of the total regional output in 1955; for 1940 on 9 countries accounting for 86 per cent; for 1945 and subsequently on all countries.

A big task therefore confronted the domestic producers of this group of countries. They had to provide substitutes for imports which could not be afforded—at first during the depression, but subsequently too. In some cases the task was made harder by price controls and subsidies that stimulated consumption, for example, of energy. Within a stationary or contracting total of imports, imports of petroleum grew rapidly, especially in Argentina and Brazil. Import substitution in steel also lagged in Argentina and Chile, although in the latter case it increased greatly in the 1950's. Output of capital equipment rose everywhere after 1939, but the demand also expanded very quickly, so that imports continued to climb except in Argentina. Nevertheless, because of shortage of equipment, there was growing pressure on capacity in several key industries, especially electric power production,[20] and the railways.[21]

One consequence of this series of developments was that the heavy industries had to be expanded rapidly. Thus, in Mexico the number employed in metallurgy, machines and vehicles rose from under 10,000 in 1930 to 173,000 in 1955.[22] The impact was, however, wider than this: industrial expansion on this scale means changes in many other industries, in fact a transformation of the whole economy. Another consequence was that the compo-

Table 13

SELECTED COUNTRIES: PARTICIPATION OF IMPORTS OF GOODS IN TOTAL SUPPLY, BY VOLUME 1928-9, 1938-9, 1950-1 AND 1957-8

(Imports as percentage of supply at 1950 prices)[a]

Country	*1928-9*	*1938-9*	*1950-1*	*1957-8*
Group U				
Brazil	15	9	12	8
Argentina	21	14	10	9
Mexico	17	9	10	10
Colombia	22	14	13	10
Chile	28	19	12	12
Peru	...	...	15	17
Group O				
Venezuela	...	11	17	17
Costa Rica	...	...	22	25
Ecuador	...	10[b]	11	14
El Salvador	...	...	15	19
Guatemala	...	...	15	18
Honduras	15[c]	13	16	20

SOURCE: ECLA, *Economic Bulletin for Latin America*, Vol. V, No. 2, and published and unpublished estimates by ECLA.

[a] 1928-9 and 1938-9 statistics of imports and supply were obtained by linking series at 1955 prices to 1950 estimates.

[b] 1939.

[c] 1929.

[20] The growth of capacity of electric power production slowed down after 1955 in Brazil, Mexico and Chile, although it accelerated in Argentina and most countries of Group 0. The consequence was that reserve capacity had fallen to very low levels by 1959 in many countries. (See *Estado actual y evolución reciente de la Energía Eléctrica en América Latina*, ECLA.)

[21] Argentina is a striking instance. The physical equipment of the rail system changed little between 1928 and 1954. The number of seats available for passengers rose by 19 per cent and the freight capacity grew by 4 per cent in these 26 years. (Effective capacity fell because of the time lost whilst rolling stock was under repair.) By 1956 the total of goods awaiting shipment amounted to 2 months' loading. (See *Economic Development of Argentina*, Vol. V, ECLA.)

[22] *Industrial Census, 1956.*

sition of imports changed greatly. While consumer goods accounted for almost half of all imports in 1928, by 1957-58 this proportion had fallen to 7 per cent in Brazil, 10 per cent in Argentina, and only slightly more in Colombia, Chile and Mexico.[23] On the other hand, capital equipment, which had accounted for about 20 per cent of imports of 1928 in countries of Group U, constituted more than a third in 1957-58 (over 40 per cent in Chile and Mexico). The only exception was Argentina, where the shortage of foreign exchange was especially acute. The share of petroleum in total imports also grew considerably in Argentina, Brazil and Chile, though not in the traditional producers such as Colombia, Mexico and Peru. Finally, there were fast increases in imports of materials —of metals in Argentina, because of the need for ore, scrap and steel products, and of non-metals elsewhere.

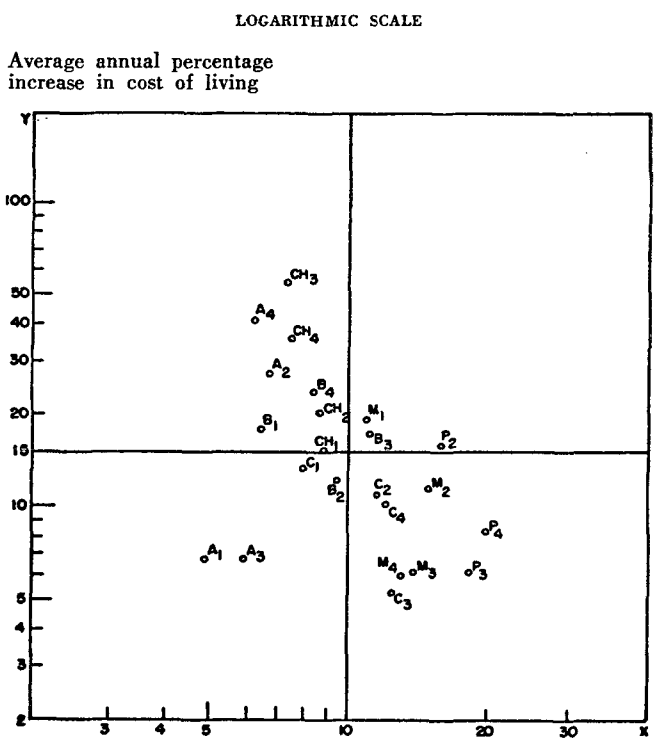
This forced shift in the pattern of imports indicates the strain caused in several countries by the attempt to grow rapidly in a period of foreign exchange shortage, especially where, notably in Argentina, the necessary rate of expansion in output in key sectors had not been achieved. Although the deterioration in export markets was less dramatic in the second half of the 1950's than in the first half of the 1930's, the impact was nevertheless comparable in some countries, because it came at a time when it was difficult to reduce imports, whereas the import structure in 1929 had afforded room for substantial reductions.

Figure VI indicates there is a close relation between the import coefficient in various periods and the rate of price increase. One obvious exception is Argentina. Before 1945, plentiful supplies of food and a fairly well-equipped economy meant that structural problems were only of limited importance in Argentina and in the early 1950's price and wage controls were being used to suppress inflation. But in general it appears that, in the countries of Group U, an import coefficient of less than 10 per cent has been associated with inflation. At levels below this, there is little possibility of using foreign exchange for imports that would relieve internal structural problems.

[23] It was still near 40 per cent in Group 0 countries such as Ecuador and El Salvador.

Figure VI

LATIN AMERICA: RELATION BETWEEN AVERAGE INCREASE IN COST OF LIVING AND IMPORT COEFFICIENT[a] IN SELECTED COUNTRIES OF GROUP U



Countries:
A - Argentina
B - Brazil
C - Colombia
CH - Chile
M - Mexico
P - Peru

Periods[a]
1. 1940/41 - 1944/45
2. 1944/45 - 1951/52
3. 1951/52 - 1954/55
4. 1954/55 - 1958/59

Import coefficient[a] (Percentage of G.D.P.)

[a] The change in the cost of living is related in the figure to the average import coefficient over a period starting and ending one year earlier than those shown here.

IV. THE SIGNIFICANCE OF ECONOMIC POLICY, 1929-59

Any historical account of this kind can impart a somewhat misleading appearance of inevitability to economic developments. In order to see the picture as a whole account must be taken of the effect of decisions of economic policy. Whether circumstances have been propitious or otherwise, the whole climate of economic development and the success with which a country's problems have been faced depend in some degree on the way in which decisions of the authorities and of those with economic power have, perhaps unintentionally, influenced events. Policies can greatly aggravate or greatly improve the current situation, and they can make the problems of future policy-makers either easier or more difficult to solve.

Before trying to summarize briefly some of the principal lines of policy followed in various fields and their relation to inflationary pressures, it must be emphasized that measures are not adopted in a social vacuum by a group of men in a position to choose freely from the whole range of alternatives. On the one hand, given the rapidly changing economic environment of Latin America, those who take decisions have been continuously facing new and serious problems and finding that they lack either previous experience or adequate machinery for dealing with them. On the other hand, conjunctures of social forces and interests impose certain boundaries on the scope for policy and may at times inhibit the adoption of necessary measures, or hamper their execution or cause other and inconsistent policies to be put into effect.

1. Weakness of available instruments

With respect to the first point, sight should not be lost of the quality and the appropriateness of the mechanisms and instruments which have been available in the region for dealing with the tasks which emerged out of the depression and out of the subsequent need to transform the traditional economic structure. The central political task in these decades can be summarized as that of achieving a rupture with the previous system of externally-oriented growth.

The situation was far from favourable in many important respects. Public administrators, for example, had to leave a world of limited and conventional functions for one in which there were heavy responsibilities, of a type unknown in the old régime of *laissez-faire* and incompatible with the old organizational structure and the traditional limited status of the public servant. The intractability of this problem is evidenced by the widespread attempt to solve it by the creation one after another of new organizations, autonomous or nearly so, which could contribute to the solution of particular administrative problems, but represented *in toto* a series of makeshifts instead of a fundamental reform of the organization and methods of the public service, such as was needed in the new situation. Secondly, the key instruments of economic policy could only be used to a limited extent. Apart from the fact that their efficiency depended ultimately on the competence of those who used them, their operation was also hindered by serious institutional defects and by certain of the characteristics of the typical economic structure. Monetary policy, for example, faced the following obstacles: the lack of scope for open market operations in government bonds; the size and independence of the external sector; the importance of credit arrangements outside the banking system; the relatively small amount of cash in bank tills; the limited or non-existent experience of the management and staffs of central banks, which had to face novel situations and to shoulder unconventional responsibilities.

An analogous set of defects hampered fiscal policy. Apart from any question as to the competence and impartiality of those administering policy, the extent of the increase in their responsibilities is indicated by the great changes which took place in a mere couple of decades in the structure of government accounts, on the sides of both income and expenditure. Treasuries were obliged to turn to new sources of taxation and find additional financial resources of a non-budgetary nature, often in economic conditions which were far from favourable. They also had to devise ways of carrying out the social and economic initiatives appropriate to the circumstances of the new era.

2. The role of political interests

Turning to the second element mentioned above, the most significant point is that only in a few countries was there a definite and irreversible decision on the need to follow a new path. Political power groupings which had been created in the course of the old scheme of development could at times be relegated to a plane of secondary importance, but in most of the countries of the region they never entirely lost their former power. Accordingly, whenever the political climate became helpful to them once more or whenever it was possible—as it was bound to be on occasion—to point the obvious failures in the new lines of policy, these traditional forces found themselves in a position not only to affect the details of policy but also to change its orientation. On the other hand, the appearance on the scene of new interests, such as the growing groups of manufacturing entrepreneurs and the associations of their employees, represented forces which had at times to be conciliated, and the customary exclusion of these interests from decision-making meant that the expression of their influence was often spasmodic and irresponsible.

In brief, there was in nearly every country a lack of widespread agreement on what constituted the national interest and an unwillingness to subordinate individual or sectional claims to it. Yet this seems something of an oversimplification, when individual countries are considered. In one or two cases, at some point along the road of economic development, a social and political decision became widely accepted about the main objectives of policy, and those who were adversely affected by this decision remained subsequently in an undoubted, even if important, minority. In this respect, the history of such countries reflected what had occurred at various stages of development in countries already industrialized (for example, Germany, the United Kingdom or the United States), when forces which favoured a break with the traditional economic way of life imposed their will.

By contrast, in most countries of the region, either because the new trends were not powerful enough or because they were diverted by mistaken decisions, the basic political orientation remained essentially unresolved. In such circumstances, which are characteristic of countries in a period of transition, what appears as weaknesses in the instruments of policy, or as incompetence in their use, may really be in great measure an expression of the incoherent and unstable way in which political pressure groups affect the formation of policy, each bound and committed to certain fundamentally incompatible economic aims.

This may help to explain the fact that only in a very few countries has economic policy clearly played a key role in the elimination, or even the moderation, of the basic economic disequilibria. As a general rule, the measures adopted have been, at least in some degree and on some occasions, successful in dealing with short-term problems, but not in creating a sound and sufficient basis for the new patterns of economic growth.

3. The change in orientation after the war

Although no clear distinction can be made between the fifteen years that ended in 1945 and the fifteen years that followed, the latter period is more interesting, as well as more topical, because some of the main features of the picture have changed considerably, affecting the over-all balance of considerations. As a generalization, the relative importance of policy has increased somewhat since the end of the war. Governments have acquired, albeit in some cases despite themselves, the power to influence events over a wider range, and there has been a considerable increase in what is expected of them. The immediate post-war period brought an improvement in foreign exchange supplies which, apart from stimulating the growth of income, created opportunities for correcting some of the more obvious existing defects in the economic structure. Moreover, the adjustments which had been forced on Latin America's economies by the depression had been at least in some degree completed. These adjustments had been carried out under extremely unfavourable conditions and had severely strained the equilibrium of nearly every economy, but they did provide both the physical basis and the human experience which were necessary preconditions for further advances towards economic independence. Developments in the institutions and instruments of economic policy, although incomplete, had changed the whole approach as to what it was feasible to expect from official policy. There was now, for example, factual

Table 14

RELATION BETWEEN PUBLIC EXPENDITURE AND GROSS DOMESTIC PRODUCT

(Current values in percentages)

Country	*1947-48*	*1952-53*	*1956-57*
Group U			
Brazil	18	22	27
Argentina	30	28	26
Mexico[a]	7	8	8
Colombia[b]	16	15	17
Chile	23	24	23
Group O			
Venezuela[c]	(12)	26	28[d]
El Salvador	9	13	11

SOURCE: ECLA, on the basis of official national statistics.

[a] The figures given are those of the Federal Government. However, in the case of public expenditure, the figure obtained for consolidated expenditure bears the following relation to the gross domestic product:

1947-48	1952-53	1956-57	1958
11	12	12	12

In this study, the comparisons are made on the basis of the Federal Government figures, since the consolidated figures for the sector were not available in every case.

[b] Gross national product.

[c] The fiscal year covers the period 1 July - 30 June in every table.

[d] Expenditure in 1956-57 is undervalued, since capital debts existed which were paid in 1958 and subsequent years.

knowledge about the effects of policy and the risks involved in its operation. So the new period involved a challenge which, though by no means simple, was less overwhelming than had previously faced the Governments of Latin America.

Nevertheless, as has been seen, the symptoms of disequilibrium, such as inflationary pressures, tended in general to increase rather than diminish during the post-war period, at least in countries attempting a diversified development of their economies. The analysis of the policies adopted in this period is therefore of special interest.[24]

An examination of the field of public finance in certain countries reveals, first, a steady growth of the proportion of public expenditure in the domestic product, and secondly a persistent imbalance in the public accounts (see tables 14 and 15). Some countries, it is true, like Mexico, do not show this relatively fast rise in public expenditure, but the general tendency is unmistakable.[25] The fiscal problem was aggravated in most cases by the performance of exports—either by their fluctuations or by their relatively slow growth.[26] Still, even those countries which were less dependent on foreign trade for revenue, or which had a more favourable experience with exports, show the same tendency for a deficit to develop. There has been, throughout the region, a general failure to introduce the fiscal reforms which were necessary, especially those which would impart a greater flexibility to revenue and reduce widespread tax evasion. In the absence of these reforms, fiscal systems have suffered from two serious defects: they are regressive[27] and they increase inflationary pressures in the economy through their tendency to deficit.[28]

The analysis of monetary developments is not more encouraging. Even if allowance is made for the structural limitations on the operation of traditional instruments of control, limitations which have already been mentioned, there was surprisingly little attempt to use them, even on a modest scale, to control the inflationary pressures arising in foreign trade or those deriving from forces at work in the private and public sectors.[29]

In the field of foreign economic policy, a more coherent rationale is evident. Objectives which were followed included the conservation of foreign exchange, the reservation of scarce exchange for essential imports, the protection of existing local industries and the promotion of new ones. Unfortunately, however, these measures were often adopted without reference to their effects in other spheres of economic policy. At times they affected unfavourably the promotion of exports, especially new products, and they caused an explosive upward movement in prices when exchange rates were adjusted belatedly, after having been held unchanged and overvalued for years. Table 16 shows how during the war and the immediate post-war years the domestic value of some currencies became completely divorced from international price patterns, as exemplified by those current in the United States. In Argentina, for example, while the index of wholesale prices (1939 = 100) rose to 927 in 1953, the exchange rate increased in the same time by only 85 per cent; in

[24] Various fields of policy are discussed in more detail in the full study. Here only some general aspects which are of major significance will be dealt with and the examples limited to one or two representative countries for which data are available.

Table 15

DEFICIT IN TAX REVENUE WITH RESPECT TO PUBLIC EXPENDITURE

(Percentages)

	Group U				*Group O*	
	Brazil	*Argentina*	*Mexico*	*Chile*	*Venezuela*	*El Salvador*
1947	13	48	41	30		4
1948	14	105	50	18		17
1949	22	47	21	47		5
1950	25	37	5	67	31	8
1951	9	30	+ 6	53	50	11
1952	16	25	17	64	12	13
1953	25	32	19	40	13	8
1954	11	39	25	30	3	0
1955	15	34	3	38	13[a]	3
1956	28	11	8	27	8[a]	8
1957	24	24	19	30	+23[a]	+ 4
1958			27		36[a]	8

SOURCE: ECLA, on the basis of official national statistics.

[a] In Venezuela, debts contracted in earlier years were paid in 1958 under the head of capital expenditure.

[25] In some cases, such as Venezuela and also Mexico, the budget deficit was covered wholly or partly by foreign borrowing, but otherwise it was financed by central bank advances, leading in turn to currency issue.

[26] In some countries of Group U—Mexico, Colombia and Chile, for example—the proportion of revenue obtained from the external sector was significant (including import duties). In 1956 it was 34 per cent, 15 per cent and 27 per cent respectively for each of these countries. In Venezuela and El Salvador, the corresponding figures were even higher: 87 per cent and 56 per cent.

[27] In the period 1953-57, the percentage contribution of indirect taxes to revenue was as follows:

All taxes		*Excluding taxes paid by big mineral companies*	
Brazil	75	Chile	67
Argentina	60	Venezuela	77
Mexico	42		
Colombia	57		
Chile	57		
El Salvador	56		

[28] There have also been well-known cases of political power being used for personal enrichment.

[29] A more comprehensive analysis of monetary factors will be included in the final version of the study.

Table 16

ARGENTINA, BRAZIL, CHILE AND MEXICO: PRICES AS A PERCENTAGE OF UNITED STATES PRICES ON THE BASIS OF OFFICIAL EXCHANGE RATES

(1939 = 100)

	Wholesale price index (A)	*Exchange rate index* (B)	*Price index in terms of dollars* $\frac{A}{B}$ (C)	*United States price index* (D)	*Prices as a percentage of United States prices* $\frac{C}{D}$ (E)
Argentina					
1939	100	100	100	100	100
1950	520	133	390	210	186
1953	927	185	501	222	226
June 1955	1 100	196	561	223	252
December 1955	1 170	400	293	224	131
1958	1 990	756	263	240	109
Brazil					
1939	100	100	100	100	100
1946	275	109	252	155	163
1950	440	111	396	210	189
1953	630	215	293	222	132
1955	920	464	198	223	89
1956	1 150	495	232	230	101
1958	1 490	691	216	240	90
Chile					
1939	100	100	100	100	100
1950	522	135	386	210	184
1953	950	285	333	222	150
1956	2 749	2 378	116	230	50
1958	4 618	4 260	108	240	45
Mexico					
1939	100	100	100	100	100
1946	225	94	239	155	154
1949	261	160	163	199	82
1953	365	160	228	222	103
December 1954	398	241	165	223	74
1958	513	241	213	240	89

SOURCE: ECLA, on the basis of national price statistics and data from the International Monetary Fund, *International Financial Statistics.*

Chile, and to a lesser extent in Brazil, similar discrepancies can be seen. Some countries, like Mexico, kept their exchange rates more closely in line with the relative purchasing power of their currencies.[30]

With very few exceptions, wage policy does not seem to have had in Latin America the significance attributed to it in the analysis of inflation in the industrialized countries of the Northern Hemisphere. The reasons are not hard to find. Most of the active population is employed in the agricultural sector; trade unions are not very powerful; employment incomes are relatively small, as a proportion of national income; and there has been in most countries little or no official action to promote wage increases, although there have been conspicuous exceptions to this last generalization, as will be seen.

Nevertheless, wage movements could still play a significant role in the development of inflation. There have always been certain groups of wage or salary-earners quite highly organized, whose achievements in wage claims have constituted incentives and provided targets for the other weaker sections. And while wage-earners have at times been powerless to achieve increases, they have consistently been able to prevent a reduction in their remuneration.

Argentina is the outstanding case among countries where wage policy has at various times, among other factors, played a significant role in the process of inflation. It is true that the increase in the level of wages, which started in 1943, did not at first affect the cost-of-living index. One reason was the pressures which unexported surpluses of foodstuffs exercised on the price level. But, from 1944 until 1949, the general salary level was readjusted annually, by substantial amounts, as can be seen from the table on page 49.

An increase in wage rates which merely equalled that in prices could not be considered an autonomous source of inflation. Indeed, because of improvements that always occur in productivity, it would permit the rise in prices to slow up. But as the data show, the movements of wages and prices have been far from parallel in the last fifteen years in Argentina.[31]

[30] Naturally the exchange rate policy cannot be appraised independently of developments in other fields and the special characteristics of the economy concerned.

[31] The figures given refer to total wages, but they reflect movements in wage rates.

Percentage annual increase from average of previous year

	Wage bill	*Cost of living*
1944	17	—
1945	14	19
1946	36	19
1947	42	12
1948	36	13
1949	34	32
1950	20	25
1951	30	37
1952	23	39
1953	11	4
1954	15	4
1955	13	12
1956	19	14
1957	22	25
1958	45	32
1959	62	114

SOURCE: Central Bank, *Producto e Ingreso de la República Argentina, 1935-54* and *Boletín Estadístico.*

This has meant that real wages have fluctuated violently. An increase in real wages in a sector which paralleled the upward trend in productivity could be considered in a sense "neutral".[32] So the fluctuation which ocurred in Argentina meant that the influence of wage increments, predominantly a result of policy decisions in this period, were far from neutral in their effect. Figure VII compares

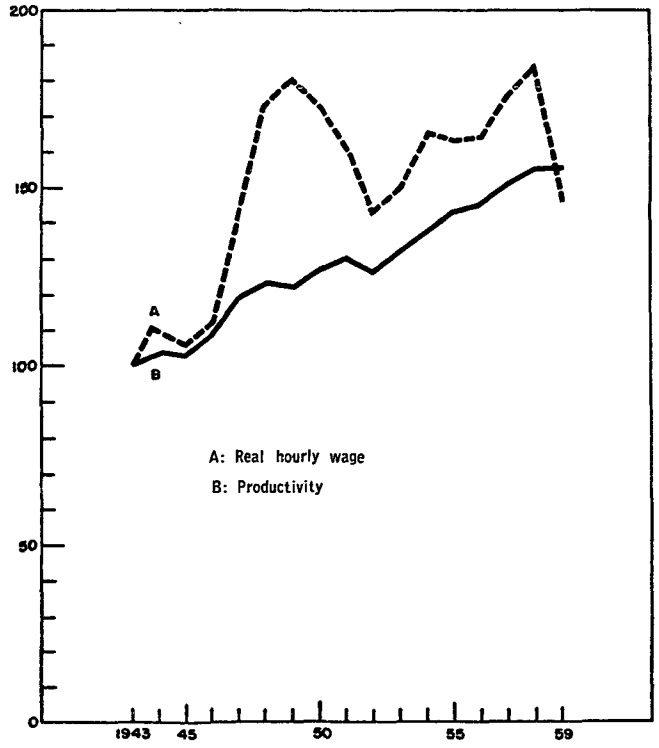
[32] If it occurred in all sectors it would imply, *ceteris paribus*, a constant share of wages in national income.

Figure VII

ARGENTINA: COMPARISON BETWEEN REAL WAGES AND PRODUCTIVITY IN MANUFACTURING 1943-59

(Indices: 1943 = 100)

NATURAL SCALE



SOURCES: *Statistical Bulletin* (Central Bank). *Monthly Statistical Summary* (Ministry of Trade).

the movements in hourly real wages and in productivity in the manufacturing sector. From 1946 to 1950, real wages climbed much the quicker of the two, but in 1950 the picture was reversed. Then after another climb in real wages, climaxing in the general wage increase of 1958, there was once more a sharp reversal, and real wages in this sector finally fell back to about the same relation *vis-à-vis* productivity as in 1943.

It might therefore be concluded that over the whole period the influence of wage changes has been neutral. In fact, however, apart from any other element—and certainly there were others of importance in Argentine experience—this sequence of events militated against the stability of the economy. Wage policy, particularly in the later years of the 1940's, pushed up costs of production and helped initiate a chronic inflationary condition.

The characteristics of policies in various fields which have been outlined, apart from the general considerations mentioned at the beginning of this section, bring out some of the fundamental weaknesses of policies followed by countries in the region, especially those most affected by inflationary pressures.

4. Failures of co-ordination

One is the consistent failure to relate different types of policy to each other. Decisions on import controls, exchange rates, development projects, rates of taxes, credit, wages, and so on, have been taken without consideration of their mutual implications. It seems that individual ministers often take decisions on the economic issues that face them without consulting their colleagues. In a tight situation, like that of most Latin American countries since the depression, a major decision in any one field changes the balance of considerations in all the others. Thus the extent of a wage increase in the economy will affect what tax rates need to be levied, what exchange rate will be viable, and so on. This lack of co-ordination has greatly aggravated inflationary tendencies. Where it has proved impossible for the proposals of various authorities to be reconciled by one or more of them agreeing to take action that would be politically unpopular, the final result has been that the demands on the economy have exceeded its resources. A second failing, which helps to explain the first, is the lack of over all economic development plans. If these had existed, it would have been easier to see the significance of policies in particular fields, and to have kept to certain priorities. In particular, import substitution would then have followed more consistent and more rational lines.

5. Relevance of foreign examples

Another weakness, evident from the history of the past three decades, is that there have been "fashions" in the objectives of policy. Moreover, these fashions have mostly been imported—often with some time-lag—from overseas. The "demonstration effect" can be seen in official attitudes in peripheral countries, as well as in patterns of consumption. The attempt to ensure stability by keeping the currency on a conventional gold standard was followed by a period of increasing recourse to deficit finance. In the war years, efforts were made to suppress inflation by price control, and subsequently doctrines of full employment and social welfare had their impact on the region.

It can hardy be over-emphasized that these ideolo-

gies were developed to solve the problems of industrial countries, and subsumed the structural features of such countries. Thus the theoretical case for stimulating an economy by deficit finance rests on the assumption of elastic supply conditions throughout the economy, so that expenditure could be increased without either raising production costs or causing a big increase in imports. This is true of highly developed countries at times when demand in nearly *all sectors* is less than would fully employ the labour and capital available. But the same assumption is hardly valid for countries like those of Latin America: even if there is spare capacity locally to satisfy increases in certain types of demand, there are limits to the expansion of output in some sectors, and a wide range of products can only be obtained from abroad. The consequence, therefore, is inflation and/or a payments deficit.

Similarly, those drawing up schemes for price control seem to have ignored the fact that they would only work if the public service was organized to administer them. Experience abroad shows that prices have to be fixed on the basis of careful study and judicious criteria; that they have to be comprehensive (otherwise excess demand spills over on to uncontrolled items), that they have to be backed by extensive rationing of supplies; and that they require the full support and co-operation of all sections of public opinion, especially trade unions and business men.

Raising the levels of living of the masses can naturally go further in economies which are more highly developed, and better balanced. A condition for extensive schemes of social security is that incomes should exceed consumer needs by a sufficient margin to provide the means for financing both development and welfare. It is also implied that the fiscal machinery is effective enough to collect the finance which is needed for all forms of government expenditure, and that there are spare resources of administration available to cope with all individual cases under welfare legislation.

6. General appraisal

How much damage did misguided policies do? The first thing to make clear is that however bad the policies of Governments in the region were, the originating causes of Latin America's problems were the world depression, the Second World War, and the slowing-up in the growth of the industrial countries in the 1950's. Really, therefore, the question is rather this: given the adverse developments in world markets, to what extent have the difficulties undergone by Latin American economies been due to the failure of government's policies or coherent development plans?

The most obvious possibility would have been to increase export earnings. The difficulty was that, in each period, the total sales of primary products depended on the needs of the industrial countries. All primary producing areas suffered more or less severely from these developments. It would of course have been possible for Latin America to gain markets from other areas, though the discrimination by France and the United Kingdom in favour of suppliers in the franc and sterling areas, together with the heavy subsidies and protection given by the industrial countries to their own primary producers limited what could be done in this respect.

It would also have been possible for individual countries in the region to gain ground at the expense of others. In fact, it can be seen from table 4 that the countries of Group O did very much better than those of Group U in the 1950's.

It cannot be concluded, however, that the whole region could have done as well as Group O. Their performance was due in part to the strong markets for two products, petroleum and bananas. Moreover, a small producer can push higher exports on to the market without drastically affecting the price. This special advantage is reflected in the international coffee agreements. Thus, in the first agreement of the current series (1958), Brazil accepted the responsibility of keeping 40 per cent of its exportable coffee out of traditional export channels, while the proportion applicable in the case of Colombia was 15 per cent, and the countries of Central America and the Caribbean had to retain less than 10 per cent. It is also interesting to note that even among dollar-standard countries, a large sugar producer—Cuba—fared much worse with its exports in the 1950's than small producers such as the Dominican Republic.

Attempts by major exporters to force the pace of exporting would probably have brought about a fall in prices for many exports and almost certainly a decline in the foreign exchange earnings of competitors, including those in the region. So the total value of Latin America's exports would have been more likely to fall than to rise.

It is true that policies in Group U countries were often such as to discourage exports, in some cases needlessly so. To the extent that price or exchange policies hampered exports, or industrialization reduced exportable surpluses (as it did for Brazilian cotton), or income taxes discouraged the exploitation of minerals, export stagnation must be attributed to these policies. But it is difficult to believe that with different policies the export performance of the whole region would have been so much better that it would have induced by itself a satisfactory rate of growth. The purchasing power of *all* the primary product exporters in the world rose by less than 20 per cent in the 1950's.

Some action was therefore necessary to enable the income of the partially industrialized countries of this group to increase at a faster rate than their exports. The growing realization of the nature of the challenge to the region led to the appearance of economic doctrines which took as their starting-point the need for development and industrialization, and which were therefore more specifically Latin American in their orientation. A shift of emphasis was taking place, in favour of Governments' accepting the responsibility for economic growth, expressed in programmes to achieve certain necessary targets. The acceptance of this responsibility was not, however, matched by the realization that all aspects of policy had to be judged in the light of their contribution to the end in question. The necessity for policy to be expansionist was on occasion interpreted as meaning that it need not be disciplined or guided by strict principles.

In the last two or three years, trends in opinion overseas have made their influence felt once more. This time they tended in the opposite direction, towards restrictive and deflationary policies. Partly as a reaction to the sharp inflation that had developed, and partly because of the need for financial assistance, this shift too was reflected in Latin American policies.

In Western Europe and North America, the expansionist and egalitarian attitude of the early post-war years

was already, in the early 1950's, giving ground before the twin targets of price stability and balanced external payments, implying a quite different balance of economic policy. Direct controls had fallen out of official favour, and the main policy instruments used were fiscal and monetary. This was, in fact, the reappearance of the gold standard in a modified form. In some countries of Latin America, too, stabilization policies were adopted.[33] Major attempts were started on the recommendations of foreign missions in Chile and Peru and by the end of the decade, similar programmes were being carried out in Argentina, Bolivia, Colombia and Uruguay. In Chile and Peru further stabilization programmes were being put into force.

Once again, it is not clear that the differences between the developed countries and the countries of Latin America have been fully taken into account. Monetary policy is only likely to be a successful regulator of the economy where the following conditions apply: an integrated economy with competition in the markets for the factors of production and products; responsiveness of both investment and savings to changes in the rate of interest; a distribution of income that reflects human needs; full employment of labour; and exports which can be promoted or discouraged by changes in home consumption. Merely to list these assumptions is to indicate that they are not particularly applicable in the countries of the region. Moreover, the financial systems of Latin America are not at present very suitable for the administration of policies of financial restraint. As has been shown, there is not the range of monetary devices (such as open-market operations and consumer credit control) which would enable monetary policy to be both balanced and flexible, and they cannot easily be developed so long as the habits of inflation prevail.

The immediate cost of stabilization programmes has generally been a lowering in the level of economic activity, with declines in both investment and consumption. The attempt to remove the excess of demand from all sectors implied a great reduction in its total, leading to inadequate demand in some of them. At the same time, the removal of price distortions, which were certainly in many cases severe, temporarily accelerated the rise in prices.

Stabilization policies have usually failed to include, as an integral part of the programme, measures to stimulate the lagging sectors of the economy, and to achieve import substitution of the right type. Indeed, policies of this sort have not always been put into effect with a careful assessment of their likely effects on investment in various sectors, and of whether these effects correspond to the country's needs. There is therefore no assurance that growth will be resumed in the near future or that when it is resumed it will be free from further inflation, and renewed balance-of-payments pressures.

It seems that opinion is changing again in the industrial countries themselves. Confidence in monetary policy as the main instrument of economic strategy has weakened somewhat. Thus, the Staff of the Joint Economic Committee of the United States Congress point out that prices have continued to rise slowly, despite the firm monetary policy followed from 1953 to 1958. "Given rapid shifts in demand, with an excess now in one sector, now in another, but with total demand not in excess, and the prevalence of market power and downward rigidities, monetary policy can stabilize the price level only if used in such drastic measure that a high level of unemployment is also generated."[34] Moreover, the ultimate test of policy in the industrial countries is increasingly whether the rate of growth is adequate to the country's needs. Although the balance of emphasis in policy, and the machinery for carrying it out, would naturally have to be very different in Latin America, this criterion is of course particularly appropriate for countries beset by poverty and by a rapid rate of increase in population.

[33] These are discussed in a paper by Raúl Prebisch in *Economic Bulletin for Latin America* (Vol. VI, 1), entitled: "Economic development or monetary stability: the false dilemma".

[34] Congress of the United States, Staff of the Joint Economic Committee, *Report on Employment, Growth and Price Levels*, December 1959. See also *Report of the Committee on the Working of the Monetary System* (Her Majesty's Stationery Office, 1959), for rather similar conclusions on experience with monetary policy in the United Kingdom.

LATIN AMERICA'S POSITION IN RELATION TO WORLD CHANGES IN TRADE POLICY

by *Esteban Ivovich**

I. Introduction

1. It is widely realized that for a number of reasons, of which the establishment of the European Economic Community (EEC) is one, developments of far-reaching importance are taking place in world trade policy which may have a great influence on the rate of economic development in Latin America. In view of the powerful motives underlying these developments it will be difficult for the Latin American countries, acting individually, to influence their course. However, the possibility of doing so can be increased if co-ordinated action can be taken, based on the common interest.

Should the Latin American countries take such action, it would undoubtedly bear fruit more readily if there were no undue delay in effecting the necessary co-ordination. As some of the developments now taking place have not yet fully crystallized, there is still time to obtain satisfactory results from collective efforts. Once the events have taken place, any joint action designed to influence or offset their effects will encounter major and perhaps insuperable obstacles.

The foregoing arguments are reinforced by the experience of Latin American countries in their valiant efforts to solve their foreign trade problems, and further still, by the serious threat to economic development posed by the loss of Latin America's position in international trade. During the last decade Latin American exports as a whole increased less, in terms of value, than those of other regions.[1]

2. The account that follows is an attempt to outline developments that have taken place recently or are under way in international trade policy, as referred to above. The intention is also to bring into perspective the reasons that, in view of those developments, make it desirable to integrate piecemeal action in Latin America so that a co-ordinated effort can be made, with better prospects than are likely to result from individual efforts, to deal with the already serious difficulties of Latin America's foreign trade, to end the present falling-off, and thereby to ensure that exports contribute effectively to the growing needs of economic development.

II. Obstacles to trade

3. Many Latin American countries that have in the past tried to protect their balance of payments by such direct control methods as prior import permits, import quotas and prohibition of imports, have been replacing them by methods of indirect control, which generally preclude any form of discrimination by origin. This change in foreign trade systems is due to a number of different causes; it is related to international agreements on the elimination of obstacles to trade, and it has largely led to the abandoning of bilateral accounts, which were one of the instruments of direct control.

4. Considerable light is thrown on the subject by studies on the results of efforts to eliminate obstacles to international trade made by inter-governmental groups in GATT (Committees II and III). Such studies as these make it possible for the first time to define accurately certain highly significant facts. They show that in some European countries that have no balance-of-payments problems the importation of many items is still subject to a multitude of restrictive trade regulations, including discriminations by origin that directly affect Latin American exports. Some of these restrictions do not appear to be in conformity with the rules of GATT. According to views expressed by Latin American Governments at the recently held nineteenth session of GATT, these restrictions nullify or impair the effect of the customs treatment agreed on as a result of negotiations through GATT in respect of the articles affected.

5. These restrictive trade regulations bear particularly heavily on agricultural products, trade in which is also handicapped by the severe limitation resulting from the exceptions that GATT has agreed to with respect to these products for reasons that are widely known—in particular the United States surpluses. Many countries fear that in addition to these restrictive measures there will shortly be others, related to EEC's agricultural policy and to certain aspects of its external tariff referred to below.

Within GATT a number of Governments have called attention to the apparent inconsistency between its trade liberalization policies and the provisions of the Agreement concerning the protection of agreed customs treatments on the one hand, and restrictive trade regulations on the other.

6. Uruguay provides an interesting example. This country carried out a very detailed investigation in Europe, and its results give a clear picture that can hardly fail to cause grave concern (see table 1). With respect to the thirty products that make up practically the whole of Uruguay's exports, the nineteen European countries which together purchase 85 per cent of that total apply over 500 separate restrictions, including both those accepted by GATT and others that would appear to be in conflict with GATT's principles.

7. As thus far little has been accomplished towards remedying the situation resulting from the restrictive trade regulations, at the nineteenth session of GATT official

* Director of the Trade Policy Division of ECLA. The present article is a summary of the account of recent developments in trade policy given at Santiago, Chile, on 28 December 1960, during the Economic Development Training Programme. The views expressed are the personal opinions of the author, and do not necessarily represent the views of the ECLA secretariat.

[1] GATT, *International Trade 1960* (Sales No.: GATT/1961-4), establishes the following facts: Latin America's share in international trade fell in 1960 to about 7 per cent of the total, in comparison with the corresponding figures of 11 per cent for 1950, 9 per cent for 1953 and 8 per cent for 1959. Between 1950 and 1960, the total exports of current prices from all the non-industrial countries increased by about 40 per cent, whereas those from Latin America increased by only 25 per cent.

Latin American sources announced their intention of initiating proceedings under article XXIII of the General Agreement for the purpose of restoring reciprocity in trade treatment between the countries against which these regulations are applied and those which apply them. It is to be hoped that formulas less in conflict with the aim of increasing world trade can be found, since if the course of action referred to above is taken, under article XXIII, the Latin American countries will be authorized to apply discriminatory restrictions against imports of goods from any market in which Latin American exports are subject to restrictive trade regulations not in conformity with GATT.

8. Essentially and technically, both for immediate practical reasons and because of the precedent involved, the problem goes beyond the scope of the Latin American countries which belong to GATT, since it is of equal or at least considerable concern to many of those which are not members. In this connexion it should be recalled that certain countries in Latin America still maintain some methods of direct control, which in practice can lead to discrimination against the market of origin of the imported goods. Perhaps it would be as well to look into the question in relation to the whole of Latin America, to consider whether it could be advisable to follow a common line in this respect, designed to speed up the elimination of obstacles to trade and the establishment of full reciprocity in this field.

III. Findings and experience of the 1960/61 tariff conference

9. The general title: 1960/61 Tariff Conference covers the fifth series of GATT negotiations; these include negotiations between EEC and other members of GATT with respect to article XXIV, paragraph 6 of the Agreement, the Dillon negotiations, involving all those belonging to GATT, and the negotiations for the inclusion of certain additional countries as members of GATT.

1. *Compensatory concessions for the increase in the average incidence of EEC's external tariff (article XXIV, paragraph 6 of the Agreement)*

10. These negotiations were concluded in May 1961. It is expected that the treatments agreed therein will shortly be made known officially.

11. The disappointment over the results of these negotiations voiced in Latin American circles is in part an indication of the different standpoint from which they were viewed by EEC and the Latin American countries. EEC, on the strength of the rules of GATT, regarded the changes as essentially a revision of the external tariff based on the principle of maintaining the balance of the reciprocal concessions with respect to specific items when the incidence is increased through the establishment of the averages used as the basis for working out the tariff. The countries thereby affected, on the other hand, including those of Latin America, apparently made an unsuccessful attempt to have the negotiations conducted within a framework that would have taken account of economic and trade factors not strictly a part of the legal basis of the negotiations.

2. *Dillon negotiations*

12. These negotiations are in progress at Geneva and are well advanced, but progress during the final stage is slow for a number of reasons, including the complex nature of the negotiations between EEC and the United States with respect to certain agricultural products. Another reason for the delay may be the fact that a new statute of association is under study, that from January 1963 on will govern the relations between EEC and the former overseas territories, which have now become sixteen independent countries. In the discussion of the over-all problem of their relations with EEC, these countries do not seem prepared to accept the prospect of losing any of the customs advantage enjoyed by their exports to Europe under the present association agreement as a result of EEC negotiations with outside countries. This perfectly legitimate stand cannot fail to militate against the favourable results that some Latin American countries had expected from the negotiations concerning tropical products.

13. Uruguay stated, with respect to its own interests in the negotiations, that as EEC had acknowledged, the external tariff resulted in less favourable treatment for the Uruguayan products covered, with no adequate compensatory concession.

14. Brazil announced that in view of the unsatisfactory results of the tariff negotiations the Brazilian Government would not ask for ratification by parliament. Brazil stated that 75 per cent of its exports to EEC had been subject to the external tariff, and that it was facing one of the gravest threats ever offered to its foreign trade.[2]

3. *Quotas*

15. Ideas have apparently changed a little with respect to quota systems, whether these consist in the alternative or the combined application of physical, seasonal and/or tariff quotas. In relation to imports from non-EEC countries, the Rome Treaty seemed to assign such systems a very limited role. In practice, developments suggest that quotas are proving more useful than saving clauses as a means to some sort of solution of a series of problems connected with third countries.

16. GATT's fifth series of negotiations have been conducted selectively, that is, product by product, the duties resulting from these negotiations being as a rule consolidated in order to safeguard them against possible increases in their rates of incidence.

In the case of various products, some of which are of great importance among the exports of Latin American countries (meat and fish meal, for example), the consolidation of duties will be valid for a specific tariff quota. Once this has been covered, further imports of the goods concerned may be subject to permits obtained beforehand, embargoes or the system of variable duties instituted as part of EEC's agricultural policy.

The quotas referred to are fixed without it being determined which EEC country or countries will be the purchasers. Under the GATT regulations, the quota cannot be reduced until it has been in force for three years.

17. Another type of quota, to remain in force for a year at a time, has also been established, not officially on the basis of negotiations with third countries, but by agreement on the part of EEC. Under this system a particular member of EEC is authorized to apply import duties lower than those contemplated in the common tariff on purchases of not more than a given quantity of a certain product.

As can be seen in tables 2 and 3, prepared on the

[2] Statement made to GATT by Brazil's Minister of Industry and Trade, Mr. Ulises Guimarães, on 27 November 1961.

basis of unofficial data, these quotas include several which might be of interest to Latin America.

18. How do the findings of the 1960-61 Tariff Conference affect Latin American countries which are not Contracting Parties of GATT?

Countries whose trade relations with one or more members of EEC are based on agreements embodying the unconditional most-favoured-nation clause would have grounds for requesting the EEC countries in question to grant them the same treatment as that agreed upon at the Conference for specific products, in the shape of external tariff reductions or consolidations. They could also adduce cogent arguments in support of their right to a share in quotas. The products of Latin American countries which have no agreement with EEC members establishing the unconditional most-favoured-nation clause would be accorded the treatment indicated in the external tariff and not the reductions or the consolidation benefit. It would seem that these countries would have no sound basis for a claim to shares in quotas.

19. If the distribution of the tariff quota were to continue exclusively in the hands of the EEC countries, as is already the case for certain goods, it might come about that when a particular shipment arrived at its destination the exporter country would be unable to secure entry for its products because other suppliers had already used up the whole of the tariff quota.

The uncertainty deriving from such a system may be prejudicial to Latin America's production and exports, unless, as is to be hoped, appropriate agreements are reached to provide for some degree of participation by the supplier countries in quota arrangements, perhaps through joint consultative groups, or by means of some other suitable mechanism.

20. As an illustration of the favourable aspects of the quota system and its potentialities, a project may be cited whereby, on the basis of adequate compensation, in the European Common Market and especially in the Benelux countries, meat production would be expanded at decreasing costs, with consequent social benefit to the farmer. This result would be obtained by using for meat production land on which at present secondary grain crops are grown for fodder; if the system were successful, these would be imported at lower cost from outside the EEC territory.

The quota system would also open up prospects for seasonal trade in specific commodities between Europe and other regions, based on the fact that their production periods do not coincide.

IV. External tariff of the European Economic Community (EEC)

21. Reference was previously made to the external tariff of EEC and to the pertinent negotiations, which form part of the business of the Tariff Conference and have now reached their final stage. It was also mentioned that at the nineteenth session of GATT various countries, including Brazil, Chile and Uruguay, insisted that EEC's external tariff had been prejudicial to their interest and felt that they had not been accorded adequate compensation at the Conference.

In face of such declarations, it would seem that EEC will probably prefer to conform to the juridical interpretation according to which, as its representatives stressed at one of the meetings of the nineteenth session of GATT, the Rome Treaty is in good company—that of the Montevideo Treaty and of the instrument setting up the European Free-Trade Association (EFTA). It is not yet known whether the Contracting Parties of GATT will announce the juridical decisions pending in respect of the Rome Treaty at the session to be held in September-October 1962, and whether these verdicts are likely in any way to affect the solution of the problem created for Latin America by the increase in the incidence of specific tariffs. It should be mentioned in passing that the type of pronouncement made will undoubtedly be strongly influenced by the position which the United Kingdom and the other EFTA countries will by then have taken up in relation to their ultimate membership of EEC or association with it.

22. Unofficially but persistently, certain authoritative European circles seem to be displaying a preference for financial and technical co-operation at the level of industrial development, rather than tariff agreements based on *ad hoc* negotiations, as a means of counteracting the direct or indirect restrictive effects on the Latin American economy which might result from the formation of the European Common Market. In this connexion, it is an open secret that Latin American circles concerned with such problems generally take a very pessimistic view of the possibility that the Latin American economy can be sufficiently indemnified for the adverse effects of the common external tariff by compensations of this type.

23. Incidentally, from the standpoint of the less developed countries, an idea frequently propounded is that in order to strengthen their capacity for external payments, recourse should be had preferably to customs facilities, not only for the primary commodities traditionally exported, but also for intermediate products and manufactured goods. At the proposal of the United States, GATT has just approved a declaration giving emphatic support to this suggestion which is one that ECLA has been advocating for several years past.

24. In the same context, it seems to be felt in some quarters in Europe that with the passage of time factors will come into play which may make it easier for them to give outside countries much more opportunity of access to their markets. In particular, attention is called to the fact that the dynamic quality imparted to the economic expansion of the EEC countries by the integration of markets opens up limitless prospects. Integration is already influencing the growth of the gross national product, which in 1957-60 attained an average annual rate of 4.8 per cent in the EEC territories, as against 3.3 per cent in the other countries of Western Europe. It is also having substantial repercussions on intra-EEC trade. While this has been increasing since 1957 at an annual rate of 20 per cent, trade between the EEC countries and the rest of the world registers an expansion of only 10 per cent per annum. One of the main aspects of the liberation of factors of production deriving from the Common Market will be a marked increase in productivity, which will place EEC's industrial prices on a highly competitive footing. This may well mean that in the future, on the basis of negotiations, the external tariff for a number of goods can be reduced and perhaps abolished. In the end, indeed, the only protection that will as a rule be needed by European production of goods similar to import lines will be that resulting from the cost of freight from the country of origin payable in the case of the foreign counterpart.

25. In short, for the Latin American countries—members

and non-members of GATT alike—serious doubts arise in connexion with EEC's external tariff. Once the Tariff Conference is over and its findings are officially known, there will be sounder basis for evaluating possible adverse effects, both individually and in the aggregate, and examining whether it would be feasible and desirable (as is thought in some Latin American circles) to approach EEC collectively with a view to reaching some mutually satisfactory understanding, and if so, in respect of which goods and by what procedure, whether an attempt should be made as part of these same negotiations or through others of an *ad hoc* character, to obtain from EEC a tariff régime calculated to facilitate the export of certain intermediate products and manufactured goods to Europe on the strength of negotiations based on reciprocal compensations; and which intermediate products and manufactures these should be. Such measures would be in conformity with the principle of differential treatment for countries at a relatively less advanced stage of development.

V. Other elements of uncertainty

1. *Entry of the United Kingdom into the European Common Market*

26. The developments still pending, whose final outcome it is impossible to foresee, include, in addition to those relating to market organization, to which reference will be made later, the possibility that the United Kingdom may join EEC and the future treatment which this would imply for the Commonwealth countries. The latters' exports, besides certain ores, metals and manufactured goods, include wheat, meat, fats, wool, coffee, cacao and bananas, products similar to those exported by Latin America. The competitive position of Latin America's export commodities in the EEC market would deteriorate if their counterparts from the Commonwealth were accorded any kind of preferential treatment as a result of the United Kingdom's membership of the European Common Market.

27. The problem to which the incorporation of the United Kingdom would give rise would affect agricultural commodities produced in the EEC countries. Objections are raised to the idea of some form of membership excluding agriculture because, *inter alia*, national agricultural policies have a certain effect on industrial prices, and hence, on competition in general within the European Common Market. Furthermore, membership of the latter is conducive to the solution of agricultural productivity problems.

28. To judge from the preliminary stage of the discussions on the possibility of the United Kingdom's joining EEC, in authoritative European circles it is considered essential that for Common Market purposes insistence upon any requisite or evidence relating to markets of origin be avoided. The attainment of this objective, envisaged by EEC, is provided for through the establishment of the common external tariff. The admission of countries to membership on the basis of commitments not including the undertaking to participate in the common external tariff would imply a reversion to the system of the Free-Trade Area, and therefore to the need for demanding evidence of the market of origin, which is a violation of the principle of unrestricted freedom of circulation of goods inherent in the Common Market.

29. The possible bases for the accession of the United Kingdom are not yet known. In the realm of mere speculation, formulae such as the following, for example, have been mentioned: reduction of the special treatment enjoyed by the Commonwealth countries in the British market and, to offset the repercussions of this measure, financial assistance to the countries affected, with a view to the improvement of productivity and the strengthening of the competitive position of their exports; association of the Commonwealth with EEC, on specific terms; or the solution of some of the Commonwealth countries' problems by means of *ad hoc* quotas in respect of particular goods. These quotas, subject to a pre-established tariff treatment, would be in force for the British market and perhaps for EEC during a given period of years. Mention is also made of a system which would consist simply in the reduction of the existing preferential treatment for the Commonwealth countries' exports to the United Kingdom without the Commonwealth being granted any kind of associate membership of EEC or quotas in its market.

30. It is understood that the United Kingdom would be willing to waive the preparation of a new external tariff and to accept that of EEC on the basis of revision of specific items.

31. If the general negotiation is successful, it is unlikely that the United Kingdom's membership of EEC would become effective before January 1963.

2. *Association between EEC and former overseas territories*

32. The bases at present in force, and due to be renewed or superseded by others from the beginning of 1963, make provision for primary commodities and manufactured goods produced by the former overseas territories of the EEC countries to enter the latter duty-free. The territories in question, on their part, can establish duties on imports from their European associates.

As yet there is a lack of background data on which to base conjectures as to the future of this system, although it is understood that political motives will play a vital part in the decisions ultimately adopted.

33. It is worth while pointing out that reference is often made in Europe to the desirability—again for political reasons—of equalizing or reconciling the tariff régime instituted by the EEC countries for their former overseas territories and the concessions that will be made to the Commonwealth once the United Kingdom has joined the European Common Market. There is, in fact, a general wish to avoid the conflicts implicit in the establishment of different treatments for Europe's imports from former overseas territories and for its purchases from the Commonwealth. Equalization would, without precluding other forms of indemnification, afford the Commonwealth countries some compensation for the setback which their agricultural exports will presumably suffer in the British market. It would be unwise to exclude another possibility —in the course of time the new bases for the association of EEC with Africa, and perhaps with the Commonwealth countries, may result in the establishment of a system of minimum prices and physical quotas for certain agricultural commodities from supplier countries belonging to the association.

3. *Common agricultural policy*

34. Since in the case of most agricultural commodities produced in Western Europe production increases more intensively than demand, the system of support prices has

become widespread. It is not, however, an adequate solution for the social problems deriving from the smallness of the agricultural worker's share in the distribution of national income. In this connexion, the view is more or less universally held that the progress of industrial productivity must, through the improvement of wages, contribute resources permitting the maintenance of a policy of high prices for certain articles—meat, for example—which may help to enlarge the share in question.

35. At the nineteenth session of GATT, EEC countries made statements which leave very little room for hope that it will be possible to apply the GATT liberalization regulations to those items in respect of which the expansion of European production outstrips that of demand.

36. Something has been said of the possibility that EEC might establish a system of variable duties on imports of agricultural commodities, as a species of movable protection. This system would be maintained within EEC for a certain number of years, until internal prices had been equalized. As regards the rest of the world, no time-limit for the duration of the system has been proposed.

37. In view of the fact, referred to above, that agricultural production in Western Europe is expanding more than demand, and of the social reasons for adopting a policy designed to improve agricultural productivity by efficient utilization of the facilities deriving from a broader market, while at the same time maintaining a high price régime for agricultural commodities, only very clever handling on the part of Europe's traditional suppliers—among them the Latin American countries—could lead to an understanding which would enable them to retain a stable footing in the European market on mutually satisfactory basis of reciprocity. Such an arrangement would, in addition, safeguard the levels of reciprocal trade.

38. Even on the assumption that co-ordinated effort would enable the Latin American countries to hold their own among the suppliers of the European market, the prospects for Europe's production of temperate-zone commodities—under the aegis of a markedly protectionist régime and the momentum of its own swing towards self-sufficiency—and the arguments for improving the agricultural worker's share in income distribution by no means augur well for the safeguarding and development of the corresponding exports from Latin America. It is therefore worth while to consider the direction that should be given to production and intra-regional trade in respect of Latin America's temperate-zone commodities, with special regard to the fact that the situation in Latin America is the converse of Europe's, inasmuch as the rate of growth of agricultural production is lower than that of demand.

VI. Linear reductions

39. The experience acquired in the course of international tariff negotiations is gradually spreading the conviction that reciprocal concessions in respect of specific products are losing their importance as stimuli to trade. Furthermore, selective item-by-item negotiation of the traditional type affords the self-interest of individual countries or sectors opportunities which may militate against the implementation of liberalization programmes tending to the common good. In this connexion, it is hoped that GATT, in pursuance of ideas long since mooted, will shortly make serious efforts to promote the application of the technique of linear reductions, either for the whole tariff or by sectors, through the adoption of mechanisms similar to that internally applied by EEC and EFTA. On this basis GATT would organize a new general series of tariff negotiations.

Some Governments have stressed that negotiations on linear reductions would also fail to attain their objective unless supplemented by others designed to eliminate non-tariff restrictions.

40. As regards linear reductions, it should be recalled that a proposal formulated by EEC some time ago is awaiting consideration. According to this proposal, EEC would agree to a 20-per cent reduction on almost all the external tariff items if the other Contracting Parties granted similar treatment on a basis of reciprocity.

It should be remembered that EEC's internal reductions already amount to 30 per cent of national tariffs and that they are extended by EEC to all the GATT countries up to the point of correspondence with the said 30 per cent, although only within the limits of the new rate of incidence established by the external tariff. A further 10-per cent reduction was to be introduced by the end of 1961. EFTA, whose internal tariff reduction also amounts to 30 per cent of the national tariffs of its seven members, is contemplating another 10-per cent reduction early in 1962. This would be ahead of time, since according to the Stockholm Treaty it is not due until July 1963.

41. What would be Latin America's attitude to possible linear reductions, as an international method wholly or partly superseding the system of selective negotiations?

Applied on a world scale, this system might be seriously prejudicial to Latin America, unless it were instituted with due regard to the principle of differential treatment—presumably for a time only—for countries at a relatively less advanced stage of development. Otherwise, the system of linear negotiations, like the traditional selective method, would help to perpetuate the disadvantage for the weaker countries, inherent in the present structure of international trade. The Montevideo Treaty fully endorsed the principle of differential treatment as a means of promoting the smoothly co-ordinated development, on an increasing scale, of countries at varying levels of economic strength. So did the Rome Treaty, through the terms established for the associate membership of overseas territories. Unfortunately, at the 1960-61 Tariff Conference these principles were not taken into account, although the desirability of adhering to them in the future was reaffirmed last November by the GATT meeting of Ministers of Foreign Trade, when it declared that in considering the application of the new methods of tariff reduction, greater flexibility must be demonstrated, with respect to the measurement of reciprocal concessions in favour of the less developed countries.

42. If, as a result of eventual acceptance of the linear reductions system, the exchange of tariff concessions between groups of countries—for example, the EEC countries on the one hand and the Montevideo Treaty or Central American group on the other—were to be promoted in the future, the strengthening of the Latin American industrial process might be seriously jeopardized if such exchanges, instead of being based on the principle of differential treatment, were negotiated in accordance with the traditional procedures.

43. In this connexion, too, as has been shown, doubtful points arise whose elucidation is of importance to all the Latin American countries.

VII. Market organization

44. In European official circles it is considered that the problems and anxieties relating to the future of exports of agricultural commodities from third countries which have been traditional suppliers of the European markets might perhaps be more satisfactorily dealt with by means of a policy of market organization. Such a policy, ceasing to attach basic importance to tariff negotiations and the eventual fixing of quotas, would aim at preventing the formation of surpluses by production in excess of demand, and at the same time reconciling the interests of EEC's internal agriculture with those of traditional imports, under a long-term programme. Hypothetically, market organization would pivot upon two main axes: physical quotas and remunerative price levels. This would represent a practical approach to a problem which is adversely affecting the economic growth of the less developed countries, namely, that of establishing a fair price for raw materials in respect of which the producer country's export trade is essential to its capacity for external payments. If such a plan were approved, the bases for the association of EEC with the former overseas territories as well as with the Commonwealth countries would have to be adjusted to the market organization framework.

Market organization agreements would perhaps fall into two phases. The first, lasting until EEC's common agricultural policy were defined, would aim at safeguarding the volume of regular trade. The second, that of full development of the organization, would be embarked upon once the said common agricultural policy had been determined.

45. At the nineteenth session of GATT stress was laid on the tremendous complications of the problem of eventual market organization both in the matter of principles and at the practical level.

The question arose when a sort of crossroads seemed to have been reached in GATT's internal affairs, upon its becoming evident that several of the larger countries were not applying to their external trade in agricultural commodities the principles that world economy develops along sounder lines, from both the economic and the social standpoint, on a basis of freedom and non-discrimination in international transactions; and, furthermore, that matters were unlikely to improve in this respect within the predictable future. On the contrary, the traditional exporters have new cause for anxiety lest their opportunities of access to the markets should diminish still further. This concern is related to such factors as EEC's agricultural policy, the use of artificial means to support and expand marginal lines of production and the placing of surpluses through non-commercial channels. In these circumstances, as was stated above, some of the Latin American exporter countries, invoking article XXIII of the General Agreement on Tariffs and Trade, declared that they might be forced, much against their will, to restore the balance of concessions by applying in their own import market restrictive measures equivalent to those adopted by the large markets. The same countries, along with others, considered that to accord agricultural commodities a treatment different from the general treatment established by GATT would be to practise inadmissible discrimination against economies whose situation depends upon the level attained by their agricultural exports. Argentina, for its part, categorically maintained that it considered the extension of different treatments to agricultural commodities and to the other international trade items incompatible with GATT.

46. The discussion at the nineteenth session, while making no claim to pronounce upon questions of principle, suggests that the idea of seeking some gradual form of practical action aiming at market organization will be considered at the inter-governmental level. By this means, if the idea were to find favour, an attempt would be made over the medium and long term to facilitate the reconversion of marginal lines of production, prevent the formation of surpluses whose existence upsets the balance of the market and regulate conditions of access to the latter on the basis of minimum prices, quotas and the building up of reserves for international aid to areas suffering from shortages of foodstuffs and of means of payment. An endeavour would also be made to find ways and means of reducing or preventing the occurrence of those situations, now so common, in which production has to be cut down in lines whose expansion falls short of that of real consumer requirements. The gradual application of the programmes concerned would be facilitated if the larger countries lifted import duties on tropical agricultural commodities altogether, in compliance with the request submitted to GATT by the relatively less developed countries. It must be stressed that this would mean a market organization based on negotiation.

47. As the outcome of the discussions at the nineteenth session of GATT, an inter-governmental group will carry out studies on conditions of acces to the world market, especially as regards trade in wheat, other cereals and possibly also meat. Among the tentative suggestions which are being informally put forward with respect to wheat is the idea of restricting import duties to those established by the amount of the difference between the price fixed for the domestic consumer market in the exporter country and that prevailing on the importer country's domestic consumer market.

48. If this policy is to be put into effect on a world scale, one of the difficulties to be overcome will be that of co-ordinating the action of the various international organizations concerned and, consequently, centralizing the headquarters of the corresponding studies and negotiations. It should be noted that in the case of wheat alone there are at present an exporters' committeee, established in Washington, the International Wheat Council, operating in London, and the FAO Group on Grains, which works in Rome, and that, furthermore, OECD, EEC and GATT also take a hand in matters connected with the wheat trade.

49. This fundamental question gives rise to the following queries among others. What would be the attitude of Latin America, or of the Latin American countries directly concerned, to the possibility of market organization? Would Latin America as a whole, or the countries concerned collectively, make a co-ordinated effort to secure a voice in the study of the bases and machinery for the organization? On what guiding principles, and in relation to which articles? How would their course of action in this respect be reconciled with each country's policy *vis-à-vis* price and other problems connected with goods that would gradually be incorporated into the market organization?

VIII. Negotiating capacity

50. There is no doubt that Latin America's negotiating capacity would be considerably strengthened by co-ordination. However, it may be useful to review, from the

standpoint of the region as a whole, the factors that will play a part in strengthening that capacity, including the aggregate importance of the Latin American countries as importers and the prospects offered by the region for the development of exports of capital goods and durable manufactures originating in other regions.

To these factors should be added the existence of high import tariffs in Latin America for certain capital goods and durable manufactures; this constitutes a practical instrument for negotiations or establishing an understanding with other countries or groups of countries.

IX. Financial matters and technical assistance

51. As already stated, authoritative circles in Europe seem in general to incline towards collaboration with Latin America in financial and technical assistance matters rather than towards negotiable tariff agreements as a means of offsetting the damage that the establishment of an external tariff might do to the Latin American economies.

In the specified fields, it is also important that Latin America should find some co-ordinated means of expressing its views, since the fact that a number of different organizations deal with these questions in relation to Latin America is an obstacle to the definition of principles and the establishment of agreements that would lead to practical action.

These organizations include the Commission and Council of Ministers of EEC and the Development Aid Group (DAG) within the Organisation for Economic Co-operation and Development (OECD). It appears that another agency—the Commission—will shortly come into being which may be very important. This will have its headquarters in Paris and, within the political organization of Heads of State in EEC, will be chiefly concerned with financial questions and technical assistance to Latin America from the six European countries forming EEC.

52. The role allotted to DAG is essentially to promote the co-ordination and efficacy of measures to aid the less developed countries. It will begin by making a sort of inventory of the OECD countries' activities in this respect, and hold periodic meetings, at least once a year, to examine the situation and study the bases for consistent action. It is generally felt that progress will be slow, because of the variety of circumstances, motives and principles—some of them peculiar to the application of each country's foreign policy—that determine the respective conduct of OECD's members.

It is understood that, during an early stage of development, DAG's activities may to a certain extent specifically relate to the establishment of a minimum level of direct assistance for the less advanced countries, which would be fixed in accordance with the income of each DAG member.

It has been proposed in DAG that, in due course, the group should concern itself with encouraging the formation of financial consortia to pave the way for the application of specific over-all development plans. In such cases, the country assisted would be invited to join a special DAG group.

53. DAG will consider the Punta del Este Charter at its next meeting, the date of which has not yet been fixed.

54. With respect to the inflow of capital into Latin America, it is felt in Europe that the establishment of some form of multilateral insurance to cover non-commercial risks in foreign investment would have a highly favourable effect on the future level of such investment. The World Bank is at present studying certain economic and financial aspects of a draft agreement on the subject which was prepared by OECD without the participation of the Latin American countries or non-members of OECD.

55. Viewed as a whole, European experience with respect to medium and long-term export credits cannot be regarded as satisfactory, according to competent observers. Not only does it to a certain extent make for the preservation of bilateralism and adversely affect the monetary régime, but it produces a type of competition whose repercussions have been felt equally by the different countries.

The European experts theoretically believe that, in so far as Latin America is concerned, it would be best to regard any system of credit for inter-Latin American exports simply as a complement to import credits, and to make every effort to finance the latter by means of international public funds. In terms of interest this would cost much less to finance than commercial credit for exports and would not exert pressure on the monetary system as would export credits.

56. EEC is controlling the policy of medium and long-term export credits for third countries through an intergovernmental group that reviews cases of exports for which total payment would be effected over a period of more than five years. By means of contact between this group and an appropriate Latin American organization it might be feasible to reach an understanding that would lessen or ward off the effects of competition, for the period of credit, between Latin American and European suppliers for sales in Latin America.

57. In December 1961, the EEC Commission planned to examine a request from the Central American Bank for Economic Integration that European organizations should participate in financing operations included in the Bank's programmes.

58. It is hoped that the progress made by the ECLA secretariat in its work on credits for inter-Latin American exports will enable a certain amount of material to be made available within the next few months for communication to and consultation with the Latin American Governments.

59. As regards technical assistance—to mention one aspect only—attention should be drawn to the invaluable assistance that Latin America might receive from the EEC countries through EURATOM.

Given the research that is being carried out in EURATOM's own laboratories and, on its behalf, in certain public and private institutions, it seems likely that a satisfactory solution will soon be found for the problem of obtaining types of reactors that are capable of producing energy at competitive prices and in conditions that afford adequate protection for health. It is expected that the construction of public power plants on a fairly large scale will be started in the EEC countries within the next four years or so. It is also estimated that by about 1985 nearly a quarter of their energy requirements will be supplied by those plants.

60. Apart from a contract for certain specific purposes between EURATOM and the Inter-American Nuclear Energy Commission (IANEC), Brazil was the only Latin American country to sign an agreement to make use of the technical collaboration offered by EURATOM. This Agreement offers Brazil the possibility of technical assistance in its prospecting for minerals of nuclear importance, in

the analysis of those minerals, in the construction of research and production plants, in the exchange of radio-isotopes and in the processing of radiation fuels. Brazil will also make use of some of the 200 fellowships provided by EURATOM. Similarly, Argentina has started negotiations for an agreement on co-operation.

61. The possible use of technical assistance from EURATOM implies the existence of certain resources that are either national or created by several countries acting in collaboration. Among them would be reactors and other laboratory equipment, and the creation of university chairs, to provide basic training for physicists, chemists, biologists, engineers and other nuclear specialists so as to equip them to channel the co-operation of EURATOM and ensure that it is advantageous for the recipient country. It should be noted in this respect that the fellowships are to be distributed among nuclear specialists of a certain standing, since the fellows work as an integral part of EURATOM's technical teams, mainly in the central laboratory at Ispra (Italy).

62. While the progress made in Latin America with the preparations for the peaceful use of atomic energy is very uneven, a new factor making for unbalanced economic growth will be brought into play in the region. This will be unfavourable to those countries which, mainly because they lack the necessary raw materials, do not make a start towards utilizing European technical assistance through EURATOM.

X. Channels and machinery

63. This list of points should be rounded off by an examination of the most appropriate channels and machinery for facilitating and imparting continuity to the contacts between Latin America and the large groups of countries—particularly EEC—which, being in the nature of customs unions, will have to develop a joint trade policy once the transition period is past. This policy is already being sketched out in some aspects.

Three years ago EEC suggested to Latin America that a consultative group should be formed at the governmental level, but did not obtain sufficient Latin American backing to put the idea into practice.

64. It is constantly stressed in European circles that one of the obstacles to the achievement of the desired understanding with Latin America is the fact that the Latin American countries act in isolation, and offer no opportunity for the maintenance of continuous contact in the study of matters where joint examination would make it easier to find solutions and bring about reciprocal collaboration.

65. Moreover, in Latin American circles, for various reasons—*inter alia*, the experiences gained at the 1960-61 Tariff Conference, and the grave misgivings to which the present situation gives rise—it is beginning to be clearly understood, in view of the present policy of grouping, that if the Latin American countries persist in acting without any co-ordination they will continue to have too little say in decisions that closely relate to their economy and their future.

66. As far as it can, the ECLA secretariat, pursuant to the recommendations of the Governments represented on the Trade Committee, is following the trend of events —some of which cannot but give rise to acute disquiet—, maintaining contact at the working level with EEC, EFTA and OECD, and keeping a close watch on the progress of affairs in GATT that are important for Latin America's over-all external policy.

67. There is no doubt that present circumstances and developments now under way, as very briefly dealt with in this paper, indicate that the views beginning to gain ground in Latin American circles as to the advisability of a joint governmental examination of the situation with a view to possible co-ordinated action are well founded.

Table 1

IMPORT RESTRICTIONS IN FORCE IN EUROPE IN RESPECT OF COMMODITIES EXPORTED BY URUGUAY

Classification under the Brussels tariff nomenclature	*Description of products*	*European Economic Community (EEC)*					*United States*	*Canada*	*European Free-Trade Association (EFTA)*								*Czechoslovakia*	*Spain*	*Yugoslavia*
		Federal Republic of Germany	*France*	*Italy*	*Belgium and Luxembourg*	*Netherlands*			*United Kingdom*	*Austria*	*Switzerland*	*Portugal*	*Denmark*	*Norway*	*Sweden*	*Finland*			
02.01	Meat of bovine animals, frozen	2	2-10	6	1-3	1	5	5	10	1-4	1-8	1-3	1-3-8	1-6	1-3-4-6	1	2	2-4	2
02.01	Meat of bovine animals, chilled	2-3	2-10	6	1-4	1	5	5	10	1-4	1-8	1-3	1-3-8	1-6	1-3-4-6	1	2	2-4	2
02.01	Meat of sheep and lambs, frozen	2	2-10	6			5	5		1-4	1-8	1-3	1-3-8	1-6	4	1	2	2-4	2
02.01	Offals of bovine animals or sheep (chilled)	2	2-10	6		1	5	5	10	1-4	1-8	1-3	1-3-8	1-6	1-3-4-6	1	2	2-4	2
16.02	Preserved meat	2	2-10		1-4				10	1	1-8	1-3	1-3-8	1	4	1	2	2-4	2
16.03	Meat extracts		10		4				10	1		1-3	1-3-8	1		1-8	2	2-4	2
10.01	Wheat	2-4-7	2-10	2	1-4-7	1-4-7	8	2		2-4-7	1-4-7	3-12	1-3-4-8	2	4-6-7	1-7	2	2-4	2
11.01	Wheat flour	2-4-7	2-10	2	1-4	1-4	8	2	10	2	2	3-12	1-3-7-8	2	4	1	2	2-4	2
10.03	Barley	2-4	2-10	11	1-4	4		2	10	2-4	1-4-8	3-12	1-3-4-8	2	4	1	2	2-4	2
10.06	Rice	2	2-10				1-3				1-4	3-4-12	1-3	1-8		1	2	2-4	2
15.07	Linseed oil, crude	9	2-10	1-3-8-9	1-4				10	9		1-3	1-3	1-8		1-8	2	1-3-4	2
15.08	Linseed oil, refined	1-9	10	1-8-9	4				10	9		1-3	1-3	1-8		1-8	2	1-3-4	2
15.07	Edible oils, crude	9	2-10	7-9	1-4		4	9	10	1-9	2-4	1-3-4	1-3-8	1	4	9	2	2-4	2
15.07	Edible oils, refined	2-9	2-10	7-9	1-4		4	9	10	1-9	2-4	1-3-4	1-3-8	1	4		2	2-4	2
23.04	Oil cake				1				10		1-4-8	1-3	1-3		4	1	2	2-4	2
23.04	Oil meal				1				10		1-4-8	1-3	1-3		4	1	2	2-4	2
41.01	Cow-hides, dried and salted								10			1-3-4	1-3				2	1-3-4	2
41.01	Sheepskins, dried and salted								10			1-3-4	1-3				2	1-3-4	2
41.01	Sheepskins in the wool								10			1-3-4	1-3			1-8	2	1-3-4	2
41.02	Bovine cattle leather	8	10		1-4	1			10			1-4	1-3			1-8-10	2	2-4	2
41.03	Sheepskin leather		10		4				10			1-4	1-3			10	2	2-4	2

Table I (Continued)

IMPORT RESTRICTIONS IN FORCE IN EUROPE IN RESPECT OF COMMODITIES EXPORTED BY URUGUAY

Classification under the Brussels tariff nomenclature	*Description of products*	*European Economic Community (EEC)*					*United States*	*Canada*	*European Free-Trade Association (EFTA)*							*Czechoslovakia*	*Spain*	*Yugoslavia*
		Federal Republic of Germany	*France*	*Italy*	*Belgium and Luxembourg*	*Netherlands*			*United Kingdom*	*Austria*	*Switzerland*	*Portugal*	*Denmark*	*Norway*	*Sweden*	*Finland*		
41.06	Chamois-dressed leather	8	10		4							1-4	1-3			10	2	2-4	2
41.07	Parchment-dressed leather	8	10									1-3-4	1-3			10	2	2-4	2
41.08	Patent leather and metallized leather	8	10		4							1-4	1-3			10	2	2-4	2
53.01	Greasy wool											1-3-4	1-3				2	1-3-4	2
53.01	Washed wool				4							1-3-4	1-3				2	1-3-4	2
53.03	Waste of combed and carded wool and other wool waste		10									1-3-4	1-3				2	1-3-4	2
53.05	Wool tops	1-3	1-3		1				10			1-3-4	1-3				2	1-3-4	2
53.07	Yarn of combed sheep's or lambs wool	1	1-3		4				10	1-3		1-3-4	1-3			10	2	1-3-4	2
53.11	Woollen shawls	1	1-3		4				10	1-3	1	1-3-4	1-3			1-8-10	2	2-4	2

KEY TO SYMBOLS:

1. *Import permit:* Individual authorization granted subjet to certain conditions. 2. *State trading:* Direction and control of import trade by the State, either directly or through official agencies. 3. *Discrimination:* Extension of advantage to products from specific countries or currency areas. 4. *Variable import duties of charges:* Levies over and above customs duties, applied to imported goods for specific purposes, such as the stabilization or maintenance of domestic prices at a given level. 5. *Health restrictions:* Prohibition of imports from countries in which foot-and-mouth disease exists. 6. *Maximum and minimum price system:* Liberalization of imports when domestic price exceeds the maximum price fixed for the product in question, and automatic suspension of imports when domestic prices fall below the fixed minimum. 7. *Tie-in purchase requirements:* Regulations requiring importers or manufacturers to purchase a given percentage of similar domestic products. 8. *Quota system:* Establishment, at regular intervals, of maximum quantities that may be imported, on the basis of either volume or value. 9. *Production or turnover taxes:* Taxes applied when goods have been manufactured from the products concerned. 10. *Tariff preference:* Application of a preferential tariff for specific countries. 11. *Seasonal regulations:* System whereby imports are suspended during certain periods of the year. 12. *Corporate system:* System under which imports are the responsibility of national associations or agencies to which the producers belong.

EXPLANATORY NOTES:

Table 1 was drawn up on the basis of data from the following sources: (a) GATT documents; (b) Information given to the Uruguayan delegation by other delegations accredited to GATT; (c) Information furnished by the Governments of the countries mentioned in the table to diplomatic missions of the Republic of Uruguay in Europe.

For the purposes of the table, nineteen countries were selected which are major consumers of Uruguayan products. As regards the latter, thirty items were taken which during 1960 accounted for 97.5 per cent of Uruguay's exports. It should be pointed out that the table includes only twelve types of restriction applied to Uruguayan exports by the nineteen countries considered; no account is taken of other important types, such as the following: (1) Certain customs duties considered to be prohibitive; (2) Bilateral agreements; (3) Domestic subsidies; (4) Preferential treatment arising out of the creation of the European Economic Community (EEC) and the European Free-Trade Association (EFTA).

No distinction is made in the table between restrictions applied under GATT provisions and those which might be considered to constitute a breach of the General Agreement.

Table 2

1960-61, TARIFF CONFERENCE TREATMENT OF IMPORTS INTO THE EUROPEAN COMMON MARKET OF SELECTED COMMODITIES EXPORTED BY LATIN AMERICAN COUNTRIES

Classification under the Brussels tariff nomenclature, BTN	*Commodity*	*National tariffs*				*External tariff EEC*	
		Federal Republic of Germany	*Benelux*	*France*	*Italy*	*BTN sub-items*	*Rates of incidence*
02.01 A	Meat of bovine animals, chilled	20	12	35	30		20 ex: The rate of incidence of the duty was stabilized for an annual quota of 22 000 tons
02.01 B	Meat of sheep, chilled or frozen	20	12	35	40	B II B III	*20* *12*
02.01 E	Offals	20	12	35	40	A I, B I, A II, IIIa, IV, B II, B III	*(16)* *(20)* *(12)*
03.02	Fish flour	10 7	20 0	35 30	35 40	A I C: from cod annual quota of 34 000 tons. From other fish—free of duty. Smoked salmon: 13 per cent	15
04.03	Butter	25	15	25	30		24
04.04	Cheese	25 10 30 [1]DM 30 per 100 kg	15	15 12	25 20 11		ex *(20)* ex *(23)*
07.05	Beans	10 Minimum amount chargeable [1]DM3 per 100 kg		18 Minimum amount chargeable [1]FF 100 per gross kg	10	A B	*10*
		1-VII 25 30-IX	10 15			ex: lentils	*7*
08.01 A	Bananas	5 10	15	20	40		*20*
08.01 C	Papayas	10	25	5	25		12
08.01 C	Pineapples	10	25	5	25		*12*
08.02 C	Oranges	15-III a 10 30-IX 1-X 10 30-III	15 0 0 15 20	20 25 35	5 5	1-IV to 30-IX I-X to 15-X to 15-X	*15* ex: I-IV to 30-IX 15 ex: 1-X to 15-X
08.02 E	Lemons	0	13	15	5		8
08.04 A	Grapes, fresh	1-IX 5 30-VI minimum amount chargeable [1]DM 5 per 100 kg 1-VIII to 8 14-VII minimum amount chargeable [1]DM 5 per 100 kg	BF 413[1] or [1]IF 31.39 per 100 gross kg	15 25	10		18 22

(Continued)

Table 2 (Continued)

Classification under the Brussels tariff nomenclature, BTN	Commodity	National tariffs				External tariff EEC	
		Federal Republic of Germany	Benelux	France	Italy	BTN sub-items	Rates of incidence
08.04 B	Grapes, dried	0 10	12	5	18		9
08.06	Apples	7 Minimum amount chargeable ¹DM 2 per 100 kg	12	10 12	10 8	16-IX 15-XII	*10* Minimum amount chargeable 0.5/UA per 100 kg
		25 Minimum amount chargeable ¹DM 6 per 100 kg				1-VIII 31-XII	*14* Minimum amount chargeable 2.4/UA per 100 kg
		10 Minimum amount chargeable ¹DM 1.30 per 100 kg				1-I 31-III	*10* Minimum amount chargeable 1.7/UA per 100 kg
		20 Minimum amount chargeable ¹DM 6 per 100 kg				1-IV 31-VII	*8* Minimum amount chargeable 1.4/UA per 100 kg
08.06 B	Pears	1-VIII 10 31-XII minimum amount chargeable	12	8 12 15	10	1-VIII 31-XII	*10* (unselected) Minimum amount chargeable 0.5/UA per 100 kg
		¹DM 1 per 100 kg 20				1-VIII 31-XII	*13* (others) Minimum amount chargeable 2 UA per 100 kg
		Minimum amount chargeable ¹DM 6 per 100 kg	6	15		1-I	10
		1-I ¹DM 1 per kg 31-I 10 minimum amount chargeable ¹DM 3 per 100 kg	12	8 12		31-VII	Minimum amount chargeable 1.50/UA per 100 kg
		10 minimum amount chargeable 1-II ¹DM 1/100 kg	6	8			
		31-V 10 minimum amount chargeable ¹DM 3 per 100 kg		15			
		1-VI ¹ per 100 kg	6	8			
		31-VII 10 minimum amount chargeable ¹DM 3 per 100 kg	12	12 15			
08.07	Plums	1-VII 20 30-IX minimum amount chargeable ¹DM 5.5 per 100 kg	20	15	5	1-VII 30-IX	15 Minimum amount chargeable 3 per UA per 100 kg
		1-X 30-VI 0				I-X 30-VI	10
08.07	Peaches	20	20	20	5 10		15
08.09	Melons	20	15	10	5		11
08.12	Prunes	8	8	22	15		*16*
08.12	Chestnuts	8	10	15	5		7
08.12	Dried apricots	8	10	10	15		*9*
08.12	Nuts	8	10	5	10		8

(Continued)

Table 2 (Continued)

Classification under the Brussels tariff nomenclature, BTN	*Commodity*	*National tariffs*				*External tariff EEC*	
		Federal Republic of Germany	*Benelux*	*France*	*Italy*	*BTN sub-items*	*Rates of incidence*
08.12	Dried peaches	10	10	5	15		9
09.01 A	Coffee beans	[1]DM 1 per kg	free	18	58 lire per kg		*16* (not freed of caffeine) 19 (freed of caffeine)
09.01 A	Coffee, roasted or ground	[1]DM 300 per 100 kg	[1]BF 717 or [1]LF 54.48 per 100 net kg	55	90 minimum amount chargeable 300 lire per net kg		25 (not freed of caffeine) 30 (freed of caffeine)
09.02	Tea (black or green) of 3 kg or less	[1]DM 50 per 100 kg	[1]BF 987 or [1]LF 75 per 100 net kg	45 (black) 30 (green)	50 minimum amount chargeable 450 lire per net kg		*23* (5 kg or less) *18* (Others)
	Others	[1]DM 500/100 kg [1]DM 350/100 kg		30 45			
10.01	Wheat	20	0	30	50 30		20
10.03	Barley seed for fodder within a given annual quota	0	0	15	10		6
	Others	0	0	40	10		13
10.05	Hybrid maize seed	0	0	15 30	40 25		*4*
	Others (white maize for starch)				0		
				30	40		7
	Unspecified				40 25		9
11.04	Banana meal		Tariff, unspecified				17
11.07	Malt	20 Minimum amount chargeable [1]DM 60 per 100 kg less 70 per cent of value	6	30	17		20
12.01 A	Groundnuts	0	0	suspended by GATT	10 8 0		Free
12.01 C	Palm nuts and kernels	0	0	10 minimum amount chargeable [1]FF 400 per gross kg	0		*Free*
12.01 D	Soya beans	0	0	5			Free
12.01 B	Copra	0	0	10 minimum amount chargeable [1]FF 500 per gross kg	0		*Free*

(Continued)

Table 2 (Continued)

Classification under the Brussels tariff nomenclature, BTN	Commodity	National tariffs				External tariff EEC	
		Federal Republic of Germany	Benelux	France	Italy	BTN sub-items	Rates of incidence
12.01	Cotton seeds	0	5	16.1/GATT	10		Free
12.01 E	Linseed	0	0	0	0		Free
12.01 H	Sesame seeds	0	0	10	10		Free
12.01 H	Sunflower seeds	0	0	10	10		Free
15.01	Animal fats (lard) for industrial use	0	0	32	20		4
15.01	Animal fats (for other uses)	14 18	0	32	20		20
15.01	Poultry fat	0	0	32	20		18
	Oils for technical use						
15.07 B	Cotton seed oil						5 8
15.07 C	Groundnut oil						5 8
15.07 E	Sunflower seed oil						5
	Oil for other uses						
15.07	Cotton seed oil						10 15
15.07	Sunflower seed oil						10 15
15.07	Groundnut oil						10 15
15.07	Soya bean oil						10 15
15.07	Sesame seed oil						10 15 20
15.07	Coconut oil						10
15.07	Palm oil						9 14 ex: for technical use 4 per cent
15.13	Margarine	30	15	30	30 35		25
16.02	Preserved meat of bovine animals	20 21 22	30	30 45	25		26
16.02	Preserved meat of sheep	20 21 22	30	30 45	25		26
16.02	Preserved meat of swine	20 21 22	30	30 45	25		26
16.03	Meat extracts	0 30	3 8 25	0 15	5 15		2 9 24

(Continued)

Table 2 (Continued)

Classification under the Brussels tariff nomenclature, BTN	*Commodity*	*National tariffs*				*External tariff EEC*	
		Federal Republic of Germany	*Benelux*	*France*	*Italy*	*BTN sub-items*	*Rates of incidence*
17.01 A	Raw sugars		Tariff unspecified				80
17.01 B	Refined and semi-refined sugars						80
17.03	Molasses	20	0 [1]BF 300 [1]LF 22.8 per 100 kg	0 2 35	105 40		Free *9* 19 65
18.01	Cocoa beans	9 (GATT 10 per cent)	L (GATT 10%)	L (GATT 25%)	L (GATT 5%)		*9*
18.04	Cocoa butter	35	10	25	25		*20*
18.05	Cocoa powder	35	10	25	25		*27*
20.06	Preserved fruit	25 35 20 10	30 15 25 13 10	15 10 5 0 50 35 25	40 16 30 25 0 5		*23* *25* *17* 19 *23*
21.02	Coffee concentrates	[1]DM 1 per kg 16 per cent incidence	L	18 (GATT 20 per cent)	65 lire per kg (incidence 10.4 per cent) GATT 50 per cent but not less than 125 lire per kg		ex: *30*
24.01	Unmanufactured tobacco	[1]DM 180 per 100 kg [1]DM 390 per 100 kg	[1]BF 413 or [1]LF31.39/100 net kg [1]BF 578.20 or LF 43.94 per 100 net kg	0	0		minimum *29* 30 *UA* maximum *42* *UA*
26.01	Iron ore	0	0	0	5 10 0		Free
26.01 C	Copper concentrates	0	0	0	0		*Free*
26.01 F	Lead ore and concentrates	0	0	0	5		*Free*
26.01 G	Zinc ore and concentrates	0	0	0	5		*Free*
26.01 H	Tin ore	0	0	0	0		*Free*
27.09	Petroleum, crude	[1]DM 12.90/100 kg	0	18 0	18 0 10 15 3 6		Free
27.10 B	Motor spirit	List G					
27.10 C	Kerosene	List G					

(Continued)

Table 2 (Continued)

Classification under the Brussels tariff nomenclature, BTN	*Commodity*	*National tariffs*				*External tariff EEC*	
		Federal Republic of Germany	*Benelux*	*France*	*Italy*	*BTN sub-items*	*Rates of incidence*
27.10 D	Distillate fuels (fuel-oil, Diesel oil)	List G					
27.10 F	Lubricating oils	List G					
27.16	Brucker oil (asphalt)	List G 0	0	3	10		3
31.02	Mineral fertilizers	0	0	0	20		*1*
	Natural nitrates and others	20		20	0 15 30		*10*
32.01	Quebracho extracts		No information				Free
41.01 A	Raw hides and skins	0	0	0	0		*Free*
41.02 A	Dressed hides and skins	3 5	6	10 12	22 20 23		*9* *10*
44.03	Wood in the rough or semi-prepared	0	0	10 0	8 20		5 some African species only, the remainder duty-free
	tropical				22 13 10 5		ex: *Free*
	coniferous	15	0	10	18 20		8 Posts of 6 to 18 metres, etc., the others being free ex: *Free*
44.03	Others	0 10	0	15 10 5 0	8 20 22 13 10		ex: *Free*
44.04/05	Wood, squared and prepared	0 13 5	0 3 5	15 0 20 7 18 5	8 15 12 20 18 5 6 10		*Free*
44.07	Sleepers	15 0	3	20	10 8 12 15 20 18		*10* *8*
44.15	Plywood	20 12 15	6 10	10 20 25	25 30		*14* *15*

(Continued)

Table 2 (Continued)

Classification under the Brussels tariff nomenclature, BTN	Commodity	National tariffs				External tariff EEC	
		Federal Republic of Germany	Benelux	France	Italy	BTN sub-items	Rates of incidence
47.01	Mechanical or semi-mechanical wood pulp	7	0 15	22	0		*Free (quota of 170 000 tons); remainder 6 per cent*
	chemical	0 20 2 5 20 9 7	0 15	22 24	0		*Free* (quota of 1 935 000 tons); remainder *6 per cent*
	others	0 7 9	0 15	20 22 24 0	6		*Free*
48.01	Newsprint	12	10	25	15 18		*7*
53.01 A	Wool, greasy	0	0	0	0		*Free*
53.01 B	Wool, washed	1 0	0	1 0	0		*Free*
53.01 B	Wool, combed or in tops	2	4 2 0	2	0 8		*3*
53.06	Woollen yarn	7	4	4 6	14		*6* *10*
54.01	Flax (raw)	0	0	0	6 15 8		Free
54.03/04	Flax	3 12 7 0	4	10 12	23 18 13 5 4		3 per cent (for quota of 500 tons) others: *10 per cent* *6 per cent* ex: *10 per cent*
55.01	Cotton, raw	0	0	0	6 8		*Free*
55.05/06	Cotton yarn	8 12 14 6 20 10 17 9	0 4 10 12	15 20 10 12	15 18 16 20 25 30 35		*9* *16*
57.01	True hemp	0	0	0	0		Free
57.02	Manila hemp	0	0	0	5		Free
57.03	Jute	0	0	0	5		*Free*
57.04	Agave	0	0	0	0		*Free*
57.04	Sisal	0	0	0	0		*Free*
57.04	Maguey	0	0	0	0		*Free*
73.01	Pig iron	3	3	4	7 5		

(Continued)

Table 2 (Continued)

Classification under the Brussels tariff nomenclature, BTN	Commodity	National tariffs				External tariff EEC	
		Federal Republic of Germany	Benelux	France	Italy	BTN sub-items	Rates of incidence
73.02 C	Ferro-silicon						Annual quota of 12 600 tons
73.02 D	Ferro-silico-manganese						Annual quota of 21 500 tons
73.02 E.I.	Ferro-chrome, etc.						Annual quota of 2 400 tons. Bars and shapes containing up to 0.1 per cent of carbon by weight and 30 to 90 per cent of chrome
73.10	Wire rod	6	6	7	10		*10*
73.10/11	Bars and shapes	15 18 12	3 8 15 6	10 18 11 19	22 35		*10*
73.12	Strip	18 25	6	18	35 22		*10*
73.13	Plates and expanded metal	18 20 22 28 9	3 4 6	16 18 19 22	23 35 20 22		*10*
74.01 C	Copper, standard or blister, in ingots	0 5	0	0 20	3.5		*Free*
74.01 D	refined in ingots	5	0	0	3.5		*Free*
	electrolytic in ingots						*Free*
	recast in ingots	0 5	0 20	0 20	3.5		*Free*
	cement and precipitates		28				*Free*
	plates, unspecified	10 15	6 15	14 15 12 30	17 16 39 13 18 17		*10*
74.07	Tubes and pipes	12	8 15	14 12 13 16 15	12 11 13		*13*
74.10	Wire (not insulated)	10	10	19	21		*13*
74.10	Wire, insulated	12 8	12	22	35 49		*13*
74.19	Other articles of copper						*18*

(Continued)

Table 2 (Continued)

Classification under the Brussels tariff nomenclature, BTN	Commodity	National tariffs				External tariff EEC	
		Federal Republic of Germany	Benelux	France	Italy	BTN sub-items	Rates of incidence
76.01	Aluminium	12	0	20 21	35		*9* *10*
						B II B I	*Free* *5*
78.01 A	Lead ingots	5	0	8	20 minimum amount chargeable 40 lire per net kg		*1.32 UA per 100 kg*
78.02	Lead bars	10 15	4 6	20	20		*10%*
79.01	Zinc spelter	5	0	12	15 minimum amount chargeable 25 lire per 100 kg		*1.32 UA per 100 kg*
79.02	Zinc bars	10 15	4	16 18	15		*10%*
79.06	Sacks of zinc tags and zinc cables	15	15	22	25		16%
80.01	Tin ingots	0	0	0	2		Free
80.02	Tin bars	6 8	6 4	10 12	10		8

EXPLANATORY NOTES:

a) The 1960-61 Tariff Conference is the title given to the fifth series of negotiations of the General Agreement on Tariffs and Trade (GATT). This series comprises:
   i) The negotiations of the European Economic Community (EEC) with the other countries members of GATT in connexion with article XXIV, 6 of the Agreement;
   ii) The Dillon negotiations, which are general in character and concern all the Contracting Parties of GATT; and
   iii) The incorporation of new countries as Contracting Parties of GATT.

b) The table contains *provisional data from unofficial sources.*

c) Rates of incidence are expressed in *ad valorem* percentage terms.

d) At the date when the table was drawn up—12 December 1961—the Tariff Conference had not yet ended, so that there may be changes in some of the rates of incidence noted.

e) A list of quotas is presented in table 3.
In table 2, "ex" implies that the duty is seasonal or that only part of a tariff item has been negotiated or consolidated, as the case may be. The seasonal duty is usually in force from 15 March to 15 September.

f) Quotas negotiated under GATT remain in force for three years, and cannot therefore be reduced within that period.
The rates of incidence which are not underlined in the appropriate column are those fixed by EEC's external tariff and not negotiated at the 1960-61 Tariff Conference. Once the quotas have been covered, imports in excess of their volume are subject to the régime of duties established by EEC for the product concerned.

g) Underlining of the percentages or of the note "Free" in table 2 implies that the treatment accorded by the common external tariff was not negotiated or consolidated at the 1960-61 Tariff Conference.

h) The value of the EEC unit of accounting, in terms of which the duties established by the external tariff are expressed, is 0.88867088 grammes of fine gold. In other words, its gold equivalence is the same as that of the United States dollar.

i) The following abbreviations have been used for national currencies:
DM = Deutschmark
FB = Belgian franc
LF = Luxembourg franc
FF = French franc (old)

Table 3

CONFERENCE ON TARIFFS FOR 1960/61. QUOTAS FOR THE COUNTRIES INDICATED, FOR IMPORTS FROM OUTSIDE OF EEC

Classification BTN	*Commodity*	*Common external tariff of the EEC*	*Importing country*	*Quotas from third countries granted to the indicated importing country*	*Maximum permissible variation from the established quotas*
48.01 A	Newsprint	7%	France	75 000 T	0
			Germany	310 000 T	0
ex 53.07 A	Combed wool yarn	6%	Germany	900 T	2%
ex 54.03 A.I	Flax yarn	10%	Germany	500 T	3%
73.05 A	Iron filings or steel powder	8%	Germany	4 100 T	3%
			Benelux	850 T	0
			Netherlands	1 400 T	0
73.02 A.II	Ferromanganese	8%	Benelux	320 T	0
			Netherlands	500 T	0
73.02 C	Ferrosilicon	10%	Benelux	20 000 T	0
			Netherlands	2 600 T	0
73.02 D	Ferrosiliconmanganese	6%	Germany	40 000 T	0
			Luxembourg	70 T	0
			Netherlands	420 T	0
73.02 E.I	Ferrochrome	8%	Italy	9 000 T	0
			Benelux	2 950 T	0
			Netherlands	160 T	0
ex 73.02 G	Ferrotungsten	7%	Benelux	60 T	0
			Netherlands	3 T	0
ex 73.02 H	Ferromolybdenum	7%	Benelux	370 T	0
			Netherlands	27 T	0
ex 73.02 H	Ferrovanadium	7%	Benelux	21 T	0
			Netherlands	9 T	0
ex 76.01 A	Unalloyed crude aluminium	10%	Germany	120 000 T	5%
76.01 B.I	Aluminium scrap	5%	Germany	24 000 T	0
			Benelux	54 T	0
			Netherlands	600 T	0
77.01 A	Crude magnesium	10%	Germany	28 000 T	0
			Benelux	375 T	0
			Netherlands	180 T	0
78.01 A	Crude lead	1.32 UC per 100 kg	Germany	54 000 T	0
			Bélgica	10 000 T	0
			Netherlands	31 000 T	0
79.01 A	Crude zinc	1.32 UC per 100 kg	Germany	74 000 T	0
			Netherlands	7 700 T	0

EXPLANATORY NOTE: This table contains preliminary data from unofficial sources. The indicated quotas are for 1961. It is understood that the quotas for 1962 will be approximately the same. Although under GATT regulations the quotas cannot be reduced within a period of three years, those included in this schedule apparently would fall outside these regulations, the reason being that the EEC countries presumably agreed on them of their own accord and not as a result of negotiations with third parties. It is to be noted that these import quotas are under a special tariff system. Once a country has imported an amount equivalent to the total quota fixed for that country, any additional imports are subject to the duties established in the EEC external tariff.

HYDRO-ELECTRIC RESOURCES IN LATIN AMERICA: THEIR MEASUREMENT AND UTILIZATION

A preliminary and brief review of Latin America's hydro-electric resources, with special reference to the amount of knowledge available on them, their approximate magnitude and the part they play in supplying the region's energy requirements, is given in this article.

In analysing the last-mentioned point, it is stated in the Introduction that Latin American hydro-electric production is growing at a steady pace and that its share in the consumption of commercial energy—which is already nearly 15 per cent—is increasing, in common with the averages for the world and its main regions. Latin America's contribution to total electric power production is slightly more than 50 per cent and is expected to expand, whereas the world average is a little over 30 per cent and is on the decline.

In section I of the present article it is stressed that the Latin American countries need to evaluate their water resources and plan their utilization with a view to obtaining the greatest possible benefit, in keeping with the experience already acquired in the integrated multi-purpose development of numerous river basins.

For this purpose, the salient concepts on hydro-electric potential are reviewed; the difficulties deriving from the use of this potential are pointed out and the particular potentials recommended that would be most suitable at the present stage of development in Latin America and the current position of water resources research there. The corresponding methods of evaluation are also described.

Generally speaking, a calculation should be made of the so-called theoretical potentials which, while constituting ceilings that are unattainable in practice, require a minimum amount of information and enable potentials for economic use to be estimated within fairly narrow limits by means of empiric coefficients.

As the irregularity of stream flow has a strong influence on the economic aspect of water resources development, a very useful coefficient, which has been recommended by the Economic Commission for Europe, is suggested for general programming studies.

In section II, up-to-date calculations of hydro-electric potentials in Latin America are given, together with the concepts in current usage and a broad outline of their application.

With respect to theoretical potentials, the assessments made by the United States Geological Survey (the sole source that covers research throughout the world) are reported; the criteria adopted were fairly uniform but the data vary in accuracy and scope. The calculation based on average stream flow attributes 23 per cent of world hydro-electric potential to Latin America, and there are no comparative data in the region against which the figures can be checked.

Conversely, in the field of economic potential, individual country assessments are available and have been compiled by the Economic Commission for Latin America. They differ considerably in method and principle. According to their data, the minimum economic potential of the region is 155 million kW.

The data on the economic potentials of selected river basins shows that the geographical distribution of these basins is irregular.

It is clear that what is lacking is a systematic evaluation based on the same criterion in every country of the region.

For purposes of illustration, an analysis is made of the variation in the stream flow of selected Venezuelan and Chilean rivers and, in the case of Argentina, a very tentative curve is constructed for this factor, in application of the calculation mentioned in section I.

An examination is then made of the extent to which hydro-electric resources have been used in Latin America (in the proportion of about 4.5 per cent of the economic potentials), from which it emerges that the low percentage denotes the abundant nature of the resources rather than any lack of interest in their development.

Section II concludes with an account of some general features of existing hydro-electric works and explores the possibility of establishing new plants in the next few years, which would accentuate the sustained upward trend of growth registered so far.

In section III, the facilities for research on Latin America's water resources are studied, and stress is laid on the importance of flow and rainfall measurements (continuous statistical series covering an adequate number of years) for the proper execution of hydraulic works.

Most of the analysis is devoted to ascertaining the number of rain gauges and flowmeters in service in the different countries and important river basins, the span of the records in years is noted and the coverage indices calculated (number of stations per 10,000 square kilometres by average years of registration).

Consideration is the given to the detailed plans showing contour lines that are available, since they are another essential item of information for the evaluation of theoretical potentials. It appears that, despite the shortage of facilities for investigating hydraulic resources in Latin America, it would be possible to make a co-ordinated, systematic and integrated evaluation of hydro-electric potentials.

Lastly, a list is given of the organizations that are responsible for taking hydrological measurements in each country, together with observations on the co-ordination of the work, centralization and the publication of data.

No analysis is made in this study of the unit costs of hydro-electric installation and production in Latin American countries, as they form the subject of a special secretariat paper.[1]

[1] See *Prices and costs in the electric energy industry in Latin America* (ST/ECLA/CONF.7/L.1.51).

THE PARTICIPATION OF HYDRAULIC ENERGY IN TOTAL WORLD PRODUCTION OF COMMERCIAL AND ELECTRIC ENERGY

An analysis of the part played by water resources in supplying commercial energy during the last twenty years, and of their contribution to electricity production in the principal regions of the world—especially Latin America—paves the way for an objective appraisal of the importance of their present role and an estimate of future prospects.

Table 1 shows that, in all the regions indicated, hydroelectric production increased in the last twenty years, usually far outpacing commercial energy but lagging behind total electricity production, as will be seen in greater detail later. Without dwelling on aspects which are dealt with at length in another ECLA study,[2] mention should be made of the rapid rate at which commercial and hydraulic energy are developing in Latin America.

While the consumption of commercial energy in 1959 amounted to 2,750 million tons of petroleum equivalent for the whole world, at a cumulative annual rate of growth of 5.5 per cent—the average for the last decade—demand in Latin America reached 83 million tons with a growth rate of 7.6 per cent. In the United States and Western Europe, demand was 937 and 556 million tons of petroleum equivalent respectively, and expanded annually at the rates of 3.5 and 3.8 per cent.

During the same two decades, the use of hydraulic energy to cover the above-mentioned requirements increased not only in absolute but also in relative terms, as may be seen from table 2.

Nevertheless, owing to the very unequal way in which the rates progressed in the regions indicated, the percentage contribution of hydraulic energy also changed in different degrees. It was highest—nearly 29 per cent—for the group of countries composed by Australia, Canada, Japan, New Zealand and the Union of South Africa, and lowest—3.7 per cent—for the less-developed countries, excluding those of Latin America.

Apart from the above-mentioned group of countries, in which hydraulic energy supplies more than a quarter of the commercial energy required to satisfy consumption, its contribution is greatest in Latin America and Western Europe, where it amounts to an eighth of the total.

The relative reduction in the part played by hydroelectric power in Latin America in 1955, which is observable from tables 2 and 3, was mainly due to the fact that the public utility systems in Brazil, in spite of having several hydraulic units in process of installation at Peixotos, Cubatao, Nilo Peçanha and Salto Grande, did not begin to function until 1956.

The share of hydraulic energy in world electricity production may be studied in table 3, which covers the same regions and years as table 2.

[2] See *The electric power industry in Latin America—present status and recent development* (ST/ECLA/CONF.7/L.1.01).

Table 1

CUMULATIVE ANNUAL RATES OF GROWTH OF HYDROELECTRICITY, TOTAL ELECTRICITY AND COMMERCIAL ENERGY,[a] 1937-59

(Percentage)

	Commercial energy	*Total electricity*	*Hydroelectricity*
Latin America	6.2	8.1	7.7
Western Europe	1.8	5.9	5.6
Eastern Europe	5.1	8.5	10.0
United States	3.0	9.0	5.9
Other developed countries[b]	3.8	6.1	5.5
Rest of the world	8.9	9.7	6.1
World total	3.7	7.6	6.0

SOURCE: ECLA, on the basis of direct information for Latin America, and on United Nations, *Statistical Papers*, Series J. 1-3, for other regions and countries.

[a] Commercial energy comprises petroleum—including natural gas and its derivatives, mineral coal and hydro-electricity. Hydroelectricity has been evaluated by the amount of petroleum (at 10,700 kCal/kg) that would be needed to produce the same amount of electricity, due account being taken of the average yields of thermoelectric plants. For further details see *The electric power industry in Latin America—present status and recent development*, op. cit.

[b] Australia, Canada, Japan, New Zealand and the Union of South Africa.

Table 2

PARTICIPATION OF HYDRO-ELECTRICITY IN COMMERCIAL ENERGY CONSUMPTION

(Percentage)

	1937	*1949*	*1955*	*1959*
Latin America	13.5	13.6	12.7	14.6
Western Europe	7.6	9.7	11.6	13.7
Eastern Europe	1.6	1.4	2.3	3.4
United States	4.1	5.4	5.3	5.8
Other developed countries[a]	24.0	26.6	27.4	28.9
Rest of the world	5.3	7.0	3.0	3.7
World total	6.6	7.5	8.0	8.7

SOURCE: ECLA, on the basis of direct information for Latin America, and on United Nations, *Statistical Papers*, Series J. 1-3, for other regions and countries.

[a] Australia, Canada, Japan, New Zealand and the Union of South Africa.

Table 3

PARTICIPATION OF HYDRO-ELECTRICITY IN TOTAL ELECTRICITY PRODUCTION[a]

(Percentage)

	1937	*1949*	*1955*	*1959*
Latin America	50.9	52.1	49.8	52.1
Western Europe	44.5	41.9	41.0	39.2
Eastern Europe	11.5	9.7	11.2	16.8
United States	37.0	30.8	19.0	17.8
Other developed countries[b]	74.3	77.6	71.5	68.0
Rest of the world	46.2	51.4	23.0	26.3[c]
World total	42.8	38.8	30.5	30.0

SOURCE: ECLA, on the basis of direct information for Latin America, and on United Nations, *Statistical Papers*, Series J. 1-3, for other regions and countries.

[a] Comprising production for public consumption and production by private services for their own use.

[b] Australia, Canada, Japan, New Zealand and the Union of South Africa.

[c] 1958.

Table 4

HYDRO-ELECTRICITY PRODUCTION AND AVERAGE RATES OF ANNUAL GROWTH

	Production (millions of mWh)				*Rates of growth (percentage)*		
	1937	*1949*	*1955*	*1959*	*1937/49*	*1949/55*	*1955/59*
Latin America	6.3	13.6	21.1	33.2	6.6	7.6	12.0
Western Europe . . .	62.3	92.1	159.7	211.0	3.3	9.6	7.2
Eastern Europe . . .	7.0	11.0	27.3	61.7	3.9	16.5	22.6
United States	44.0	90.0	120.4	158.4	6.1	5.0	7.2
Other developed countries[a]	51.0	85.2	131.4	(178.0)	4.4	7.5	(7.9)
Rest of the world . .	6.2	12.8	11.4	(27.3)	6.3	—1.8	(24.3)
World total	176.8	304.7	471.3	(670.1)	3.4	7.6	(9.1)

SOURCE: ECLA, on the basis of direct information for Latin America, and on United Nations, *Statistical Papers*, Series J. 1-3, for other regions and countries.
[a] Australia, Canada, Japan, New Zealand and the Union of South Africa.

In contrast to the trend of events observed in the production of commercial energy, hydraulic energy is, on the whole, taking an increasingly small part in total electricity production in spite of its steady increase in absolute terms. This contraction is due to the more rapid development of electricity in recent decades which, from constituting 15 per cent of world commercial energy consumption in 1937, expanded to 20 per cent in 1949 and to over 29 per cent in 1959, without any apparent pause in its upwards climb.

The only regions where hydro-electric power increased its participation in electricity production during the last two decades were Eastern Europe (mainly because of progress in the USSR) and, to a lesser extent, Latin America.

Together with the group of highly-developed countries consisting of Australia, Canada, Japan, New Zealand and the Union of South Africa, the Latin American region and Eastern Europe used water resources more extensively in their total electricity production (in proportions of 68, 52 and 39 per cent respectively), while the world average was 30 per cent.

A summary of world hydro-electric production, which reveals the accelerated development of water resources in the world and in Latin America in particular, is given in table 4 in absolute terms.

Nevertheless, it may be said that Latin America has barely started to tap its hydraulic potential. The first confirmation of this statement comes from table 5, which shows the amount of hydro-electric power that was produced per unit of area in 1959.[3]

When the table is analysed, it is interesting to note that the Latin American and other less developed countries account for only 1.6 and 0.4 mWh/km², while the world average is 5.0, and the respective figures for Western Europe, the United States and Eastern Europe are 22.5, 20.3 and 13.8 mWh/km². It is undeniable that hydraulic potential varies considerably from one basin to another, in accordance with topography, precipitation, evapotranspiration and underground infiltration, but even without going into these aspects in detail, it may safely be stated that in no case are they sufficiently adverse in Latin America as a whole as to give rise to potentials that are equal to only a third part of the world average, which is the state of development in Latin America today.

On the contrary, and despite the fact that the investigations made so far in this field have been on a small scale, it may be accepted that the potential per unit of area is considerably higher than the world average as it stands at present. Hence, it is obvious that development of hydraulic energy in Latin America is exceptionally low, although this source plays an important part in electricity production.

Of the different ways in which water will help in the economic development of the region, not the least important will be its role in the production of electric energy. On the one hand, the growth of demand for this form of energy, which is expected to increase at a rate of between 7 to 12 per cent annually (doubling or trebling in 10 years' time) according to the country in question,[4] and, on the other, the wealth of hydraulic potential, on which little is known as yet, will provide a sound economic basis for multi-purpose river development.

[3] It should be remembered that available head and flow are the prime factors determining potential in each hydro-electric plant. The former is a function of the topographic conditions and the latter of a number of elements, such as precipitation, evaporation, underground infiltration, and *the extension of the catchment area up to the point under consideration*. For this reason, it is customary, in evaulating potential and hydro-electric uses, to relate them to the unit of area.

[4] *Expansion of the electricity sector in Latin America and its capital requirements for 1960-70* (ST/ECLA/CONF.7/L.1.11).

Table 5

HYDRO-ELECTRICITY PRODUCTION PER UNIT OF AREA, 1959

	Millions of mWh	*Millions of square kilometres*	*mWh/km²*
Latin America	33.2	20.38	1.63
Western Europe . . .	211.0	9.36	22.50
Eastern Europe . . .	61.7	3.74	16.50
United States	158.9	7.83	20.30
Other developed countries[a]	178.0	19.54	9.10
Rest of the world . .	27.3	74.52	0.37
World total	670.1	135.37	4.95

SOURCE: ECLA, on the basis of direct information for Latin America, and on United Nations, *Statistical Papers*, Series J. 1-3, for other regions and countries.
[a] Australia, Canada, Japan, New Zealand and the Union of South Africa.

For this reason, it is becoming increasingly necessary to make a proper evaluation of the inherent possibilities of the Latin American river and lake systems.

The general review of facilities for investigating water resources from the standpoint of stream flow, which comprises the last chapter and was specially undertaken for the purposes of the study on hydro-electric potentials, is wholly valid and can be used as a basis for other analyses, including that of multiple-purpose development.

I. HYDRO-ELECTRIC RESOURCES: CONCEPTS AND METHODS OF EVALUATION

1. General considerations

Water is in limited supply on every continent and is of vital importance to mankind. It must therefore be used in the best interests of the community as a whole. While this becomes more essential everywhere as time goes on, it may even be a critical factor in some areas and seriously curtail their prospects of economic development.

The experience gained in many parts of the world with respect to the multiple-purpose development of rivers and basins and the evolution of the many theories on the subject have clarified a number of problems arising from optimum use of water.

The Latin-American countries, with their vast territories and untapped water resources, thus have the opportunity to plan their development in the light of present-day concepts and methods, and they must do so.

The following characteristics of a body of water must be determined before it can be equitably distributed among consmers and used to the best advantage: on the one hand, the volume, quality, geographical distribution and rate a flow (within a hydrological year and from one year to another) and, on the other hand, the amount required for various purposes (drinking water, irrigation, power production, industry, navigation) as well as the benefits to be derived from regulating increases in the flow of water.

It should be borne in mind that hydro-electric potential does not only depend upon the volume of water available in the time unit; it also implies that changes in elevation must be considered as well as the rate of stream flow. Hence, the hydro-electric potential is proportional to the product of these two factors.

It should also be noted that the operation of a hydro-electric plant as a source of energy depends as much on the demand for electricity within the network or system to which it is attached as it does on the volume of water available in the basin on which it is located to supply all the water requirements for which it is intended. Hence, its method of operation should combine the requirements of the various sectors in the best possible way to secure the maximum benefit for the community. Specific cases arising in practice may cover a wide range, from a river primarily used for electric power generation to one where such production is merely the lesser of several uses to which the water is put.

It is essential that the organs responsible for the development of electricity services and those concerned with planning the multiple-purpose use of water resources should work in close co-operation. Experience in Latin America nevertheless shows that authorities often give high priority and adequate funds for investigation of a specific development which can be completed within a short period of time. They are less inclined to invest in general research aimed at planning the over-all development of a basin or region, particularly those involving long-term measurements. These specific projects often waste other possibilities of river use which might have been obtained had more time been taken over them, as advocated here, for research and planning.[5]

Data essential to the planning of specific hydro-electric projects should be divided into two types: information which can be obtained in a relatively short period of time provided the necessary staff and technical equipment (topographical maps, geological surveys, soil mechanics, etc.) are available and the hydrological and hydro-meteorological data requiring several years of uninterrupted observations. With regard to the latter, it generally takes from twenty to thirty years before mean statistical values are obtained which can be considered reliable for future use as mean average values.[6] It should be pointed out, however, that in many cases much less time is required, provided there are adequate correlations by which statistics on stream flow can be extended within a tolerable margin of error and, secondly, if the economic loss resulting from this lack of absolute accuracy is less than the loss suffered by the community if a particular hydro-electric project were not carried out.

Generally speaking, over-all development planning for an entire basin, involving as it does many experts in various fields and diversified research, must proceed slowly in view of the size of the investment required and the benefits to be derived.

In any case, a good knowledge of the geographical distribution of water resources and their specific features, including a knowledge of the hydro-electric potential, is clearly a basic requisite for river basin development planning. Full knowledge of a country's hydro-electric resources facilitates proper power development programming, the selection of the most suitable sites for electric power plants of different types (hydro-electric and thermal) and their relative role within each network, including the lines of interconnection and transmission. Similarly, if hydro-electric power can be at sufficiently low cost, a valuable basic element will have been provided for the location of certain chemical and metallurgical industries which require a large supply of electric power.

2. Definitions of hydro-electric potentials

The United Nations specialized agencies, and particularly the Economic Commission for Europe and the Economic Commission for Asia and the Far East, have carried out studies for the purpose of laying down rules governing the uniform evaluation of hydraulic potentials at various levels,

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[5] See: *Comisión Federal de Electricidad de México, Planning a system. Study based on the development of the Sonora-Sinaloa system* (ST/ECLA/CONF.7/L.2.3), a document in which are analysed the hydraulic development of north-west Mexico and the consequences of inadequate research and planning.

[6] See: ECAFE, *Flood Control Series, No. 7, Multiple Purpose River Basin Development*, Part I, *Manual of River Basin Planning* and *ECAFE Methods of Assessment of Hydro-Electric Potentials*. I & NR/Sub.1/HPWP/1.

based on available data. Only thus can valid international or inter-regional comparisons be made.[7]

The present position, while already discussed at length, is summarized below simply for the purpose of clarifying and emphasizing some practical aspects of immediate interest to the area. At the same time, a few specific suggestions are offered.

Two definitions of potentials are of particular interest to over-all hydro-electric evaluations:

(*a*) The *theoretical potential* (sometimes called the gross potential) fully measures the resources of a hypothetical annual production of energy of a basin or river system in their natural state, that is to say without any alterations produced by works built to generate that energy. It is considered that all water at an elevation above sea level is susceptible of producing electric power, with a 100 per cent output.

(*b*) The *technical potential* (also called "exploitable potential" or "practical potential") measures resources by existing power plants and those capable of being installed at a given moment by conventional technical methods for this type of structure or with present techniques, without exceeding a previously set ceiling to the cost of installed kW.

The concept of technically exploitable potential may seem very vague if no cost limit is set. In fact, if any construction is considered physically realizable (excluding the cost factor) the exploitable potential, or potential that can technically be achieved, is close to the theoretical potential.

It should be pointed out that the theoretical potential, as defined earlier, is an unalterable characteristic of each basin and is completely independent of the attitude of man,[8] unlike the evaluation linked to development, either technical or economically achievable.

Theoretical potential should be divided into two parts:

(i) The *gross run-off potential* which measures the theoretical annual output of energy (or respective mean potential) by unit of area (kWh/km^2 or kW/km^2) corresponding to the water of a basin or region, neglecting the losses of water, and measured by each unit of surface with its altitude above sea level in its initial run-off.

Rain water falling on an area, it should be remembered, is divided into three parts which follow one of the three processes set out below:

1. Evaporation and transpiration from vegetation;
2. Surface run-off;
3. Infiltration with underground run-off.

The gross surface potential of a basin should preferably be estimated by "surface run-off" provided that there is adequate hydrological data or enough general information on which to base an adequate indirect assessment of the run-off coefficient (relation of volume of run-off to volume of precipitation).

If this cannot be done, the volume of precipitation (excluding losses) can be used to calculate the gross potential.

As very different results are achieved, depending upon the method used (by using the first method the estimated potential may be anywhere from 20 to 80 per cent of the figure obtained by the second method), every estimate of this type of potential should include: (*a*) the uniform application of one method for the entire project; (*b*) a clear indication of the method used, together with the specific values. (For more details, consult the UN, ECE and ECAFE documents referred to.)

(ii) The *gross river potential*—on river beds—which measures the potential of the mean flow (or annual energy) along the course of each waterway and thus gives the kW (or annual kWh) for the whole river or for each unit of length.

The criticism levelled at theoretical potentials, namely that they are of no practical value because they only constitute unattainable upper limits, is valid if the problem is only considered from that point of view. However, once this fact has been recognized, they nevertheless serve some purpose in the over-all approach to the problem. In fact, such limits should be considered unchangeable yardsticks against which actual progress in use achieved in a country or region can be measured. The same practical purpose can be served by the theoretical limit of thermo-dynamic efficiency (also unattainable) in the steam cycle.

Similarly, within the technical potential a fraction is usually separated under the name of *economic potential* to define the potential that can be used on a short—or medium—term basis within the framework of the general economic development of the country concerned. In relation to the technically exploitable potential, the economic potential excludes that part of the development or portion of annual production which, in the event of insoluble conflicts with other water uses, do not have any priority over them when an integral analysis is made. It also excludes those incapable of supplying the same category of power (load factor, reliability of service, etc.) at a cost equal or less than that obtainable from other sources of electric power[9].

The economic potential varies with changes in a number of factors: competitive price of power, cost of equipment, interest rates, construction costs, etc.

3. Difficulties in methods of evaluation

Estimates of the hydro-electric potential of river basins and countries, linked always to development sites considered economically exploitable, have for some time now been made in various parts of the world.

If the results of separate estimates on the same country or river system are compared, they will be found to differ widely, the most recent estimates being frequently the highest.[10] The explanation for these anomalies may be briefly summed up in the following main points:

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[7] See: Economic Commission for Europe, *Hydro-electric potential in Europe and its gross, technical and economic limits* (E/ECE/EP/131), Economic Commission for Asia and the Far East, *Report of the working party on assessment of hydro-electric potential to the sub-committee on electric power* (E/CN.11/I & NR/Sub.1/2) and *Methods of Assessment of Hydro-Electric Potential* (I & NR/Sub.1/HPNP/1).

[8] Not including changes in the rain pattern which may be produced by the method of "artificial rainfall" (increase in moisture nuclei by such agents as vapours of silver iodide).

[9] The cost of hydro-electric power, when used for multiple purposes, obviously must be determined after a judicious distribution of investment among the several consumers. It is equally obvious that in each specific case the delay before the plant begins to operate and the foreign exchange investment are factors which must be borne in mind.

[10] There are numerous cases in Latin America, among which the following may be mentioned:

(i) Argentina, with estimates of 6.5, 7, 11, 13 and 20 million kW within a period of not more than ten years (Guillermo A. Mazza, paper IA$_2$/2 submitted at the Madrid Sectional Meeting of the World Power Conference held on 9 June 1960).

(ii) Colombia, with an estimated power potential of slightly over 4 million kW up to 1954. Very broad estimates on the subject made by *Electricité de France* and Gibbs & Hill Inc. (1955) now place the figure at 40 million kW.

(iii) Venezuela, with a potential previously estimated at 3.2 mil-

1. Lack of hydrological and geomorphological data;
2. Lack of uniform evaluation criteria;
3. Evolution of construction techniques and methods.

Proper investigation of a river or lake system calls for the establishment of measurement units along the main waterways and the installation of flowmeter and hydrometeorological stations by which the flow at key points can be measured over a period of years. The statistical series relating to basic pluviometer stations must at least provide measurements covering a period of several decades, with a minimum of 15 years for the flowmeters in order to establish a correlation with the former by which the statistical series can be extended to 20 or more years (preferably over 30) before the final plans for hydro-electric development are carried out. The difficulty of obtaining the above statistics will be more clearly appreciated if it is pointed out that very often a high percentage of the hydrometrical stations required have to be maintained over a period of years in remote areas difficult to reach. In Latin America the sites must range from high mountain zones to wooded areas with a tropical climate.

On the other hand, changes in elevation along rivers are difficult to measure mainly because of their inaccessibility, there being few roads over which they can be reached. However, general estimates of hydroelectric potential can now be made and civil engineering projects planned by means of aerophotogrammetry, which has become an efficient and rapid method of obtaining the necessary preliminary data, except perhaps in very densely wooded areas.

It should be pointed out that the data provided by the type of investigation mentioned above merely covers "volume of flow" and "head", to the product of which the theoretical potential of a waterway is proportionally related; it does not provide other information which is essential to the definition of the technical or economic potential of a site, such as data relating to geological characteristics, soil mechanics, volume of flow regulation, the complementary or conflicting nature of the development with other uses of water, etc.

Determination of hydro-electric potentials in Latin America has not only suffered from lack of basic hydrological and topographical data but also from lack of uniformity in the definitions and procedures used in different countries and even within the same country. Estimates have been made with respect to the same rivers or river systems, based on the same background information, which have produced vastly different results depending upon the expert or institution entrusted with the survey.[11]

It is therefore essential that the countries in Latin America should agree on specific definitions of potential so that uniform estimates at various levels can be achieved on the basis of the data available. Only a very few countries in the area have adopted the relevant recommendations of the World Power Conference and even in many of these the recommendations have not always been carried out.

The widespread practice in the region of evaluating potentials solely on the bases of sites "considered to be economically exploitable" has, it should be pointed out, created specific difficulties even though it has been applied on the basis of uniform criteria.

In fact, the personal factors which affect the over-all concept of every project in determining its possible use introduce an element of extreme variability which must be reduced to the minimum. Moreover, improved techniques and construction methods, *inter alia,* may in time substantially modify the economic aspect of projects so that some, considered unjustified in the past, may be recommended as feasible in the future.

Since a study of the "economic electric exploitability" of water resources should include not only electric power but the other uses to which the water can be put, harmonic plans should be formulated for its multiple use on the basis of general economic considerations which lessen the viable and categorical nature of the estimates of the potential in question. There should be, among other things, standard criteria for determining the priority of a group of structures within the over-all developement plan.

In practice, it is difficult to lay down a rigid method by which systematic determination of economic potentials on a 10 or 15 year basis can be effected. The conditions affecting the economic character of a project are linked to a number of unpredictable factors such as the volume and structure of demand; the availability and price of other competing sources of electric power production; characteristics of the consumer pattern to be met not only as a result of demand growth but also of the type and economic features of the plants built prior to the development project under consideration; the complementary or conflicting nature of the project with other uses of water and criteria for the distribution of investments made in multiple-purpose projects; development of construction techniques and costs, etc. Even the rates of interest on capital, which vary, have a substantial effect on changes in the cost of electricity from a single source since, under present average conditions, capital costs represent up to 85 per cent of the cost of power in a hydro-electric plant as against only 40 per cent for a thermal plant.

Moreover, its general application is hardly feasible in Latin America at present because so much data and background information of different types is needed which require time and specialized staff and equipment.

In short, for developing countries such as those in Latin America it is essential that the study of a particular river development project under construction should include an evaluation of the hydro-electric potential limited to the economically exploitable "quantum" (together with criteria for the optimum utilization of water). However, evaluations on a larger scale for purposes of planning, which should be carried out as rapidly as material conditions in each country will allow, call for the adoption of simpler, more expeditious, concepts and criteria.

4. Suggested methods of evaluation

(a) *Gross runoff potential*

The method of determining the gross runoff potential requires the division of the region or country under study

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lion kW up to 1955, is now considered to have a potential of 16 million kW following studies and research carried out mainly on the Caroní River.

The following cases can be mentioned for Europe.

(i) Switzerland, with estimates of 15, 20 and 27 million mWh in 1914, 1934 and 1946 respectively, for annual technically exploitable energy.

(ii) Sweden, with 40, 50 and 80 million mWh in 1938, 1952 and 1955, also for technically exploitable power. (E/ECE/EP/131) *Hydro-electric Potential in Europe and its Gross Technical and Economic Limits,* and A. J. Dilloway "Comparative Study of Hydro-electrical Resources as Exemplified by European Experience"—paper submitted to the World Power Conference—9 June 1960.

[11] For instance, the potential of Lake Titicaca has been estimated at anywhere from under 1 million kW to over 2.5 million kW.

into small sub-basins for which information is available on stream flow, with statistics covering a long period (not less than twenty years) or, if the period covered is only some twelve or fifteen years, with statistics that can be extended by co-variation with rainfall, subject to prior verification of a satisfactory correlation.

In brief, the theoretical runoff potential in millions of kWh a year is given by formula (1), assuming full utilization and a 100 per cent yield.

$$(1) \qquad Ps = \frac{V \times H^{12}}{367}$$

Here V is the volume of annual runoff in millions of cubic metres (average for a period of years as described above) originating exclusively in precipitation in the sub-basin in question, and H is the average height of the sub-basin above sea level in metres. The addition of these values gives the hydro-electric potential in a region or a country.

Dividing the potential, thus calculated, of each sub-basin by its area in square kilometres gives the specific value of its potential in kWh/km².

If the value of the specific potential of the sub-basin is marked at its geometric centre on a map, and the process is repeated on a larger scale (national or regional) covering the whole area, equipotential lines can be interpolated.

In such countries as those of Latin America, where hydrological information is limited, the main problem is that of the means of determining the value of V, and in some cases of H, for each sub-basin.

In this connexion, the best method of establishing V in the absence of direct hydrological information is by use of runoff data deduced from rainfall data but checked against actual flow data recorded at a stream-gauging station. (Details are given in the Annex, section 1.)

In countries with rivers that cross the frontier it is necessary in determining the national potential to reduce the potential of the basins concerned, since the average elevation of each sub-basin is reduced by being calculated not from sea level but from the elevation at the point where the river into which it flows crosses the frontier.

Land-locked lakes in which underground filtration and evaporation balance the flow of the affluents (enclosed basins) are a special case. Automatic application of the principle of evaluating the hydro-electric potential as linked to the area of the basin of its first runoff, with 100 per cent utilization of the slope to the sea, would exclude any exceptions, although nature itself limits the slope by the level of the lowest point in the basin. A typical example in Latin America is the Lake Titicaca-Desaguadero River-Lake Poopó system, where a high proportion of the potential can be exploited on the basis of the potential head above sea level, by substantial reduction of evaporation[13], and a result of other favourable features such as altitude, geographic situation, topography, and so forth.

Examples of a diametrically opposite situation are to be found in the case of enclosed basins in Mexico in the States of Chihuahua, Durango and Coahuila, where it would appear logical in view of natural features very different from those described to regard the potential as limited by the level of the lakes concerned.

For the sake of uniformity it would be advisable in every case to give the theoretical surface potential in relation to sea level, with a specific separate indication of the potential that should be discounted because of the difference in elevation between the surface of undrained land-locked lakes and sea level.

(b) *Gross river potential*

The recommended method for calculating the gross river potential, which is also a constant intrinsic characteristic of the river system of a country or region, is as follows:[14] each river or water course in the area is divided into sections bounded by the points of confluence of successive tributaries; however, for practical reasons these sections should not exceed 10 kilometres in length.

For each section the potential is calculated by the formula:

$$(2) \qquad P_L = 9.8 \times Qm \times H$$

Here P_L is the average potential in kW; *Qm* is the average mean flow at each end of the section

$$(Qm = \frac{Q_A + Q_B}{2});$$

and *H* is the difference in elevation between the water level at each end, in metres.

Repeating the same procedure for all sections of the river and its tributaries and adding the results gives the gross river potential of the whole basin, country or region.

However, this method is not usually employed in the upper reaches of the tributaries or the lower reaches of the river (near the mouth), those stretches being excluded from the point where the potentials are lower than 15-20 kW per kilometre. In Latin America the higher limit could be adopted.

To calculate the annual energy that corresponds to the gross river potential given in kW, it is sufficient to multiply the latter by 8,760 (number of hours in the year) to get the number of kWh.

The river potential can conveniently be marked on a map by drawing lines of different thicknesses following the river, varying according to a given scale with the potential per unit length obtained in kW per kilometre for each section. The graphic representation of this potential and the advantages it provides are given in the Annex, section 2.

(c) *Technical potential*

The best method of evaluating this potential, and the only direct method, is to draw up detailed schemes for the regulation and utilization of the waters of the river or river system in question. By this method it can be clearly established what will be the geographical location, quantity, seasonal characteristics and hydrologic dependability of the power in proposed electric power plants, in addition to the probable proportion of base and peak energy that can be expected. The difficulty of this method is obvious:

[12] Given the known formula $P(kW) = 9.8 \times Q \times H$, which expresses the output of a fall of water in kW in function of the flow Q (cubic metres per second) and height H (metres), with an ideal yield of 100 per cent, the formula can be found for the annual power in kWh:

$$Ps = 9.8 \times H \frac{V}{31.5} \times \frac{8{,}760}{10^6}$$

where the new numerical coefficients are:
8,760 = number of hours in the year
31.5 = number of seconds in the year, in millions.

[13] It would clearly be possible from the strictly technical point of view to reduce evaporation by lowering the level of Lake Titicaca by construction of a drainage system that would reduce the area of that lake and of Lake Poopó, with a consequent reduction of the volume of water evaporated.

[14] This method is that used in France to evaluate hydro-electric potential by *Electricité de France* (see, *Hydroelectric potential in Europe and its gross, technical and economic limits* (E/ECE/EP/131)).

even for a single moderately large basin it could require much time and considerable funds. Nevertheless, this is the method that should be adopted for the final plan for the multiple purpose development of a basin.

In general evaluations for planning purposes, the recommended alternative to direct determination of the exploitable potential, both because it is simple to apply and because it is no less reliable than other indirect methods, is to obtain it as a fraction of the gross river potential by analogy with other basins or river systems that have been studied in detail and have similar geographical and physical features, as indicated in the following section.

5. Comparison between the two types of potential

Although the two theoretical potentials referred to give ceilings that are unattainable in practice (and that do not agree), the gross river potential is closer than the runoff potential to technical and economic potentials. Moreover the gross river potential has the great advantage of indicating on the maps representing it the location of the rivers and which sections have a high potential, thus pinpointing the places that should be studied in greater detail (by geological prospecting, soil mechanics investigations and studies of regulation and of other complementary or conflicting uses of the water, etc.) in order to compile the information required for an economic study. Maps of runoff potential, on the other hand, link the potential to the source of the water without necessarily indicating possible sites for the production of electric power.

The information required to give the runoff potential, however, is simpler than in the case of the gross river potential, and thus easier to obtain in countries where there are large under-developed areas about which there is a lack of information, as in the Latin American countries.

Experience in more developed countries in various parts of the world shows that generally speaking the relationship between the theoretical potentials under discussion and the economic potentials, which in the last analysis are what matter, fall within a fairly narrow range of values. In a number of European countries with a high level of hydro-electric production it has been shown in the last decade that the exploitable potential as a whole is from 20 to 25 per cent of the gross runoff potential, with wider local variations.[15] In the ECE paper referred to it is stated that a study of eight European countries showed the ratio between the real economic potential and the gross runoff potential to be between 0.17 and 0.20.

The results of some other studies,[16] however, show that the ratio between the real economic potential and the gross river potential is roughly between 0.33 and 0.40.

Here lies the main interest for under-developed areas and countries in determining their theoretical potentials, since even with relatively simple hydrological and geomorphological investigations, and without great expenditure of time, they can estimate the upper and lower limits that will establish the approximate hydro-electric potential for economic use.

ECE is preparing a map at scale of 1:2,500,000 with the theoretical runoff potential covering the greater part of the countries of Europe with lines of equal hydro-electric power per surface unit.[17]

This map will make it possible to revise the relations between the runoff potential and the technical and economic potentials for some river systems and countries, by making use of information available for those where a greater part of the water resources have already been developed and where a full investigation has been conducted for the areas where the water resources still remain to be developed. This information will be of great value for the countries of Latin America and for other under-developed areas.

Some countries that have reliable hydrologic and geomorphologic information have in practice omitted the evaluation of the theoretical potentials in order to concentrate their investigations directly on the technical and economic potentials. This is the type of work being undertaken by the Federal Power Commission[18], and to some extent the Geological Survey[19] in the United States. However, some authorities in the latter country favour evaluation of domestic hydro-electrical resources at the previously-mentioned theoretical, technical and economic levels.[20]

6. Irregularity of stream flow in the rivers

It has already been seen that the proposed theoretical potentials (runoff and river) are concerned by definition with the average annual stream flow and take no account of the changes that actually occur in the course of time, both from year to year and during the course of a single hydrologic year (seasonal variations). However, it will be readily appreciated that the irregularity of the stream flow of a river is a factor that appreciably affects that part of the potential that can be economically developed in relation to the theoretical potential.

The study of any particular hydro-electric project normally includes detailed technical analysis of the duration of natural flow and the installations required to regulate it in order to obtain, on economic terms, the optimum use of the resource, but, as previously indicated, such analysis is of little practical value in investigations relating to general planning and programming of the use of the water resources of an area or a country. Hence for some time an index has been sought that would make it possible to draw maps showing the territorial distribution of the runoff irregularity of rivers, and a number of proposals on these lines have been made in different countries at different times. The most appropriate seems to be that selected by ECE to indicate irregularity during the course of the hydrologic year.[21]

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[15] In Sweden the proportion is exceptionally high, being 40 per cent. In view of Sweden's highly favourable runoff conditions and geological conformation, this is probably an upper limit. See A. J. Dilloway, United Nations, "Comparative study of hydro-electric resources as exemplified by European experience" (paper presented at the Madrid Sectional Meeting of the World Power Conference, July 1960).

[16] ECAFE study op. cit., which includes references to V. M. Yevdjevic and O. Marjanovic, *Power resources of Yugoslavia* (Belgrade, 1956), Vol. 1, and to United Nations, *Determination of hydro-electric potential in the USSR* (ECE, Committee on Electric Power, Working Paper No. 46, 13 February 1956).

[17] The line of least potential drawn on this map is that representing 0.25 kWh per square metre, and the other lines represent successive multiplication by two (0.5, 1.0, 2.0, etc.) up to the line showing 6 kWh per square metre in the central zone of the Alps. See A. J. Dilloway, op. cit.

[18] See Frank L. Weaver, "Hydro potentialities as indicated by Federal Power Commission" (paper presented at the Twenty-First Annual Meeting, American Power Conference, Chicago, April 1959).

[19] See *Developed and potential water power of the United States and other countries of the world* (op. cit.).

[20] See ST/ECLA/CONF.7/L.3.5.

[21] See *Specifications for construction of an index of stream-flow irregularity* (E/ECE/EP/205), which should be consulted for more general information, since the present study does no more than examine briefly some relevant aspects of the question.

For a given year, the formula is:

$$Cri = \frac{Vi}{Wi},$$

where *Cri* is the coefficient (index), *Vi* is the storage capacity required for full regulation of runoff for that year, and *Wi* is the volume of runoff for the year.

The mean value of coefficient *Cr* for a set of observations covering *n* years can be obtained merely by taking the average of the values for *Cri*.

For the sake of simplification, in preliminary studies a coefficient *Cr* can be used that corresponds to a fictitious year, for which the figure for each month is the arithmetic mean of the flow figures for the month concerned. The same method can be used to arrive at final conclusions, provided that the *Cr* value used is multiplied by a correction factor greater than 1, but the advantage of this procedure is open to question, since the correction factor has to be calculated separately in each instance.

There is little or no correlation between the values of *Cr* and the size of the catchment area concerned, a fact which justifies the drawing of maps showing this coefficient as basic background information for planning activities, together with estimates of hydro-electric potentials. In calculating this coefficient special care must be taken not to include lakes or reservoirs, as the resulting distortion of the corresponding values would be so great as to invalidate the map concerned. In order to draw lines of interpolation joining points where *Cr* has the same value, the *Cr* value should be entered at the centre of the basin or sub-basin concerned. Care should also be taken to avoid drawing these lines across mountain ranges or extensive depressions.

It should not be overlooked that a run-of-river plant designed for an average river stream flow of Qm will produce an average of:

$$kWh = (1 - Cr) \times 9.81 \times 8{,}760 \times Qm \times H$$

with a yield of 100 per cent. For normal yields, the value of 9.81 should be replaced by another of the order of 8.3.

II. LATIN AMERICAN HYDRO-ELECTRIC POTENTIAL

1. Concepts and current estimates

Generally speaking, knowledge of hydro-electric potential in the Latin American countries is in its infancy, as will be seen from the analysis of the method and concepts used and of current research facilities. The biggest handicaps to an estimation of the region's total potential on the basis of the direct information available are the lack of uniformity in the evaluation criteria and the meagre explanations that accompany the calculations supplied by each country.

(a) *Estimates prepared by the United States Geological Survey*

The paper on "Developed and potential water power of the United States and other countries of the World December 1954" [22] estimated hydro-electric potentials at the end of 1954 from two different standpoints.

The first, based on *ordinary minimum flow* (flow available 95 per cent of the time) attributes to Latin America as a whole a potential of 57 million kW (12 per cent) out of the figure of nearly 480 million estimated for the whole world.

The second, based on *mean flow*, attributes to the region as a whole 520 million kW, out of the estimated world total of almost 2,270 million kW (see table 6).

The most important points elucidated by the above-mentioned study with respect to its method of execution refer mainly to potentials estimated on the basis of ordinary minimum flow, and are as follows:

Developed and undeveloped sites are considered on the basis of 100 per cent efficiency;

The regulatory effect of storage reservoirs has been disregarded, except in those sites where they are already operating;

The estimates for the United States, Canada and Europe are based on known sites;

For the Asian countries (except Japan), Africa and South America (except Brazil),[23] the estimates are based principally on rainfall and topography and consequently are not as dependable.

These few indications suffice to give a fairly good idea of the general criterion adopted by the author of the paper, which was brought into line with the relevant recommendations by the World Power Conference.

The comments which may be made on this type of study in relation to countries with large under-developed areas and little information (as in Latin America) relate mainly to the concept of ordinary minimum flow and endeavour to assimilate it to that of flow available 95 per cent of the time.

(i) The determination of ordinary minimum flow from data that are predominantly on rainfall is much more difficult than the mere determination of mean flow, which was done in the other evaluation made in the same document and in the definitions of theoretical potential that have been examined earlier. There is no doubt that the accuracy with which this type of flow has been estimated differs considerably from one country to another, and this has militated against the uniformity that is to be aimed at in such evaluations.

(ii) The estimate of potentials for Q 95 per cent automatically places the countries that already have big reservoirs (taken into account in the evaluation) on a different level from those that have none, since a regulated flow is generally greatly preferable to the natural run off available 95 per cent of the time. The overestimation of potential in countries already possessing storage plants would disappear with the adoption of the concept of mean flow.

Hence, the evaluation that will play the most important part hereafter will be that based on mean flow in the *Geological Survey Circular*, which comes very close to the definition of theoretical linear potential. The only discrepancy between the two would seem to be the fact that the former was limited to "known sites" in the United States, Canada and Europe.

[22] United States Department of the Interior, *Geological Survey Circular 367*, 1954 (reprinted 1958). The authors are Benjamin E. Jones and Lloyd L. Young. It should be pointed out that this was the only estimate made on a world wide basis up to 1954 and it was used in studies such as Schurr and Marschak, *Economic Aspects of Atomic Power*; P. C. Putnam, *Energy in the Future*, and the ECLA study on *The Electric Power Industry in Latin America*, op. cit.

[23] It coincides with the official estimate made in 1951 by the *Divisao de Aguas do Departamento Nacional da Produçao Mineral.*

Table 6

HYDRO-ELECTRIC POTENTIAL IN LATIN AMERICA AND THE WORLD

	Based on ordinary minimum flow (thousands of kW)	*Based on mean flow*		
		Total (thousands of kW)	*Per km² (kW/km²)*	Per capita (*W* per capita)
Latin America	57 398	520 024	25.50	2 700
Western Europe . . .	32 356	111 382	29.78	350
Eastern Europe[a] . . .	61 138	288 414	12.31	950
United States	26 864	85 376	10.91	490
Other developed countries[b]	40 517	133 952	6.86	980
Rest of the world . .	259 561	1 126 959	16.61	670
World total	477 834	2 266 107	16.74	800

SOURCE: ECLA, on the basis of data presented in United States Department of the Interior, *Geological Survey Circular 367*, with respect to hydro-electric potentials; and United Nations, *Statistical Yearbook 1958* for territorial areas and population.

[a] Including the total for the USSR.

[b] Australia, Canada, Japan, New Zealand and the Union of South Africa.

Table 6, which was prepared from data given in the reference paper, enables a comparison to be made between Latin America and other regions of the world.

From column 2, it appears that Latin America's hydro-electric resources are equal to the sum of the same resources in Europe (including the USSR total) and in the United States. They also constitute more than 22 per cent of the world potential.

The penultimate column shows an average of about 25 kW/km² for the region, which exceeds both the world average (16.7 kW/km²) and those of the other regions and groups of countries considered, with the sole exception of Western Europe, for which the average is 30 kW/km². The other group of less developed countries, Eastern Europe and the United States, follow in descending order with approximately 17, 12 and 11 kW/km². In pointing out that the evaluation was limited to "known sites" in the case of Canada, the United States and nearly all the European countries, the document raises the question of whether Latin America's potential has not been over-estimated, in comparison with the figures for the other regions on which little information is available.

The last column of the table contains a *per capita* evaluation of the same potential, in which the figure for Latin America, also because of the region's low population density, is almost 2,700 watts; this is more than three times the world average of 800 watts and far exceeds the averages of the other regions and countries in question. The areas that come closest to one another are the group of countries formed by Canada, Japan, New Zealand and the Union of South Africa, with 980 watts *per capita*, and Eastern Europe (including the USSR total), with 950 watts *per capita*. The United States and Western Europe appear with only 490 and 350 watts *per capita* respectively.

Lastly, the table confirms the previous observation, made, for the sake of comparison, on the determination of potentials solely on the basis of the flow Q 95 per cent in that the estimates for countries already possessing large storage plants are also too high. Whereas, in fact, the Q 95 per cent potential in Latin American and other less developed countries is only 11 and 23 per cent of the mean flow potential, in the United States, in the group of developed countries consisting of Australia, Canada, Japan, New Zealand and the Union of South Africa and in Western Europe, it amounts to 31.5, 30 and 29 per cent respectively. It should not be forgotten, of course, that the degree of regularity of the rainfall régimes also has a direct bearing on these results.

(b) *National estimates*

The following observations may be made on the information which the ECLA secretariat has compiled on the basis of the estimates of potential prepared in every Latin American country:

(i) Some countries have no data on potential nor have they undertaken any research on the subject;

(ii) In other countries, the data differ considerable according to their source, and explanations of the concepts and methods used are either non-existent or else so concise as to be impossible to classify;

(iii) The data are often limited to a few basins only or to the best-known areas within each country;

(iv) Lastly, a few countries have already made over-all studies on their hydro-electric resources, and are currently engaged upon a more systematic survey, improving and expanding their hydrometeorological and hydrological networks.

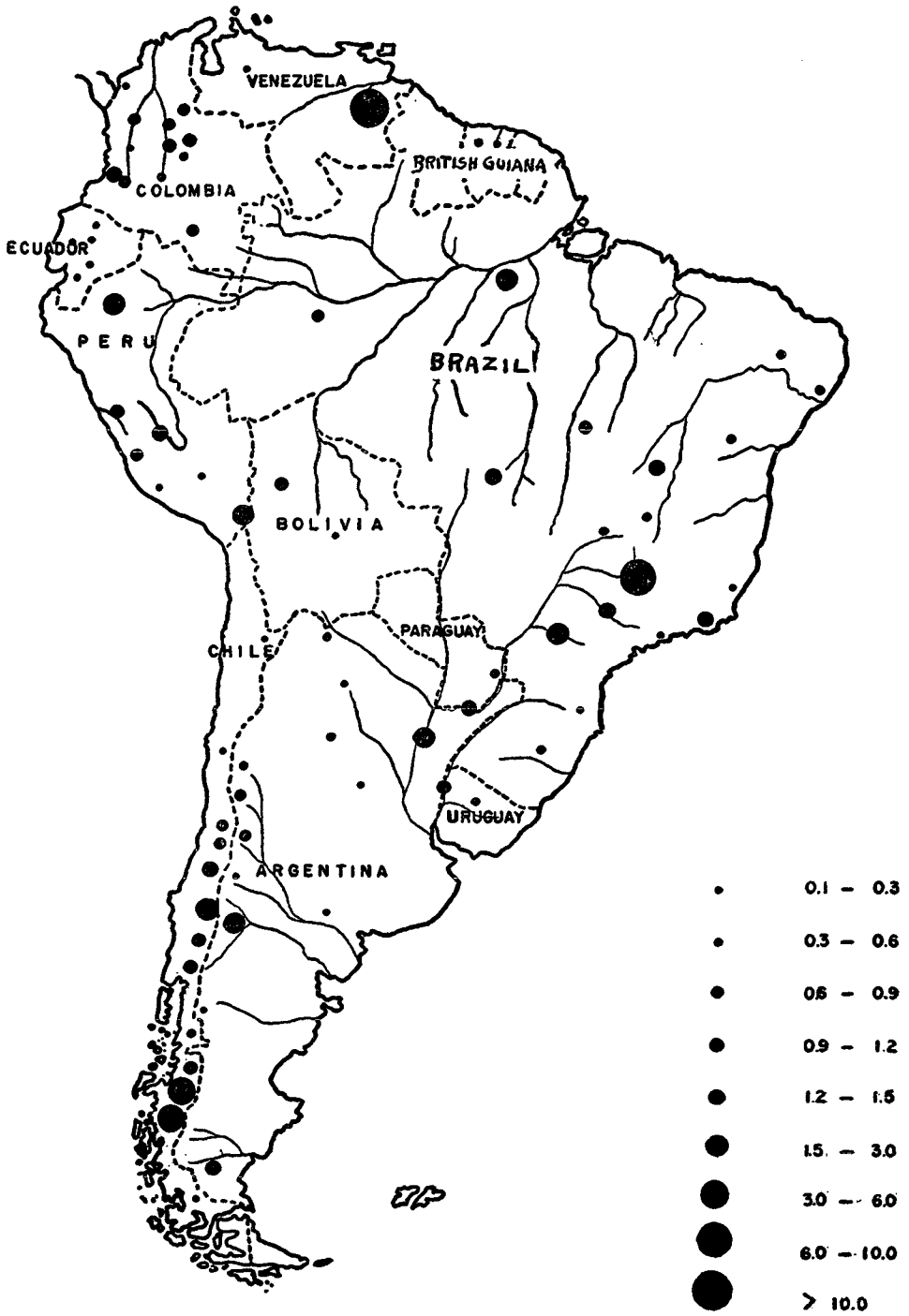
An initial selection was made, from all the background information available, of those estimates which, because of the reliability of the source and related considerations, could form part of a general scheme with some possibility of classification—however remote—despite the fact that lack of uniformity and consistency were the salient characteristics revealed by the evaluation methods in many of the figures presented (see table 7).

An analysis of table 7 shows the most common evaluation concept is undoubtedly installable economic capacity, in known localities or sites, notwithstanding the major problems and limitations which, as seen earlier this estimate assumes.

In spite of these observations, which rule out the possibility of a close comparison between national hydro-electric resources in the absence of a *standard* concept of economic potential, provisional estimates have been made in table 8 on the basis of national surveys and studies, although some of these do not provide more than partial coverage. Map I-1 (a) and (b) is included on the same provisional basis.

Map I-1 (a)

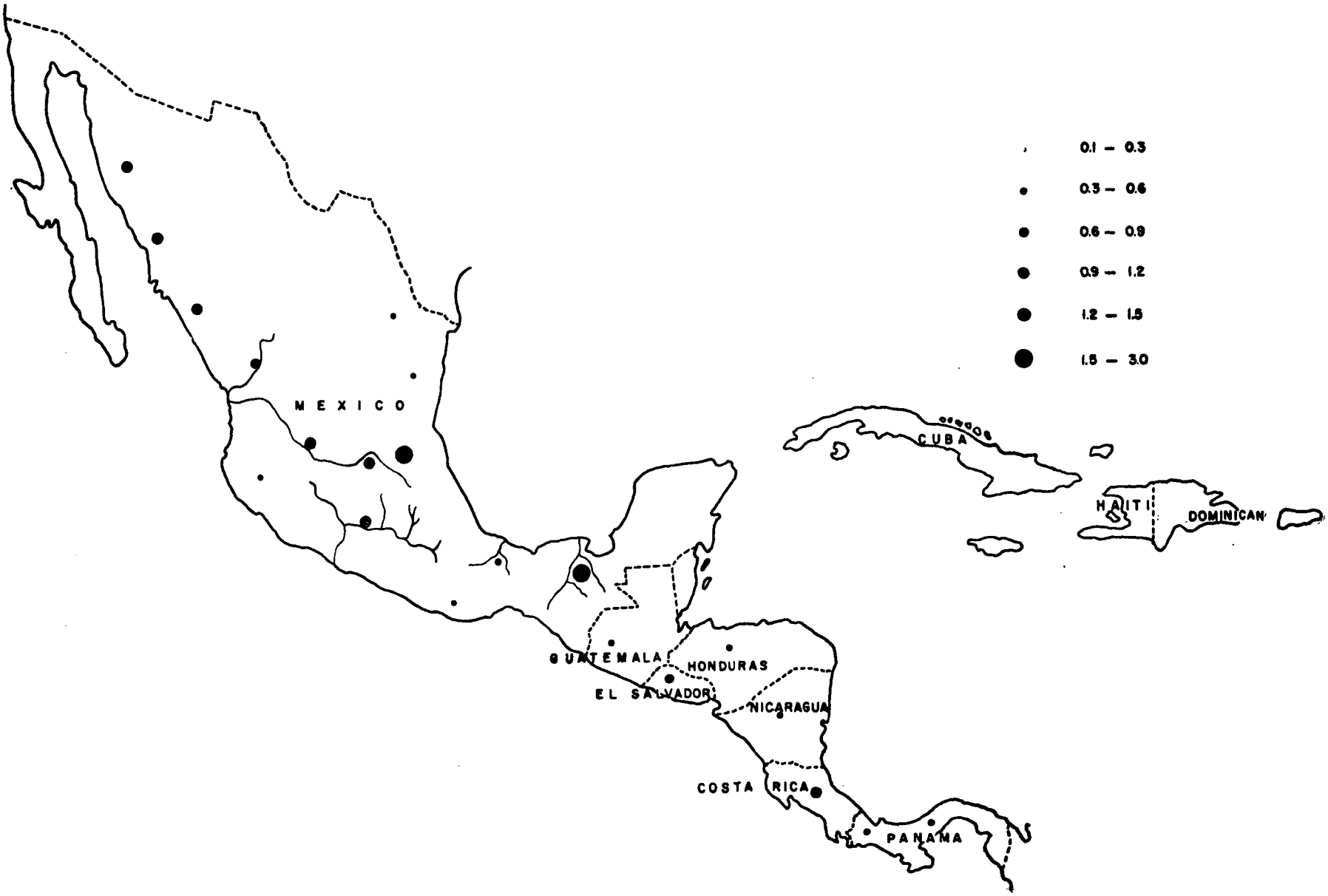
ESTIMATED ECONOMIC HYDRAULIC POTENTIAL FOR GEOGRAPHICAL REGIONS
(In million of kW)



NOTE: The boundaries shown on this map do not imply official endorsement or acceptance by the United Nations.

Map I-1 (b)

ESTIMATED ECONOMIC HYDRAULIC POTENTIAL FOR GEOGRAPHICAL REGIONS
(In million of kW)



NOTE: The boundaries shown on this map do not imply official endorsement or acceptance by the United Nations.

Table 7

LATIN AMERICA: HYDRO-ELECTRIC POTENTIALS

(Official and private estimates in each country)

Country	*Year of estimate*	*Potential (millions of kW)*	*Source of information*	*Remarks*
Argentina	1934	20.0	Adolfo Niebuhr, *La electrificación en la República Argentina.*	Estimate of utilizable potential based on precipitation and differences of elevation in national territory.
	1958	12.5	Water and Energy. Reply to questionnaire.	Power stations in operation and economically-utilizable sites during next development period. Capacity of generating units.[a]
Bolivia	1959	2.7	Department of Water and Electricity. (data sent to ECLA).	Power stations in operation and economically-utilizable sites. Capacity of generating units.
Brazil	...	16.4	Official estimate (see General Carlos Berenhauser Jr. (ECLA/TAO, *O Problema de Energia Elétrica no Brasil 1959.*	Q (95 per cent) corresponds to the norms of the World Power Conference.
	...	30.0	Estimate by competent agencies. (See General Carlos Berenhauser, Jr., op. cit., and the Joint Brazil-United States Economic Development Commission, *Relatorio sobre Energia Elétrica no Brasil.*	Power stations in operation and economically-utilizable sites. Flow regulation and inter-valley exchanges. Capacity of generating units.
Colombia	1960	7.6	Institute of Water Utilization and Electricity Development. Reply to questionnaire.	Some economically-utilizable sites (Q 50 per cent), with 85 per cent yield. Capacity of generating units.
	1954	40.0	National electrification plan (Gibbs & Hill, Inc., and Electricité de France).	Estimate for whole country. Capacity of generating units. Annual plant factor 0.57.
Costa Rica	1959	1.5	Costa Rican Electricity Institute, *Investigación de recursos hidroeléctricos* (CCE/SC.5/I/DT.8).	Economic potential. Capacity of generating units (?).
Cuba	1954	—	Agricultural Development Bank. Preliminary reconnaissance of 19 rivers and 2 swamps.	The estimated potential is less than 0.1 million kW.
Chile	1952	10.6[b]	ENDESA, *Plan de electrificación del país.*	Linear potential for Q (95 per cent). Norms of the World Power Conference.
	1952	23.6[b]	ENDESA, *Plan de electrificación del país.*	Linear Potential for Q (50 per cent).
	1952	26.6[b]	ENDESA, *Plan de electrificación del país.*	Linear potential for Q (mean) = gross river potential.
	1952	20.9[b]	ENDESA, *Plan de electrificación del país.*	Economic potential.
Ecuador	1958	2.0	R. Schröder, *Study of water resources in Ecuador* joint ECLA/BTAO/WMO study in draft form; Mr. J. Rittershaussen (BTAO).	Power stations in operation and economically-utilizable sites. Capacity of generating units.
El Salvador	1959	0.91	Atilio García Prieto, *La investigación de recursos hidráulicos* (CCE/SC.5/I/DT.12).	Economic potential of some sites studied.[c] Capacity of generating units. Annual plant factor 0.5.
Guatemala	1959	0.15	Department of National Electrification, Directorate of Public Works, *Investigación de los recursos hidroeléctricos* (CCE/SC.5/I/DT.4).	Economic potential of some sites studied.[d] Capacity of generating units. Annual plant factor 0.5.
Honduras	1959	0.4	Julio A. Lang, *Investigación preliminar y parcial de los recursos hidroeléctricos* (CCE/SC.5/I/DT. 18).	Economic potential of some sites studied.[e] Capacity of units to be installed.
Mexico	1939	4.7	Ministry of Agriculture and Development, *Catálogo General de Aprovechamiento de Aguas Nacionales para Generación de Fuerza Motriz.*	Potential of 2 604 known sites. The reference seems to be to Q 95 per cent.
	1948	5.7	Guzmán Cantú, *Energía en México.*	Corresponding to the fundamentals of the above appraisal.
	1948	21.0	Guzmán Cantú, *Energía en México.*	Described as "practical". It seems to be based on conditions similar to those of "exploitable" potential.
	1953	11.0	C. Lara Beautell, *La Industria de energía eléctrica.*	This seems to refer to plants in operation and to economically-utilizable sites in a forthcoming development period. Capacity of generating units.
	...	9.0	Barragán Vega and others, *Aspectos del estado actual de la industria eléctrica* (1961).	Estimate based on minimum river runoff.
	...	15.0	*Idem.*	Estimate of capacity which can "economical" be installed.

(Continued)

Table 7 (continued)

Country	Year of estimate	Potential (millions of kW)	Source of information	Remarks
Nicaragua	1959	0.33	National Electric Power Commission, Ministry of Development and Public Works, *Plan de Electrificación nacional e investigación de los recursos hidroeléctricos* (CCE/SC.5/I/DT.1 & DT.15).	Economic potential of some sites studied.[f] Capacity of generating units. Annual plant factor 0.5.
Panama	1959	0.9	Economic Development Institute, *Proyecto de recursos hidráulicos y electrificación del S.C.I.F.E.*, 1960.	Economic potential of some sites studied. Capacity of generating units.
Paraguay	1954	3.1	H. Foster-Smith (TAO). Information for 1960.	Q 95 per cent. No further data available.
Peru	1949	25.0	Pablo Boner, *El problema de la energía eléctrica* (Reports of the Society of Engineers).	This seems to refer to "exploitable" potential.
	1956	10.0	Swiss-Peruvian Consultative Economic Council, *L'industrie électrique au Pérou.*	The potential dealt with may perhaps be compared with minimum economic potential.
	1959	6.5	Jorge Grieve, *Potencial hidroeléctrico del Perú* (Forum on energy problems).	Power stations in operation and known sites that are likely to be economically-utilizable.[g] Capacity of generating units.
	1959	15.0	Jorge Grieve, *Potencial hidroeléctrico del Perú* (Forum on energy problems).	Gross river potential.
Uruguay	1959	1.2	José L. Buzzetti, *El potencial hidroeléctrico en nuestro país;* Elvio Sacco, *Política energética en el Uruguay.*	Economic potential with regulated flow. Capacity of generating units. Annual plant factor 0.51.[h]
Venezuela	1959	16.0	R. Schröder, *Study of water resources in Venezuela,* a joint ECLA/TAO/WMO study in draft form.	Economic potential of some sites studied. Capacity of generating units.[i]
Surinam	1959	1.5	Brokopondo Bureau, Government of Surinam, *Appraisal survey of Hydroelectric power resources in Surinam,* 1959.	Economic potential of main rivers.

[a] Only 700,000 kW, i.e., half the international utilization are considered in the case of the River Uruguay (Salto Grande).
[b] Including 0.6 million kW—half the international resources shared with Argentina.
[c] Rivers: Lempa Grande de San Miguel, Paz, Goascorán, Jiboa, Cucumacayán, Mirazalcos and La Cabrera.
[d] Corresponding to Lakes Amatitlán, Atitlán and Ayarza and to the Rivers Samalá, Aguacapa, Cahabón, Yocotán, Negro or Chixoy and Chilasco.
[e] Corrresponding to Rivers Ulúa, Patuca, Choluteca and to Lake Yojoa-River Lindo.
[f] Corresponding to Rivers Tuma, Viejo, Matagalpa, Coco and Grande de Matagalpa.
[g] Half of the Lake Titicaca International Project was considered, i.e., 1.2 million kW.
[h] Only 700,000 kW, i.e., half the international utilization, are considered in the case of the River Uruguay (Salto Grande).
[i] Fourteen million kW are linked up with the total utilization of the River Caroní.

2. Geographical distribution

Out of an approximate total of 155 million economically installable kW in Latin America (see again table 8), about 70 per cent is concentrated in four countries—Colombia, Brazil, Chile and Venezuela—which have 40, 30, 21 and 16 million kW respectively. They are followed by Mexico, Argentina and Peru, which, with 15.0, 12.5 and 6.5 million kW, constitute 20 per cent of the total for Latin America.

The distribution of this potential per unit of area is also fairly uneven. El Salvador, Colombia, Costa Rica and Chile would seem to be the best endowed, with 45, 35.2, 29.5 and 28.3 kW/km², followed by Venezuela with 20.6 kW/km². Then come Panama, Mexico, Paraguay, Ecuador and Uruguay, but with much lower figures ranging from 11.8 to 6.5 kW/km².

Moreover, in relation to their current population levels, the countries that are best provided with water resources for electricity production are Venezuela, Colombia, Chile and Paraguay, with 2,990, 2,940, 2,910 and 1,850 watts *per capita* respectively.

As national estimates do not afford any possibility of building up a complete picture of homogeneous hydro-electric potentials at another level, table 9 presents, by countries, the figures estimated by the United States Geological Survey in 1954, with particular reference to the evaluation based on mean Q. According to this table, the best-endowed countries would seem to be Brazil, Colombia, Peru and Venezuela, with 176.6, 73.6, 40.5 and 36.8 million kW respectively, followed by Mexico (33.1) Argentina (29.4) and Ecuador (25.8).

When the same potential is measured by unit of area, the countries best provided for would seem to be the West Indies, Costa Rica, Ecuador, Guatemala and British Guiana, with 177.9, 115.7, 97.9, 81.1 and 68.5 kW/km², followed consecutively by Colombia, El Salvador, Honduras, Surinam and Venezuela.

The last column of table 9 shows that Surinam, British Guiana, Bolivia, Ecuador and Venezuela are richest in hydro-electric resources in relation to their current population levels, with 30.6, 27.4, 6.7, 6.4, and 5.8 kW *per capita* respectively.

No direct inter-country comparison can be made between the estimates of the United States Geological Survey and the over-all group of national assessements. In the first place, the national estimates are governed by theoretical concepts that are at different levels; secondly, as explained before, varying criteria and methods were used and different territorial areas were covered. Thirdly, the coverage of the basic data employed must have been very irregular —at least in certain areas—since the exceptional case of

Table 8

LATIN AMERICA: HYDRO-ELECTRIC POTENTIAL
(Estimates of economic utilization, 1960)[a]

Country	Millions of kW	Resources per capita and per square kilometre	
		W/per capita	kW/km²
Argentina	12.5	615	4.5
Bolivia	2.7	814	2.5
Brazil	30.0	477	3.5
Chile	21.0	2 910	28.3
Colombia	40.0	2 940	35.2
Costa Rica	1.5	1 430	29.5
Cuba	—	—	—
Dominican Republic	...	...	...
Ecuador	2.0	498	7.4
El Salvador	0.9	373	45.0
Guatemala	0.2	56	1.9
Haiti	...	...	...
Honduras	0.4	220	3.6
Mexico	15.0	460	7.6
Nicaragua	0.4	292	2.7
Panama[b]	0.9	856	11.8
Paraguay	3.1	1 850	7.6
Peru	6.5	647	5.1
Uruguay	1.2	438	6.5
Venezuela	16.0	2 990	20.6
British Guiana	...	...	...
West Indies	...	...	...
Surinam	1.5	6 200	10.5
Regional total[c]	155.8	835	7.8

SOURCE: ECLA, on the basis of direct information, and United Nations, *Statistical Yearbook 1958* for territorial areas.

[a] National estimates. They correspond to the sum of the capacities of established plants and those of plants that can be economically set up in known localities or sites.

[b] Including the Canal Zone.

[c] Excluding countries for which information is not available.

Chile, for which the estimate of economic potential exceeds that of theoretical potential, is otherwise inexplicable. Elsewhere, on the other hand, the estimate of theoretical potential is several times larger than that of economic potential; in Ecuador, for instance it is more than ten times as big. However, for Latin America as a whole (after compensation of errors), the relation of 0.29 between the two potentials seems to be reasonable provided that due account is taken of the fact that errors by omission undoubtedly predominate in national estimates.

The distribution of economic potential in each country is also very unequal. This is revealed in table 10, which gives the estimated potential of an economic development of selected basins, according to each country's surveys (see again map I-1 (a) and (b)).

It is interesting to note that, in some cases, high proportions of the country's total estimated potential are concentrated in one or two rivers only. The real phenomenon of irregularity in geographical distribution in undoubtedly understated in table 10 in the case of a number of countries because of the way in which the potentials were estimated, and its extent is increasing in proportion to the improvement in the facilities for investigating resources. As many of the basins chosen are those which have been most thoroughly studied (with, of course, a few exceptions), the potentials assigned to them are closer to the real figures than those forming part of the total country appraisal, which are relatively underestimated. In addition, the lack of uniformity in certain data justifies a sample demonstration of special cases of inconsistency, such as that of the River Grande in Brazil (São Paulo-Minas Gerais) whose potential, in the table, has been more recently estimated and is higher than that attributed to it in the country assessment.

Table 9

LATIN AMERICA: HYDRO-ELECTRIC POTENTIAL

Country	Based on ordinary minimum flow (thousands of kW)	Based on mean flow		
		Total (thousands of kW)	Per km² (kW/km²)	Per capita (kW/per capita)
Argentina	3 974	29 440	10.60	1.45
Bolivia	2 650	22 080	20.10	6.72
Brazil	14 720	176 640	20.70	2.81
Chile	5 152	18 400	24.80	2.52
Colombia	3 974	73 600	64.65	5.44
Costa Rica	1 030	5 888	115.67	5.47
Cuba	—	—	—	—
Dominican Republic	—	—	—	—
Ecuador	1 472	25 760	97.90	6.44
El Salvador	221	1 104	55.20	0.46
Guatemala	1 546	8 832	81.10	2.47
Haiti	—	—	—	—
Honduras	1 030	5 888	52.50	3.21
Mexico	6 256	33 120	16.80	1.02
Nicaragua	810	4 416	29.80	3.17
Panama	515	2 944	38.80	2.80
Paraguay	2 061	7 360	18.10	4.42
Peru	4 710	40 480	31.50	3.96
Uruguay	294	2 208	11.80	0.82
Venezuela	3 165	36 800	40.30	5.82
British Guiana	2 650	14 720	68.50	27.36
West Indies	368	2 944	177.90	2.80
Surinam	800	7 400	51.80	30.60
Regional total	57 398	520 024	25.50	2.70

SOURCE: ECLA, on the basis of data from the United States Department of the Interior, *Geological Survey Circular 367*, with respect to hydro-electric potentials, and direct information for territorial areas and population.

Nevertheless, it is worthy of consideration that the River Lempa in El Salvador, the Caroní in Venezuela, Lake Yojoa-River Lindo in Honduras, the Negro in Uruguay, the Alto Beni in Bolivia, and the Tuma, Matagalpa and Viejo, in Nicaragua, appear to comprise more than 90, 85, 40, 40, 35 and 30 per cent of their respective national hydro-electric potentials. Fairly high concentrations of this resource are also to be found in other countries, as may be seen from table 10. Sometimes, as in the case of the Rivers Tunuyán, Diamante, Atuel and Negro in Argentina, a big potential is concentrated in an area that is relatively remote from the principal centres of electricity consumption.

Table 10

LATIN AMERICA: HYDRO-ELECTRIC POTENTIALS, 1960

(Estimated economic potential of selected basins)

Country, basins or sub-basins	*Potential*		*Country, basins or sub-basins*	*Potential*	
	Million of kW	*Percentage of country total*		*Million of kW*	*Percentage of country total*
Argentina[a]			Guatemala		
Tunuyán-Diamante-Atuel sytems	1.38	11.0	Haiti		
Río Negro	2.33	18.6	Honduras[j]		
Córdoba system	0.28	2.2	Lake Yojoa - Río Lindo	0.17	42.0
Bolivia[b]			Mexico		
Upper Beni (Bala)	1.00	37.0	River Balsas[k]	1.6	10.6
Rivers Coranstel-Espíritu Santo	0.15	5.6	Rivers Lerma-Chapala-Santiago[l]	1.83	12.2
Brazil			River Papaloapán[m]	0.89	5.9
River San Francisco[c]	3.10	10.3	Nicaragua[n]		
Río Grande[d]	7.00	23.3	Rivers Tuma-Matagalpa-Viejo	0.13	32.5
Rivers Paranapanema and Tieté	2.50	8.3	Panama[o]		
River Paraná	7.00	23.3	River Chiriquí	0.2	22.2
Chile[e]			Paraguay[p]		
River Maule	1.55	7.4	River Acaray-Monday	0.35	11.3
River Bío-Bío	2.38	11.4	Peru[q]		
River Maipo	0.61	2.9	Río Santa	1.00	15.4
Colombia			Uruguay[r]	...	
River Bogotá[f]	1.00	2.5	Río Negro	0.49	40.8
River Cauca (as far as Buga, including the Cauca Dagda project)	1.6	4.0	Venezuela[s]		
Costa Rica[g]			River Caroní	14.0	87.5
River Reventazón	0.57	38.0	British Guiana	...	
River Grande Tárcoles	0.16	10.7	West Indies	...	
Cuba			Surinam		
Dominican Republic			River Surinam[t]	0.2	13.3
Ecuador[h]					
River Mira	0.15	7.5			
River Esmeralda	0.16	8.0			
El Salvador[i]					
River Lempa	0.84	92.3			

[a] Water and Electric Energy. Economically-utilizable potential, study by G. A. Mazza, 1958.
[b] Department of Water and Electricity.
[c] San Francisco Valley Commission, A Valeriçao do Vale do São Francisco, 1957. (Regulated by the Tres Marías reservoir.)
[d] Brazilian National Committee, World Power Conference, Electric power in Brazil 1960, (regulated by the Furnas reservoir). The capacity of this basin differs from that assigned to it in the country estimate. Some estimates place the river potential as high as 10 million kW.
[e] Plan de electrificación del país, op. cit. Economic potential.
[f] Data supplied by the Costa Rican Electricity Institute.
[h] Estimate by J. Rittershaussen (TAO).
[i] *La investigación de recursos hidráulicos*, op. cit.
[j] *Investigación preliminar y parcial de los recursos hidroeléctricos*, op. cit.
[k] Estimate based on power stations in operation and established projects.
[l] C. Lara Beautell, *La industria de energía eléctrica*. Economic potential.
[m] Papaloapán Commission, Department of Hydraulic Resources, *Economía del Papaloapán*.
[n] *Plan de electrificación nacional e investigación de los recursos hidroeléctricos*, op. cit.
[o] *Proyecto de recursos hidráulicos y electrificación del SCIFE*, op. cit.
[p] Direct information Supplied by the National Electricity Administration.
[q] S. Antúnez de Mayolo, *Plan de instalaciones hidroeléctricas de la Corporación Peruana del Santa en el Valle del Río Santa en el Perú*, 1949.
[r] *El potencial hidroeléctrico en nuestro país*, op. cit.
[s] *Study of water resources in Venezuela*, op. cit. Economic potential.
[t] *Appraisal survey of hydro-electric power resources in Surinam*, op. cit.

3. Irregularities of stream flow by countries

There is no information to indicate that extensive regional maps or studies have been undertaken on the irregularities of stream flow in Latin America.

In order to obtain some idea of the degree of over-all stream flow irregularity in each country, particularly for purposes of comparison, the relation between the potentials estimated by the United States Geological Survey on the basis of ordinary minimum flow and on that of mean flow should be studied. Due consideration should be given to the fact that the storage works set up so far are generally unimportant as far as nation-wide regulation is concerned; the most significant work in this respect having been done by Argentina, Brazil and Mexico.[24] The relevant figures are given in table 11.

Chile and Paraguay appear to have the most regular stream flows, the most irregular being found in Brazil, Colombia, Ecuador and Venezuela. The near-uniformity of the irregularities recorded for Mexico and the other Central American countries contrasts with the situation in the remaining countries of the region, and seems to bear out the author's own observation that Latin American estimates are more inaccurate than those for developed areas because of the scarcity of basic data. In view of the difficulty of determining ordinary minimum flow from data that deal almost exclusively with rainfall, as stated before, it seems only reasonable to place less dependence on estimates of potential that are based on Q 95 per cent.

In any case it is obvious that more information is required on rainfall and stream flow and that the existing data should be processed more satisfactorily, by means of a systematic research on hydro-electric potentials.

Whenever studies evaluating hydro-electric potential by countries or basins are carried out, the relevant maps should also be prepared on flow irregularities during the hydrological year under consideration.

Flow coefficients have been calculated for a rather limited number of rivers in the studies by the ECLA/BTAO/WMO Water Resources Survey Group on Chile and Venezuela.[25]

In the case of Chile, it was thought worthwhile to make a quantitative evaluation of the variation in irregularity of the rivers flowing from north to south. Its qualitative aspects are already well-known, because of both the longitudinal variation in the rainfall régime and the accumulative action of snow in the Cordillera as a storer of large volumes of water which varies according to latitude.

[24] This estimate is based on a different concept from that of the recommended coefficient of irregularity Cr.

[25] *Los recursos hidráulicos de Chile* (E/CN.12/501/Add.1), United Nations Publication, Sales No.: 60.II.G.4, and *Water Resources in Venezuela* (E/CN.12/593).

Table 11

LATIN AMERICA: RELATION BETWEEN POTENTIALS BASED ON ORDINARY MINIMUM FLOW AND POTENTIALS BASED ON MEAN FLOW

Argentina	0.14	Mexico	0.19
Bolivia	0.12	Nicaragua	0.18
Brazil	0.08	Panama	0.18
Chile	0.28	Paraguay	0.28
Colombia	0.05	Peru	0.12
Costa Rica	0.18	Uruguay	0.13
Ecuador	0.06	Venezuela	0.09
El Salvador	0.20	British Guiana	0.18
Guatemala	0.18	West Indies	0.13
Honduras	0.18		

Table 12

CHILE: DEGREE OF IRREGULARITY IN THE FLOW OF SELECTED RIVERS IN A HYDROLOGICAL YEAR

River	*River gauge*	*Latitude (approximate)*	*Cr*
Carmen (Huasco)	Ramadillas	28°47′	0.10
Claro (Elqui)	Rivadavia	30°	0.11
Choapa	Cuncumén	31°55′	0.34
Maipo	La Obra	33°35′	0.25
Tinguiririca (Rapel)	Bajo Briones	34°44′	0.24
Achibueno (Maule)	Los Peñones	35°58′	0.23
Maule	Afluentes de Laguna de La Invernada	34°48′	0.20
Laja (Bío-Bío)	Afluentes del Lago Laja	37°22′	0.18
Allipén (Toltén)	Los Laureles	38°57′	0.16
Pilmaiquén (Bueno)	El Salto	40°37′	0.15
Maullín	Llanquihue	41°13′	0.10
Puelo	Carrera de Basilio	41°37′	0.09

SOURCE: *Los recursos hidráulicos de Chile*, op. cit.

The coefficients for the different rivers were calculated at what may be regarded as transitional points between the Cordillera of the Andes proper and the flat area or longitudinal valley. The results are given in table 12.

In the case of Venezuela, it was also important to show in quantitative terms the marked irregularity of flow of its rivers (with the exception of the Motatán), which seriously affects their utilization and reflects the seasonal distribution of rainfall; the Guarinco, for example, which registers the

Table 13

VENEZUELA: IRREGULARITY COEFFICIENTS OF THE RIVERS IN THE LLANOS AND THE RIVER MOTATAN

River	*Station*	*Approximate irregularity coefficient*[a]
Guárico	Puente Carretera El Sombrero	0.45
Pao	Paso La Balsa	0.36
Tinaco	Puente Carretera Tinaco-El Pao	0.38
Tirgua	Paso Viboral	0.21
Cojedes	Puente Carretera San Carlos-Acarigua	0.23
Agua Blanca	Puente Carretera San Carlos-Acarigua	0.28
Acarigua	Puente Carretera Acarigua-Guanare	0.31
Guadie	Puente Carretera Acarigua-Guanare	0.32
Baconó	Peña Larga	0.25
Masparro	Puente Carretera Guanare-Barinas	0.27
Santo Domingo	El Curay	0.25
Uribante	Puente Colgante	0.23
Motatán		0.13

SOURCE: Ministry of Public Works, *Resumen de Datos Hidrométricos 1940-59 (Summary of Hydrometric Data 1940-59)*, Caracas, 1960 (taken from the ECLA/TAO/WMO study, in draft form, on the water resources of Venezuela.

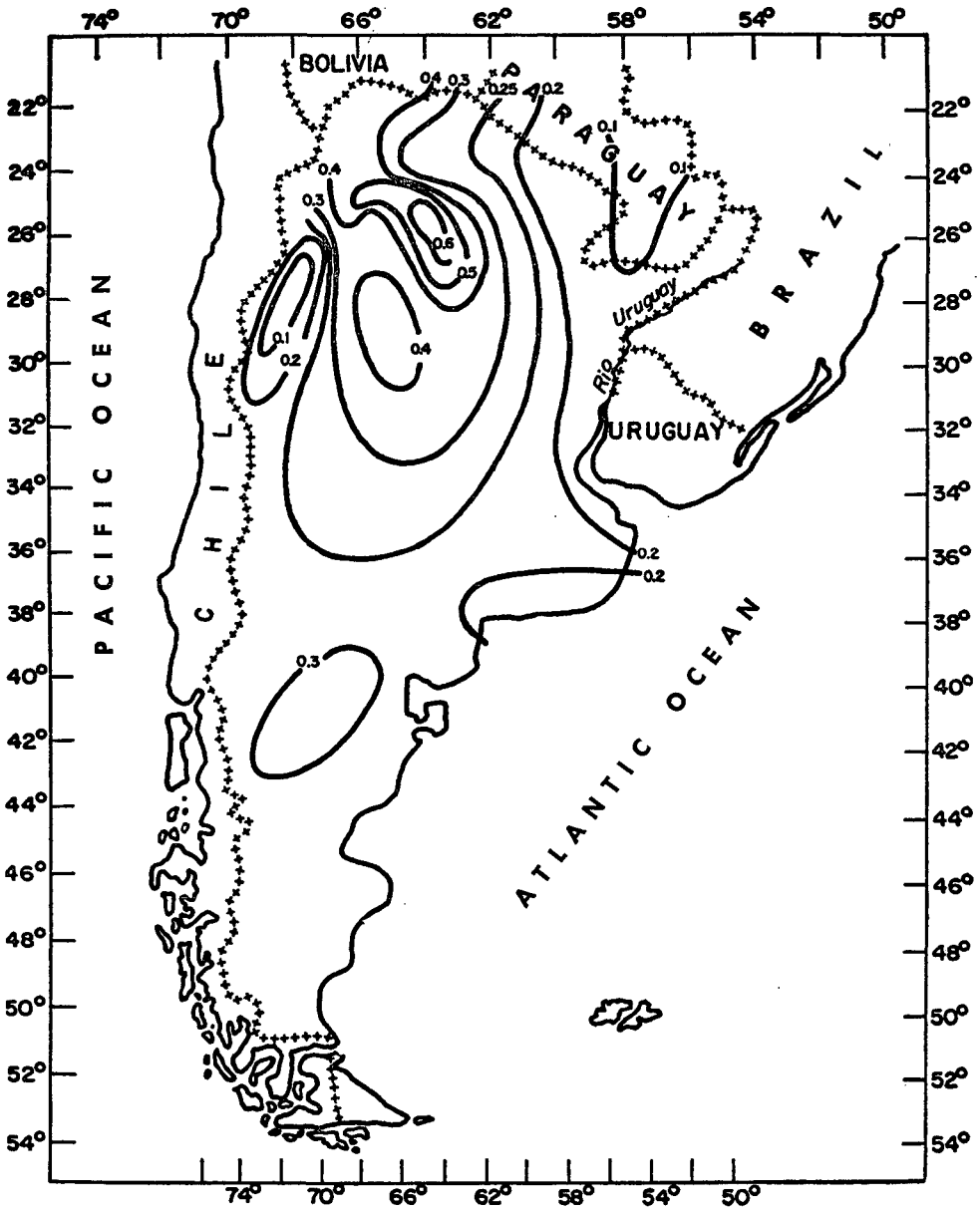
[a] Calculated on the basis of the mean hydrological year and of monthly mean figures only.

Map I-2

ARGENTINA: IRREGULARITY OF FLOW OF RIVERS

Equal index lines (provisional tracing)
(See text for definition)

++++ International border



NOTE: The boundaries shown on this map do not imply official endorsement or acceptance by the United Nations.

Table 14

INSTALLED HYDRO-ELECTRIC CAPACITY IN 1958 IN RELATION TO POTENTIAL RESOURCES-MEAN Q

	Millions of kW	*Percentage of potential*
Latin America	6.22	1.2
United States	30.10	35.3
Western Europe	50.26	45.1
Eastern Europe	12.45	4.3
Other developed countries	29.90	22.3
Rest of the world	9.11	0.8
World	138.04	6.1

SOURCE: ECLA, on the basis of data supplied by United States Department of the Interior, *Geological Survey Circular 367*, with respect to hydro-electric potentials; direct information for installed capacity in Latin America; and United Nations, *Statistical Yearbook 1960*, for the rest of the world.

highest coefficient, has a wet season of only 5 months (see table 13).

By way of a sample of the methodology used, a map of Argentina was very provisionally constructed on the basis of the index cited (see map I-2).

In the Cordillera, owing to the regulatory action of the snow on the high summits, curves with a low index of irregularity are recorded, especially between 26 and 32 degrees of latitude. This phenomenon probably extends

Table 15

LATIN AMERICA:[a] UTILIZATION OF HYDRO-ELECTRIC POTENTIAL IN 1958

Country	*Installed hydro-electric capacity*	
	Thousands of kW	*Percentage of estimated economic potential*
Argentina	290	2.3
Bolivia	85	3.2
Brazil	3 316	11.1
Chile	594	2.8
Colombia	489	1.2
Costa Rica	79	5.3
Cuba	4	...
Dominican Republic	—	—
Ecuador	37	1.8
El Salvador	56	6.2
Guatemala	28	14.0
Haiti	—	—
Honduras	3	0.8
Mexico	1 197	8.0
Nicaragua	10	2.5
Panama[b]	52	5.8
Paraguay	—	—
Peru	440	6.8
Uruguay	128	10.7
Venezuela	159	1.0
British Guiana	—	—
Surinam	—	—
West Indies	13	...
Regional total[a]	6 967	4.5

SOURCE: ECLA, on the basis of direct information and miscellaneous publications.

[a] Excluding in the second column, the Dominican Republic, Haiti, British Guiana and the West Indies, for want of data on economic potentials.

[b] Including the Canal Zone.

Table 16

LATIN AMERICA: UTILIZATION OF HYDRO-ELECTRIC POTENTIAL IN THE CASE OF SELECTED RIVER BASINS (1959)

Country, basin or sub-basin	*Installed hydro-electric capacity*	
	Thousands of kW	*Percentage of estimated economic potential of the basin*
Argentina:		
Tunuyan-Diamante-Atuel	74	5.4
Rio Negro	12	0.5
Córdoba System	100	35.7
Bolivia		
River Corani	—	—
Brazil		
River San Francisco	198	6.4
River Jacui	77	...
Rio Grande	105	1.5
River Uruguay	7	...
River Paraiva	664	...
River Tiete	876	...
Chile		
River Maule	102	6.6
River Bio-Bio	136	5.8
River Maipo	118	19.7
Colombia		
River Bogota	128	12.8
River Cauca (as far as Buga)	18	1.1
Costa Rica		
River Reventazon	5	0.9
River Grande de Tarcoles	62	38.8
Cuba		
Dominican Republic	—	—
Ecuador		
River Mira	3	2.0
River Esmeraldas	16	10.0
El Salvador		
River Lempa	45	5.4
Guatemala		
River Michatoga	12	...
Haiti		
Honduras		
Yojoa-Rio Lindo	—	—
Mexico		
River Balsas	449	28.0
Lerma-Chapala-Santiago	201	11.0
Papaloapan	154[a]	17.3
Nicaragua		
Rio Viejo	—	—
Panama		
River Chiriqui	6	3.0
Paraguay		
Peru		
Rio Santa	52	5.2
Uruguay		
Rio Negro		
Venezuela		
River Caroni	150	0.9
British Guiana	—	—
Surinam		
River Surinam		
West Indies	—	—

SOURCE: ECLA, on the basis of direct information and miscellaneous publications.

[a] The installation of 300 MW was completed by 1961.

farther south, but the map does not show it for the simple reason that very few of the data required for tracing the relevant curves were available. Around the Rivers Paraná and Uruguay, the low irregularity coefficient curves mainly reflect the regularizing influence of the magnitude and diversification of the river systems in the tributary basins concerned (particularly in Brazilian and Paraguayan territory), and also, although on a lesser scale, the uniformity of the rainfall régimes in the areas lying between the two rivers and in the provinces of Santa Fe and El Chaco.

Conversely, for the Jujuy, Salta, Tucumán and other neighbouring areas curves with a high index of irregularity are registered, in consequence of fluvial characteristics which vary during the course of the hydrological year, of undiversified tributary characteristics.

4. Present development

Table 14 enables a comparison to be drawn, although only approximately, between the proportions of hydro-electric resources developed by different regions, on the basis adopted for the construction of the table.

The table indicates that Latin America has developed only a very small proportion of its potential, since the percentage in question would amount to no more than one-fifth of the world average and to about one thirty-seventh and one twenty-ninth of the relative utilization figures for Western Europe and the United States.

An analysis of the degree of development by countries, *on the basis of the estimated economic potential,* appears in table 15.

For the region as a whole, the utilization referred to above is 4.5 per cent. The countries showing the highest relative development figures are Guatemala, Uruguay, Mexico and Brazil, with 14.0, 11.1, 10.7, and 8.0 per cent respectively.

Guatemala appears with a high percentage, not because it has developed its resources to an exceptional extent in relation to other countries, but because the rated potential would seem to be under-estimated inasmuch as only part of the country's river system has been taken into account. Obviously, in general terms, all the Latin American countries are still a very long way from utilizing their hydro-electric resources in the same proportion as other more developed countries. In the United States, the proportion of utilization in 1959, calculated on bases similar to those adopted here, was over 24 per cent.[26] Similarly, for Switzerland, France and Austria the corresponding proportions were, in the same year, 17.7, 14.6 and 8.5 per cent respectively.[27]

Nevertheless, if the resources situated near the large population centres or the areas of most intensive industrial activity in each country are studied individually, it becomes evident that there are some which are already fairly well developed, especially in comparison with the corresponding national averages. Among the cases for which information is available, special mention may be made of the Río Grande de Tárcoles (Costa Rica), with nearly 40 per cent of its potential now utilized, the Córdoba system (Argentina), with over 35 per cent, the Balsas (Mexico), with 28 per cent, the Río Negro (Uruguay), with more than 25 per cent (1958)[28] and the Maipo (Chile), with almost 20 per cent (see table16).

Of the estimated potential of the Rivers Bogotá (Colombia), Lerma-Chapala-Santiago (Mexico) and Esmeraldas (Ecuador), 13, 11 and 10 per cent respectively is utilized.

In Brazil, a high proportion of the Rivers Paraíba and Tieté is already being utilized. The former has an installed capacity of 664 mW and the latter of 876 mW.

5. Development characteristics

Approximately 45 per cent of the aggregate capacity of those hydro-electric power plants for the public service which were in operation in Latin America in 1959 and on which data are available was contributed by plants of the run-of-river type, and the rest by hydro storage plants (see table 17). The proportion of power produced by the former was 36 per cent. In most countries—the exceptions being Argentina, Brazil, Colombia, Mexico, Peru, Uruguay and, on a smaller scale, El Salvador which in the year in question had a larger proportion of hydro-electric capacity in a storage reservoir—run-of-river hydro plants were predominant. In fact, for many years the general tendency was to develop hydraulic resources of the Cordillera type—small flows and relatively high heads, without regulation. Plants were projected for minimum river flows frequently available for more than 95 per cent of the time. This is the type of plant for which investment requirements are proportionally smallest, but it implies very low percentages of development of natural resources. Later, in response to the simultaneous pressure of increased demand for electricity and of agricultural and drinking-water requirements, large regulation works began to be constructed with a view to more rational, and usually multiple-purpose, water utilization. At the present time, in almost all the countries of the region, the idea is gaining ground that no hydraulic project should be put into execution without prior study of the optimum use of water in the widest interests of the public, due consideration being simultaneously given to the needs and possibilities for irrigation, drinking-water, flood control, navigation, etc., with the production of electric energy, generally speaking, as the economic-financial basis for any and every programme.

Argentina, Brazil, Chile, Colombia, Mexico and Uruguay in particular afford good examples of this policy. There can be no doubt that the contribution of hydro storage plants to the production of hydro-electricity will gradually increase in all the Latin American countries, along with the concurrent tendency to make more use of them for producing energy during peak-load hours (low plant factor) in systems fed simultaneously by thermal electric plants and by different types of hydraulic plants (in so far as other water uses permit), as is the case in the majority of the more highly developed countries.

In an extensive system fed by power stations of different types, it is desirable that the base load be served as far as possible by the run-of-river hydro plants (or by nuclear plants where these exist), with some help—as a rule significant—from thermal power plants (those with the highest yields) and/or a few of the hydro storage plants. The upper part of the load curve is assigned to a considerable proportion (or all) of these last, with the support of gas

[26] Select Committee on National Water Resources, United States Senate, *Water Resources Activities in the United States,* Print No. 10 (estimates prepared by the Federal Power Commission).

[27] Information supplied by ECLA, on the basis of data given in *The electric power situation in Europe in 1958-59 and its prospects* (ST/ECE/EP/2) and *Hydroelectric potential in Europe and its gross, technical and economic limits* (E/ECE/EP/131).

[28] With the Baygorria power station brought into service (1960), over 45 per cent of this river's potential is utilized.

Table 17

LATIN AMERICA: CAPACITY AND PRODUCTION OF HYDRO-ELECTRIC POWER STATIONS FOR THE PUBLIC SERVICE, 1959

Country	Run-of-river plants[a]		Storage plants		Storage capacity[b] (millions of kWh)
	Capacity (thousands of kW)	Energy (millions of kWh)	Capacity (thousands of kW)	Energy (millions of kWh)	
Argentina	88	140[c]	202	500[c]	484
Bolivia	52	220	18	50	29
Brazil[d]	1 442	4 593	1 580	11 897	3 360
Chile	242	1 020	240	1 140	515[e]
Colombia	198	860[c]	258	1 126[c]	75
Costa Rica	73	334	—	—	—
Cuba	3	...	—	—	—
Dominican Republic	—	—	—	—	—
Ecuador	31	135	—	—	—
El Salvador	11	60	45	167	38
Guatemala	28	106	—	—	—
Haiti	—	—	—	—	—
Honduras	3	12	—	—	—
Mexico	427	2 040	706[f]	3 667	3 170
Nicaragua	1	3	—	—	—
Panama[g]	6	16	—	—	—
Paraguay	—	—	—	—	—
Peru	68	165	166[h]	633[h]	159
Uruguay	—	—	128	760[i]	600
Venezuela	159	100[j]	—	—	—
British Guiana	—	—	—	—	—
Surinam	...	...	...	...	...
West Indies	13	85	...	...	...
Regional total (excluding countries for which no data are given)	2 842	9 889	3 343	20 080	8 430

SOURCE: ECLA, on the basis of direct information and miscellaneous publications.

[a] Without regulation of flow.

[b] The kWh capacity of each storage plant was evaluated on the basis of the sum of the heads of all hydraulic power stations further down-stream operating in series.

[c] Estimated energy.

[d] 1958: the following are the power stations with an appreciable degree of regulation which are taken into account: Nilo Pecanha, Fontes, Cubatao, Itupararanga, Peixoto, Bugres, Canastra, Salto Grande, Americana and Itutinga. When the Tres Marías power station and reservoir (River San Francisco) enter operation, the capacity added will be 520 mW and the energy capacity stored will increase by 4 000 million kWh, including the head of the Paulo Alfonso Power Station.

[e] The useful storage capacity of the Abanico Power Station was in process of expansion.

[f] Hydroelectric plants belonging to the Miguel Alemán System, the Temascal (Papaloapan) Power Station, the Necaxa System, Lerma and La Boquilla.

[g] Excluding the Panama Canal Company's power station for want of production data.

[h] Power stations connected with the natural reservoirs in the upper basin of the Sta. Eulalia. (Part of the discharge utilized is run-of-river, from the River Rimac.)

[i] The figures are for 1958 because production in 1959 was seriously affected by floods.

[j] The 150 mW installed at Macagua (Caroní) had no load.

turbines (where these exist). The intermediate section—reduced to a minimum by the operation of the types of plant enumerated—is allocated to the thermal plants with lower yields. In every case, of course, there are many factors that must be considered in this regard. For example, the other uses to which the water is simultaneously put (irrigation, navigation, etc.) may make it necessary to manage the reservoirs on lines different from those dictated by energy considerations alone. Again, run-of-river hydro plants with little regulation are common, and should be operated so as to distribute their capacity between base-load and peak-load, etc.

Today it can be asserted that all the plants of any importance now being constructed, projected and programmed in Latin America include regulation works.

As far as can be judged from the available data, reservoir capacity throughout the region (in 1959) amounted to approximately 28 per cent of the energy produced by the hydro power plants and about 42 per cent of that produced by hydro storage plants.[29]

Brazil (São Paulo-Cubato, Río de Janeiro-Fontes and Nilo Peçanha-Peixoto Systems), Mexico (Miguel Alemán, Temaxcal, Necaxa, Lerma and La Boquilla Systems), Uruguay (Río Negro), Argentina (Córdoba and Mendoza Systems) and Chile (Abanico and Cipreses Systems) are the countries whose storage capacity is proportionally biggest in relation to the energy produced (1959 figures) by the power plants concerned.

Utilization of public service installations in 1959 can be studied, by countries, in table 18 (second column). In countries where the share of hydro-electricity in total installed capacity is large, combined utilization figures of

[29] See table 17, note [b]

Table 18

LATIN AMERICA: DEVELOPMENT OF INSTALLED HYDRO-ELECTRIC CAPACITY FOR THE PUBLIC SERVICE, BY PROGRAMMES

Country	1959		1965	1970	Annual rate of increases of capacity	
	Capacity (thousands of kW)	Annual utilization (hours)	Capacity (thousands of kW)	Capacity (thousands of kW)	1959-65	1959-70
Argentina	290	2 207	728	2 578	16.6	22.0
Bolivia	70	3 857	130	...	10.9	...
Brazil	3 097	5 447	5 792	...	11.0	...
Chile	482	4 477	985	1 489	12.6	10.8
Colombia	458	4 640	1 141	1 799	16.3	13.2
Costa Rica	73	4 514	135	...	10.8	
Cuba	3	3 500	...	...	...	
Dominican Republic	—	—	...	...		
Ecuador	31	4 355	101	...	21.7	
El Salvador	56	4 054	96	...	9.4	
Guatemala	28	3 786	98	...	23.2	
Haiti	—	—	...	...		
Honduras	3	4 000	...	...		
Mexico	1 133	5 037	2 556[a]	...	17.7	
Nicaragua	1	3 000	...	...		
Panama[b]	6	3 200	...	...		
Paraguay	—	—	...	...		
Peru	234	3 333	859	1 419	24.2	17.8
Uruguay	128	5 938[e]	233	933	10.5	19.8
Venezuela	159	3 943[d]	350	4 350	14.1	35.0
British Guiana	—	—	...	...		
Surinam	...	...	16[c]	...		
West Indies	13	6 615	...	...		
Regional total (excluding countries for which no data are given)	6 185	4 800	13 220	12 568	12.5	19.6

SOURCE: ECLA, on the basis of direct information and miscellaneous publications.

[a] Up to 1964. *Compañía Federal de Electricidad* (C.F.E.) programme.

[b] Excluding the Panama Canal Company's power stations, for want of production data.

[c] The figure given represents the maximum capacity freely available for the public service at the 150 mW power station which is being constructed by the Surinam Aluminium Company (SURALCO) under an agreement with the Queen of the Netherlands represented by the Government of Surinam.

[d] The figure is for 1958 because the Macagua (Caroní) plant had no load in 1959.

[e] See table 17, note [1].

more than 5,000 hours are found, and the annual average for Latin America exceeds 4,800 hours. The region's most important electricity systems (but for a few exceptions, outstanding among which are Buenos Aires, Caracas, Havana, Guayaquil and Asunción) operate with hydro base power plants whose installed capacity is generally characterized by a high degree of hydrologic reliability. In smaller systems the base load is often served by run-of-river hydro plants, diesel groups being available to cover the increase in demand at peak load hours and to meet emergencies.

The low utilization of Argentina's hydro power plants is partly attributable to the peak role assigned to some of the hydro storage plants, and partly reflects the lack of supplementary works at specific power plants in the provinces of Mendoza and Córdoba.[30]

The information available is insufficient for an analysis of plants in service or under construction in respect of degree or type of regulation (daily, weekly, seasonal, annual etc), head, age of installations, etc.

The foregoing remarks relate solely to hydro power plants for the public service. In the case of self-generation or, in other words, private supply services, thermal power plants generally predominate (petroleum, sugar, manufacturing and miscellaneous industries, etc), although there are countries where substantial use is made of hydraulic plants in the mining of metals (Peru, Bolivia). The proportion of total self-generation represented by hydro-electric production is approximately 35 per cent.

6. Develoments projected

Several countries have official programmes for the expansion of the public service systems; in others, the leading enterprises have drawn up their own development programmes. In both cases there are some divergencies between the goals established and the progress actually achieved in the various works projected for different dates. The relevant data, unadjusted, constituted the basis for the last four columns of table 18, which presents projections of hydro-electric capacity for the public service for the years 1965 and 1970, together with the corresponing annual rates of cumulative growth for the periods 1959-65 and 1959-70.

The 13 countries for which data up to 1965 are available will probably install, in the aggregate, 7.0 million

[30] For "Los Molinos I", which has an average of only 2,600 hours of utilization, the construction of the Anizácate dyke is under study. Similarly, a compesating reservoir would seem to be needed at the San Roque dyke power plant.

hydro-electric kW during the period 1959-65, which gives a cumulative annual rate of 12.5 per cent. Similarly, the programmes of the six countries for which data up to 1970 are to hand represent, in the aggregate, the installation of 10.8 million kW during the period 1959-70. This implies a cumulative annual growth rate of 19.4 per cent. Both estimates clearly reveal the importance of hydro-electric development in the region during the next few years. Up to 1965, the largest absolute increments would seem to be those planned by Brazil and Mexico,[31] (2.70 and 1.48 million kW respectively), Colombia, Peru, Chile and Argentina following with 0.68, 0.63, 0.50 and 0.44 million kW respectively. Up to 1970, Venezuela and Argentina, which are projecting 4.2 and 2.3 million kW, are outstanding among the countries with known programmes.

[31] C. F. E. programmes only.

The highest rates of growth registered in the period 1959-65, which easily exceed the regional average, are those recorded by Venezuela, Peru, Guatemala and Ecuador (24.2, 23.2 and 21.7 per cent respectively). Also very significant are the corresponding figures for Mexico,[32] Argentina, Colombia and Venezuela (17.7, 16.6, 16.3, and 14.1 per cent respectively).

For the period 1959-70, the most striking rates are those of 35.0 and 22.0 per cent estimated for Venezuela and Argentina.

Generally speaking, larger increments are contemplated for hydraulic capacity than for thermal capacity in almost all the Latin American countries.[33]

[32] *Ibid.*

[33] ECLA, The electric power industry in Latin America *Present status and recent development* op. cit.

III. ANALYSIS OF WATER RESOURCES RESEARCH MEDIA IN LATIN AMERICA

1. General considerations

In view of the fundamental importance of the various uses of water for the life and development of nations, it seems worth while to recall once more the vital significance attaching to research on water resources as a prerequisite for achieving, through their use, the greater welfare of the community.

It is common knowledge that an essential requisite for the study of any hydraulic project and for the designing of the constructions involved is the availability of the relevant hydrological information, which must fulfil two basic conditions; the data must be characterized firstly by accuracy and secondly by continuity over a sufficiently lengthy period.

Prevention of flood catastrophes and avoidance of the over-designing of structures which raises construction costs, as well as the more efficient operation of all hydraulic works, constitute the rewards that more than compensate for the proper collection, processing and analysis of hydrological and hydrometeorological statistics. Moreover, such work represents only a small fraction of the investment—usually substantial—required for hydraulic constructions.

Although the production of energy is not the primary purpose for which water is used, the magnitude of Latin America's hydro-electric resources—which can be divined from the statistics presented earlier—in conjunction with the outstanding contribution they already make to the supply of electricity in many countries, would alone suffice to justify a detailed analysis of the medium available for ascertaining the distribution and characteristics of water sources throughout the region, as a preliminary to any attempt at the integrated evaluation of such resources and the programming of their development.

The United Nations Economic and Social Council, in a resolution adopted on 24 August 1954, had recommended that Governments and the appropriate specialized agencies should "give particular attention to the assembly of hydrological data",[34] an activity which was undertaken by the United Nations Energy and Water Resources Programme.

[34] United Nations Economic and Social Council, *Official Records: Eighteenth Session. Resolutions* (E/2654), resolution 533 (XVIII) (International co-operation with respect to water resource development).

ECLA, at its sixth session, in resolution 99 (VI), recommended to the secretariat that it should evaluate such data with the aim of determining potential and optimum development of resources, and at the Commission's eighth session, in resolution 166 (VIII), this recommendation was endorsed and reaffirmed. A joint ECLA/BTAO/WMO working group is making detailed country studies of water resources and their development.

Given the limitations inherent in such a study, the magnitude of the problem, which involves investigation of the quantity and quality of hydrological data in Latin America (number of stations and length of time covered by the records), is too great for anything but a general panoramic view of it to be obtained. Nevertheless, the following points may be brought out:

(*a*) In several countries a basis exists for making—or at least beginning to make—an evaluation of theoretical potentials (discussed in section I of this article), in order to obtain more reliable data on the region's hydro-electric resources and their geographical distribution;

(*b*) Although various local shades of difference can be recognized within each country and from one country to another, the over-all picture of the media for research on water resources is not very satisfactory;

(*c*) The importance of hydrological data for the projecting and operation of hydraulic works has not been fully grasped by the appropriate authorities, who apparently do not always give adequate support to the institutions responsible for such measurements;

(*d*) The fact that the shortage of data is greater in the case of river stages and flows than in that of rainfall suggests that for the moment evaluations must be primarily based on precipitation data. It also indicates that in the expansion of networks of hydrological and hydrometeorological stations priority should be given to those of the former which offer possibilities of correlation, within a few years' time, with the precipitation stations already in operation, whose records of ovservations are continuous and cover a long period.

In the following paragraphs the situation in Latin America will be rapidly reviewed, although with the proviso that the lack of basic information in certain countries and the availability of only partial data in others may have resulted in the accidental inclusion of some figures which are not strictly in line with the facts. The numerical data

Table 19

LATIN AMERICA: NUMBER OF RAIN GAUGES, FLOW METERS AND EVAPORIMETERS IN SERVICE

Country	Year	Area of territory (km^2)	Density of population in 1959 (Number of inhabitants per km^2)	Rain gauges		Flow meters		Evapo-rimeters
				Number	Average area per rain gauge	Number	Average area per flow meter	
Argentina	(1959)	2 778 412	7	3 613	769	537[a]	5 174	110
Bolivia	(1959)	1 098 581	3	200[b]	5 493	67	16 397	1
Brazil	(1959)	8 513 844	7	2 577	3 304	1 287[c]	6 615	...
Chile	(1959)	741 767	10	479	1 549	260	2 853	19
Colombia	(1959)	1 138 355	12	510[d]	2 232	197[d]	5 778	8
Costa Rica	(1958)	50 900	21	128	398	15	3 393	4
Cuba	(1958)	114 524	56	188[e]	609	26[e]	4 405	...
Dominican Republic	(1958)	48 734	57	208[e]	234	10[e]	4 873	...
Ecuador	(1958)	263 206	15	86[f]	3 061	18[g]	14 623	...
El Salvador	(1959)	20 000	122	95[h]	211	41[h]	488	8[h]
Guatemala	(1958)	108 889	33	149[e]	731	8[e]	13 611	7
Haiti	(1958)	27 750	123	100[e]	278	29[e]	957	2
Honduras	(1958)	112 088	16	62[d]	1 808	40[d]	2 802	...
Mexico	(1958)	1 969 269	16	2 035[i]	1 064	965[i]	2 041	535
Nicaragua	(1958)	148 000	9	60[j]	2 467	16[j]	9 250	7
Panama (including the Canal Zone)	(1959)	75 902	14	112[k]	678	47[k]	1 615	6
Paraguay		406 752	4	...	...	...	...	
Peru	(1959)	1 285 215	8	127	10 100[l]	90	14 300	35
Uruguay	(1959)	186 926	14	547[m]	342	...	...	...[m]
Venezuela	(1959)	912 050	7	1 016[n]	898	248[n]	3 678	143
British Guiana		214 971	2	...	...	...	...	...
Surinam	(1959)	142 822	2	60[o]	2 380	—	—	—
West Indies		16 552	146	...	...	...	...	...

SOURCES: ECLA, on the basis of direct official information (in the shape of replies to the relevant questionnaire) and miscellaneous publications (see notes on individual countries).

NOTE: The sources of information acknowledged in connexion with this first table on the present subject, as well as the years (shown in parenthesis) up to which data have been taken into account, are valid for the remaining tables. The areas adopted are those given in the United Nations *Statistical Yearbook 1959*.

[a] National Department of Port Facilities and Navigable Waterways *(Dirección Nacional de Construcciones Portuarias y Vías Navegables), Agua y Energía Eléctrica (1959)* and *Anuario Hidrográfico 1948-50*.

[b] R. Schröeder, *Sugerencias para la organización de un servicio meteorológico e hidrológico adecuado para las necesidades de Bolivia (1960)*, a joint ECLA/TAO/WMO study in course of preparation.

[c] Belonging mainly to the Water Deparment of the Ministry of Agriculture.

[d] Direct information supplemented with the data provided by the Pan American Institute of Geography and History of the Organization of American States, *Estudios sobre Recursos Naturales en las Américas*, Mexico 1953, Vol. II, Project 29.

[e] *Ibid.*

[f] R. Schröeder, *Study of water resources in Ecuador, Present state of hydrometeorology* (1959), a joint ECLA/TAO/WMO study in draft form. (Four stations in the Galápagos Islands are not included.)

[g] Charles G. Hawes, *Report on water resources in Ecuador*, a joint ECLA/TAO/WMO study in draft form (1959).

[h] Atilio García Prieto, *La investigación de recursos hidráulicos en El Salvador* (CCE/SC.5/I/DT.12),1959.

[i] Pan American Institute of Geography and History, op. cit., Vol. IV; Water Resources Department, Lerma-Chapala-Santiago Study Commission, *Boletín Hidrológico No 1: Ingeniería Hidráulica en México*, February 1956; and Federal Electricity Commission, *Boletín Hidrológico No. 2: Cuenca Río Balsas*.

[j] Pan American Institute of Geography and History, op. cit., Vol. I; National Energy Commission, *Plan de Electrificación Nacional e Investigación de los Recursos Hidráulicos* (CCE/SC.5/I/DT.1).

[k] Pan American Institute of Geography and History, op. cit., Vol. I; Inter-American Co-operative Economic Development Service *(Servicio Cooperativo Interamericano de Fomento Económico*—SCIFE), *Proyecto de Recursos Hidráulicos y Electrificación*, 1960.

[l] The average figure for eight southern departaments is 4 486 km^2 per rain gauge (see data quoted from a report by Robert Grace in *Study of water resources in Venezuela*, op. cit.).

[m] State Electricity, Gas and Telephones *(Usinas y Teléfonos del Estado*—UTE) *Memoria Descriptiva General del Río Negro y de las Obras Hidroeléctricas construidas*, 1959.

[n] Ministry of Public Works, *Resumen de Datos Hidrométricos 1940-59*, and data supplied by the National Institute of Sanitary Engineering *(Instituto Nacional de Obras Sanitarias—INOS)*

[o] Bokopondo Bureau, *Appraisal Survey of Hydro-electric Power in Surinam.*

given below should therefore be regarded merely as a first approximation to the analysis of the problem at regional level.

2. NUMBER OF RAIN GAUGES, FLOW METERS AND EVAPORIMETERS, BY COUNTRIES

Of all the observations recorded in the field of hydrology, those relating to the measurement of precipitation are (together with volume of flow measurements) the most fundamentally important and, at the same time, the most widespread. The establishment of precipitation/run-off relationships makes it possible, when information on stream flow variations in a watercourse is inadequate, to estimate these on the basis of precipitation data, which, except in a very few cases, constitute the longest statistical series available in hydrometry.

Several factors affect a country's ideal minimum density requirements in respect of rain gauges, the most important being the irregularity of the surface distribution of rain-

fall, topographical characteristics and the purpose which the observations are intended to serve.

Consequently, the area that a rain gauge can representatively cover varies widely; however, figures ranging from 100 to 1,000 km² per rain gauge may be considered, on an average, to reflect satisfactory station densities for many purposes in various parts of the world.[35] The highest densities correspond to mountainous districts where rainfall is more unevenly distributed than in the plains.

As regards stream flow gauging stations, it may be considered desirable for there to be one at the confluence of every important tributary with the main water course, as well as at tappings feeding existing works and at sites where the construction of new plant is contemplated. Despite the foregoing suggestion that the ideal number of stream flow meters for a given basin is a function of the number of confluences of major water courses, by analogy with precipitation stations (although their significance is not the same) comparisons are often established on the basis of the average territorial area corresponding to each station.[36]

Notwithstanding the importance that is attributed to the determination of evaporation by experiment in order to establish water balances in a basin or area, the simple methods in use (such as the tank or Piche evaporimeters and the Livingstone atmometer) do not exactly measure the natural process of evaporation, and are therefore regarded as only relative indicators of the phenomenon they attempt to assess. Consequently, rules for determining the optimum number of evaporimeters for a specific territorial area have not yet been laid down.

Table 19 shows the total number of rain gauges, flow meters and evaporimeters in service in each of the Latin American countries. In the case of rain gauges and flow meters, the average area of mainland territory per instrument is also given. The figures for rain gauges include snow gauges, which are few in number and, according to the data available, are to be found only in a few localities high up in the Andean massif and, as a rule, far from the equator (the countries possessing the largest number are Argentina, which has 88, and Chile, which has 24). Only in ten countries does the over-all average figure for the area per rain gauge fall below 1,000 km². El Salvador, the Dominican Republic, Haiti, Uruguay and Costa Rica show the most satisfactory averages (210,234, 280,340 and 400 km² per rain gauge, respectively). Cuba, Panama, Guatemala, Argentina, Venezuela and Mexico are the other countries with better averages than those indicated. It may be noted that the countries of relatively small size which have a high population density and whose economies are heavily dependent upon tropical crops (coffee, cacao, sugar-cane, etc.) are among the best equipped for these observations, Conversely, Peru, Bolivia and Brazil are those registering the largest average area per rain gauge (10,100, 5,500 and 3,300 km², respectively).[37]

Chile and Ecuador have each signed (1960) agreements with the United Nations Special Fund with a view to the expansion and improvement of their meteorological and hydrological networks on the basis of the studies carried out by the ECLA/BTAO/WMO Water Resources Survey Group in these two countries. The relevant programmes are already being put into effect.

The data available are not sufficiently complete to allow of a detailed analysis of the proportion of rain recorders in the corresponding precipitation stations. According to the information to hand, the highest relationships would seem to be found in Panama, Colombia, El Salvador, Costa Rica and Brazil (42, 23, 20, 10 and 7 per cent respectively). The additional data supplied by the automatic recording devices (continuous time-precipitation relationships) and their greater reliability, together with the fact that rain recorders do not require constant supervision (and are therefore highly suitable for sites which are difficult of access or are cut off altogether at certain times of year) are so many more reasons for the use of an increasing proportion of these instruments in Latin America, despite their heavier cost.

As regards flow meters (see table 19), El Salvador, Haiti, Panama, Mexico, Honduras and Chile are the best-equipped countries, the respective areas per unit being 490, 960, 1,620, 2,040, 2,800, and 2,850 km². Costa Rica, Venezuela, Cuba, the Dominican Republic and Argentina follow with between with 3,390 and 5,170 km² per flow meter. The available data indicate that the largest areas per stream flow gauging station are found in Bolivia, Ecuador, Peru and Guatemala, where 16,400, 14,620, 14,300 and 13,610 km² per unit are registered.[38]

The information to hand is insufficient for a precise analysis, by countries, of those hydrological stations which measure only river stages, with no possibility of the data obtained being converted into terms of stream flows through discharge curves already or about to be established. However, the statistics presented above relate only to stations designed for flow measurement purposes, except in the case of Argentina, where they include data referring to 200 stations operated by the National Department of Port Facilities and Navigable Waterways *(Direc-*

[35] See ECAFE, *Proceedings of the third regional technical conference on water resources development in Asia and the Far East: Flood Control Series No. 13*, United Nations Publications, Sales No.: 59.II.F.2, Bangkok, 1958.

[36] See W. B. Langheim and W. G. Hoyt, *Water Facts for the Nation's Future*, New York, 1959, p. 63, for an account of variations in the United States from 6,500 km² per station in arid and sparsely populated States like Nevada to 1,700 km² per station in the more densely populated Eastern States, with their damper climate.

[37] In Europe the average area *per meteorological station* is 192 km² and in the United States 1,536 km². See Rudolf Schröeder, *Study of water resources in Venezuela. Present state of hydrometeorology* (a joint ECLA/TAO/WMO study in draft form), which alludes to a quotation, in a report by Robert Grace, from H. Landsberg, *Physical Climatology*, Pennsylvania State College, 1941.

[38] Further light is shed on the subject by a comparison with the similar situation prevailing in some of the countries of Asia and the Far East in 1955, as indicated in the following table:

Country	*Total area in km²*	*Number of inhabitants per km²*	*Number of km² per rain gauge*	*Number of km² per flow meter*
Burma	677 950	29	3 660	...
Ceylon	65 610	131	137	224
India	3 288 375	116	934	6 450
Japan	369 813	241	83	138
Republic of Korea	93 634	230	2 340	1 610
Laos	237 000	6	59 300	47 500
Federation of Malaya	131 287	46	129	501
Pakistan	944 824	87	1 630	4 180
Philippines	299 404	74	1 450	1 310
Thailand	514 000	39	1 280	2 940

SOURCE: ECAFE, *Proceedings of the third regional technical conference on water resources development in Asia and the Far East*, op. cit.

ción Nacional de Construcciones Portuarias y Vías Navegables) solely for the registration of river stages for navigation purposes. The great majority of the flow meters consist of firm cross-stream sections (weirs, bridge corners, gauging frames and structures, aqueducts of reinforced concrete or masonry, etc.) fitted with simple scales (limnimeters) for reading the level of the water. The flows in question are computed by means of empirical formulae established on the basis of direct gauging, or specific relationship in hydraulic models. The number of cases in which scales are being replaced by automatic recorders (limnigraphs), which have advantages similar to those already pointed out in the case of rain recorders, is increasing in the various countries, but the relative share of these instruments in the total is still not very high. Thus, it was possible to establish that in the countries listed they accounted for the following percentages: Costa Rica, 100; Colombia, 25; El Salvador, 17; Argentina, 13; and Ecuador, 6. In other countries, either data are lacking or the figures given are so low as to be of dubious value.

Where evaporation stations in operation are concerned, Mexico, Venezuela and Argentina are quite outstanding, with 535,143, and 110 respectively. The corresponding figures for Peru, Chile and Colombia are, respectively, 35, 19 and 8. Bolivia, Costa Rica, El Salvador, Guatemala, Haiti and Nicaragua also record observations of this type.

Although in some countries, such as Argentina, Brazil, Chile, Colombia and Mexico, sediment transportation is measured in certain watercourses, the information obtained was not sufficient for inclusion in the present study.

3. Number of rain gauges and flow meters, by selected basins and sub-basins

In each individual country, of course, rain gauges and flow meters are very unevenly distributed, as can be seen from a comparison of table 19 with table 20. The latter

Table 20

LATIN AMERICA: EXISTING EQUIPMENT IN SOME OF THE BASINS AND SUB-BASINS WHERE RESEARCH IS MOST SATISFACTORY, BY COUNTRIES

Country, basin or sub-basin	*Total area (km²)*	*Rain gauges*		*Flow meters*	
		Number	*Average area per rain gauge (km²)*	*Number*	*Average area per flow meter (km²)*
Argentina					
Río Negro	189 196	102	1 855	49	3 861
Córdoba System[a]	70 873	237	299	29	2 444
Northern zone[b]	170 000	320	531	79	2 152
Bolivia					
Lago Titicaca-Río Desaguadero	43 400	32	1 356	4	10 850
Brazil					
River Doce	88 000	93	946	116[c]	759
River Paranaiba	219 000	24	9 125	57[c]	3 842
Río Grande	147 000	165	891	166[c]	886
River Uruguay	169 000	114	1 482	118[c]	1 432
River San Francisco	614 000	476	1 290	178[c]	3 449
River Tietê	72 000	76	947	37[c]	1 900
Chile					
River Maipo	16 000	53	302	15	1 067
River Bío-Bío	26 960	48	562	19	1 419
Colombia					
River Cauca (as far as Manizales)	25 142	47	535	38	662
River Magdalena (as far as Honda)	56 903	127	448	69	825
Costa Rica					
River Grande de Tárcoles	2 105	22	96	4	526
River Reventazón	2 105	27	78	5	421
Cuba					
River Hanabanilla	200	...	...	...	...
Dominican Republic					
River Yaque del Norte	7 000	...	...	7	1 000
Ecuador					
River Guaillabamba (inter-Andean zone)	4 000	3	1 333	2	2 000
River Ambi	1 100	3	367	1	1 100
El Salvador					
River Lempa (as far as "5 de Noviembre" power station)	6 540	40	164	21	311

(Continued)

Table 20 (continued)

Country, basin or sub-basin	Total area (km^2)	Rain gauges		Flow meters	
		Number	Average area per rain gauge (km^2)	Number	Average area per flow meter (km^2)
Guatemala					
Lake Amatitlán-River Michatoga	2 700	15	180	1	2 700
Lake Atitlán	560	4	140	—	—
Haiti					
Honduras					
River Ulúa	24 290	13	1 868	18	1 350
River Chamalecón	6 548	9	7 276	2	3 274
Mexico					
River Lerma-Chapala-Santiago	125 555	208	604	67	1 874
River Balsas	108 000	45	2 400	53	2 038
Nicaragua					
Lake Nicaragua and River San Juan	29 000	27	1 074	7	4 143
Panama					
River Chiriquí	1 700	7	243	6	283
River Santa María	3 300	11	300	6	550
Paraguay					
Peru					
River Rimac	3 630	4	908	5	726
River Mantaro (as far as Chinchihuasi tributary)	27 590	9	3 066	15	1 839
Uruguay					
Río Negro	69 175	...	...	12	5 765
Venezuela					
River Tuy	6 750	129	52	74	91
Lake Valencia	2 800	71	39	14	200
British Guiana					
Surinam					
West Indies					

SOURCE: See table 19.
[a] Including Rivers Primero, Segundo, Tercero, Cuarto and Carcaraña.
[b] Consisting of the upper basins (in Argentine territory) of the following rivers: Bermejo, as far as Elordi; Salado, as far as Suncho-Corral; and Dulce, as far as Santiago del Estero.
[c] Belonging mainly to the water Department of the Ministry of Agriculture.

shows the situation in some of the basins and sub-basins which are most thoroughly studied in each country, with respect to the average area covered by each rain gauge and flow meter in operation.

As regards rainfall measurements, for example, the position of Peru, Bolivia and Brazil is worth noting. Although for their territories as a whole the largest average areas per station are indicated, the figures for specific basins are a good deal more favourable. In the basin of the Rimac River in Peru, 908 and 3,066 km^2 per rain gauge are registered. The Titicaca-Desaguadero River basin, in Bolivia, shows 1,356 km^2 per rain gauge, and for the basins of the Río Grande and the Tieté River in Brazil, the corresponding figures are 891 and 947 km^2, respectively. Similar observations apply to the other countries in respect of both precipitation and stream flow measurement. The other highly enlightening aspect of table 20 is that relating to the experience afforded by the Latin American countries—as to the area—in terms of broad averages for which a rain gauge or flow meter seems sufficiently representative, in basins where hydraulic works are in operation, under construction or projected. In most of the basins studied the equipment ascertained to exist implies an area of less than 1,000 km^2 per rain gauge, and in the Cordillera and other mountainous districts (see Chile, Colombia and Ecuador) this figure is reduced to some 500 km^2 per rain gauge. As regards stream flow gauging (due allowance being made for the comparatively negligible significance attaching, as already pointed out, to indications of the area for which, on an average, one flow meter is considered adequate), between 500 and 2,000 km^2 per station might be mentioned as common. These statistics testify to the inadequacy of the media available for the collection of hydrological and hydrometeorological data in Latin America as a whole.

4. Length of records

The flow of water in a river may vary a great deal year by year, from one season of the year to another, and even at different times of day. Consequently, it is of the greatest

Table 21

LATIN AMERICA: BREAKDOWN OF STATIONS BY LENGTH OF RECORDS (NUMBER OF YEARS COVERED)

Country, basins or sub-basins	Year	Throughout the country								In some of the basins where research is most satisfactory							
		Less than 5 years		6 to 15 years		16 to 30 years		More than 30 years		Less than 5 years		6 to 15 years		16 to 30 years		More than 30 years	
		Precipitation	Flow	Precipitation	Flow	Precipitation	Flow	Precipitation	Flow	Precipitation	Flow	Precipitation	Flow	Precipitation	Flow	Precipitation	Flow
Argentina	(1959)	—	1	1 327[a]	271[a]	1 330[a]	77	956	188								
Río Negro										—	—	37	28	39	5	26	16
Córdoba System										—	1	85	5	91	16	61	7
Northern zone[b]										—	—	115	59	121	15	84	5
Bolivia	(1959)	18	30	53	27	73[a]	10	56[a]	—								
Lake Titicaca-River Desaguadero										—	—	6	1	12	3	14	—
Brazil	(1959)	110	120	836[a]	360	408	737	1 223[a]	70								
River Doce										1	4	12	25	42	85	—	2
River Paranaiba										—	11	11	32	4	14	—	—
Río Grande										2	2	3	22	81	141	—	1
River Uruguay										33	19	7	23	13	76	—	—
River San Francisco										15	12	27	42	56	105	5	19
River Tieté										1	—	14	16	16	21	—	—
Chile	(1959)	61	72	230[a]	110[a]	92	68	96	10								
River Maipo										8	2	14	5	12	5	12	3
River Bío-Bío										4	9	6	1	8	6	13	3
Colombia	(1959)	282	132	122	49	79	14	27	1								
River Cauca (as far as Manizales										10	15	27	22	7	1	3	—
River Magdalena (as far as Honda)										74	40	24	16	28	12	1	1
Costa Rica	(1958)	42	10	51	5	34	—	1	—								
River Grande de Tárcoles										10	3	7	1	4	—	1	—
River Reventazón										10	5	11	—	6	—	—	—
Cuba	(1958)	...	...	...	...	...	...	...	...								
River Hanabanilla										...	...	...	...	...	...	...	...
Dominican Republic		—	...	72	...	133	...	3	...								
River Yaque del Norte										...	...	...	...	...	...	...	...
Ecuador	(1958)	53[a]	17	27	1	5	—	1	—								
River Guaillabamba (inter-Andean zone)										2	1	—	1	—	—	1	—
River Ambi										1	1	2	—	—	—	—	—

El Salvador	(1959)	34	40[a]	24	1	15	—	22	—									
River Lempa (as far as "5 de Noviembre" Power station										12	20	10	1	9	—	9	—
Guatemala	(1958)	—	—	40	8	103	—	6	—									
Lake Amatitlán-River Michatoga										—	—	3	1	11	—	1	—
Lake Atitlán										—	—	—	—	3	—	1	—
Haiti		...	...	...	...	...	...	...	...									
...										...	...	...	...	...	...	...	...
Honduras	(1958)	18	40	38	—	5	—	1	—									
River Ulúa										4	18	9	—	—	—	—	—
River Chamalecón										—	2	4	—	4	—	1	—
Mexico	(1959)	170[a]	90[a]	754	451	520	359	407	65									
River Lerma-Chapala-Santiago										2	10	87	20	95	33	24	4
River Balsas										29	21	16	28	—	3	—	1
Nicaragua	(1958)	25	14	8	—	21	—	6	2									
Lake Nicaragua and River San Juan										8	5	1	—	16	—	2	2
Panama	(1959)	37	36	28	4	18	—	29	7									
River Chiriquí										5	6	2	—	—	—	—	—
River Santa María										10	6	—	—	1	—	—	—
Paraguay		...	...	...	...	...	...	...	...									
...										...	...	...	...	...	...	...	...
Peru	(1959)	22	32	84	23[a]	20	19	1	16									
River Rímac										—	—	2	1	2	1	—	3
River Mantaro										3	7	4	6	1	2	1	—
Uruguay	(1959	...	—	...	5	...	1	...	6									
Río Negro										...	—	...	5	...	1	...	6
Venezuela	(1959)	221	202[a]	570[a]	30	186	16	39	—									
River Tuy										23	67	77	2	21	5	8	—
Lake Valencia										9	10	41	3	14	1	7	—
British Guiana																		
Surinam																		
West Indies																		

SOURCES: See table 19.

NOTE: In the case of those countries for wich the only data available were supplied by the Pan American Institute of Geography and History of the Organization of American States, *Estudios sobre recursos naturales en las Américas*, op. cit., Vol. II, is was estimated that the precipitation and stream gauging stations existing in 1953 and appearing in that publication were operating regularly in 1959.

[a] Including estimates.

[b] Consisting of the upper basins (in Argentine territory) of the following rivers: Bermejo, as far as Elordi; Salado, as far as Suncho-Corral; and Dulce, as far as Santiago del Estero.

importance that continuous records of the flow be available, and that they should cover a long period, so that the mean monthly, seasonal or annual discharges that may be counted upon for a project can be ascertained with the requisite degree of accuracy. Moreover, the peak and minimum discharges corresponding to periods of flood and of drought may constitute the decisive conditions for a project. For example, exceptionaly high discharge figures, with frequencies as distant as 1 in 1,000 or 1 in 2,000 years, are sometimes used to determine spillway dimensions for certain dams. As the high and low extremes occur too irregularly for these peak and minimum discharges to be established by extrapolation, the loss of one such opportunity of recording them can seriously affect research work since it may mean that many years will pass before a similar situation recurs. It is for all these reasons that hydrological observations should be initiated long before the construction of works is begun.

Serious catastrophes arising from dam failures have had their origin in the under-estimating of maximum flood discharges through lack of continuity in hydrologic records or unduly short statistical series. Again, substantial losses are caused by over-designing of works and inefficient operation of projects, attributable to the same cause—inadequate hydrologic data whose chief deficiency is that the time covered by the record is too short. Latin America affords several examples of hydro-electric power stations constructed for over-estimated flows and therefore operating with low plant factors, while it must not be overlooked that the opposite situation also exists, and that the source is sometimes under-utilized because of lack of knowledge of the available flow.

In various countries of the region hydrological stations can be found which were formerly installed as part of the permanent measurement network but have been closed down or dismantled before the completion of a hydrological period that can be regarded as representative or enables valid correlations to be established with other and longer series of rainfall or stream flow records, so that the initial effort and work have been wasted. Such situations are often due to lack of funds for these activities, because their importance has not been fully grasped.

When the data for this study were being collected, there were instances in which information was obtainable only up to the early 1950's.[39] For the sake of uniformity with the majority of countries, for which data were available up to December 1959, the period of years covered by the records of the former group was prolonged on the hypothesis that the observations had been uninterrupted. This procedure meant that countries for which indirect and rather out-of-date information had been obtained, and which had installed rain gauges and flow meters two or three years prior to 1959, were probably credited with fewer sets of equipment than they actually possessed, but were not much affected as regards the length of their records.

Table 21 presents a break-down of stations by the number of years their records cover, for each country as a whole and for selected examples of the better-known basins. The table includes many estimates and must be regarded as highly provisional. Data on existing stocks and sites of rain gauges and flow meters were actually more complete than those relating to periods of operation and length of records. To round off the over-all picture and calculate the coverage coefficient, estimates were made when these data were lacking, as far as possible on the basis of considerations relating to the creation of the institution owning the equipment or to the date of initiation of its activities (railway stations, airports, etc.), and in the remaining instances by the arbitrary assignment of lengths of series in relation to those known of in the same country.[40]

The length of rainfall records is often considerable (or relatively so), owing to the fact that many instruments were installed by private institutions at the time of their foundation for purposes closely linked to their main activities (railway companies when their construction works were begun, crop and stock farming enterprises, airlines, etc.).

The high proportion of precipitation stations with records covering many years in Brazil, Argentina, Mexico, Bolivia and Chile, for example, is worth noting, and so, on the other hand, is the extensive but more recent action taken by certain official agencies in countries like Colombia and Venezuela.

As regards stream gauging, Argentina, Brazil and Mexico can be seen to have begun recording observations on a large scale at an earlier date than the other countries of the region for which such data are available. Chile next, and then Colombia, afford evidence of more recently systematized activities on the part of the official bodies responsible for this work, and the same is true of the Central American countries.

A similar analysis in respect of certain selected basins confirms the disparities in levels of research as between one such basin and another within the same country, and even among different rivers in the same basin or from one reach of a river to another, according to their distance and accessibility from the main population centres.

5. Coverage coefficient

In order to assess the level of development of hydrological research in a given basin or territory, the coverage index for rainfall measurements and stream gauging simultaneously takes into account the density of observation stations and the age of the pertinent records, since these two elements play independent roles.

The index in question is determined by the product of two factors: the number of observation stations per 10,000 km² of the territory under study,[41] and the average age, in years, of the corresponding records.

Table 22 enumerates these coefficients by countries, for both precipitation and stream flow gauging stations.

The countries in whose case this coefficient reflects the most thorough knowledge of precipitation conditions in

[39] This was principally true of the Central American countries and the West Indies, in whose case the want of direct information was supplied mainly by recourse to the report of the Pan American Institute of Geography and History of the Organization of American States, *Estudios sobre Recursos Naturales en las Américas*, Vol. II, Project 29, Mexico, 1953.

[40] The classification into groups was based on the view that for the purposes of executing a final project of average importance records incorporating less than 5 years observations are inadequate. Records covering from 6 to 15 years might be used in certain special instances, but with reservations. Those in the 16-30 years group may be taken as satisfactory in most cases, and those of over 30 years, highly satisfactory.

[41] In the present study it was felt preferable to consider the number of stations per 10,000 km², instead of per 1,000 km² as in the ECAFE report referred to above, since the station density figure was too low in some countries.

Table 22

LATIN AMERICA: COVERAGE COEFFICIENTS

Country	Precipitation records			Stream gauging records		
	Average length of records (i)[a]	Number of stations per 10 000 km² (ii)	Coefficient (i)×(ii)	Average length of records (iii)[a]	Number of stations per 10 000 km² (iv)	Coefficient (iii)×(iv)
Argentina	24.1	13.0	313.3	23.9	1.9	45.4
Bolivia	19.8	1.9	37.6	7.0	0.7	4.9
Brazil	26.6	3.0	79.8	17.9	1.5	26.9
Chile	19.0	6.5	123.5	10.8	4.2	45.4
Colombia	9.8	6.0	58.8	6.5	1.9	12.4
Costa Rica	10.1	26.5	267.7	3.8	2.9	11.0
Cuba	24.0	16.4	393.6	...	...	...
Dominican Republic	20.8	42.7	888.2	...	2.1	...
Ecuador	7.6	3.3	25.1	2.3	0.7	1.6
El Salvador	16.1	47.5	764.8	2.6	20.5	53.3
Guatemala	19.0	13.7	260.3	9.0	0.7	6.3
Haiti	...	36.0	...	...	10.5	...
Honduras	8.6	5.5	47.3	2.7	3.6	9.7
Mexico	26.0	11.5	299.0	10.4	9.3	96.7
Nicaragua	26.0	4.1	106.6	13.0	1.1	14.3
Panama[b]	19.7	14.8	291.6	7.2	6.2	44.6
Paraguay	...	...	...	...	...	...
Peru	9.7	1.0	9.7	15.8	0.7	11.1
Uruguay[c]	...	...	...	31.0	0.7	21.7
Venezuela	11.0	11.1	122.1	6.0	2.7	16.2
British Guiana	...	...	...	...	...	...
Surinam	...	...	...	...	...	...
Trinidad and Tobago	...	...	...	...	...	...

SOURCES: See table 19.

NOTE: In calculating coverage coefficients, stations that had been closed down were taken into account along with those in existence, when the information available permitted.

[a] In the case of stations for which no data on length of records were available, an estimated length was arbitrarily assigned on the basis of the average for other stations in the same country.

[b] Including the Canal Zone.

[c] The data available were confined exclusively to the stream gaugin stations on the Río Negro.

their territory are the Dominican Republic, El Salvador, Cuba, Argentina, Mexico and Panama, the respective figures being as follows: 888, 765, 393.6, 313, 299 and 292, followed by Costa Rica and Guatemala. Chile, Venezuela and Nicaragua would seem to occupy an intermediate position, with coefficients of 124, 122 and 107 respectively, while Peru, Ecuador, Bolivia, Honduras, Colombia and Brazil present the lowest coefficients. Attention should be drawn, in connexion with the coefficient under study, to the importance acquired in some cases by rain gauge density and in others by the average age of the records; Argentina, Cuba and Mexico register an intermediate rain-gauge density and a high age of records, whereas El Salvador and Costa Rica show a high rain-gauge density and intermediate age of records, while for Nicaragua, Brazil and Bolivia the station density is low and the number of years covered by the records high.

Coverage coefficients for research on stream flows and river stages mark out Mexico, El Salvador, Argentina, Chile and Panama as the countries with the best knowledge of their territory in this respect, the relevant figures being 97 and 53, respectively, for the first two, and 45 for the three last-named. In Argentina's case, if only those stream gauging stations which are operated for purpose of flow measurement are taken into account, the coefficient drops to 16. Brazil, Uruguay, Venezuela, Nicaragua and Colombia appear in an intermediate position with 27, 22, 16, 14 and 12. The lowest coefficients are registered for Ecuador, Bolivia, Guatemala, Honduras, Costa Rica and Peru.

It should be noted that El Salvador shows the highest station density alongside, on the average, one of the shortest series of records; and, conversely, Argentina presents a low station density together with the greatest average length of records.

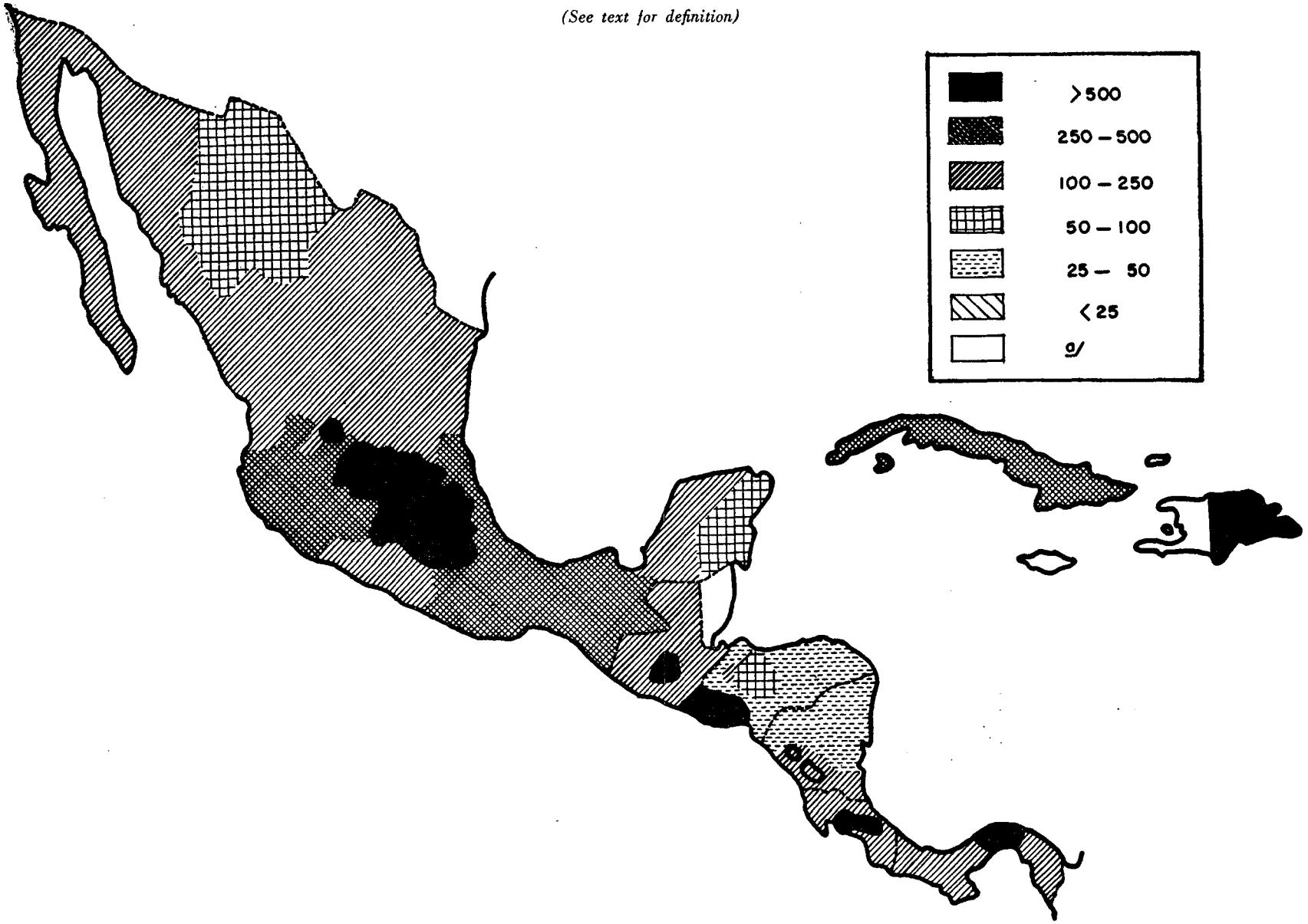
Maps of Latin America showing, in broad outline, the precipitation and stream flow gauging coverage coefficients for selected areas are presented below (see maps II-1 (a) and II-2 (b)).

In studying these maps certain special circumstances must be borne in mind.

There are arid zones in the continent where the low density of precipitation and stream gauging stations is justified. This applies to vast tracts such as the high plateaux of Mexico and the Chihuahua desert, the peninsula of Baja California (especially in its extreme north-east), the arid belt along the coasts of Peru and northern Chile, the south-west of Bolivia and the north-west and south-east of Argentina. There are also smaller arid zones to the south of the Caribbean in Venezuela, Puerto Rico and Mexico (north-east Yucatán, besides Tehuantepec and the middle reaches of the River Balsas-Mexcala). A rather different state of affairs prevails in the *"Polígono das Secas"* (in north-eastern Brazil), where the rainfall is characterized not only by a relatively low mean volume, but also, in the main, by great irregularity. Consequently,

Map II-1 (a)

APPROXIMATE REGIONAL VALUES OF THE PLUVIOMETRIC COVERAGE COEFFICIENT IN CENTRAL AMERICA
1958-59
(See text for definition)



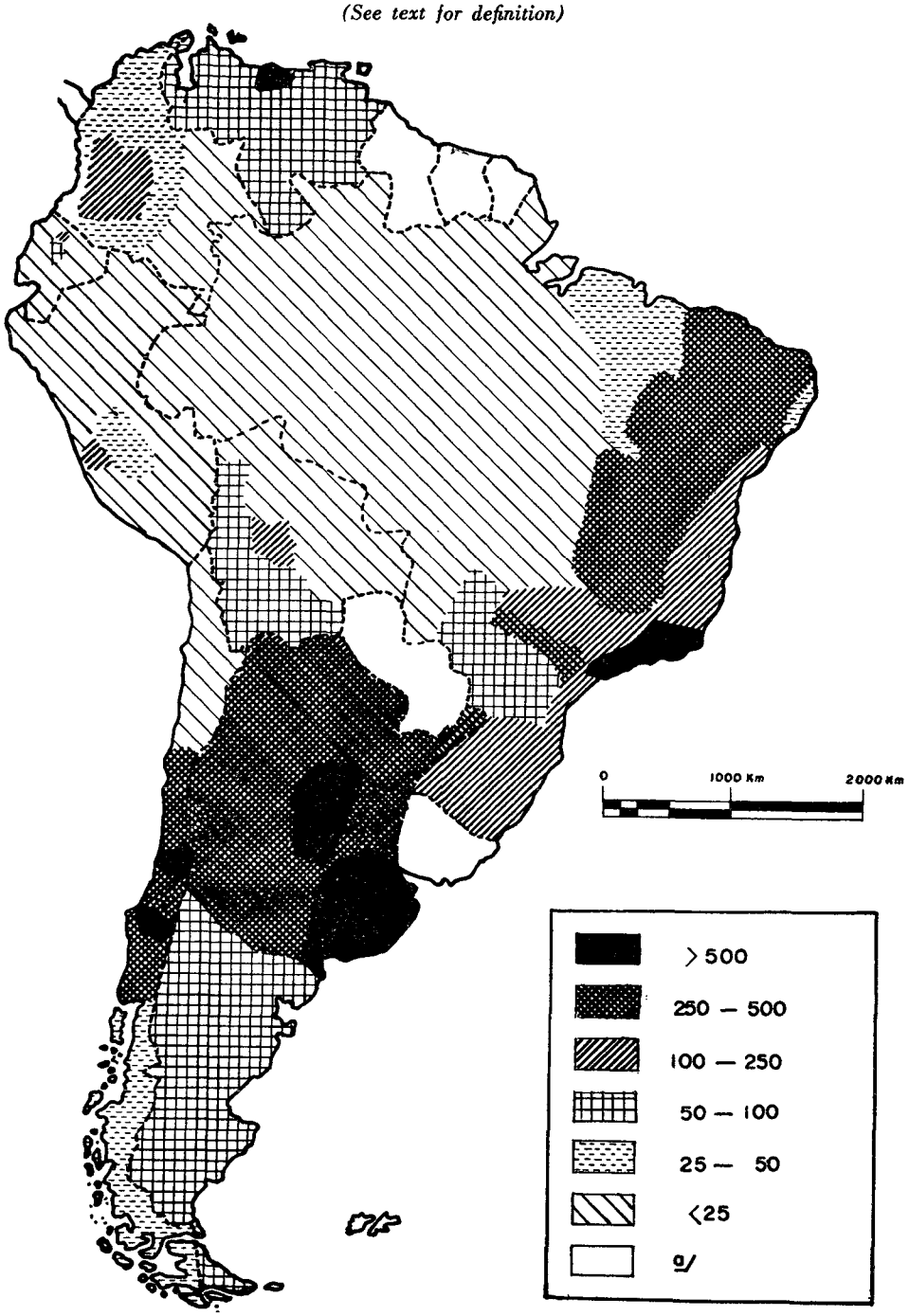
NOTE: The boundaries shown on this map do not imply official endorsement or acceptance by the United Nations.
[a] Data unavailable.

Map II-1 (b)

APPROXIMATE REGIONAL VALUES OF THE PLUVIOMETRIC COVERAGE COEFFICIENT IN SOUTH AMERICA

1958-59

(See text for definition)

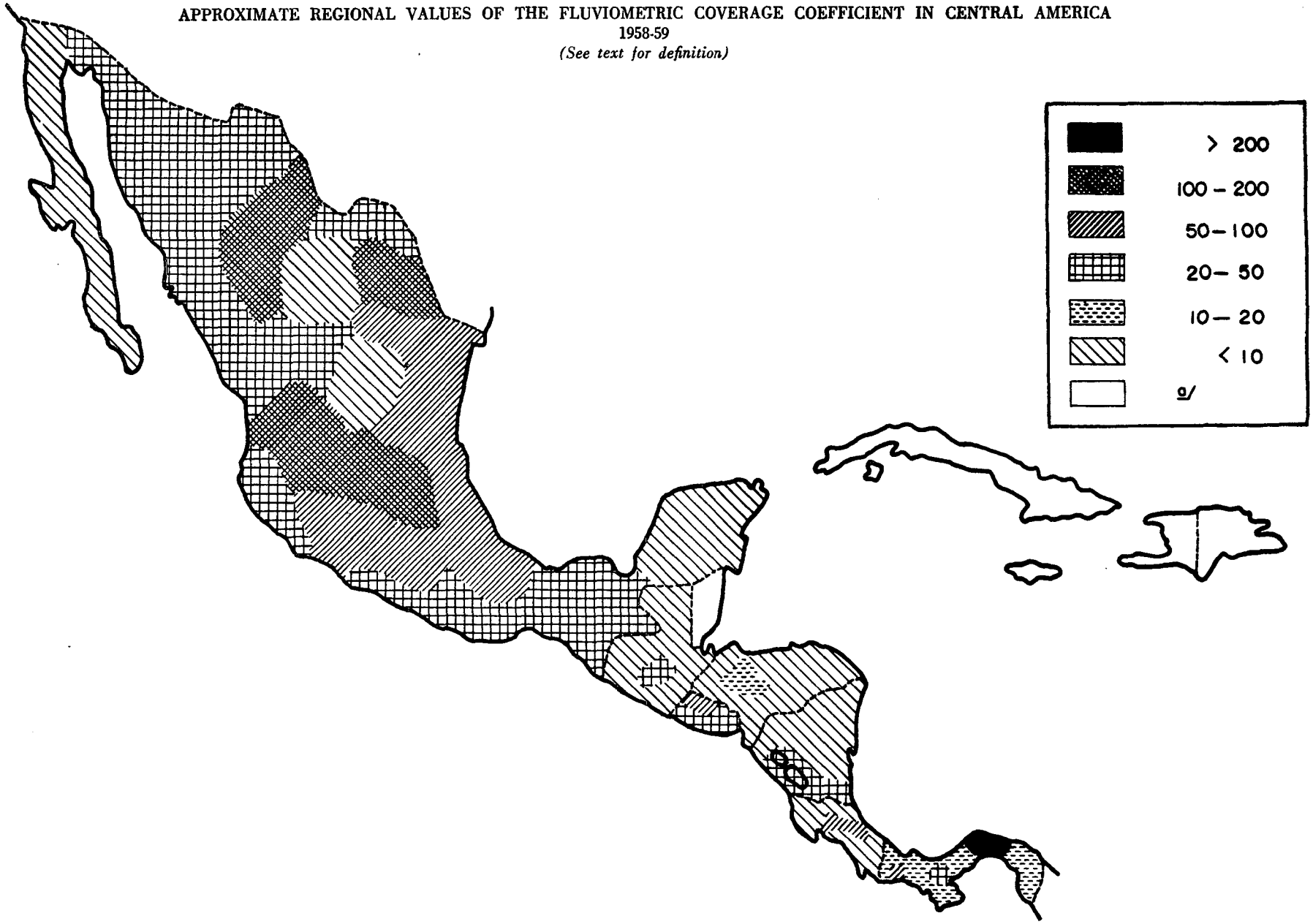


NOTE: The boundaries shown on this map do not imply official endorsement or acceptance by the United Nations.

[a] Data unavailable.

Map II-2 (a)

APPROXIMATE REGIONAL VALUES OF THE FLUVIOMETRIC COVERAGE COEFFICIENT IN CENTRAL AMERICA
1958-59
(See text for definition)

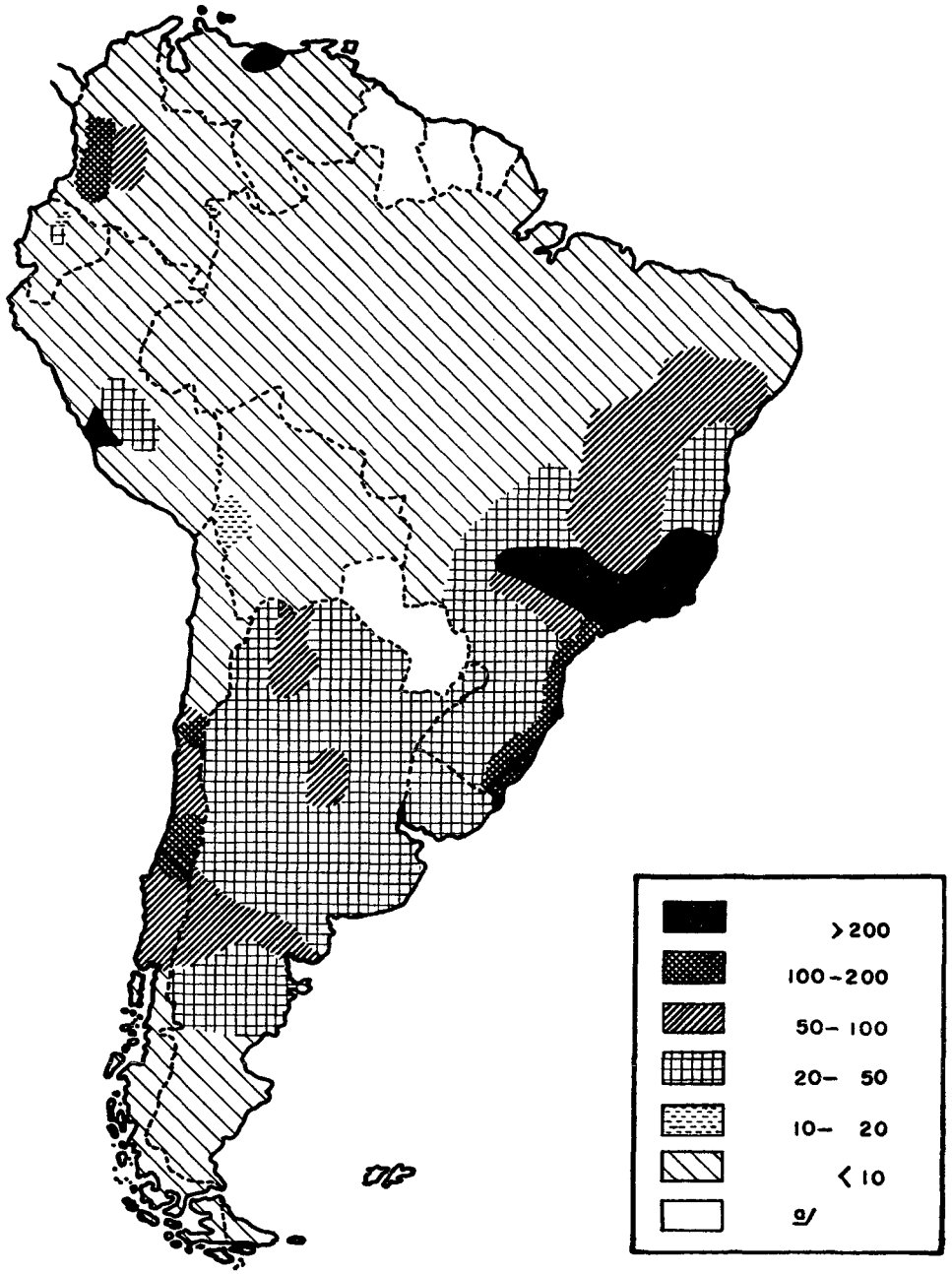


NOTE: The boundaries shown on this map de not imply official endorsement or acceptance by the United Nations.
[a] Data unavailable.

Map II-2 (b)

APPROXIMATE REGIONAL VALUES OF THE FLUVIOMETRIC COVERAGE COEFFICIENT IN SOUTH AMERICA

(See text for definition)



NOTE: The boundaries shown on this map de not imply official endorsement or acceptance by the United Nations.

[a] Data unavailable

precipitation and stream gauging research is of great importance here for regulatory purposes, with a view to irrigation works.

In the Amazonian jungle, vast unexplored areas and others that are scarcely inhabited show very low average population densities and therefore lack precipitation and stream gauging stations (States and districts of Río Branco, Amazonas, Pará, Mato Grosso, Acre and Guapré in Brazil, and the llanos of Colombia, Ecuador, Peru and Bolivia).

Lastly, in the study of stream gauging programmes, the importance of linking them up with those relating to precipitation measurement should not be forgotten, since flow statistics can as a rule be greatly improved upon by means of satisfactory correlations with rainfall data. The central zones of Mexico, Guatemala, Costa Rica, Argentina and El Salvador, and the north-east of Brazil, are examples of other areas where more comprehensive flow data than might be supposed from the corresponding coverage coefficients could be obtained for specific studies, on the basis of the available precipitation data.

A comparison with countries in other regions on the basis of coverage indices shows that as a whole the Latin American countries are ill-informed as to their water resources. For example, in the group of more developed countries for which complete data are available, Japan has coverage coefficients 5 and 4 times greater than the highest country figures registered in Latin America for precipitation measurement and stream gauging, respectively (El Salvador and Mexico).[42]

6. Availability of contour maps

It was not possible to establish, by countries, the availability of contour maps drawn to scales which would enable evaluation studies of integrated theoretical potentials to be carried out.[43]

Geographical institutes attached to the armed forces of various countries prepare maps and charts both by aerophotogrammatic methods and by direct measurement, on scales which as a rule allow room for enough planimetrical and altimetrical detail (1:200,000; 1:250,000; 1:500,000; 1:100,000,000, etc.) to serve the purposes mentioned above. Possibly, therefore, large areas in different countries already have at their disposal a sound cartographical basis on which at least to begin an integrated evaluation of their hydro-electric resources.

7. Institutions responsible for hydrological measurements

In almost all countries there exists a series of fiscal institutions, public corporations and private agencies concerned with hydrological (including hydrometeorological) observations and, in some cases, with the corresponding research.

The public institutions which finance and carry out activities of this type include, besides the national meteorological services, all those relating to agriculture, navigation and waterways, drinking-water and sewage and aviation, as well as electricity companies, railways, the armed forces, universities, etc.; while the private institutions comprise mainly electricity companies, those of an agricultural-industrial nature (coffee, banana, sugar companies, etc.), airlines and some mining enterprises.

Unfortunately, the advantage taken of the activities to which numerous institutions contribute is proportionally only very small, owing to the lack of uniformity, co-ordination and centralization of the observations recorded. A great many data benefit solely the company or institution taking the observations, and that only to a limited extent, while but a meagre proportion of them is published so as to place them within the reach of the various interested persons or institutions.

Co-ordination among the many institutions responsible in each country for hydrological observations is of particular importance for the following purposes:

(*a*) Satisfactory planning and distribution of stations so as to obviate duplication in some places and gaps in others;

(*b*) Standardization of instruments and methods so as to reduce costs and facilitate the comparison of findings; and

(*c*) Processing and publication of the observation recorded.

Thus, for the relatively small additional costs which such co-ordination would imply, the present yield from scattered and partly unrecognized activities could be greatly multiplied in many countries.

It has been suggested in several countries that a National-Co-ordinating Committee should be set up with jurisdiction over all hydrological and meteorological activities. This Committeee, in its turn, would form part of another national body empowered to co-ordinate all activities connected with the development of hydraulic resources.[44]

Table 23 lists the main institutions in each country that are active in one way or another in the field of hydrology. More undoubtedly exist (particularly of a private nature) than the number given in the table.

There is some co-ordination of functions in Argentina, Bolivia, Chile, Colombia, Costa Rica, Mexico and Peru, but it varies in scope and degree. Ecuador has set up a Department of Meteorology and Hydrology *(Dirección General de Meteorología e Hidrología)* with jurisdiction over the whole republic.[45]

Most countries have meteorological publications which

[42] To facilitate further comparisons, a table with the pertinent coverage coefficients for selected countries in Asia and the Far East is inserted here.

Country	Precipitation measurement	Stream gauging	
		In general	Flow measurement only
Burma	77	...	...
Ceylon	2 840	400	820
India	535	32	18
Japan	3 900	...	380
Republic of Korea	77	81	27
Laos	1	8	—
Federation of Malaya	1 550	240	57
Pakistan	368	288	...
Philippines	104	38	37
Thailand	202	51	5

Source: ECAFE, *Proceedings of the third regional technical conference on water resources development in Asia and the Far East*, op. cit.

[43] 1:500,000 and above. Every country has maps on a reduced scale with level curves such as, for instance, those used for aerial navigation which are on a scale of 1: 1,000,000.

[44] *Los recursos hidráulicos de Chile*, op. cit., and *Study of water resources in Ecuador* (Information document submitted at the eighth session of ECLA).

[45] March 1960. This institution complies with the general recommendations made by the ECLA/TAO/WMO Water Resources Survey Group, which undertook a mission in Ecuador in 1959.

Table 23

LATIN AMERICA: INSTITUTIONS RESPONSIBLE FOR RAINFALL AND/OR FLOW MEASUREMENTS

Country	*Governmental and semi-governmental*	*Private*	*Co-ordination of functions*	*Centralization and publication of data*
Argentina	National Meteorological Services. National Department of Facilities and Navigable Waterways. Water and Electric Energy.		The National Meteorological Service records observations made by all the officially-recognized rain gauges installed in the country administered by that Service, the Railways, and national provincial and private agencies.	Publications: *Anuarios Hidrológicos de Agua y Energía Eléctrica.* *Anuarios Hidrológicos de Construcciones Portuarias y Vías Navegables.* *Estadísticas Climatológicas* of the National Meteorological Service, which centralizes hydrometeorological information.
Bolivia	Department of Meteorology. Inter - American Agricultural Service. Bolivian Development Corporation. Department of State Railways. Lloyd Aéreo Boliviano. Universidad Mayor de San Andrés. Department of Irrigation.	Panagra. Bolivian Power Company, Ltd.	Department of Irrigation and Department of Meteorology.	...
Brazil	Ministry of Agriculture. National Department of Irrigation (Ministry of Communications and Public Works). Metereological Service. Rio Grande do Sul Electric Power Commission. Vale do San Francisco commission. Department of water and Electricity of São Paulo and Paraná. Minas Gerais electric power stations.	Brazilian Technical Services Company. Brazilian electricity companies.	...	Publications: *Anuarios Fluviométricos* and *Forças Hidráulicas del Ministerio da Agricultura.*
Chile	Chilean Meteorological office. Chilean Air Force. Department of Irrigation. Department of Sanitary works. National Electricity Company (ENDESA). Agrometeorological Service. Universities.	Braden Copper Company. Panagra.	None. Information is, however, exchanged among a number of institutions.	None.
Colombia	Meteorological Service. Ministry of Public Works. War Ministry. Agustín Codazzi Geographical Institute. Institute of Water Utilization and Electricity Development. Bogotá water and Sewage Company. State anterprises of Medellín Colombian Airport Company. Valle del Cauca Corporation.	Bogotá Electric Power Company. National Federation of Coffee-Growers. Geophysical Institute of the Colombia Andes.	The National Meteorological and Hydrological Committee co-ordinates activities throughout the country.	Partial centralization. Publications: *Boletín del Instituto de Aprovechamiento de Aguas.* Miscellaneous reviews. *Anales del Observatorio Meteorológico Nacional.*
Costa Rica	National Meteorological Service. Costa Rican Electricity Institute (ICE). Inter-American Technical Service for Agricultural Co-operation.	National Light and Power Company. Inter-American Institute of Agronomics. Costa Rican Banana Company. Costa Rican Coal Company. Northern Railway Company. Panagra.	The Costa Rican Electricity Institute and the National Meteorological Service.	No centralization. Publication: *Boletín Trimestral* of the National Meteorological Service.

(Continued)

Table 23 (continued)

Country	*Governmental and semi-governmental*	*Private*	*Co-ordination of functions*	*Centralization and publication of data*
Cuba	National Observatory. River Hondo Development Commission.	Cuban Aviation Company. Observatories of the Jesuit Fathers.	...	... The Casa Blanca National Observatory has produced some publications.
Dominican Republic	Naval Meteorological Service. Section of Hydrology and Irrigation Planning (Department of Public Works and Irrigation). Santiago Town Council	Grenada Company. Barahona Company.	...	...
Ecuador	Department of Meteorology. Department of Civil Aviation. Ecuadorian Army and Air Force. Observatory. Executive Committee on Communications in the Province of Guayas. Inter-American Co-operative Service. National Irrigation Institution. Municipality of Ibarra.	Ecuadorian Banana Association Anglo-Ecuadorian Oilfields.	Department of Meteorology and Hydrology (created in March 1960).	No centralization. Publications: *Boletín Meteorológico de la Dirección General de Meteorología. Boletín Meteorológico de la Armada.* Publications by the Observatory.
El Salvador	National Meteorological Service. Department of Meteorology (Ministry of Defence). National Agronomics Center. Tropical Institute of Scientific Research (National University) Department of Agricultural Engineering (Ministry of Agriculture). River Lempa Hydroelectric Executive Committee.	International Central American Railways. El Salvadorian Railways. Santa Ana Electric Power Company. Sonsonate Electric Power Company. Panagra.	None.	No centralization. Publications: *Anales del Observatorio Nacional Meteorológico. Boletín Meteorológico* of the University of El Salvador. *Revista de la Asociación de Cafeteros.*
Guatemala	Ministry of Agricutlure. Department of Public Works.	United Fruit Company.	...	...
Haiti	Ministry of Public Works.	Meteorological Observatory of San Marcial Seminary.	...	...
Honduras	Department of Irrigation. National Meteorological Service.	Tela Railroad Company.	None.	...
Mexico	Mexican Meteorological Service. Department of Hydraulic Resources. Federal Electricity Commission.	...	Information is exchanged and there is some co-ordination among the principal institutions.	Publications: Bulletins dealing with hydrological questions are published by the Federal Electricity Commission, the Department of Hydraulic Resources and the National Irrigation Commission.
Nicaragua	National Electric Power Commission.	...	...	...
Panama	Inter-American Co-operative Service for Economic Development (SCIFE).	Panama Canal Company (Section of Meteorology and Hidrology).	Information is exchanged between the two institutions named.	Publications by the Panama Canal Company and by the Department of Statistics and Censuses of the Republic of Panama.
Paraguay	...	...	...	...

(Continued)

Table 23 (continued)

Country	*Governmental and semi-governmental*	*Private*	*Co-ordination of functions*	*Centralization and publication of data*
Peru	Department of Meteorology (Air Ministry). Meteorological Service (Ministry of Development). Meteorological Service (Ministry of Agriculture). Peruvian Civil Aviation Corporation. Inter-American Co-operative Service. Water and Irrigation Department (Ministry of Development). Department of Irrigation (Ministry of Agriculture). Peruana del Santa Corporation.	Private tobacco monopolies. Guano Administrative Company. Cerro de Pasco Corporation.	The Department of Meteorology administers and co-ordinates the observations throughout the country. With respect to flow measurements, it co-ordinates its activities with those of the Ministry of Development and Ministry of Agriculture.	The Department of Meteorology centralizes all meteorological information, and publishes the following: *Boletín Anual Meteorológico. Boletín Climatológico Mensual. Boletín Diario.* A publication on hydrological questions. A daily bulletin with general information.
Uruguay	Meteorological Service. Department of State Power Plants and Telephones (UTE).		...	The Meteorological Service centralizes information and publishes a *Boletín* and a *Revista Meteorológica.*
Venezuela	Ministry of Public Works. Ministry of Agriculture and Livestock. Venezuelan Development Corporation (Caroní). Ministry of Defence. National Institute of Sanitary Works.	Shell. Mene Grande Socony Vacuum Creole. Venezuelan Railways. Iron Mine Company of Venezuela.	None, Information is, however, exchanged among a few institutions.	The Meteorological service centralizes a certain amount of information and publishes fortnightly bulletins and a yearbook.
British Guiana	...	...	...	...
West Indies	...	...	...	...
Surinam	...	...	...	...

also cover hydrometeorological observations to a certain extent. In the field of fluviology, however, only Argentina, Brazil, Colombia, Panama, Peru and Mexico issue publications.

8. Staff and level of training

Governmental and semi-governmental hydrological services have developed at very varying rates in the different countries, and even within the same country notable disparities are to be observed among the organizations that take rainfall and flow measurements. The effective implementation of their activities is most frequently impeded by two factors whose influence is direct and immediate: shortage of personnel and shortage of funds. With few exceptions, the people who work in this field are still paid at low rates in Latin America, although specialists in hydrology and hydrometeorology are hard to find there.

At the lower, non-university, level of the observers, it is customary in a number of countries to employ people who have other activities as well, and who make the observations and fill in the forms sent to them by the head offices simply to earn more money (although they do occasionally work free of charge).

The element of routine in the work of observation, the fact that it requires no special training, and the inadequate supervision exercised from above, sometimes lead to the gradual introduction of operational deficiencies and even to defects in the instruments which may pass unperceived for a long time in the data-processing offices with the inevitable consequences.

Solely in the case of three countries could fairly complete and reliable information be obtained on the personnel engaged in hydrological and hydrometeorological activities, according to level of training, in the principal institutions (see table 24).

The sample shows that, in relative terms, the greatest shortage of specialized personnel is at the intermediate level, and of non-specialized persons at the level of those who have completed their secondary school studies.

Table 24

PERSONNEL ENGAGED IN HYDROLOGICAL AND HYDROMETEOROLOGICAL MEASUREMENTS AND STUDIES, BY LEVEL OF TRAINING

Country	*Specialized University training*		*Non-University*	
	Higher	*Intermediate*	*Secondary studies*	*Primary studies*
Argentina[a]	16	7	30	397
Chile[b]	9	26	52	286
Colombia[c]	16	16	17	598

[a] Water and Electric Energy in hydrological studies only.
[b] Department of Irrigation, ENDESA and the Chilean Air Force, in hydrological and hydrometeorological studies.
[c] The Bogotá Water and Sewage Company, the Valle del Cauca Corporation, Medellín State entreprises and the Institute of Water Utilization, in hydrological and hydrometeorological studies.

ANNEX

1. Evaluation of the gross run-off potential on the basis of rainfall data checked by a stream-gauging station

Reference is made in point 4 of section I to the determination of the gross run-off potential of a region or a country; this is done by dividing the area into small sub-basins and using the hydrologic data provided by a stream-gauging station at the lowest point of each sub-basin. However, if this division involves areas greater than 400-500 square kilometres (a common situation in Latin America because of the lack of stream-gauging data) it is advisable to adopt the method indicated below, which involves a further sub-division into micro-areas by standard squaring (see figure I-A).[1] Let A be the area in square kilometres of such a sub-basin, F the stream-gauging station, and t the length in kilometres of the side of a single square. The average elevation H of each square above sea level can be calculated from a map at a suitable scale (1:500,000 to 1:250,000) showing contour lines. On the basis of extensive[2] rainfall data in the form of isohyetal lines it is possible to obtain the hydraulic contribution of each square to the total run-off *Qm* of the sub-basin, either by calculating the average annual loss by evapo-transpiration for the whole area A,[3] or by calculating this loss for each square (t^2) by one of the available empirical formulas (Vermeule, Khosla, Justin, etc.) on the basis of such variables as elevation above sea level, average temperature, rainfall, etc. In the second case a final correction is required, in the form of a proportional modification of the contribution of each square so that the run-off measured at F shall be equal to the sum of the contribution of each square. When the flow has been finally estimated as the contribution of each square to the flow Qm, V and the potential Ps can be determined for each of the squares, and by addition for the whole basin.

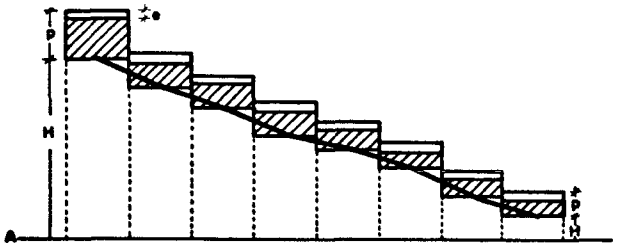
[1] This method was proposed by the ECE Committee on Electric Power: see United Nations, *Hydro-electric Potential in Europe and its Gross, Technical and Economic Limits* (E/ECE/EP/131).

[2] Ideally covering a period of 30 years.

Figure I-A

EVALUATION OF GROSS SURFACE POTENTIAL BASED ON FLUVIOMETRIC AND PLUVIOMETRIC INFORMATION

A: Sea level
H: Elevation above sea level (m)
p: Mean annual depth of rainfall
e: Mean annual evapo-transpiration loss
F: River gauge station
t: Side of each square



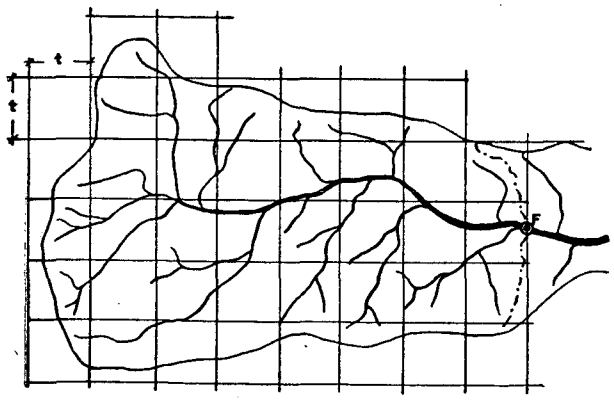
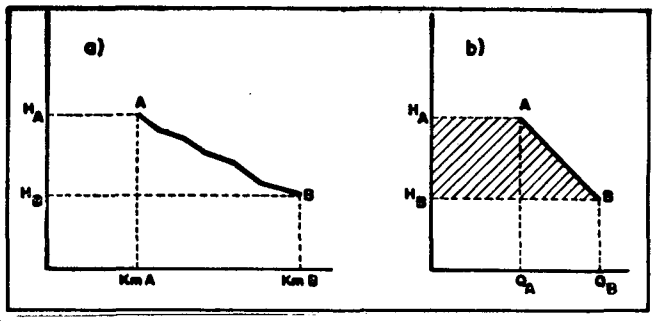


Figure I-B

BASIC DIAGRAM OF LINEAR GROSS POTENTIAL

a) Longitudinal profile b) Diagram of potential
H_A and H_B: Elevations at points A and B (m)
Km A and Km B: Horizontal projection (km)
Q_A and Q_B: Flow at points A and B (m^3/sec)



2. Graphic representation of the gross river potential

Point 4 of section I gave a general outline of the method of evaluating the gross river potential. Further details are given below, together with the graphic representation.

Let the stretch of river concerned be AB (see figure I-B).

The average annual flow should be known at each of these points, by direct verification (or direct verification and covariation, on the basis indicated for determining the gross run-off potential) from a statistical series covering a period of not less than twenty years.

The elevation of the water level above sea level in metres at each point, H_A, and H_B, must also be determined.

The maximum theoretical potential of the section concerned in kW is given by formula (2), which assumes a 100 per cent yield,

[3] By one of the following formulas:

(i) $e_1 = \dfrac{\Sigma\, t^2 p - 31{,}536\ Qm}{A}$ (Height of the water in millimetres),

where p is the annual precipitation in millimetres for each square, and 31,536 × 13 is the number of seconds in the year

(ii) $e_2 = P - Qm$ (m^3/sec.), where

$P = \dfrac{\Sigma\, t^2 p}{31{,}536}$ represents the average annual volume equivalent to rainfall on area A, expressed in cubic metres per second.

and represents the upper limit of the total output of a group of hydraulic power plants in series:

$$(2)^4 \qquad P_L = 9.8 \frac{Q_A + Q_B}{2} (H_A - H_B)$$

where Q_A and Q_B are the values for the average flow immediately downstream of A and upstream of B, respectively, expressed in cubic metres per second.

A graphic representation of this potential is given in figure I-B. Using rectangular co-ordinates and a given scale, elevations H_A and H_B are drawn as ordinates and flows Q_A and Q_B as abscissae. The shaded area P represents the potential P_L at the appropriate scale.

Figure I-C is a diagram representing the principal course of a river and two tributaries flowing into at points C and E. The second tributary has a small tributary of its own. It should be noted that a tributary consisting of a single stream is represented by a triangle such as B_1CB, whereas when a tributary has another stream flowing into it, the basic diagrams are superimposed to form geometric figures like that at D_1GD_2HED. Variations in shading make it possible to distinguish between the potentials of the various components. It should be noted that points of equal elevation (at the basis of the diagrams of the tributaries) such as B and C (and D and E in the other example) represent the same place on the course of the main river, and are given different letters only in order to indicate the river's flow including and excluding that of the tributary.

The potential of a river system between its source and any point X on its main stream can be easily determined by measuring on the appropriate diagram the area represented as above a horizontal line X-X drawn at the level of that point. Generally speaking the potential between any two points on a river is given by the area included between the horizontal lines drawn on the diagram to represent the elevations of the two points.

[4] For the first section of the river the formula is reduced to:

$$P_L = \frac{9.8}{2} Q_B (H_A - H_B)$$

Figure I-C

DIAGRAM OF LINEAL GROSS POTENTIAL OF A RIVER AND ITS TRIBUTARIES

H_A, H_{BC}, H_{DE}, H_F: Elevations at points A, B, C, D, E, F (m)

Q_B, Q_C, Q_D, Q_E, Q_F: Flow at points B, C, D, E, F (m^3/sec)