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PRELIMINARY STUDY OF THE TECHNIQUE OF PROGRAMMING ECONOMIC DEVELOPMENT

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PART TWO

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/CHAPTER I

PART I. OUTLINE OF THE TECHNIQUE OF PROGRAMMING

CHAPTER I. PRINCIPAL PROBLEMS OF THE PRELIMINARY TECHNIQUE OF PROGRAMMING

1. Programme of Development and Regulation of the Economy

There is a certain amount of confusion between the concept of a programme of development and that of rigid regulation of economy by the State, which it is necessary to dispel. A programme is based on a simple idea, namely, the expansion and careful direction of capital investment with a view to stimulating and accelerating the development of the economy. Undoubtedly the State may thus encompass a very wide sphere of action, supplanting the role of private enterprise, to some degree. But this is by no means inherent in a programme of development. Furthermore, intervention by the State may take place without the objective of economic development, and there may be no improved direction of investment. Also, a programme may be implemented with a minimum of State intervention. The field open to private initiative and free enterprise in a programme of development [1] may be very large, without implying that the State should limit itself to a classical attitude of "laissez-faire". On the contrary, a development programme calls for the firm application of a policy of accelerating economic growth, but this may be done without confining private initiative. In fact, a programme may stimulate private initiative by providing incentives to undertake given activities, proferring, for example, access to essential resources. The State possesses efficient means for this purpose, namely its fiscal and exchange control policies, the monetary and credit policies and domestic and foreign loans, apart from direct participation in basic investment which for one reason or another cannot be carried out by private enterprise. Well handled, they may become the principal instruments of a programme to the extent that they reflect a policy of development.

1/ There can be no other explanation for the fact that institutions such as the International Bank for Reconstruction and Development, which show marked preference for the stimulation of private initiative and free enterprise, agree on the need for formulating programmes, with those who consider that the State must extend its functions. By so doing, the area for private enterprise may be diminished, though the scope for private initiative may be expanded.

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It would be also well to guard against confusion in this sector. There are two types of State intervention, that involving the use of the above mentioned instruments, creating a favourable atmosphere for the development of private initiative and enhancing its ability to fulfil certain goals or objectives. Again, there is another type of intervention which tends to regulate and to determine what private initiative may or may not do. The control of foreign exchange or of prices is characteristic of the latter type of intervention. A good programme, far from strengthening or insisting upon the continuation of this type of control on the individual conduct of the entrepreneurs could, on the contrary, create favourable conditions for its elimination by means of a more uniform and rapid growth of the economy.

There is no point in repeating the reasons set out in an earlier work, advocating the formulation of development programmes in the Latin-American countries. 1/ The objective of the present paper is to advance into a more concrete field and to discuss the technique of such programming. This field is very vast so that the study will be limited to the consideration of the preliminary technique of constructing a programme, that is, the several methods of analysis and projection by which the basic elements of a programme may be determined. This preliminary technique comprises a series of problems which are closely inter-connected. This introductory chapter contains a general commentary on these problems in order to clear the way for the subject-matter of the following chapters.

2. Goals of Development and Investment

The first problem refers to the goals for economic growth in a programme; this, naturally, is of fundamental importance. It is necessary to determine at what rate a country must grow in order to reach a given level of output and consumption within a fixed number of years. The answer to this question cannot be made abstractly; it must be made in terms of past trends and present possibilities. It is, therefore, necessary to begin by an analysis of these trends in order to have a basis for meaningful estimates concerning potential rates of future economic growth. If a country's rate of development has been satisfactory, the goal of the programme might be the unhampered continuity of that rate. However, this is naturally not the case

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1/ See Chapter IV of Theoretical and Practical Problems of Economic Growth, United Nations Economic Commission for Latin America (Document E/CN.12/221).

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in most countries of Latin America, all of which are concerned with accelerating their rate of development by increasing capital investment.

In order to carry out this aim it is necessary to consider the range of potential rates of annual growth. One of the determining factors is the volume of investment required in practice to achieve these rates. Careful calculation of the exact amount required for investment involves prolonged study. In view of this we may adopt simplified methods based on the past experience of a country's economy to derive a first approximation of the order of magnitude of such investment. These methods are based on the ration of the stock of capital to the gross product over a relatively recent and representative period. This relation would indicate approximately the requirements for new investment to obtain a given increment in the gross product. Thus, on the basis of experience obtained since 1935 for Latin America as a whole, it may be estimated that, in order to obtain an increase of 1 per cent in gross product, 2.1 per cent of that product must be applied to net new capital investment, apart from the investment which must compensate for the maintenance and depreciation of capital stock, which is estimated to be at a rate of 2.5 per cent of the stock of capital of the economy of Latin America as a whole.

With the investment coefficient obtained from these output-capital ratios, the rate of investment required to obtain a given rate of growth in the gross product may be approximated. In this way, projections of the gross product and investment may be formulated, based on past experience. These projections are naturally general or aggregative. It is then necessary to project needs and goals for individual sectors of the economy, including more detailed estimates of the capital requirements in each of them. By means of these calculations, the aggregate projections of investment needs may be subsequently corrected. This, however, occurs in a more advanced phase of programming; meanwhile, the work must continue on the basis of general projections.

Returning now to the question of the investment required for alternate rates of economic development, the first limitation in the series of alternatives encountered in programme analysis appears. To attain a higher rate of development, the coefficient of investment must be raised; this implies a corresponding increase of saving, involving the reduction of the current volume of consumption. On paper, it is easy to see how the lowering

of average per capita consumption by the adoption of certain measures would enable the coefficient of investment to rise. Within a short period, the gross product could be increased and consumption would return to its former level, subsequently expanding at a higher rate than previously. The numerical illustration of the acceleration of growth is, in fact, a very simple concept. However, transforming such hypotheses into real fact, creates appreciable difficulties. Preference for current consumption is very strong and the population will not readily accept any change in its consumption and saving habits unless an appreciable alteration takes place in the size of the gross product, or in its distribution between the different social groups. This attitude is all the more basic in countries such as those in Latin America, where the level of consumption - which has risen rapidly - is nevertheless still low, although the pattern of distribution of the gross product would tend to indicate a much higher coefficient of saving in the high income groups than in fact exists.

These practical difficulties are one of the fundamental reasons for the fact that it is generally considered necessary to supplement saving with foreign capital in order to attain a higher rate of growth. The other main reason will be studied below. The supplement of foreign capital in a development programme is generally considered a transient device to enable the attainment of a higher rate of development without lowering the current level of consumption. Its impermanence rests on the simple principle that it is necessary to increase the gross product as rapidly as possible by means of foreign capital until it reaches a level beyond which all the investment requirements, to continue development at a higher rate, can be met by domestic saving without need for further external assistance. From this standpoint, the goal of the foreign capital inflow is to create favourable conditions for increasing the coefficient of domestic saving. The period required to transform the initial foreign investment coefficient into a coefficient of domestic saving, adequate for the desired increase in the rate of development, will be called the period of transition in the programme.

In other words, foreign capital should facilitate the raising of the coefficient of saving in the country without requiring the reduction of the current level of the population's consumption. However, it is essential to restrict the expansion of future consumption in a measure with the expansion of the gross product. A large proportion of the increment to the gross

product obtained from increased investment should be used for purposes of saving. If this is not done and if the coefficient of saving remains at the same level, it will be necessary to maintain the flow of foreign capital indefinitely in order to maintain the increased rate of growth required. This would be impracticable for a series of reasons, among which must be counted the increase in burden of remittances of profits and interest accruing to foreign investment, which could only be borne on the impractical and impossible assumption that the flow of foreign capital would continue indefinitely, not only to meet the deficit of domestic saving, but also to meet the obligations arising from the above mentioned remittances.

Between this assumption of continued and indefinite increase in the inflow of foreign capital and the other assumption of restriction of consumption to accelerate development, without recourse to foreign capital, there are alternate intermediary hypothesis. It all depends on the proportion of the increment of the gross product which is to be set aside for saving during the period of transition. The higher this proportion and the more rapidly a country's domestic saving attains the level of the coefficient of saving corresponding to a higher coefficient of investment, the smaller will be the amount of foreign capital required to attain this objective. The question of feasibility must also be taken into account, which, as in the preceding case, are affected by political, social as well as economic considerations. The analysis of the problem and prospect for economic development must show the alternate possibilities as objectively as possible in order to facilitate the decisions taken by the authorities responsible for the programme. However, not only must this aspect be taken into account, but also that of the substitution of imports or the increase of exports, as will be seen below. It is not sufficient to enhance domestic saving, it is also essential to create the possibility of transfering them in the importation of capital goods.

3. The Basic Need to Increase the Coefficient of Domestic Saving

It was pointed out above that the coefficient of domestic saving would have to be raised to cover the investment requirements of an accelerated rate of economic development. This is one of the most delicate points in a development policy, in view of the persistence in saving and consumption habits, as was indicated above. It cannot, therefore, be expected that the

coefficient of saving will rise spontaneously as a result of gradual and moderate increments of the gross product obtained by a programme, unless distribution is altered concomitantly in favour of the high income groups which have the greatest propensity to save. However, if these groups do not change their consumption and saving habits, their share of income would have to be increased substantially by inflationary methods in order to raise the coefficient of saving sufficiently for the economy as a whole. There are no concrete data for Latin America to enable any further generalization of this nature to be made. However, recent experience in Mexico, considered in the Economic Survey for 1952, submitted together with this report, [1] suggests that it is necessary to ascertain whether or not the social cost of this method of increasing the coefficient of saving by a redistribution of income is not excessively high in relation to the low degree of immediate improvement in the measure of welfare thus achieved.

The technique of programming must, therefore, take into account the means by which the Government can alter the coefficient of saving in terms of the existing situation concerning the distribution of income. In this connexion it should be remembered that a substantial proportion of private investment takes the form of reinvested earnings by firms or enterprises which retain them rather than distributing them. The incentive for this type of saving might be very effective and undoubtedly could be given by the system of taxation by means of a reduction or deferment of the taxes on reinvested earnings. This is one of the most important objectives of the fiscal policy in a programme of development. The fiscal instrument might thus be used to encourage saving by entrepreneurs before their earnings flow into consumption, but taxes might also be used directly to discourage consumption, especially in the high income groups, which do not have an adequate propensity to invest. If the coefficient of saving of these groups is relatively low and the means of discouraging consumption is inadequate to increase it, the fiscal policy might contribute effectively to this aim if a substantial proportion of the tax on such income is used for purposes of investment. By this means the State would divert to investment resources which would, otherwise, have been made available for consumption. Moreover, this investment might also be made through private channels if the resources thus obtained were placed at the

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1/ Chapter II (Document E/CN.12/291).

disposal of entrepreneurs who would invest them wisely instead of resorting to the familiar expedients of inflation in the banking system.

At the risk of repetition this is one of the main assurances for the effectiveness of a development programme. If the coefficient of domestic saving cannot be raised sufficiently in a measure commensurate with the growth in the gross product, arising from the inflow of foreign capital, the effects of the latter will have been wasted and after its utilization the economy will tend to return to its former rate of development so that the programme may not have achieved its main objective.

It is, nevertheless, essential to bear in mind that fiscal means may also be used to hamper development. Excessive expansion of State expenditure in relation to the gross product of a country may affect the coefficient of saving of the population adversely, exercising similar repercussions on the rate of development. It is very difficult to draw a clear line between what is and what is not excessive in this field. There is evidently great need for good services in Latin America, but it is equally important to increase consumption of goods and certain private services. Hence, the trends in the proportion of Government services in relation to the total gross product must be carefully examined. A programme must be based on certain assumptions concerning the rate of development of these expenditures as compared with the increase of the gross product. It is necessary to determine whether the facts differ appreciably from that assumption, in which case the execution of the programme must be revised or abandoned.

Factors of this nature are evidently determined by other motives than economic development. However, the analysis of development and the projections of the consequences of these factors on the rate of economic development may perhaps contribute appreciably to ensuring that the fiscal policy expenditure is considered generally with that concerning the problem of a country's development.

4. Limitations on Development Arising from the Capacity to Import

Another problem which arises in the technique of programming will now be studied. It was pointed out previously that one of the reasons for using foreign capital was the practical difficulty encountered in attempting to compress consumption in order to increase investment. However, even though these difficulties could be eliminated, others would occur since the additional

investment requirements would necessitate the expansion of capital goods imports to the detriment of imports of consumer goods. This aspect must be considered in detail in view of its considerable practical importance. If the position of capital goods imports in relation to total investment had as small a relative importance as the coefficient of consumer goods imports in relation to total consumption, there would be no difficulty in using the increment of saving for the acquisition of foreign capital goods. In that case, additional saving would be shared between imported capital goods and domestically produced capital goods in proportion with the relative reduction in the consumption share of domestic and imported goods. However, this is not the case; even in those Latin-American countries which have provided a strong incentive for the manufacture of capital goods, it has been found that the coefficient of capital goods imports in relation to total investment is much higher than the corresponding coefficient with respect to total consumption. Hence, the relative decrease in consumption to the benefit of saving does not lower the volume of imports to the same extent as it raises the investment demand for imported capital goods. Two important conclusions are derived from this: on the one hand, increased saving and their transfer abroad (for the purchase of capital goods) may weaken demand for domestic manufactures of consumer goods, although this may not be offset by a corresponding increase in the demand for domestic capital goods. On the other hand, imports will have increased in line with the investment demand for imported capital goods. Both of these consequences are, in fact, aspects of the same phenomenon, the deficiency in domestic demand for consumption goods being equivalent to the excess of imports.

This excess is, in fact, the subject of this conclusion. The displacement of income from consumption to saving naturally raises the volume of imports. It might be possible to restrict unessential imports in order to compensate for this increase, but (apart from the fact that this does not occur spontaneously, and, on the contrary, calls for selective government controls) the margin for restriction is very limited in countries which have already placed heavy limitations on the expansion of imports, when the latter are equivalent to the full capacity to import, as occurs in certain Latin-American countries.

However, this is only one aspect of a more general problem, namely, the limitations imposed by the capacity to import on economic development. Even

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when the increment in imports of capital goods is counterbalanced by the decrease of imports of other goods, or foreign capital is used to achieve equilibrium, only a temporary difficulty is removed. There still remains an obstacle of greater importance to economic development, to which frequent reference has been made in these reports. It consists in the fact that as the per capita gross product expands, imports generally do not increase more than the capacity to import for reasons which need not be discussed in the present analysis. This difference makes the substitution of imports by domestic production inevitable in order to continue the expansion of the product at the desired rate.

A development programme calls for an assessment of the degree of substitution possible in order to attain a given rate of expansion of the gross product. For this purpose two series of hypothetical calculations should be made. On the one hand, it is necessary to determine the probable expansion of the requirements for goods which are at present imported, and this may be done by a series of projections to which further reference will be made. It is also necessary to estimate the probable course of the capacity to import in terms of exports and their relative prices and the amount of foreign capital which it is deemed will be necessary for the implementation of the programme. In view of the probable increase of these requirements and the declining tendency of the capacity to import (relative to the gross product) in Latin America, the difference between these estimates will indicate the volume of imports which must be substituted. Different alternatives will suggest the choice of the most suitable substitutions, or, alternatively, the promotion of exports. Apart from other considerations, the fundamental criterion should be the relative increase in the gross product obtained from the different alternatives: the greater the increment obtained by a certain addition of capital, the larger the volume of available goods and services for the community. Further reference will be made to this subject. For the present, it will be sufficient to note that the calculation of substitutions and other basic estimates of the programme rests on a series of hypotheses which must be carefully built up taking into account past developments and future prospects; though, it would be too hazardous to say whether or not they can be fulfilled. It is, therefore, necessary to introduce new elements of flexibility in the programme which would enable its adaptation while modifying to the least possible extent, its primary objectives.

/5. The projections

5. The Projection of Demand in Terms of the Rate of Growth

The problem which has just been described f rms part of a much broader area. It has been set apart from the remainder due to certain differential characteristics to which we attribute a special significance. This other problem is associated with the estimation of the expansion in demanda for goods and services in order to calculate investment requirements in the different sectors of economic activity and in the different branches of each sector.

The general projection gives a first approximation of the volume of capital required to obtain a given rate of growth and its corresponding coefficient of investment. It is now necessary to make a second approximation by calculating investment requirements by sectors. Subsequently, the former calculation may have to be adjusted or alternatively the rate of growth must be adjusted. In this way the general projection of the product and total capital requirements provide a basis for projections by sectors. Only then may more elaborate calculations be made by the specialists in the different activities. To work satisfactorily, it is essential to provide the specialists with clear and precise information with respect to sector goals based on the probable growth of demand and the goods and services available to meet it.

At this point the role of the projection may be seen more clearly. It would not be possible to project the probable expansion of demand in each sector of economic activity without having determined the general rate of expansion which it is desired to attain. The degree of intensity of the expansion of the per capita product envisaged determine the form and degree of the growth of demand by sectors. It is, therefore, necessary to pass from the general to the specific, from the top to the bottom in accordance with the graphic expression used in the following chapters in order to return again to the general projection and make the necessary adjustments in them.

If future demand expands proportionately with present consumption, its calculation would be very simple: it would be sufficient to apply the rate of growth of the general projection to each sector. However, this is not the case. Given an increment in the gross product, the intensity of expansion of demand for the different goods and services varies; in some cases demand rises more than the product, whilst in others it rises to the same extent, and

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yet in others it does not improve to the same extent as the product. This makes it necessary to calculate the elasticity of demand according to the principal groups of goods and services. This task is by no means easy, given the precariousness of Latin-American statistics. However, in this study an attempt was made to use certain acceptable means in the absence of better information. The same is applicable to the estimate of capital needs in the different sectors. However, to go into detail on this subject would be to repeat what will be explained in other chapters.

The main problems of the technique of programming have been described briefly in order to clarify the subject, although this does not imply that in practice these problems must be considered in the same order. In reality, once the rate of expansion has been determined, the analysis of the problems will develop according to the relationship suggested by their interdependence. Thus the estimate of capital needs, to which reference was made a moment ago, could not be estimated independently of the analysis of labour availability and its productivity, and this subject will also be studied in this introductory chapter.

6. The Productivity and Displacement of Labour

In economic development there are two main stages which distinguish the process of development in underdeveloped and in more highly developed countries. Technical progress has been extended to the less developed countries in a characteristic way, as was explained in a previous report. 1/ Latin-American primary activities, with the exception of export activities, are characterized by an abundance of labour and a shortage of capital, as well as by low productivity. Thus, a high proportion of the labour force is engaged in these primary activities. As technical progress is extended to these activities, that proportion falls gradually. Labour in primary activities is channeled to industry, commerce, transport and services. In these other activities capital stock per worker is often higher than in primary activities, with a commensurate difference in the level of labour productivity. Consequently, as the population is displaced from activities in which productivity is lower to others where it is higher, average productivity throughout the economy is also raised even though no exceptional

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1/ Economic Survey for Latin America, 1949, United Nations Economic Commission for Latin America (Document E/CN.12/164/Rev. 1).

improvement may occur in any individual sector. It is sufficient, for instance, that the increment of the population which cannot find employment in agricultural activities be absorbed by other more productive activities for this result to occur. In reality, this process is associated with an improvement in the productivity of the different sectors. Thus, the transfer of labour force from primary activities becomes greater to the extent that the same amount of the product can be turned out with a smaller number of workers. The same is applicable in other sectors, although to a varying degree and both compound the increment of productivity.

Given the degree of progress in production technology there is a limit to the proportion of working population engaged in primary activities which can be displaced without adversely affecting the relation between output in the different sectors. The complete assimilation of improved technology in primary activities enables them to part with the surplus labour force in this activity. The initial phase of economic development will, thus, have been completed.

In the second stage there are no great shifts in the labour force, by activities. There is a greater technological homogeneity in all economic activities, compatible with the degree of technical progress reached in the distinct branches. There will, naturally, be certain displacements flowing from the varying intensity of the technical progress in the different branches and the irregular expansion of demand, according to the coefficient of elasticity to which reference was made. However, the basic unilateral displacement from primary activities will not recur. There will be no further striking increases of productivity arising from the mere transfer of labour, but only from the improvement of its skill and the size of the capital stock per worker in the individual sectors.

The Latin-American countries are now in the first stage of development, although some are now reaching the final phase of this stage and are ready to enter upon the second stage. This means that they have the problem of transferring labour from agriculture to industry, transport and services. The labour force is, therefore, not generally a limiting factor of development, at least so far as its numbers are concerned. The limiting factor lies in the capital required to free it from low productivity activities and, in turn, to raise the productivity in other sectors by increasing the stock of capital.

This is one of the principal reasons for drawing up an adequate programme

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instead of partial plans. How would it be possible, for example, to raise per capita productivity in agriculture if, at the same time, an attempt were not made to reabsorb in other activities the labour force which agriculture will no longer retain in view of its expanded productivity ? From another standpoint, it might well be asked: how industrial development could be accelerated unless information is available with respect to the labour force which may be withdrawn from agriculture or personal services, which also have a low level of productivity ?

The problem consists essentially in the following: given the probable expansion of demand in the different activities and the probable increment of productivity which may be obtained in each of them by raising the stock of capital, it would be necessary to determine the distribution of labour force, by activities, the transfers which must be obtained, and the destination and method of absorbing the transferred labour force.

7. Productivity and the Investment Alternatives in the Programme

The solution to this problem requires an understanding of the meaning of productivity and the manner in which it is enhanced by capital accumulation. This is a basic concept in programming economic development. A given rate of growth and its attainment within a given period is established, a first approximation of the capital requirements must then be calculated, and, subsequently, it is necessary to direct the distribution of the capital between the different sectors of economic activity. An estimate is, naturally, made of the expansion of demand for goods and services in these different sectors and branches. Alternatives occur with respect to the distribution of these capital requirements, and one of the most important factors in choosing among them, though not the only one, is of course productivity.

There are two types of alternatives. In the first case demand may be satisfied by domestic output and imports. It is well known that not all the goods which are at present imported can continue to enter the country due to the fact that expansion of the capacity to import is more difficult than the expansion of the gross product. It is, therefore, necessary to effect substitutions, and here, also, are alternative possibilities. The question becomes one of deciding whether to increase output of this or that food product instead of this or that raw material or manufactured product. It is also necessary to ascertain the selection criteria which must be employed if the maximum increment to the gross product is to be attained, given the calculated

increment in the stock of capital and in the labour force. These are the first types of alternatives which the analyst must study in formulating a programme.

In the case of the second type of alternative, the problem does not encompass the whole field of economy, but is concerned with each of its individual branches. There is, therefore, a close connexion between this and the preceding case. The problem lies in the existence of different alternative solutions for the production of a given article or service, requiring different amounts of capital stock per worker. It is necessary to determine the criteria to be followed in order that the series of investments made will lead to the maximum increment of output.

The discussion of this aspect makes it necessary to take into account the two forms in which productivity is measured, namely, output per worker and output per unit of capital. These are two aspects of the same problem: the increment of capital foreseen in a programme with a view to obtaining the maximum expansion of output for the economy as a whole. This must also coincide with the maximum output per unit of capital and output per worker. The problem involves the economy as a whole, but does not necessarily affect each of its individual branches. Reference should be made to these two forms of productivity in order to understand this problem clearly.

To increase the unit output by either of the two methods mentioned, it is necessary to raise the stock of capital. However, this increase does not generally have the same effect on output per worker as on output per unit of capital. The final objective of technical progress from the standpoint of the economy is to increase output per worker progressively, that is, to reduce the amount of labour per unit of output. However, in order to obtain a given increment of output per worker, it may be necessary to obtain a disproportionate increase in capital. In this sense, three different types of developmental processes are illustrated in the following example :

Three Types of Possible Development of Productivity

	Capital per worker	Output	
		Per worker	Per unit of capital
	First type		
	1,000	500	0.50
	2,000	1,500	0.75
Increment	1,000	1,000	1.00
	Second type		
	1,000	500	0.50
	2,000	1,000	0.50
Increment	1,000	500	0.50
	Third type		
	1,000	500	0.50
	2,000	800	0.40
Increment	1,000	300	0.30

For purposes of simplification the same initial capital per worker will be used, yielding the same unit output, both per unit of capital and per unit of labour. The different trends of these outputs are shown when the volume of capital varies.

In the first type, output per worker increases to a greater extent than capital which implies that the output per unit of capital is also raised. In the second example, output per unit of capital remains constant while output per worker expands proportionately with capital. Lastly in the third instance, output per worker rises more slowly than capital and output per unit of capital declines.

It is evident that the proportionately greater increase of output per unit of capital also represents a proportionately greater increase of output per worker. This would be the most advantageous solution and the one which would provide the best results from increasing the stock of capital continuously in the course of economic development. But, either for reasons which are inherent to technical progress itself, or because such progress seeks to effect the greatest possible improvement in labour productivity, solutions such as the second or third type are not only conceivable, but are in fact, extremely important in countries which are technically and mechanically more highly developed. In the United States, however, the

output-capital ratio, despite constant fluctuations over short periods provoked by factors of another order, tends rather more to remain constant. This would seem to indicate that the effects of technical progress, which tend to increase the output per worker and output per unit of capital disproportionately, have been compensated by those which provoked the opposite effect.

The latter will now be considered. The third example shows the smallest increment in output per worker given the same increase of capital as in the preceding cases. However, the increment in capital per worker in this case is generally considerably greater (relative to output per worker) than in others, given the characteristics of technical progress. It is by this means that the very sharp increases have been obtained in labour productivity although the expansion of investment was proportionately greater than the expansion of output.

This is one of the most interesting aspects of the dynamics of development. If the capitalist entrepreneur were guided by the principle of giving preference to investment of the first type in order to obtain proportionately greater increments of unit output than the increment to the stock of capital, and thus obtain the maximum immediate output for the economy as whole, he would not resort to investment of the second type or even of the third until investment of the first type had been exhausted. However, impelled by technical progress there is no reason for him to adopt this order. If such programmes enable him to increase labour productivity by reducing costs and increasing profits, he will adopt them without regard for the output-capital ratio. This apparently uneconomic procedure, from the static viewpoint, involves profound dynamic consequences. By raising labour productivity in this way, wages will tend to rise so that labour will be attracted from activities in which output per worker is lower although the output-capital ratio may be higher. In this way these activities are, in turn compelled to seek methods which will increase labour productivity and enable them to pay competitive wages, although this may imply a reduction of the output-capital ratio. In an elementary stage of production technology, where capital per worker is very small, as occurs generally in most of Latin-American agriculture for domestic consumption and in handicrafts, the output-capital ratio is relatively high. As modern technique is extended to these activities, this process will be repeated, and to raise labour productivity it will be necessary to reduce the output-capital

/ratio. This

ratio. This occurs, for instance, in the mechanization of agriculture, although it also illustrates the compensatory factors since technical progress in agriculture constantly offers new means of increasing output per unit of land and labour with relatively small amounts of capital.

This historical development of technique and its consequences in the economic process, have taken place gradually in the more highly developed countries, and high technical standards prevailing currently have been attained in this manner. However, there is no reason for the underdeveloped countries to follow the same gradual process of evolution. This advanced technique is readily available and there is no need to pass through all the various stages of development. However, they lack the necessary capital for this purpose, and even if they had it, they would not be able to absorb the full complexities of this technique rapidly. Latin America has an average gross product of 245 dollars per capita (at 1950 prices). Taking into account the fluctuations in the purchasing power of money which have occured, it would be necessary to go back as far as 1840 to find a similar figure in the United States. However, at that time per capita investment was only 505 dollars as compared with 3,330 dollars at the present time, both figures being computed in dollars at 1950 prices. Thus, the Latin-American countries, as well as the other underdeveloped countries throughout the world with a gross product equivalent to that of the United States more than a century ago, are faced with results of technical progress which demand a high level of per capita investment.

This calls for a very intensive investment effort. However, it is impossible to attain the required amount of capital stock and the corresponding level of productivity in the short space of a few years, as will be seen in the following chapter. The amount of capital available would be insufficient with respect to the requirements for this stock of capital and, consequently, the analysis of the increment of capital necessary to obtain a given increase in output per worker touches one of the most vital aspects of the programming of development.

This leads to the question of alternative investments in a given branch of activity, to which reference was made above. Investments of different capital density may be made in the same branch. In some cases the stock of capital may be very high, coinciding with a high level of productivity per worker, although the output-capital ratio is lower than in other investments

/or in

or in the rest of the activities in the economy. It is evident that if there were sufficient capital to increase the stock of capital in all activities, the problem would have been solved. However, that is not the case and the obtaining of the maximum product from the economy as a whole, suggests the adoption of solutions with a higher output-capital ratio, although the output per worker may be lower.

However, as was pointed out in another report to which reference has already been made, 1/ it is not always possible to find solutions of this kind because technological research in the more highly developed countries where capital is relatively abundant, is rather more directed to saving labour rather than capital.

It might be well to digress in order to illustrate the above in connexion with the evolution of technical progress. A British transport authority recently pointed out that the underdeveloped countries have assimilated the road building methods of countries such as the United States, thereby implying a cost which many of them are at present unable to meet. Progress in the field of motor vehicles, with the abundance of capital encountered in that country, has led to increasing the weight and speed of vehicles and, therefore, created new problems for road building experts, involving a corresponding increase of investment per unit of surface. This is a further indication of the remarkable difference between the moderate per capita product in underdeveloped countries and the high rate of investment demanded by modern productive technique. In the particular instance mentioned, technical research from the standpoint of the underdeveloped countries should be directed towards vehicles requiring small investment at the expense of speed and cheaper roads.

Thus, circumstances may lead to the adoption of solutions shich imply a much lower output-capital ratio than for alternative new investments due to the unavailability of alternative solutions in the same branch of economy. On the other hand, the technical methods corresponding to a high density of capital per worker, associated with a high level of output per worker, attract the Latin American entrepreneur just as they do the typical entrepreneur in the evolution of capitalism. However, in the latter case, the technical progress was gradual and achieved by easy stages, whereas the underdeveloped

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1/ Theoretical and Practical Problems of Economic Growth, United Nations Economic Commission for Latin America (Doc. E/CN.12/221)

/countries have

countries have sought to absorb this advanced technique rapidly in view of the prospects for higher profits. Thus, it frequently occurs that entrepreneurs who individually possess sufficient resources, choose the alternatives involving a high stock of capital whereas the economy as a whole has only sufficient capital to effect investments corresponding to a much lower capital density. The dynamic effect which the entrepreneur obtains in the more highly developed countries by raising the wage level in the rest of the economy, is not repeated, or only to a very small extent, owing to that shortage of capital. Moreover, the capital available is not distributed in a manner to ensure the maximum increment of output.

This evidently is not conducive to the best economic distribution of the small amount of capital available. It is, therefore, advisable in a programme of development to focus attention on these problems especially in those cases where the State effects direct investments or guides the investment policy by its exchange control, fiscal or credit measures.

The other types of alternatives are of equal importance, although they do not arise in the same branch of activity, but as between different branches, especially in connexion with the substitution of imports. It is essential in this case, likewise, to consider the output-capital ratio, but in a particular way which will be described below. Above all, if in order to achieve a given rate of development it is essential that a certain portion of substitution be effected in a country, it would be necessary to select those which also represent the highest putput-capital ratio. It might, nevertheless, occur that as these substitutions are effected, the unit output will decline until it is lower than that obtained from new investments in the rest of the domestic activity. In that case the only alternative would be to export, providing a unit output could be obtained which would be higher than that of the substituted activities. Should this be impossible, the reduction of the output-capital ratio would be necessary to continue economic development. While this phenomenon is associated with an increasing rate of labour productivity, there is no reason for anxiety. But, if the decline of the output-capital ratio coincides with a fall in output per worker, then the case is different. This is not an arbitrary hypothesis, but a fact which might well occur if substitution is extended in countries which do not have a sufficiently ample market to absorb the output deriving from investment in activities in which the stock of capital is high. The small size of the

market is, therefore, one of the most serious obstacles to economic development beyond certain limits, which often are not particularly wide.

These considerations demonstrate that the analysis of productivity is all important in a development programme. Nevertheless, there is a shortage of analytical material in the Latin-American countries on which a study of this subject could be based. Here, and in questions of the gross product, is where the greatest effort must be made in preparing the analysis of statistical material for the study of the problems of economic development.

8. The Neutrality of Programming Technique

In this chapter frequent reference was made to alternative solutions which the analyst of a programme should submit objectively to the programme officials who have the responsibility for final decisions. In some cases the terms of the alternatives are strictly economic. In other cases, factors of a political or social order may intervene. These decisions do not concern the experts, as such, although the technique of programming should provide fundamental material so that the decisions can be taken in full knowledge of the elements at play and the consequences which may be expected from such decisions.

The first neutral step in the technique of programming is the discussion of the possible rates of development and the determination of whether or not to employ foreign capital and to what extent it should be used in order to achieve these rates of growth. As has been pointed out, there are different solutions from the economic standpoint and their choice inevitably depend on considerations of political and social nature. The role of the expert is to submit the different alternatives impartially and to objectively point out the requirements and the probable effects of each of them. It is necessary to ascertain, for instance, to what extent consumption will have to be limited in order to accelerate the rate of development to a given degree, if foreign capital is not to be used; or the alternative amounts of foreign capital according to the extent to which it is judged that consumption should be allowed to expand in relation to investment, with respect to the additional increment of the gross product as was explained at the beginning of this chapter. At the same time, in connexion with the question of increasing saving, the technique of programming should take into account the alternative possibilities existing either by resort to taxation or other means, but no opinion should be expressed with respect to any particular solution, although

its effects on the distribution of income and consumption of the different social groups will have to be explained.

This neutrality of the technique of programming is not only commendable from the standpoint of defining functions, but also because it strengthens the moral authority and persuasive force of those who formulate the programme. A programme is an extremely complex instrument requiring the cooperation of all important groups. The impartial submission of possible goals and different alternatives for obtaining them, is essential in order to obtain that cooperation. The final goal of every programme is the attainment of a substantial increment in future consumption and this inevitably calls for the raising of the level of investment by moderating the growth of current consumption. A clear understanding of this need to raise the coefficient of investment can only be obtained with the support of the vast sectors of public opinion upon which it is necessary to exercise that persuasive sense without the support of which a development programme cannot be efficiently implemented, however reasonable and well ordered it may be.

CHAPTER II. SOME GENERAL PROJECTIONS DERIVED FROM THE EXPERIENCE OF LATIN AMERICA DURING THE PAST QUARTER CENTURY

1. Problems of Programming Technique in Latin America

In the preceding Chapter in considering the problems arising in the technique of programming, an attempt was made to give a general idea of the subject matter contained in this report. This is a new field in Latin America in which it is necessary to begin by collecting data and gradually transforming the lessons learned into principles for practical action. Meanwhile, there is the risk of formulating an abstract process which will not prove useful in practice. This danger has been borne in mind in the present work and, to avoid this, it was believed advisable to consider a concrete example and to trace the general outline, however modest, of a preliminary programming technique. The concrete case chosen was Chile. It was not the intention of the authors of this report to prepare a development programme for this country, but to formulate a series of projections of alternative possible developments in order to illustrate the nature of the fundamental problems of economic development and to show hoy they might be dealt with by the programming technique formulated hereunder. Moreover, Chile offers an interesting example of a country where growth could be accelerated if the limiting factors retarding its development, could be satisfactorily controlled. These limiting factors appear to a greater or lesser extent in other Latin-American countries and the lessons learned in Chile might prove of considerable advantage. From the standpoint of implementing the task, Chile presents, in addition, the advantage of being the headquarters of this Commission, thus facilitating direct access to information as well as discussion and consultation with qualified officials whose collaboration has been of the greatest value. It would have been more difficult to carry out this first experiment away from the working centre. With the completion of this work, however, it is believed that the Commission will be in a position to extend this type of study to other countries. It is intended to undertake a similar type of analysis of the economic development of Brazil, and for this purpose, certain preliminary general projections have been made which, together with those of Chile, are cited in Chapter III. The Executive Secretariat has, therefore, recently reached an agreement with the new Economic Development

Bank of Brazil with a view to setting up a mixed working group to carry out this task, the results of which will be published jointly. There can be no doubt that by adding the experience of Brazil to that of Chile the Commission will be able to progress firmly in this new field of programming technique. This technique should not only take into account the nature of the problems encountered in Latin America, but should also take the opportunity to emphasize the scanty statistical material available and the urgent need to expand and improve this material.

Before dealing with the subject, reference should be made to certain fundamental problems in the programming of the economic development of Latin America in general, without reference to the case of Chile, even though this country contains many of the problems common to the other Ibero-American countries. Consequently, in this second chapter, some aspects of the possible economic development of Latin America as a whole will be studied. It will be necessary to determine the past rate of growth and the possible future rate of growth, in comparison with other more highly developed regions. Similarly, it is necessary to determine the present and future investment effort and the level to which foreign investment would have to rise in an initial and transitional period in order to accelerate the rate of development without reducing present consumption. Similarly, reference must be made to the manner in which foreign trade is a present and potential limiting factor, and the probable trend of structural change in the economy which would have to be affected in order to attain a higher rate of growth. Similarly, it is necessary to determine what increments of labour productivity are required to attain that rate of growth, with a given rate of increase in the labour force and the shift of the relative share of the labour force from agriculture to other activities. And, lastly, what new complications would be created by the instability of the Latin-American countries, due largely to external factors, in addition to those inherent to the task of programming. All these points will be briefly considered in the present chapter. The mere mention of them indicates that the growth perceived consists principally in drawing the attention to certain aspects of the phenomenon of Latin-American economic growth which have not yet been sufficiently studied. The consideration of these problems calls for research and analysis which can only be carried out when more knowledge is obtained concerning the more characteristic countries. However, in this first outline, a general idea will be given of the nature and

magnitude of some of the fundamental problems.

The first query which arises in dealing with this subject is to ascertain whether or not the rate of growth in Latin America has been satisfactory. In addition to this question another suggests itself, namely the criteria for determining whether or not it has been satisfactory.

2. The Rate of Growth of the Gross Product of Latin America in Comparison with that of the United States.

It is first of all necessary to determine the historical rate of growth of Latin America. During the period 1935-51, the gross geographic product of Latin America as a whole expanded at an annual rate of 4.7 per cent while the growth of the population was 2.1 per cent, the annual increment in the per capita product being 2.5 per cent. It will be observed that the expansion of the gross product was comparatively greater than that of output, due to the improvement in the external terms of trade, which began in 1946, as was explained in the Economic Survey submitted at the same time as the present report. The annual average rates of expansion of output were 4.6 per cent in the aggregate and 2.4 per cent per capita.

In the first Chart of Plate 1 the gross product is shown and the trend line calculated at the average rate mentioned. The corresponding data form part of a study which is being prepared on the economic growth of Latin America as a whole, since the world crisis, and in this work the statistical series and the sources and methods will be presented. The choice of 1945 as an initial year for the calculation was not arbitrary; as may be seen from the gross product curve, the Latin-American economy had already recovered from the sharp decline of the post-1929 crisis and experienced a new stimulus of growth. This impetus was effected by several dynamic domestic factors which had appeared before the crisis, but did not exercise a decisive influence until afterwards. These factors then supplanted the weakening external factors which had prevailed until then in the process of economic development of Latin America. It may, therefore, be said that since the crisis a new phase of growth began in Latin America.

The chart also shows that the gross product curve fluctuates constantly above and below its trend line, rising and falling in characteristic movements but always tending to return to that line. These movements of the gross product further complicate the task of programming, as was pointed out above.

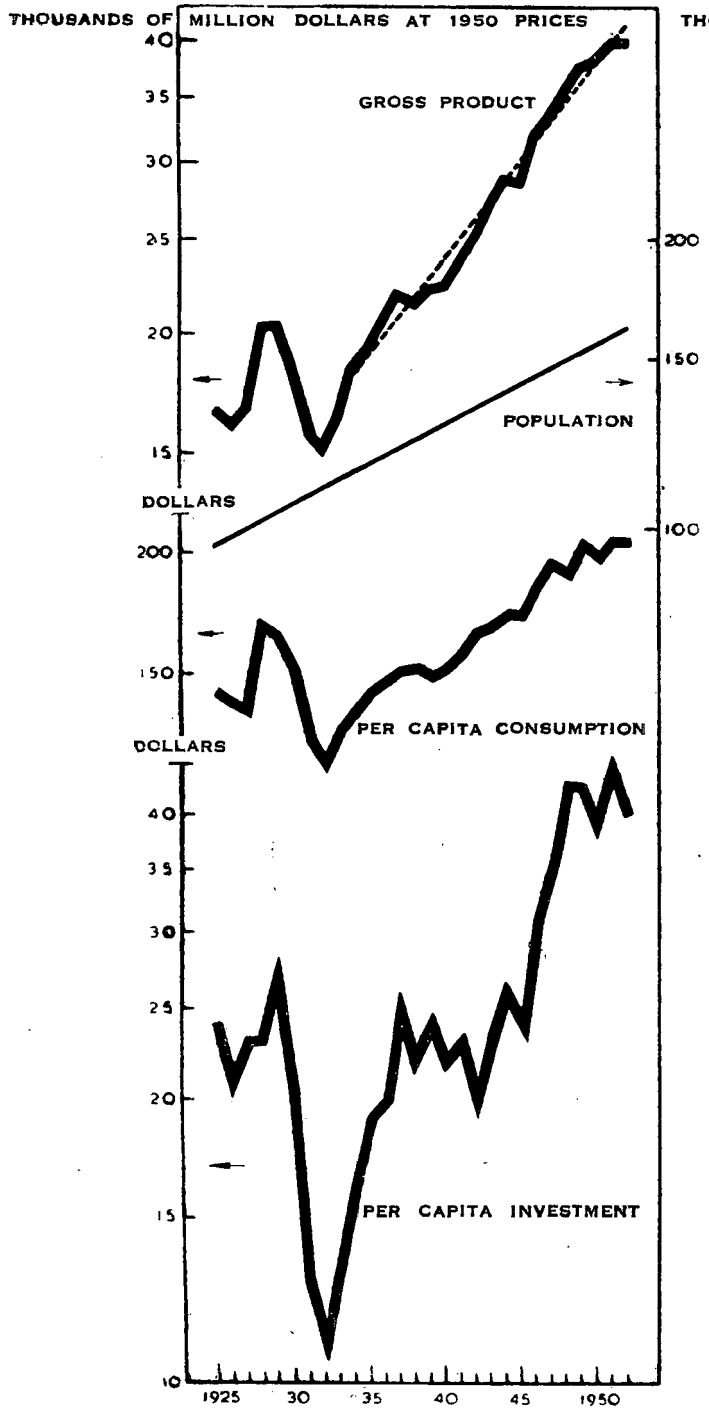
/Having determined

PLATE 1

RATE OF GROWTH AND THE CAPACITY FOR EXTERNAL PAYMENTS IN LATIN AMERICA, 1925-52

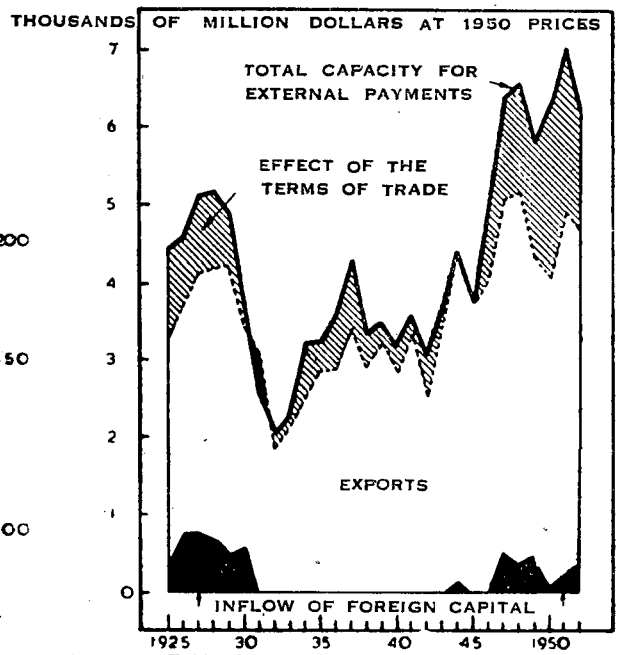
GROSS PRODUCT, POPULATION, CONSUMPTION AND INVESTMENT

(SEMI-LOGARITHMIC SCALE)



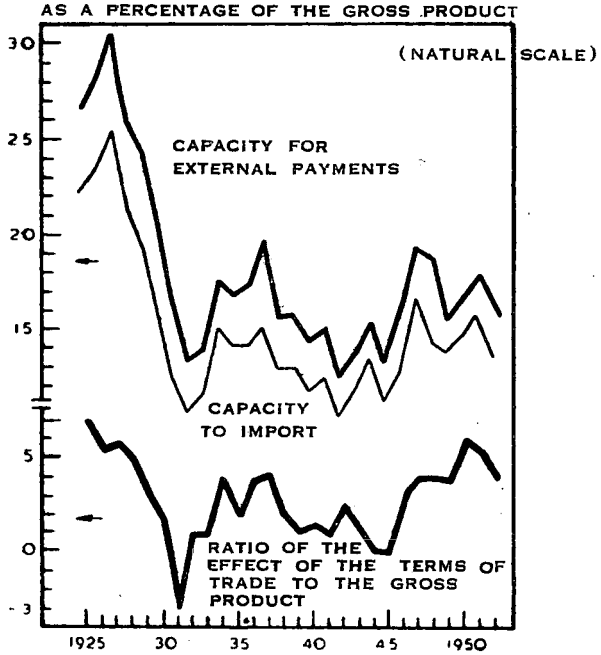
CAPACITY FOR EXTERNAL PAYMENTS AND ITS COMPONENTS

(NATURAL SCALE)

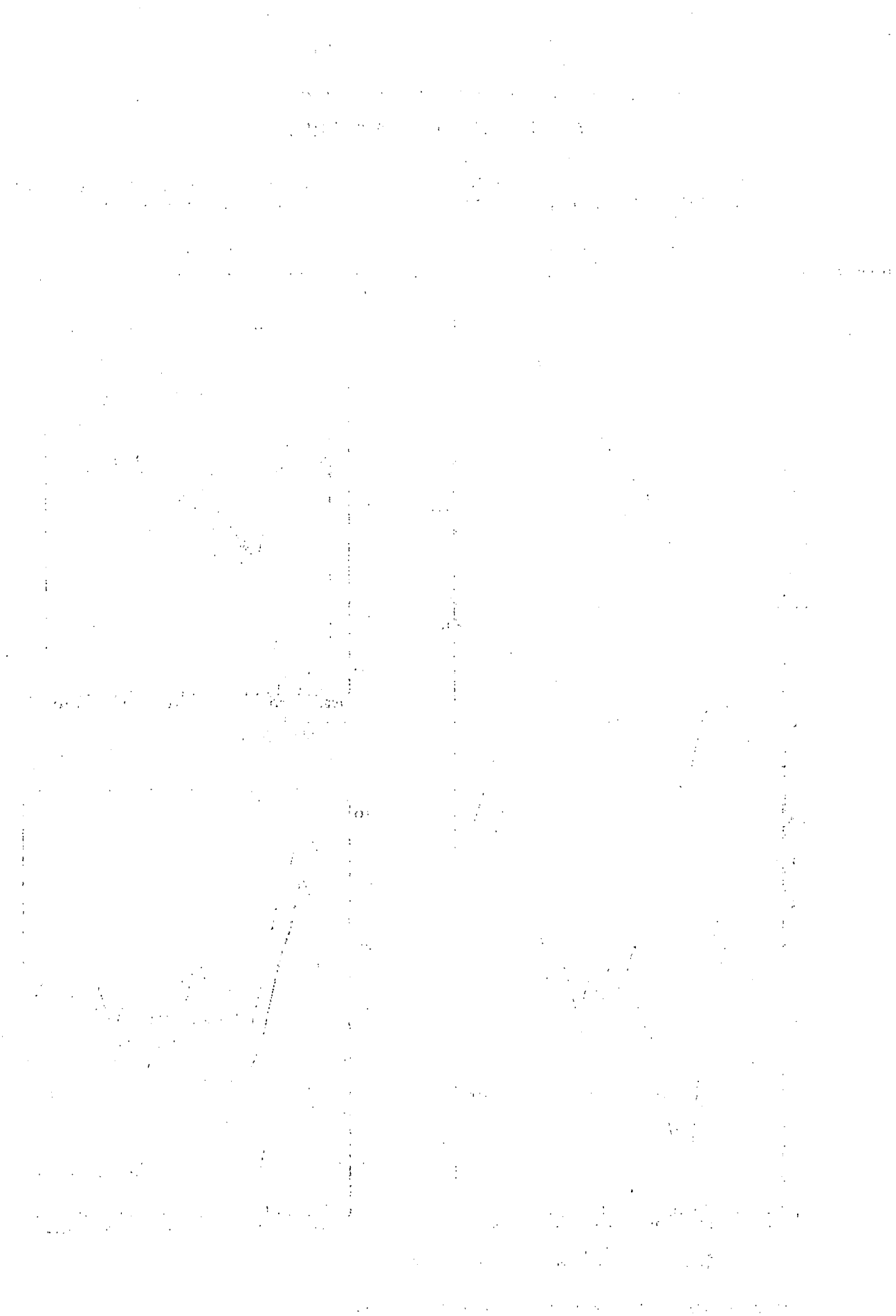


RATIO OF THE CAPACITY FOR EXTERNAL PAYMENTS, CAPACITY TO IMPORT AND EFFECT OF THE TERMS TO THE GROSS PRODUCT

AS A PERCENTAGE OF THE GROSS PRODUCT



UNITED NATIONS ECONOMIC COMMISSION FOR LATIN AMERICA



Having determined the historical rate of growth it is necessary to ascertain whether or not it is satisfactory. If it is compared with the rate of growth of other countries and regions which have experienced a rapid rate of development, the Latin American annual rate of growth of 2.5 per cent per capita may be considered very satisfactory. In fact, the general tendency of expansion in the United States over a long period of time was considerably lower. During the period 1869-1952, the average per capita rate of growth in the United States was 2.1 per cent. In this 83-year period, the early years, that is 1869 to 1883, showed the highest rate of growth and, in fact, it is in this period that the per capita rate of 2.5 per cent is found, coinciding with the Latin American rate for the period 1935-1952.

However, this simple comparison of rates of growth lacks historical perspective. The development of the United States represents a gradual process of technical discoveries and the accumulation of capital. It is capitalistic development par excellence, whereas in the Latin-American countries and in other similar regions, it is essentially a process of assimilation and adaptation of this capitalistic technique which does not necessarily have to cover the same phases nor take as long as the original process. Moreover, there are psychological and social factors of decisive importance which have made it necessary to consider the need for accelerating the rate of Latin American development.

This process of assimilation and adaptation has two aspects: on the one hand, the pattern of consumption in countries which have attained high levels of economic activity tends to be extended rapidly to the underdeveloped countries, both in the private sphere and in the field of government action. Again, the forms of production tend to be extended relatively slowly both due to the process of absorbing technological progress and the typical shortage of capital. In other words, new patterns of consumption are absorbed much more rapidly than new forms of output, which fact gives rise to economic and social tensions that can only be eased by the acceleration of economic development.

3. Effects of a Possible Acceleration of Economic Growth.

From this standpoint the acceleration of development signifies the more rapid attainment of the level of the gross product of more developed countries,

/than heretofore.

than heretofore. If the problem of growth is expressed in these terms, the answer to the question as to whether the rate is satisfactory or not, will have to be given in terms of the time required to attain those levels.

The average per capita gross product in Latin America was 245 dollars in 1952 (at 1950 prices), and represented slightly less than one-eighth of the sum of 2,000 dollars which is the per capita gross product of the United States. A development programme should establish goals which can be attained in a reasonable period of time; which means that it would undoubtedly not be rational to attempt to attain this high per capita figure rapidly. In order to facilitate the setting of the first long-term goal this sum will be reduced to one third of its present amount, that is, an average per capita product of 665 dollars, which is still two and a half times more than the present per capita product in Latin America. It would be significant to ascertain when the gross product would attain a level of 665 dollars per capita if it continues to increase at the rate of 2.5 per cent. The answer will indicate whether or not this rate of development of Latin America is satisfactory, since to reach that goal a total of 42 years would be required. However, the problem does not end with this aspect.

The gross product of the United States has certainly not reached a static level. The Paley report,[1/] bases its calculations of the probable product of that country in 1975 on the assumption that the average rate of expansion of the per capita product will be 2 per cent annually. If this "Technique of Programming" study makes use of this supposition, another estimate might be made for exploratory purposes. This would be to ascertain the length of time required for the per capita product of Latin America to reach a level equivalent to one third of the per capita product of the United States in the event that the latter continues to expand at an annual rate of 2 per cent, and assuming that the per capita product of Latin America continues to expand at an annual rate of 2.5 per cent. Given the relatively small difference between the two rates, the period would be extremely long and, therefore, would lose all practical significance. In fact, according to the calculations, 255 years would be required. Naturally, a calculation of this

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1/ Resources for Freedom, the President's Materials Policy Commission, William S. Paley, Washington, D.C., June 1952.

/kind has

kind has no purpose other than to show the impossibility of progressively reducing the very wide margin that at present exists between the per capita gross product of the United States and that in the countries of Latin America if the latter do not make a decisive effort to accelerate their own rate of development. Also, there would be no point in making an extrapolation for so long a period if, apart from other factors, a slight change in the rate of growth of the population would be sufficient to alter the results completely.

These considerations are sufficient to indicate the magnitude of the problem in Latin America. If the appreciable difference between the present standard of living of Latin America, and the level attained in the United States, is to be narrowed progressively, it would be essential to accelerate the rate of economic development. For this purpose it is necessary to raise the coefficient of investment, which was 16.5 per cent of the gross product in 1946-52. It will be assumed that foreign investments can raise this figure rapidly to 20 per cent. 1/

Interesting results can be obtained with this new coefficient. In the first place it is necessary to study its effect on the rate of development and the time required for the per capita gross product to attain one-third of the level prevailing in the United States and, consequently, the amount of foreign capital required, in accordance with the desired rate of growth of consumption.

With a coefficient of investment of 20 per cent, the average annual rate of expansion of the per capita product would rise from 2.5 per cent to 4.1 per cent, in which case a period of only 25 years would be required instead of 42 years for the per capita product of Latin America to reach a level equivalent to one-third of that of the United States. By thus reducing the period, the difference between the levels of the product would likewise be diminished. Indeed, if the per capita product of Latin America could continue

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1/ Of the coefficient of investment of 16.5 per cent it is estimated that 5.4 per cent covers the depreciation of capital. This gives a net investment rate of 11.1 per cent. Thus, raising the investment coefficient to 20 per cent, yields an increase in the investment rate of 3.5 per cent; in addition to this increase, another of 0.6 per cent of the gross prodct was made in order to compute the increment to working capital (inventories) which must accompany that of fixed capital. The coefficient of 16.5 per cent recorded in Latin America in 1946-52 does not take into account working capital owing to the lack of adequate information.

/to expand

to expand at the rate of 4.1 per cent for a further one quarter of a century or, to be more exact, for 24 years, it would have reached a total of 1,744 dollars, which would be equivalent to one-third of the per capita product in the United States, providing the annual rate of expansion of 2.1 per cent in that country continued in force. It would be hazardous to conclude whether in fact that rate would prevail. This per capita rate of expansion is in fact, very high, and in practice would be impaired by other obstacles, some of which will be described later in the present chapter. Meanwhile the second part of the calculation should be considered, that is to say the amount of foreign capital required to ensure this rate of growth.

4. The Supplementary Volume of Foreign Capital

It is necessary to ascertain in absolute terms the volume of foreign capital required to accelerate the rate of growth, as indicated above. It is not possible to find a solution until one of the problems, whose primary importance was noted in the first chapter, has been adequately discussed. It was pointed out above that the coefficient of saving would have to rise in proportion with the acceleration of the expansion of the gross product in order to preclude the need for continued reliance on net new increments of foreign capital, within a reasonable period of time. This interval was referred to as the period of transition in the first chapter. The programme now consists in calculating the total volume of foreign capital requirements according to the rate of expansion of the coefficient of investment during that period of transition. As the coefficient of investment increases, the share of new foreign investment should decrease until they cover only the amount of amortization at the close of the period of transition. From that time forward the volume of foreign capital would remain constant in the projected estimates. At the beginning of the period, a net new foreign capital inflow is required in order to raise the coefficient of saving from the 16.5 per cent taken as a basis for the projection to the projected 20 per cent. It will be assumed that the initial year is 1953, in order to base the analysis on recent data. Two hypotheses may be formulated. In the first, the coefficient of domestic saving would begin to rise in 1954 and would reach 20 per cent in 1960, when the net new contributions of foreign capital would cease. In the second case, the period of transition would be prolonged to twice the length in the first case and the coefficient of domestic saving

/would not

would not attain the required level to finance investment until 1967.

The results of the calculation of these two hypotheses may be examined; in the former, a total supplement of net new foreign capital equivalent to 15,400 million dollars (at 1950 prices) would be required, that is an average of 2,200 million dollars annually for the seven years of the period envisaged. In the second case, when the coefficient of saving develops more slowly, a total of 44,000 million dollars would be required, that is, 3,140 million dollars per year over the fourteen year period.

It should not be assumed that by using these figures an attempt is being made to suggest a definite policy of foreign investment in Latin America. The intention of the present report, as has already been pointed out, is merely to give some idea of the magnitude of a problem which thus far has been very slightly considered.

The analysis of the results of the calculation may be made with a view to determining their significance. For this purpose two small tables will be used comparing the data of the first case, in which the period of transition lasts for seven years, with the second, with a transition period lasting for fourteen years.

Projections of the Per Capita Gross Product and Consumption and the Coefficient of Domestic Saving

Years	Gross product	Consumption		Coefficient of Domestic Saving	
		First case	Second case	First case	Second case
1953	255	213	213	16.5	16.5
1960	337	270	276	20.0	18.0
1967	445	356	356	20.0	20.0

Average Annual Rate of Growth of the Gross Product and Consumption per Capita

Periods	Gross product	Consumption	
		First case	Second case
1953-60	4.1	3.4	3.8
1960-67	4.1	4.1	3.7
After 1967	4.1	4.1	4.1

In both cases the intensity of the rate of expansion of the gross product is the same, thus fulfilling the purpose of expanding it at an annual rate of 6.2 per cent and a per capita rate of 4.1 per cent. However, the

/trend of

trend of consumption is different. In the first case, where the coefficient of domestic investment reaches its goal in 1960, the expansion of consumption is naturally much slower, since domestic investment expands much more rapidly. In the second case, consumption grows more rapidly at the expense of domestic investment; hence, the need for a larger amount of net new foreign capital. It should be observed, however, that the slower expansion of consumption, when the period of transition lasts for only seven years, is compensated by the fact that after 1960 its rate of growth is equivalent to that of the gross product, whereas in the second case, a further seven years must pass before consumption attains the anuual average rate of expansion of the gross product, namely, 4.1 per cent. This is tangible evidence of the benefits of greater domestic saving. However, it could not be said of the first case that the expansion of consumption was weak. On the contrary, the average rate of growth would be 3.4 per cent until 1960, which is substantially higher than the 2.6 per cent recorded for the period 1946-52 under exceptionally favourable conditions for external factors. Consequently, the first hypothesis is far from austere, and the second, even less since the average rate of expansion of consumption would be 3.8 per cent until 1960.

It would be quite feasible to decrease the requirement for foreign capital by reducing the rate of expansion of consumption; however, it is necessary to indicate that the practical difficulties in carrying out such a programme are increased more sharply when an attempt is made to raise more rapidly the coefficient of domestic investment to the level required to achieve the objectives of development. This is due not only to growing resistence against any change in saving and consumption habits, but it is also due to the time required for the substitution of imports until the balance of payments position can bear the consequences of the suspension of the net capital inflow.

At this point it would be advisable to digress for the moment. There is a certain risk involved in these projections, namely, that of considering the results as final data from which definite conclusions may be drawn, rather than regarding them as instruments of analysis, for the formulation of hypotheses, with a view to obtaining a preliminary approximation of the nature and magnitude of the problem, as has been suggested elsewhere.

In this particular case it should be remembered that all the estimates are based on the assumption that the output-capital ratio will remain stable. There are no factors which would justify the setting aside of this assumption;

/nor would

nor would it be necessary to do so in this preliminary survey. However, it should be borne in mind that development depends not only on the labour force and the stock of capital per worker, but also on the combination of other factors, among which natural resources are of fundamental importance. In a relatively short period of time, however, there is justification for considering this factor as constant; although this is not applicable when the lapse of time is extended, as is the case in some of the estimates shown above. The comparison with the United States amply illustrates this, but there can be no doubt that the intensity of development in that country arises mainly from the very favourable combination of resources and manifest aptitudes of its population for economic development. It may well be that for this reason, in the course of time, however much effort Latin America may make to achieve a stock of capital comparable with that country, its gross product will not attain a corresponding level owing to the decline of the output-capital ratio caused by limitations of natural resources or the lack of determination to use them. In this connection Latin America itself offers contrasting conditions which will be brought to light in the individual study of each country, but which need not be mentioned in detail here, due to the nature of the present comments.

5. Foreign Capital and the Incidence of Its Remittances on the Capacity for External Payments

There is another aspect of fundamental importance in connection with the problem of foreign capital which will have to be considered and that is the manner in which remittances of profits and interest is concerned with Latin America's capacity for external payments. In 1946-52 these remittances accounted for 12,3 per cent of that capacity. It remains to be seen what proportion would be absorbed in the two cases outlined, that is, an investment of 15,400 million dollars in sever years or 44,000 in fourteen years, in order to attain an annual rate of per capita growth of 4,1 per cent.

In order to answer this question it is essential to estimate the yield of foreign capital. In 1946-52 the yield (relative to the depreciated replacement value of foreign capital) was 7.5 per cent for Latin America as a whole. If this rate is maintained until 1960, when the period of transition terminates in the first case, remittances would have absorbed 27,6 per cent of the total capacity for external payments, [1] in comparison with a

[1] In the hypothesis submitted below, the capacity for external payments rises at an annual rate of 2.2 per cent.

proportion of 12.3 per cent for the period 1946-52. This proportion is very high in the projections, but it need not be so high in fact. The estimate was made on the basis of the average yield of 7.5 per cent, which was substantially affected by the high return on private foreign capital. It is well known that the interest on public international loans is appreciably lower, fluctuating during the past few years between 3 and 4 per cent for the operations of the International Bank for Reconstruction and Development, and those of the Export-Import Bank. If this were to be the predominant form of the foreign capital inflow, and the average yield were to drop to 5.5 per cent, [1/] the share of remittances (relative to the capacity for external payments) would correspondingly decline to 20 per cent. This figure can be more easily managed and would have to be obtained by accentuating the process of import substitutions referred to in the following sub-title. After 1960 there will be no net new foreign capital inflow in Latin America, and it is assumed that inflow will be only sufficient to offset amortization and servicing on the existing level of foreign capital. Thus, the above mentioned 20 per cent would be gradually reduced and would absorb a declining share of the capacity for external payments. This would atenuate the process of substitution after the period of transition. At all events, this proportion would seem to indicate that it is not possible to go much further in the absorption of foreign capital in Latin America. In the second case, the 44,000 million dollars required to extend this period of transition to fourteen years, would, by 1967, require half of the capacity of external payments for the remittances of profits and interest, with a yield of 7.5 per cent, and 31 per cent of that capacity, with a yeild of 5.5 per cent, either of which would serously impair the capacity to import.

6. The Capacity to Import and the Substitution of Imports

From another standpoint it should be remembered that there is another limiting factor on economic development which should be considered now, since its effects were quite tangible during the period following the world crisis and will surely continue to exercise considerable pressure for some time to come. This factor is the disparity between the rate of expansion of the gross product and that of the capacity to import, to which reference was also made

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1/ This was calculated on the assumption that new capital would have an average yield of 4 per cent, whereas the capital already invested would have continued to yield 7.5 per cent.

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in the first chapter. Because exports increase at a slower rate than the gross product, the effort of substitution must be proportionately greater as the rate of development rises, other conditions being equal. In order to obtain one-third of the level of the current per capita product in the United States within 25 years, the economy of Latin America would have to develop at an annual per capita rate of 4.1 per cent instead of the 2.5 per cent observed in the period 1935-51. Consequently, the efforts of substitution would have to be all the more intense. There is a further obstacle in that the economically more advanced countries of Latin America have already completed the stage of easy substitution, as was pointed out in the Economic Survey for 1951-52. Before analysing this other phenomenon of development, based on the projections formulated, it would be advisable to obtain a clear idea of the causes of these past trends. For this purpose reference will be made to Plates 1 and 2.

Studying the second and third Charts of the first Plate, it will be seen that the trend of the capacity for external payments in Latin America during the last quarter of a century has by no means parallelled that of the gross product. In 1946-52, the capacity for external payments rose by only 28.1 per cent, as compared with 1925-29 level, whereas the gross product has expanded by 102.1 per cent. It should be borne in mind that this weaker development of the capacity for external payments occurred despite the fact that the terms of trade provided remarkable assistance, as may be seen in the shaded portion of the second Chart. Thus, the coefficient for external payments, that is, the ratio relative to the gross product, dropped from 26.9 per cent in 1925-29 to 17 per cent in 1946-52. The capacity to import is obtained by substracting the remittances of profits and interest, and other balance of payments outflows from the capacity for external payments. It will be found that the capacity to import also decreased from 22.1 per cent of the gross product during the earlier period, to 14.5 per cent thereof during the latter period. This decline is somewhat less sharp than that of the capacity for external payments due to the fact that the proportion of remittances to the gross product also declined.

This sharp decrease in the capacity to import, the explanation for which has been given in earlier reports, [1] has brought with it a considerable change in the composition

[1] See Economic Survey for Latin America, 1949 and Theoretical and Practical Problems of Economic Growth, United Nations, Economic Commission for Latin America (documents E/CN.12/164/Rev. 1 and E/CN.12/221).

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in the composition of imports which may be clearly ranked with the structural transformation that has taken place in the economies of Latin America. Reference should now be made to Plate 2, beginning by the composition of imports. The share of consumer goods imports in relation to total imports has decreased remarkably, being supplanted by imports of capital goods, raw materials and fuel. The following figures are of interest in this connection:

Average Proportion of Total Imports

Periods	Consumer goods	Capital goods	Raw materials	Fuels
1926-29	47.6	33.1	13.1	6.2
1946-52	33.2	38.5	17.7	10.6

From the charts it will be seen that these changes in composition have been irregular and that there have been sharp fluctuations in line with the capacity to import. Thus, when the capacity to import has declined, or access to foreign goods has been difficult, the proportion of raw materials increased noticeably, whereas that of capital goods declined, and viceversa. This is logical since it eases the impact of external fluctuations on the domestic economy at the expense of sharper fluctuations in investment, to which further reference will be made.

The following table shows how these changes are related to the growth of available goods and services and their distribution between consumption and investment. The share of consumer goods imports in total consumption dropped to a coefficient of only 5.8 per cent in 1946-52 pointing effectively to the results of the substitution of imports. These effects may also be observed in capital goods, although the coefficient of the latter in relation to total investment continues to be relatively high, that is, 34.6 per cent over the recent period. Below are shown the comparative figures for the two periods.

Coefficients of Imports in Relation to Available Goods and Services

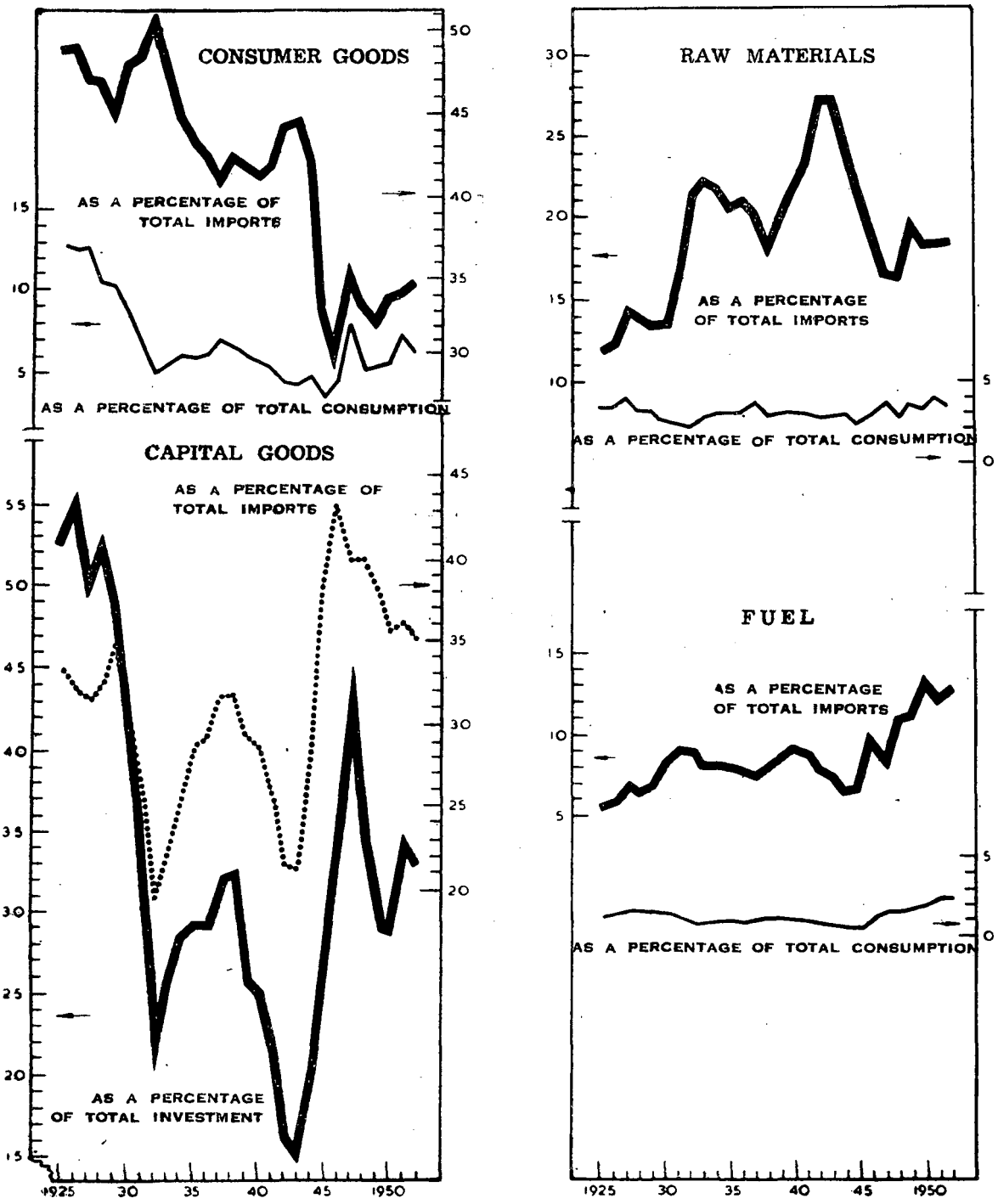
Periods	Ratio of consumer goods imports to consumption	Ratio of capital goods imports to investment	Ratio of raw materials imports to consumption	Ratio of fuel imports to consumption
1926-29	11.8	52.1	3.2	1.5
1946-52	5.8	34.6	3.1	1.9

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PLATE 2

RATIO OF IMPORTS OF THE DIFFERENT GROUPS OF GOODS TO TOTAL IMPORTS AND TO AVAILABLE GOODS AND SERVICES IN LATIN AMERICA, 1925-52

(NATURAL SCALE)



UNITED NATIONS ECONOMIC COMMISSION FOR LATIN AMERICA

While the coefficient of consumer goods and capital goods imports in relation to consumption and investment declined, imports of raw materials closely followed the upward trend of consumption and fuel increased even more sharply. Consequently, the greatest difficulties of import substitution may have been found in these two groups of goods in Latin America. However, it cannot be said that the coefficient of raw material imports is high in relation to total consumption, inasmuch as it only averaged 3.1 per cent for the period 1946-52. The coefficient of fuels was even lower, despite the expansion, reaching only 1.9 per cent in the recent years. These two groups together, however, accounted for more than one quarter of total imports in the period 1946-52. If the rate of economic development which has prevailed since 1935 continues, these two groups would absorb a growing proportion of total imports, unless the prevailing tendencies can be radically modified. This probable trend will become even sharper if the rate of development is increased, as was suggested elsewhere.

This is one of the most important problems of economic development. If the expansion of imports of raw materials and fuels continues to absorb an increasing proportion of total imports, it would be necessary to determine to what extent imports of consumer goods and capital goods may be restricted. Similarly, it is necessary to determine to what extent the process of substitution observed thus far can be continued. The margin of substitution would appear to be greater for imported capital goods which in 1946 accounted for 38.5 per cent of total imports and 34.6 per cent of investment. On the other hand, imports of consumer goods, represented only 5.8 per cent of total consumption, but accounted for 33.2 per cent of total imports. These are the principal aspects of the problem of future economic development. However, it is necessary to keep in mind the possibility of expanding the development of petroleum extraction and making more efficient use of hydroelectric resources, thereby altering the prevailing tendency with respect to fuel imports in certain countries; the same considerations apply to imports of raw materials in some countries . Be that as it may, it would be necessary to continue active substitution of consumer and capital goods imports to a greater or lesser extent, according to the resources and the rate of development of individual countries.

/7. A Hypothetical

7. A Hypothetical Projection of the Coefficient of Imports from Latin America

The extent to which the effort of substitution affects the countries of Latin-America not only depends on the degree to which imports of raw materials and fuels can be reduced but also on the future trend of the capacity to import. No overall projection may be made concerning the possible trend of Latin American exports, without individual analysis of the prospects for different products; and this would only be the first stage of analysis. Nevertheless, to illustrate the problem, reference should be made to certain recent calculations of the capacity to absorb imports in the United States, in order at least to arrive at a tentative conclusion, namely, that there is little prospect of a fundamental change in the tendency of Latin-American exports to develop less rapidly than the gross product.

The significance of these calculations may be considered more explicitly. Recently the Economic Report of the President, [1] (of the United States) presented an analysis of United States demand for imports from which it may be inferred that, historically, for each 1 per cent of expansion in industrial output in the United States there was an increase of only 0.66 per cent in imports. This report also concluded that there are no indications that this tendency will impose in the future. A preliminary estimate made earlier by the Economic Commission for Latin America based on the projections of United States imports from Latin America according to the evaluation of United States raw materials requirements published in the Paley report [2] and the Economic Commission for Latin America's estimated of United States demand for other products of Latin America, a similar coefficient of the elasticity of demand for Latin American imports in the United States was computed.

In the past quarter century the elasticity of demand for imports of goods from Latin America was higher in the United States than in Europe. Consequently, the present calculations can hardly be considered excessively pessimistic by assuming that aggregate Latin-American exports to the world, in the best of conditions, would develop proportionately with their volume directed to the United States. On this basis it can be estimated that aggregate Latin American exports would not tend to increase at an annual rate of more than 2.2 per cent. This should not be regarded as a forecast, but

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1/ The Economic Report of the President, Washington D.C., January 1953.

2/ Resources for Freedom, The President's Materials Policy Commission, William S. Paley, Chairman, Washington, D.C., June 1952.

/mainly as

mainly as a working hypothesis in order to obtain a first rough approximation of the magnitude of this obstacle to Latin American economic growth.

The consequences of this possible trend on the alternative projections of growth formulated earlier will now be considered. For the sake of simplicity and to avoid a complexity in the estimates by varying the time factor in alternative ways, attention will be focussed on the year 1977, that is the 25 yearsperiod required for the gross product of Latin America to attain a per capita level equivalent to one third of the present position in the United States, given an annual per capita rate of growth of 4.1 per cent for the gross product of Latin America. In this case, if exports grow, as was suggested, at 2.2 per cent annually and the terms of trade remain at the 1952 level, the coefficient of imports (relative to the gross product) of Latin America will have to decline to 5.5 per cent by 1977. In order to understand the full implications of this decline, it is sufficient to consider that imports comprised 21.3 per cent of the gross product in 1925-29 and 15 per cent in 1946-52. It is evident that this low import coefficient in Latin America would call for a very intense effort of import substitution, and it is necessary to determine to what extent this policy could be pursued without adversely affecting output-capital ratio. It might be contended that this coefficient is similar to that of the United States during the twenties. However, the facilities which existed in that country for reducing imports differ greatly from the situation in Latin America. This refers not only to the favourable conditions for development which were noted above, but also to institutional factors of great importance. If the United States were able to reduce the relative importance of its international trade so remarkably, this was because it was possible to make use of its vast resources freely in its extensive territory. Economic development, in fact, was accompanied by an intense process of integration. There is no need to emphasize the outstanding importance of this difference in relation to Latin America. In the latter continent economic development is being pursued in water-tight compartments and some countries may possibly be reaching a stage in which the limitations of their market constitute a serious obstacle to the acceleration of economic growth.

8. The Displacements of the Labour Force and the Increment to Output and Productivity in the Projections

One of the most serious obstacles which might prevent the gross product

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of Latin America from attaining an annual per capita rate of expansion, of 4.1 per cent, has just been outlined, but, of course, this is not the only hindrance. Agricultural production has expanded relatively slowly, in comparison with manufacturing, during the past quarter century. It would be difficult to say to what extent this fact is the result of the elasticity of demand for agricultural products or to what extent it springs from difficulties in increasing output. However, there can be no doubt that in raising the rate of per capita growth of the gross product from 2.6 per cent to 4.1 per cent annually over the next 25 years, that is until 1977, the pressure of demand for agricultural products will rise appreciably. There is no way of knowing how agricultural output in Latin America as a whole will respond to this incentive; it would be necessary to carry out an analysis in each country on similar lines to that presented in the case of Chile in the second half of the present document. Meanwhile, any conjecture lacks substance.

Projections of demand may be made, but they will be submitted solely for illustrative purposes. It will be necessary to use the coefficients of elasticity of demand for foodstuffs and raw materials, both of which would be about 0.6 to judge from the partial data available. It is probable that by raising per capita income the coefficient of demand for foodstuffs would decline, while that of raw materials would remain constant or even rise. In order not to exaggerate the force of this pressure of demand, it was found preferable to err by understatement rather than overstatement, so that it was assumed that the total coefficient would remain constant as a result of these opposing trends. Given a rate of growth of 4.1 per cent for per capita gross product, the annual average increment of demand for agricultural products would be 2.5 per cent.

Although this rate is substantially lower than that of the per capita expansion of the gross product, it would imply trebling the volume of agricultural production, while the total output of goods and services would have to expand by slightly more than 4-1/2 times its present level in the next 25 years, in accordance with the annual rate of 4.1 per cent increase in the per capita gross product, which is equivalent to an annual expansion of 6.2 per cent in the aggregate gross product.

One of the most serious unknown quantities may now be examined. It remains to be seen whether agricultural production during the next quarter century could grow at an aggregate annual rate of 4.5 per cent (which means trebling its present volume in 25 years) when the annual rate of expansion for the ten-year period 1940-49 was only 2.8 per cent for the aggregate.

/Evidently it

Evidently it would not be fundamentally a problem of labour force, but rather of expanding the cultivated area and raising the yield. From the standpoint of labour force, any increase in the stock of capital would facilitate a reduction in the number of agricultural workers. Given the increment in demand, the labour force required by agriculture for the quarter century would depend essentially on the increase in the product per worker.

The product per worker in agriculture in Latin America averages 245 dollars (at 1950 prices) in comparison with 1,261 dollars in other activities, in 1952. The progressive narrowing of the gap between these two is a characteristic feature of economic development. For this purpose it is essential that the per capita product should rise more rapidly in agriculture than in other activities. In the illustrative projection this was assumed so that the per worker product of agriculture was projected to rise by 4.3 per cent annually, while the projected per worker average annual rate of increase in productivity for other activities is 3.3 per cent. These rates together give the 4.1 per cent average increase in the gross product per capita, since it is assumed that the labour force will expand at the same rate as the population.

According to these figures the labour force would increase from 33.1 million to 40 million in agriculture, between 1952 and 1977, and from 24.9 to 57.5 millions, respectively, in other activities. This would imply a relative decline in the former from 58 per cent to 41 per cent of the total labour force.

It is evident that if productivity were to rise less than 4.3 per cent in agriculture, this activity would have to retain a higher proportion of the labour force and the annual rate of expansion of productivity in other activities would have to be more than 3.3 per cent in order to attain the desired increment in the per capita product. On the contrary, if more intensive technical progress enabled a greater improvement of per worker productivity in agriculture, a greater proportion of the agricultural labour force would be absorbed by other activities, and the required productivity increment would be lower, unless larger capital investment availabilities could be counted upon to accelerate development more rapidly. This, however, would sharpen the pressure of demand on agriculture.

From what has been said above, it will be seen that these data are a sample illustration of this aspect of the phenomenon of economic development, with a given rate of growth. However, no information is available in Latin America to carry out estimates of this nature with any reasonable degree of

accuracy.

9. Instability of the Economy and Implementation of a Programme

The use of projections, as shown above, to explain some of the more important consequences of economic growth, and to anticipate the probable magnitude of its results, is one of the first steps in the analysis required for programming. It should be remembered, however, that projections are not only analytical instruments, but are also the means whereby the amount and the distribution of investment requirements may be determined in order to attain a given rate of growth in the gross product. Projections are here used in this manner, in the concrete case of Chilean economy to discuss the technique of programming, with a view to calculating the year by year investment requirement and the gross product generated in the individual sectors of the economic activity. The gross product thus assigned to a given year is the result of the investment placed in preceding year, in accordance with an investment coefficient which was computed precisely in the light of the gross product which it was desired to obtain. The figures thus calculated were used to form a series of tables which present the different aspects of thefformulation of the programme. A glance at these tables, and the rigid progression and interdependency of the figures they contain, gives rise to doubts which must now be dispelled. It may be questioned whether in actual fact this regular orderly growth year by year can be achieved, even assuming great persistence and continuity of purpose by the authorities responsible for the programme. It might well be asked whether the mere will of these officials to attain the required coefficient of investment and the desired level in the ourput-capital ratio will suffice.

These doubts lead to questioning the possibility of implementing a programme in countries which are subject to constant instability in the economic sphere, as is the case of the countries of Latin America. Naturally, this instability proscribes any possibility of a rigid programme. It must contain elements of flexibility which will enable it to be adapted to the constant changes of circumstances without, however, losing sight of its fundamental objectives. The extent to which this can be achieved in fact is of importance. Before determining that degree, it is necessary to examine the principal factors of economic instability in Latin America and their repercussions on economic development.

/These principal

These principal factors of instability are of external origin. Their influence during the past few years is carefully analysed in the Economic Survey for 1951-52. They must now be considered from a wider standpoint encompassing the past quarter century.

These external factors exert direct and indirect pressure. In the first place, they cause the volume of available goods and services to vary with respect to the output of goods and services. If the terms of trade do not vary and if the components of the balance of payments were such that the exports of goods and services always equalled imports, available goods and services and output would similarly always be equivalent one another. However, this is not the case and the difference between them is often very large. The indirect repercussions are also of considerable importance and affect investment and the degree of utilization of the stock of capital. A general idea of these factors of instability and their effects since 1925 may be obtained from Plate No. 3.

In the Economic Survey attention was drawn to the close relation between investment and the capacity for external payments, in 1946-52, by relating both concepts to the gross geographic product. Emphasis was also placed on the effect of the terms of trade in relation to the gross product. Analysis of experience over a longer period of time, confirms the importance of the effect of the terms of trade. The relation between the coefficient of the capacity for external payments and that of investment, however, do not appear to have the same general tendency. While the coefficient of the capacity for external payments declined, the coefficient of investment rose, as may be seen from Chart 1 of Plate 3. Nevertheless, the close relationship between the fluctuations of these coefficients over short periods of time will be observed. This movement is effected by the terms of trade, as may be seen from studying the first two curves of the first chart; their movements are very similar. However, whereas in the past few years the effect of the terms of trade barely reattained their earlier level, immediately after the post-1929 world crisis, the coefficient of investment is now substantially higher than before. External and domestic factors account for this. Among the external factors, the most important is the declining proportion (relative to the gross product) of the remittances of profits and interest on foreign capital investment in Latin America. This contributed to the expansion of domestic saving and, thereby the coefficient of investment. It is not surprising, therefore, that

/if the

if the coefficient of remittances is added to the coefficient of investments, and this, then, is related to the gross product, the resulting curve closely resembles the trend of the effect of the terms of trade, as may be seen by comparing the two lines appearing on the same chart.

Nevertheless, there is considerable instability in the coefficient of investment arising from the influence of the irregular movements of the external terms of trade.

This is one of the indirect forms in which external factors affect the stability of Latin American output. It is now necessary to consider the influence on the degree of utilization of capital. Elsewhere reference has been made to the implications of the movements in the output-capital ratio. However, in considering these fluctuations account was only taken of the relatively gradual movement in the growth of an economy during the alteration of the composition and density of capital. The fluctuations in the output-capital ratio to be examined now are of another kind. They are short-term movements springing not from structural factors but from the higher or lower degree of utilization of the stock of capital. These fluctuations respond to changes in demand and the movements of the level of investment.

Factors of an external order are also important in the fluctuations of demand, though this does not preclude the importance of internal factors. The corresponding curve of the second chart shows how the output-capital ratio fell, especially during the crisis, and rose again during the subsequent recovery. The slight decline of economic activity, prior to the second world war, similarly affected adversely the output-capital ratio. However, the shortage of capital goods during the war and the sharp increase in demand, resulting from expansionary pressure and the need to substitute imports, made it necessary to intensify the utilization of the stock of capital so that the output-capital ratio attained, and even surpassed, the pre-crisis level. Since 1945, it has pointed downwards again, but the influence of the changes in the composition of capital on this tendency cannot be measured. As was pointed out in the Economic Survey there can be no doubt that the sharp increase of investment since 1945 attenuated the war time pressure on capacity and created a margin of idle capacity, in reserve for future expansion of demand, but naturally, in the meantime, adversely affecting the output-capital ratio.

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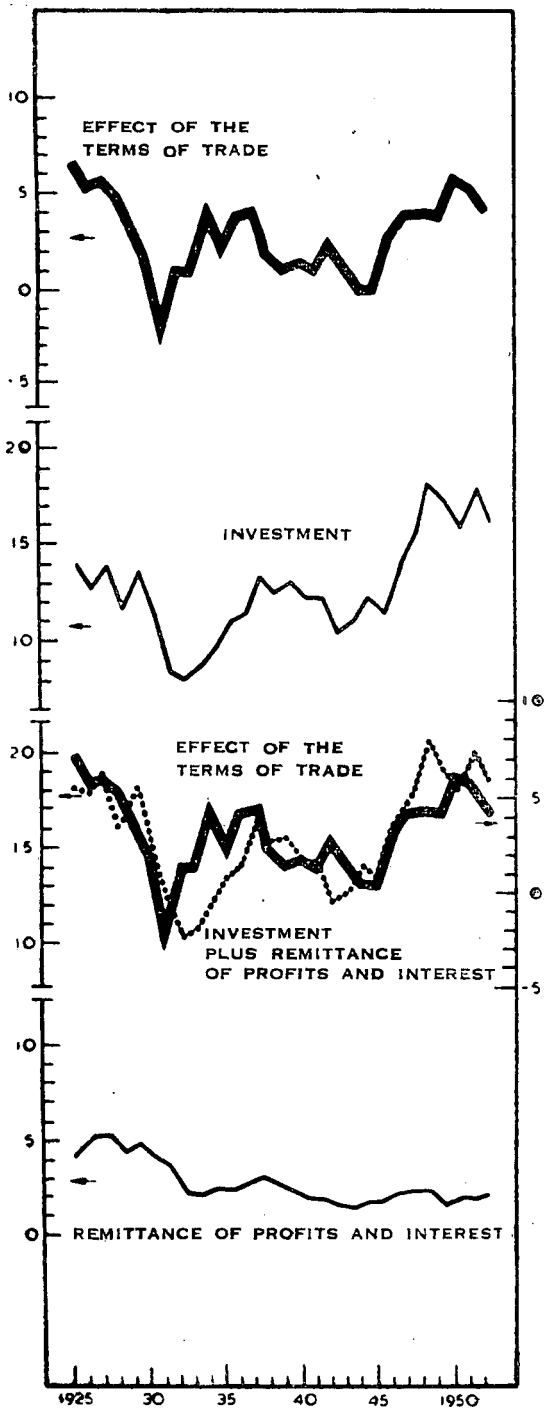
PLATE 3

THE FACTORS OF INSTABILITY AND THEIR EFFECTS ON THE ECONOMIC DEVELOPMENT OF LATIN AMERICA, 1925-52

EFFECT OF THE TERMS OF TRADE ON INVESTMENT

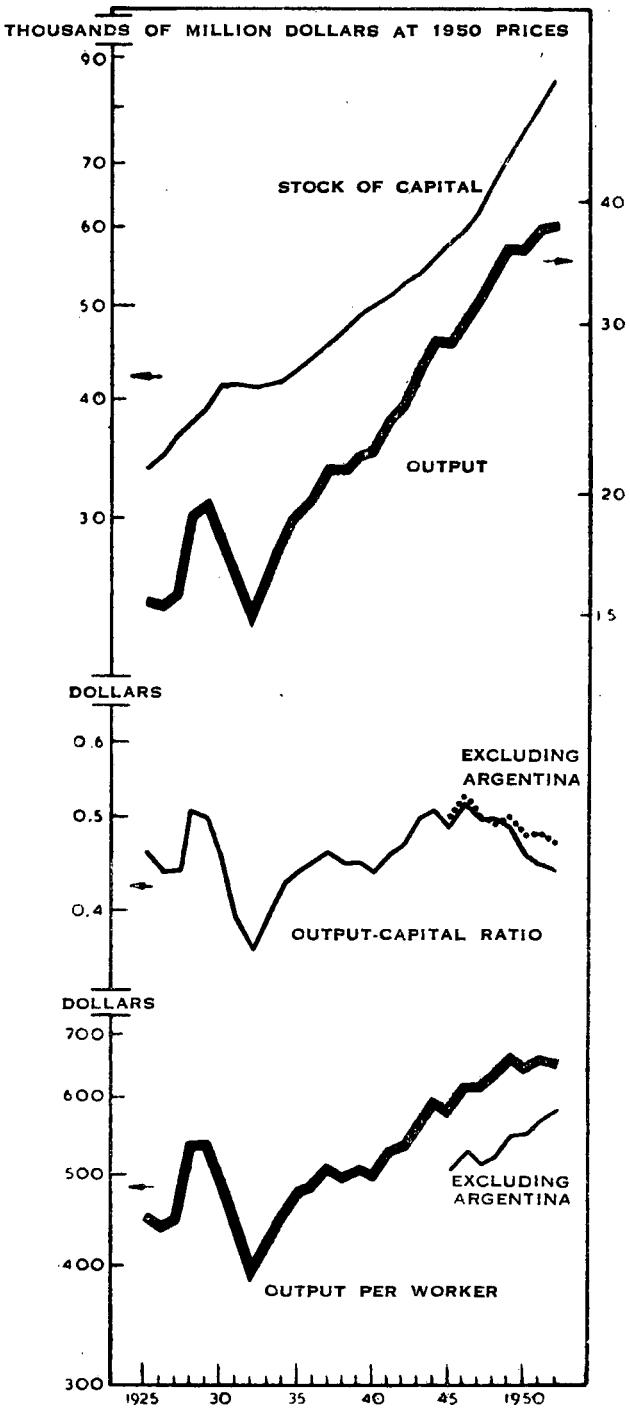
(NATURAL SCALE)

AS A PERCENTAGE OF THE GROSS PRODUCT



PRODUCTIVITY TRENDS

(SEMI-LOGARITHMIC SCALE)



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Returning to the subject under discussion, it will be remembered that the question arose as to whether in view of the instability of economic conditions it was possible to implement the programme of development, however well planned it might be. Realistically, the question should not be put in this way, that is, as to whether or not a programme is possible. It would be wiser to enquire as to what type of programme complies with the characteristics of the economies of Latin America. The choice of programme is determined by conditions themselves. It should be closely associated with measures which will attenuate the consequences of external stability as much as possible. A programme should not only aim at the general goal of as high a rate of economic development as may be practicable, but also ensure that such development shall be regular and orderly with a minimum of fluctuations.

The consequences of external instability on domestic demand and, therefore, on the degree of capital utilization, may be checked by a compensatory fiscal policy in which investment must play a very active role. However, the question remains as to how to employ investment for this purpose when the decline of domestic demand itself reflects the phenomena which similarly influence investment adversely. A carefully planned programme will have foreseen the means of solving this problem. Certainly, as the capacity for external payments contracts, investments with a relatively high coefficient of imports will likewise have to be reduced, though, at the same time, investments with a low coefficient of imports could be increased. This, for instance, is the case of construction in a good many Latin-American countries. The government and the mortage credit institutions could be very effective in this connection.

From another standpoint, the reduction of investments having a high import coefficient would mainly affect imports of equipment for the expansion of production. However, it has already been pointed out that more intensive utilization of the stock of capital would permit the continuation of economic expansion for some years to come, if the incentive of demand is not weakened.

Once the adverse phase of external tendencies has been passed,(the typical fluctuations to which Latin-American economy has been subjected), there may be a recurrence of international trade conditions which would facilitate high import coefficient investments. This is precisely where the projection of a programme, continuously adjusted to conform to changing conditions may be useful. These fluctuations often obscure the scene. Short-term pehnomena and the nature of the difficulties and the problems to which

/they give

they give rise, often obscure the general picture of development and investment needs. If in the phase of depression it was necessary to lay stress on certain types of investments, it now becomes necessary to have a precise idea of the investments postponed, in order to develop them in such a way that, when a new period of difficulties occurs, the country is in a condition to continue growth by means of the compensatory policy indicated above. It would be sufficient to recall the serious difficulties which certain countries have had in the field of energy and transport to justify the importance of this point. It is in periods of favourable conditions that a country is best equipped to take measures which will transform the structure of its economy, thus facilitating future economic growth and the application of an efficient compensatory policy. Reference is made specially to the substitution of imports. This would be the time to promote them in such a way that future expansion of the gross product will not cause external disequilibrium, compelling imports to be restricted or contracted, as has ocurred so frequently. However, precisely because of the abundance of external resources characteristic of these favourable periods the tensions which are germinating in the core of the economy do not appear. They only make themselves felt when the external situation changes and the relative shortage of foreign exchange finds the country unable to obtain all the imports required to maintain, if not raise, the level of activity prevailing in the more prosperious area.

Because the economy of the Latin-American countries is subject to important factors of instability a policy with foresight is required to check its adverse effects. A development programme is a concrete means for evolving such a policy and its forsightedness must necessarily be based on analysis of past events and a projection of the future. Consequently, instability is one of the principal justifications for a programme. The need to accelerate economic growth is another.

International action can facilitate greatly the implementation of a programme, either by methods which will attenuate the sources of fluctuations or by methods which will tend to compensate for their consequences in countries undergoing a process of development. In the latter, investment may play a very important role. Historically, private capital movements have closely followed phases of prosperity and depression, sharpening the effects of such phases. The regular development of the economy requires precisely the opposite, that

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is, the adoption of a sort of compensatory policy by means of which the expanding investment requirements of countries in the process of development may be fulfilled most efficiently.

CHAPTER III. THE APPLICATION OF GENERAL PROJECTIONS

1. The Limited Scope of General Projections

In the preceding chapter a rough application of the general projection was made with two purposes in view. On the one hand it was decided to obtain an idea of the implications of expanding in Latin America's gross product, at the rate experienced since 1935, in comparison with the level of the gross product in more highly developed regions. Secondly, it was also desired to obtain some general idea of the obstacles which would be encountered in accelerating the rate of development in order to close the substantial gap between the Latin American gross product and that of more highly developed regions. These obstacles would be considerable if a persistent attempt were made to maintain a higher rate of growth than that observed heretofore. In order to understand the nature of these obstacles more clearly, a working hypothesis was put forward according to which the per capita product would rise by 4.1 per cent annually instead of 2.6 per cent, as had been the case over the period 1935-51. On the assumption thatthe necessary supplement in foreign capital would be available.- (it is not considered pertinent to discuss this assumption in the present report) - three main difficulties were encountered. These comprise: 1) the difficulty of raising the coefficient of domestic saving in order to minimize the relative magnitude of investment holdings after the period of transition; 2) the need to intensify the process of import substitution in order to obtain a very low import coefficient relative to consumption and investment; and 3) the growth of the gross product would require an extraordinary expansion in agricultural production; the possibility of attaining this cannot be evaluated without a detailed study of specific cases.

However, the object in view is by no means that of determining this high rate of per capita growth, is or is not feasible. This study is concerned with the problems which the method of projection presents with a clarity that cannot be obtained without the hypotheses on which these projections are based.

It is evident, moreover, that it would be impossible to consider an aggregate Latin American programme of economic development without first studying the individual problems of each of the countries in this region.

/These preliminary

These preliminary hypotheses have, moreover, the advantage of providing a preview, and, thereby, preclude the considering of goals out of proportion with the real possibilities of programming. A programme which proposes to achieve too rapid an increase in the rate of growth, however praiseworthy its purpose, is exposed to grave difficulties in its realization. Rather than reduce the projected rate of expansion after overestimating growth possibilities, it is preferable to establish a moderate rate of increase. Once the goals have been achieved during the period of transition, the possibility of accelerating that rate further may then be considered. This was the criterion adopted in applying the methods of the general projections to the two concrete examples which are presented in the present chapter, namely, Brazil and Chile.

I. General Projection of the Gross Production in Brazil to 1962

2. The determination of the Rate of Growth in the Projections

These two examples, despite their differences and the varying rates of growth in their respective projections, have certain characteristic features in common. As was pointed out in the Economic Survey 1951-1952, Brazil's per capita gross product during the past five years was exceptionally high, namely, an annual average of 5,7 per cent. Chile is in a diametrically opposed position with a fairly modest rate of growth. Until a detailed analysis of the problem is completed, it would be hazardous to contend that Brazil could not maintain this rate. However, the rate of growth resulted from exceptional circumstances which are also examplained in the above mentioned document. This by no means implies a premature judgement of the problem as a whole. These projections, in addition to providing a rough approximation of the required volume of investment, also indicate the extent of the process of import substitution which will have to be carried out in order to enable Brazil to maintan that rate.

This set of projections is, therefore, a rough outline which will serve as a guide in the course of a broader study which will be started in a short time. It would be redundant to emphasize the preliminary nature of the calculations shown below.

It is proposed to make a general estimate of Brazil's investment requirements for a given rate of development; subsequently, some simple projections will be presented of the probable growth of demand by sectors. This will be done not with a view to completing a detailed examination of

the projection, but rather for two immediate purposes, namely, to establish the degree of import substitution required and to ascertain to what extent the estimate of capital requirements by sectors is compatible with the first aggregate approximation. This, in turn, would provide an example of the kind of adjustment which must be introduced into the projections.

During the past two years the investment rate in Brazil was almost 20 per cent. This level was achieved with the assistance of compensatory foreign credits which enabled the country to expand the volume of available goods and services over and above the level of the gross product. It is assumed that Brazil will maintain this coefficient, which would enable it to expand at an annual rate of 6,2 per cent. However, for this purpose a net new inflow of foreign capital would be required, but in a form and for a period compatible with economic development, and amounting to 500 million dollars up to 1957. The period of trasition is assumed to continue until 1957 and, in this period, Brazil would have to make an effort to raise the coefficient of domestic saving to approximately 20 per cent. If this can be achieved, the rate of growth of 6.2 per cent will continue, investment requirements being financed by domestic saving, with the exception of the amounts required to cover the remittances of profits and interest and the amortization of foreign debt. The year 1957, however, would be too soon to evaluate the effests of a programme, it would be necessary to wait some years more during which time the rate of growth would continue. It was, therefore, decided to selected 1962 as the terminus of the hypothetical programme period.

It has been pointed otu that the average annual rate of expansion would be 6,2 thus showing a per capita increase of 3,7 per cent. The explanation for this lies in the fact that Brazil has to cover the depreciation of about 2.3 per cent of its capital stock annually, which equals 5.3 per cent for gross product. If this depreciation is substracted from gross investments, a net investment coefficient of 15.6 per cant is obtained, allowing the gross product to expand at an annual rate of 6.2 per cent. Hence, for each 1 per cent of the increment to the gross product which it is desired to obtain, a prior net investment of 2.5 per cent of that product must be made, that is to say, each unit of net capital invested yields a product of 0.40. There are two reasons why this output-capital ratio is lower than athat for other countries, namely, the fact that the coefficient of investment projected refers both to fixed capital and

/inventories and,

inventories and, secondly, there are a series of factors which have exercised adverse pressure on the output-capital ratio in Brazil. It is evident that the improvement of this ratio would attenuate the need for new capital or, alternatively, would facilitate a higher rate of growth. Such improvement appears feasible. Indeed the possibility of improving the efficiency of the productive capacity with little or no investment is very great in Brazil, as is generally recognized. Although in its present stage the Brazilian economy requires large investment in basic sectors, such as transport, energy and heavy industries — all of which are characterized by a relatively low output-capital ratio — it is also true that such investments give rise to immediate improvements in productivity in other subsiduary sectors. The better utilization of industrial equipment which might result from the increase in the supply of energy, would probably more than compensate for the effect of investment in hydroelectric plants on the average output-capital ratio. The same consideration is applicable to investment in transport and particularly in railways.

It is well known that Brazil's economy is characterized by high costs, that is to say, it is an economy in which the output-capital ratio is relatively low. These high costs have tended to rise during the last decades for a series of different reasons, among which, emphasis should be placed on the decline in soil fertility, the utilization of land which is increasingly distant from consumer centres and export ports, the destruction of the most accessible sources of fire wood, (the principal source of fuel), excessive wear and tear on the transport system, etc. All these factors of inefficiency would appear to have been sharpened in the present phase due to the pressure of the accelerated rate of growth. The country is well aware that unless these obstacles are overcome, it would be difficult to maintain the present rate of economic development. However, once this has been achieved, Brazil's economy could probably attain a much higher level of productivity than prevails at present.

Despite these considerations, it was found preferable to consider the output-capital ratio of 0.40, which reflects past experience, as a basis for these preliminary projections, while admitting that better knowledge of the real situation might justify more optimistic projections.

3. Projections of the Capacity to Import and Demand for Current Imports

The data indicated above were used in calculating Table 1 with projections for 1962 based on the data for 1950.

Table 1. Projections of Economic Development in Brazil on the Assumption of Continuation of the Recent Rate of Growth

	1950	1953	1962	% of average annual growth 1953-1962	
	(thousands of million cruzeiros at 1950 prices)			Aggregate	Per capita
Gross product	264.6	312	536	6.2	3.7
Output	251.7	312	536	6.2	3.7
Available goods and services	259.1	314	536	6.1	3.6
Consumption	217.5	254	421	5.8	3.3
Investment	41.6	60	115	7.5	5.0
Stock of capital	624.6	731	1.346 a/	6.2 b/	3.7
Output-capital ratio	0.4	0.4	0.4	-	-

a/ Capital at the end of 1962 including net investments of 1962.

b/ This rate refers to the expansion of capital between the beginning of 1953 and 1962.

Reference must now be made to the first problem outlined above, namely, the appreciable consequences of the high hypothetical rate of expansion in the demand for imported goods and on the degree of substitution required.

With this objective in view, it is necessary to begin by calculating the probable tendency of imports. If their level continues to rise, as it has done in the past,[1/] the annual rate of increase would be 2.3 per cent. This does not imply that Brazil could not increase this rate; on the contrary, analysis of its resources leads to the conclusion that this might be possible. Meanwhile, however, it is considered prudent to base projections on a conservative calculation of this rate of increase. For purposes of simplification, two other assumptions will be established, namely, that the terms of trade shall maintain their 1952 level and that additions to remittances of profits and interest on foreign owned capital shall be

1/ The quantum of Brazilian exports during the present century has increased at an aggregate rate of 1.7 per cent, although during the second quarter of the 20th century the rate was 2.7 per cent. However, this sharp increment was limited to the '30s whereas in the '40s, the annual rate dropped to 1.2 per cent.

/compensated by

compensated by new capital inflows after the termination of the programme's period of transition. Different assumptions might have been made, which would call for more complex projections. However, in this outline it was found preferable to establish simple hypothesis in order to obtain a preliminary view of the problem.

The capacity to import established according to these assumptions must now be compared with the probable expansion of demand for imports. In order to determine the volume of this demand, a series of hypotheses were established which will be referred to below. For the time being, the general results will be shown without further details in Table 2.

Table 2. Hypothesis of the Capacity to Import and the Expansion of Demand for Goods which are at Present Imported

	(thousands of million cruzeiros at 1950 prices)		Percentage increment	
	1950	1962	Annual	Aggregate
Exports	35.9	46.9	2.3	30.7
Capacity to import	32.2	42.1	2.3	30.7
Demand for goods at present imported	30.5	60.3	7,1	97.7
Required substitutions	-	18.2	-	-
Coefficient of imports (as a percentage of the gross product)	11.5	7.5	- 2.5	- 3.5

According to these results the demand for goods which are at present imported would rise at an annual average rate of 7.1 per cent, that is substantially higher than the rate of expansion of the gross product which is 6.2 per cent. In view of this difference, the coefficient of imports which averaged 15.1 per cent for the period 1947-52 will have to fall considerably to reach 7.5 per cent by 1962. It is evident that this would require more extensive substitution of domestic production for imports, to the extent that the average annual rate of expansion of exports (2.3 per cent) could not be accelerated. Undoubtedly, a concrete study of the alternatives is one of the most important and the most interesting aspects of programming in Brazil. It would be necessary to examine the alternative possibilities for increasing exports beyond the level assumed, or undertaking new exports, and to compare these results with the additional substitution of imports which must be made in the absence of further

/exports.

exports. In this connexion it would be necessary to take into account, not only the output-capital ratio obtained in each case, but also the greater risk of fluctuations generally involved in export activities.

Emphasis must be laid on the scope of the projections. The assumption that exports will continue to expand at an average annual rate of 2.3 per cent, does not imply making a forecast, but is merely the establishing of an hypothesis. If exports do maintain this rate of expansion, and if the gross product increases by 6.2 per cent annually, it will be necessary to substitute imports to the extent that the rate of expansion of exports cannot be raised. These projections provide preliminary information on the magnitude of the problem.

According to these projections, demand for goods which are at present imported, would be equivalent to 60.3 thousand million cruzeiros in 1962 (at 1950 prices), as compared with the total of 30.5[1/] thousand millions in 1950. However, the capacity to import would only attain 42.1 thousand million cruzeiros in 1962, making it necessary to substitute 18.2 thousand millions by domestic output, that is, the difference which would exist in 1962 between the demand for goods which are now imported and the capacity to import. It is evident that the need for substitution (or its possible combination with additional increments in exports over and above the rate assumed) would be quite substantial. Of the 29.8 thousand millions cruzeiros increment in demand for goods at present imported, only one third would continue to be imported and the rest would have to be obtained from within the country.

It would be advisable now to consider broadly the possible trends of these substitutions. For this purpose reference will be made to past experience and certain known possibilities with respect to the future.

1/ The differences between the aggregate data for imports and exports shown in the present study and those in the official Brazilian statistics arise from the utilization of different rates of exchange. The need to facilitate international comparisons requires the using of a rate which reflects domestic purchasing power of Brazilian currency more realistically than the official rate of 18.5 cruzeiros per dollar. A detailed analysis of the methods used will be contained in the final version of the present report.

/A summary of

A summary of the preliminary conclusions of this analysis is contained in Table No. 3. Briefly, they are as follows: despite a substantial improvement in the agricultural production, imports will have to continue rising although less sharply. In order to prevent the impact of this increased import demand from pressing too heavily on the available margin for imports of capital goods and petroleum, where the most intensive expansion of demand would occur, intensive substitution of the industrial products now imported will have to take place, both of processed and semi-processed goods and raw materials. This substitution, in fact, will not only prevent the expansion of the imports, but would also reduce the volume of those which have been made in 1950.

Thus, the proportion of imports in the supply of industrial goods and in total consumption in Brazil would be sharply reduced, as may be seen from the two final columns of the table. The proportion of imports of agricultural products would also decline, but not so sharply. However, the volume of imports of capital goods and petroleum, despite the intensive efforts of substitution which will have to be made, would remain relatively high, as compared with total consumption in these categories. Having indicated the general trend of the process, reference should now be made to the possibilities which exist for substitution to the extent that they can be perceived from a preliminary analysis.

/Table 3

Table 3. Hypothesis of the Changes in the Structure of Output and Imports Required for Economic Development During the Period 1953-62

1. Rates of growth

	Demand	Imports	Output
Agricultural products:			
Aggregate rate	55.3	34.4	56.8
Annual rate	4.5	3.0	4.6
Industrial Products			
Aggregate rate	108.0	- 3.0	126.0
Annual rate	8.5	- 3.0	9.5
Capital Goods			
Aggregate rate	110.0	50.0	160.0
Annual rate	8.6	4.6	11.2
Petroleum:			
Aggregate rate	200.0	50.0	6900.0
Annual rate	13.0	4.6	52.7

2. Proportion of imports a/

a) in relation to demand for each group

	1953	1962
Agricultural products	9.5	8.0
Industrial products	11.4	3.7
Capital goods	44.0	31.6
Petroleum	97.8	48.9

b) in relation to consumption or investment

Agricultural products	b/	2.2	1.6
Industrial products	b/	4.0	1.5
Capital goods	c/	28.9	15.7
Petroleum	a/	2.0	1.6

a/ It was assumed that the coefficients of imports for 1953 would not differ substantially from those of 1950.

b/ Proportion of imports to total consumption

c/ Proportion of imports to total investment.

/4. The Preliminary

4. The Preliminary Analysis of the Possibilities of Substitution

From the analysis of Brazilian imports during the period 1948-50, it would be seen that about one fifth of the c.i.f. value of these imports consisted of services (freight, insurance and other services in the country of origin of the merchandise); two fifths represented consumer goods (crops and live-stock products and manufactured goods, including semi-processed goods and raw materials, computed at producer prices) and the remaining two fifths consisted of capital goods (including fuel, also calculated at producers prices).

Product by product a study was made of import possibilities for finished goods in order to determine the residual capacity to import capital goods at the close of the period. With reference to crop and live-stock produce, it was found that the elasticity of demand for unprocessed foods was estimated at 0.7 for the basic period, whilst that of processed foodstuffs was 1.2. It is assumed, as a working hypothesis, that the former of these coefficients would be reduced during the next ten years to 0.5, since such a high income elasticity would in principle be incompatible with the improved diet which should have been established in Brazil by 1962, if per capita consumption expands at an annual rate of 3.3 per cent. The second coefficient would remain constant.

Providing foreign demand for agricultural products rises by about 25 per cent, and domestic demand by the coefficients indicated above, the determination of the level of domestic production should depend merely on the estimated probable volume of imports. Brazil's imports of foodstuffs consist principally of wheat. There are substantial possibilities for expanding the production of this crop, although no precise forecast has as yet been made. As a simple working hypothesis, however, it will be assumed that output could be increased by two thirds by 1962, that is to say, it would rise from 600,000 tons consumed in 1952 to 1 million tons. This growth is certainly not out of proportion with more optimistic prospects contained in recent statements made in Brazil.

On the basis of the above assumptions, the following table was prepared, with projections to 1962, of output foreign trade, and the domestic supply of agricultural products.

/Table 4.

Table 4. Projection of Output and Foreign Trade in Agricultural Products on the Assumption of Moderate Growth

	1950	1962	Percentage annual rate of increment
	(millions of cruzeiros at 150 prices)		
Output for domestic consumption:			
Foodstuffs of vegetable origin	30,337	50,807	4.3
Raw materials of vegetable origin	4,404	9,181	6.3
Foodstuffs and raw materials of animal origin	9,991	16,953	4.5
Output for export (at producer prices)	16,881	21,607	2.3
Total output	61,613	98,548	4.0
Output for domestic consumption	44,732	76,941	4,6
Imports	3,142	4,457	3,0
Domestic supply	47,874	81,398	4.5

Source: United Nations, Economic Commission for Latin America.

In order to obtain a rate of expansion of 4.5 per cent in domestic supply of crop and live-stock products - which is what would be required for the expansion of foodstuffs and agricultural raw materials [1] in the hypothesis of moderate development - imports of these goods would have to rise by 3 per cent, providing that domestic output of wheat would attain 1 million tons. If that is not the case, agricultural imports would grow more sharply than other imports, that is to say, their proportion to total imports would rise.

The possibilities of substituting finished manufactured goods must be studied more carefully than is possible within the limited scope of the present document. On the basis of published plans of expansion and recent studies of the possibilities, certain hypotheses were established in this connexion. It was assumed, for instance, that imports of paper and pulp, representing 14 per cent of the supply of these products in 1949 [2] could be totally eliminated, despite the sharp increase of domestic

1/ Demands for agricultural raw materials was estimated on the basis of expansion of demand for manufactures in which they are incorporated.

2/ The calculation of the supply of manufactured goods refers generally to 1949, when an industrial census was effected.

/demand.

demand. A recent study 1/ on the possibilities of development of pulp and paper industries in Brazil authorizes this assumption. A reduction in the proportion of imported pharmaceutical and chemical products in relation to the total supply of these goods was envisaged, from 23 to 5 per cent, taking into account published expansion plans and the country's possibilities. A reduction from 5 to 2 per cent would be effected in textile imports, and from 7.5 to 2 per cent for leather goods and skins. The prevailing tendency of manufacturing increased quantities of durable consumer goods within the country was expected to persist. The share of the domestic industry in the manufacture of automobiles (in terms of producers prices), would rise from 27 to 60 per cent. This objective can be easily attained by manufacturing whole parts of motor vehicles in the country, or by increasing the proportion of the assembly parts of imported vehicles.

If the substitution of imports of consumer manufactures indicated above can be effected by 1962, there will be a reduction of approximately 30 per cent in total imports in this sector. This reduction would entirely offset the increment foreseen in imports of agricultural products, 2/ so that the volume of consumer imports could remain unchanged.

As was pointed out above, during the basic period, two fifth of imports consisted of consumer goods, two fifths were capital goods and one fifth consisted of services incorporated in the merchandise. Assuming that the latter item rises proportionately with the total volume of imports, that is to say, by 25 per cent, and assuming likewise that imports of consumer goods will remain constant, it will be seen that the capacity to import capital goods will be 50 per cent higher.

5. Hypotheses of the Expansion of Domestic Output

In analysing foreign trade, it is necessary to formulate certain hypotheses concerning domestic output, particularly of agricultural products.

1/ Document (E/CN.12/294)

2/ Imports of consumer goods during the base period would consist of 42.5 per cent of agricultural products and 57.5 per cent of manufactures. If the former of these groups were to increase by 41.8 per cent, and the latter decrease by 30 per cent, the composition of imports would be modified so that the respective percentages would be 60 and 40 and there will be no change in the total volume.

/The expansion

The expansion of the different production sectors must be considered from the standpoint of meeting the demand for consumption and investment purposes within the hypothesis of moderate development.

The expansion of agricultural products forecast in Table No. 4 for the period 1950-62, was equivalent to 60 per cent. However, taking into account its development between 1950-52, it was estimated that an increase of 50 per cent could be obtained in the period, beginning in 1953.

In order to determine the share of demand for consumer manufactures which must be satisfied by domestic output, it is first necessary to project the volume of that demand which, in turn, calls for an assessment of its income elasticity. An analysis of demand for manufactures was based on the censuses of 1939 and 1949 and on import data. This analysis, which was made purely for exploratory purposes, shows a series of income elasticity coefficients varying between 1.2 for textiles and 3.0 for certain durable goods. On the basis of these coefficients, demand for consumer manufactures was projected and it was estimated that it would rise by 108 per cent between 1953 and 1962.

In view of the fact that, during the base period, imports constituted 11.4 per cent of the total supply of consumer manufactures, and that demand for these goods would rise by 108 per cent, while imports decreased by 30 per cent, it was calculated that domestic output would have to rise by 126 per cent in order to meet the projected demand.

The analysis of demand for services requires more information than is available without making careful investigation in each sector. However, certain assumptions will be established on the basis of the data available and this will be used as a working hypothesis. It was assumed that residential building would expand in proportion with the growth of the urban population. It was also assumed that demand for electric power would rise in proportion with the real income of the population and manufacturing output. The data obtained from the industrial census of 1939 and 1949 indicate that demand for electric power in industry rose 1.8 times more than the real value of manufacturing output. Taking into account: a) that during the basic period manufacturing would absorb approximately 40 per cent of the power generated; b) the rate of expansion of the real volume of available goods and services for consumption, and c)

the growth foreseen for the urban population, it was estimated that the probable increase in demand for electric power would be equivalent to 140 per cent by 1962. This corresponds to an increment 1.7 times greater than the growth in the gross product, a proportion resembling that experienced between 1939 and 1949 in the relative rate of expansion of the gross product and the volume of electric power consumption in Rio and São Paulo.

A projection of demand for transport is more difficult, largely because no precise information is available concerning the present deficit of capacity in these sectors. It will be assumed that the total capacity of transport would develop proportionately with the volume of goods moving within the economy, which is expected to increase by 85 per cent.

Having established these preliminary hypotheses concerning the probable development of consumer manufactures, agricultural products, transport and energy, an estimate can be made of demand for equipment in general. This calculation was based merely on the assumption that demand for equipment in each of these sectors would grow proportionately with output. It is possible that in certain sectors and, particularly, in agriculture, there would be intensive mechanization, that is, that demand for equipment would rise more rapidly than output. However, it should also be remembered that technical improvements, particularly in transport and energy, may cause a relative reduction in demand for equipment.

In view of the impossibility of forecasting the trend of all the factors at play, it was assumed that there will be no change in the ratio of output to equipment. A brief analysis of the composition of demand for equipment during the period 1949-51 showed the following distribution: industry 49 per cent; transport 30 per cent; electric power 12 per cent; and agriculture 9 per cent. On the basis of these data and the assumptions established above, concerning the probable expansion of each of these sectors, it was estimated that the probable increase in demand for equipment would be 110 per cent. Having determined the demand for equipment and the capacity to import equipment, it would be easy to calculate the volume of demand to be met by domestic output in this sector. Imports (at producer prices) would contribute 44 per cent of the total supply of the equipment during the basic period. Since this supply will have to rise by 110 per cent and equipment imports will only increase by 50 per cent, it was

/assumed that

assumed that the share of imports would decline by 30 per cent, whilst that of demand to be met by domestic output would increase by 160 per cent.

Briefly, the expansion of consumer manufactures will be 126 per cent, whilst that of capital goods will be 160 per cent. Bearing in mind that during the basic period the latter accounted for 25 per cent of the total, it will be seen that manufacturing output as a whole would have to rise by 134 per cent. The share of capital goods industry in the total would have to attain 29 per cent, whereas between 1940 and 1950 the share rose from 20 to 25 per cent.

Table 5 Increment in the Groups of Activities Indicated, on the Assumption of Moderate Development

	Percentage increase from 1953 to 1962
Crop and live-stock products	50
Total manufactures	134
Consumer manufactures	126
Capital manufactures	160
Transport	85
Electric power	140
Residential building	50

Source: United Nations, Economic Commission for Latin America.

6. Hypothesis of Capital Requirements

Having determined the probable rate of expansion of the principal sectors of economic activity, the capital requirements may be assessed on the assumption of moderate development. This includes basic capital re requirements, sector by sector, in addition to the cost of installation, transport and other services. This estimate obviously calls for a source of information concerning the degree of utilization of installed production capacity as well as raw material resources, sources of energy, etc. The present text will be limited to a brief review designed solely to give a general idea of the nature of the problem.

/The output-capital

The output-capital ratio in manufacturing is assumed to remain constant and was estimated at 0.43 on the basis of census data for 1940.[1/] Having estimated the total value of manufacturing output in 1952, (70 thousand million cruzeiros at 1950 prices), it was considered that the stock of capital in manufacturing in that year amounted to 163 thousand million cruzeiros at 1950 prices. In order to raise production capacity by 134 per cent, the stock of capital would have to be increased to 381 thousand million cruzeiros, involving an additional net capital investment of 218 thousand millions.

An expansion of 140 per cent in the supply of electric power would require the installation of 3,080,000 kw, assuming that in 1950 the installed capacity was 2,200,000 kw. If, based on 1950 prices, an average net investment of 12,000 cruzeiros is assumed for each installed kw, including transmission and distribution, net new capital investments in this sector would be 36,960 million cruzeiros.

Net new capital investment in residential building was estimated at 125,000 million cruzeiros, for the period 1953-62. This estimate is based on a figure of 10,000 millions for net investment in residential housing in 1952 and the assumption that these investments would rise uniformly throughout the period 1953-62 in order to reach a level in 1962 which would be 50 per cent higher than that of 1952.

The estimate of capital requirements for the expansion of agricultural production was based on a calculation made for the base period relative to the share of investment in agriculture in relation to total investment. An estimate was then made of the decrease effected in that proportion by the fact that agricultural production will not rise to the same extent as the gross product. It was found that the share of agriculture production could in fact decline from 22 to 18 per cent of total net investment. In the gross output projection, this would be equivalent to 15,300 million cruzeiros at 1950 prices. Total net investment during the period under

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1/ Unfortunately, the 1950 census is of little value in estimating the output-capital ratio since the data concerning real capital of the enterprises did not take into account the rise in prices reflected in the output and capital data.

//consideration

consideration, would therefore be 119,400 million cruzeiros. Another means of calculating the investment required for agricultural production would consist of assuming that it would rise proportionately with production activity, that is to say, by 50 per cent. Thus, a total net investment of 128,700 million cruzeiros would be required. It was found advisable to strike an average between the two, that is, a total net investment of 124 thousand millions.

In order to calculate capital requirements arising from the expansion of the transport system, two methods were used. The first is based on a comparison of the relative share of investment in transport at the beginning and at the end of the period considered. By this method a total of 109,5 thousand million cruzeiros was computed. The other method consists of assuming that the capacity of the transport system would rise in proportion to the demand for transport and that the output-capital ratio would remain constant. In this case, the estimate was calculated at 94,000million cruzeiros, and once again the average between the two estimates was used, namely, a total net investment of 102 thousand million cruzeiros.

Table 6 shows the calculation of the total net investment required for development in each sector, and a comparison of the total estimate made in the aggregate projections shown in Table 1.

Table 6 Net Investments During the Period 1953-62 on the Assumption of Moderate Development

	Thousand millions of cruzeiros at 1950 prices	As a percentage of the total aggregate projection in Table 1.
Total net Investment Requirements calculated by sectors		
Crop and live-stock activities	124	20
Manufacturing	218	35
Residential building	125	20
Transport	102	17
Electric power	37	6
Total	606	98
Investment calculated in the aggregate projection	615	100
Remainder for other sectors	9	2

Source: United Nations, Economic Commission for Latin America.

/The excessive

The excessive number of simplifications in the calculations shown above, limits the value of the methodology. However, these simplifications can be progressively eliminated as basic data are obtained for each sector. The purpose of an initial simplified estimate, such as the foregoing, is to provide a general idea of the relative magnitude of investment requirements in each sector in order to attain and maintain a given rate of economic development.

At first glance the investment requirement in each sector shown in Table 6 would appear to be covered by the original estimate. However, taking into account the fact that certain important sectors have not been included, it is evident that the investment effort contained in the first aggregate projection is inadequate to attain the desired level of development. One of the most important sectors which has been overlooked, is that of petroleum. In formulating the hypothesis concerning foreign trade, it was decided to assume that the capacity to import petroleum would rise in proportion to the capacity to import capital goods, that is to say, by 50 per cent. Even bearing in mind the freeing of foreign exchange which would be obtained by domestic refineries and the transport of imported petroleum in Brazilian tankers, it is evident that the capacity to import would be inadequate to meet demand in that country. A rough estimate throws light on the seriousness of the problem. Consumption (which is practically equivalent to imports), during the base period, was estimated to be about 150,000 barrels daily. If the economy is to develop, as foreseen in the hypothesis adopted, a substantial increase in this level of consumption would be required. Assuming that consumption would be trebled by 1962, it would have reached 450,000 barrels daily. This hypothesis is merely an extrapolation of the tendency observed during the past 15 years.[1/] Assuming that foreign exchange availabilities would enable the doubling of imports, there would still be

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1/ Between 1937 and 1952, petroleum consumption in Brazil rose at an annual rate of 12.4 per cent. Applying this rate to the period 1953-62, the resultant level would be 3.2 times higher. Only more detailed studies would enable a forecast to be made concerning the sharp upward tendency observed during the past 5 year period and the possibility of its persistence in the future. This tendency reflects partly the relative backwardness of other sectors, particularly of hydroelectric power, and the low relative price of petroleum and motor vehicles favoured by external over-valuation of the cruzeiro. The number of motor vehicles in Brazil doubled between 1937 and 1948, and again between 1948 and 1952.

150,000 barrels which would have to be produced within the country. The oil reserves discovered as of the beginning of 1953 would permit an output of 15,000 barrels, so that domestic production would have to be increased by approximately 135,000 barrels daily. According to current estimates in Brazil, this would call for a net investment of about 13.5 thousand million cruzeiros.

This would exceed the total volume of investment foreseen in the initial projection, and, in addition, other sectors with capital requirements for the projected development of the economy were also not taken into account. Although nearly all the data lack precision and therefore may contain a relatively wide margin of error, this comparison points to a fact of undoubted importance, namely, that the reduction of the relative share of foreign trade in Brazilian economy would involve the need for a greater investment effort. If domestic manufacturing is to provide those articles which were normally imported and paid for with the products of an extensive system of agriculture, Brazil must invest more intensively in its production mechanism. This does not necessarily imply that the output-capital ratio will have to be reduced since it has been frequently observed that the existing stock of capital is being inefficiently used. A more detailed study of Brazilian economy would very probably indicate a higher degree of priority for investment tending to raise the productivity and rate of utilization of existing equipment. If this could be achieved, it would offset the declining tendency in the output-capital ratio which would appear to be one of the main sources of the problem of economic growth, as outlined above.

II. Aggregate Projections of the Gross Product of Chile to 1962

7. The Rate of Growth and the Requirement for Supplementary Foreign Capital

It has already been pointed out that a programme of economic development should not differ too greatly or radically from the rate of growth prevailing in the past. The rate must be raised gradually in order not to demand too great an effort from the economy. In Chile this rate has been quite low. In the Economic Survey for 1949 attention was drawn to the far reaching effects on this country of the world depression, which compounded the effect of the nitrate crisis which began earlier. The Chilean economy has not entirely recovered from these trials. Its capacity for external payments in 1952, despite good copper prices, amounted to 36.6 thousand million pesos at 1950 prices, whereas between 1925 and 1929 it had been equivalent to 59.5 thousand million pesos, computed on the same basis. Inasmuch as the gross product has risen above the level prevailing in the earlier period, the capacity for external payments which then comprised a coefficient of 55.5 per cent (relative to the gross product) was only 24.9 per cent in 1952. The trend of the external terms of trade have exerted a strong influence on this phenomenom. Despite their improvement in recent years, their level in 1952 was 38.8 per cent lower than during the period prior to the world economic crisis era. It is, therefore, not surpising that the coefficient of investment has been unable to recover its former level, and the average ratio of investment to the gross product was 13.3 per cent in 1952, as compared with 17.8 per cent between 1925 and 1929.

These succint facts provide the principal explanation for the relatively slow growth of the Chilean economy. Between 1940 and 1952, the average annual rate of growth of the gross product was 2.5 per cent, which could hardly have been higher owing to the fact that the average annual rate of growth in the stock of capital was only 2.6 per cent. Action must first be taken in this sector, therefore, in order to accelerate the country's rate of growth.

It is necessary to determine what rate of growth could be established as an objective for the development programme. As was pointed out above, no very sharp acceleration of the rate is possible since the obstacles become greater as the rate is increased. Two of these obstacles are of particular importance, namely, the requirement for supplementary foreign capital and the difficulties arising in the substitution of imports.

/With reference

With reference to the former, it was found that Chile would be compelled to resort to foreign capital in order to increase its rate of growth if it could not feasibly contract per capita consumption sharply in order to increase investment, as will be shown below. If foreign capital is to be used, its magnitude, and the commensurate burden of profits remittances, might possibly constitute a serious limiting factor in attaining a high rate of growth within a few years.

Before using figures to confirm this statement attention should be drawn to a statement made in the preceding chapter, namely, that the supplementary requirement for foreign capital is a transitory resource used to increase the gross product to a level which will enable domestic saving to meet the investment requirement to accelerate the rate of growth. This period of transition may last prudently some 5 years in the case of Chile, providing that the programme does not seek to raise the rate of growth too rapidly.

As has already been pointed out, the rate of growth between 1940 and 1952 was at an annual average of 2.5 per cent. It will be assumed that in 1953 a programme is begun which proposes to raise the rate of growth to an annual average of 4.5 per cent (the equivalent of 3.8 per cent annually for the period 1950-62, taking into account the assumption of more rapid depreciation of the stock of capital beginning in 1953). Naturally, 1953 was chosen just as any subsequent year could have been used, as a point of departure, since the present purposes are entirely concerned with methodology. If the new rate prevails after 1953, and consumption expands moderately, approximately 173 million dollars of foreign capital at 1950 prices would be required to maintain this new annual rate of 4.5 per cent during the transition period which would terminate in 1957. [1/] The moderate rate of growth of consumption would, meanwhile, make possible a rise in the coefficient of domestic saving commensurate with the total coefficient of investment required in order to

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1/ As has just been seen, the period of transition would last 5 years and as will be observed when details of these calculations are given, foreign capital investment would preferentially be concentrated in the early part of the programme. This assumes that investment projects are adequately prepared for implementation and that the investments thus effected will immediately become productive. Since this is not a concrete programme, but merely a series of simple projections, these simplifications were made in order to avoid introducing additional data which would complicate the presentation still further. It would be redundant to emphasize that in the case of a real programme, these assumptions would have to be compatible with the real facts.

/enable the

enable the economy to continue expanding at this same rate until 1962, which is envisaged as the final year of the programme.

This annual rate of 4.5 per cent is evidently moderate in comparison with the experience of other Latin American countries. If the rate of Chilean economic development is to resemble that of other countries, foreign capital requirements would have to increase substantially, for example, in order to attain a rate of growth of 6.4 per cent within the same 5-year period (which would be equivalent to a rate of 5.1 per cent for the period 1950-62), and with the same moderate rate of consumption, a total of 230 million dollars of foreign capital would be required.

8. The Expansion of Consumption and the Requirement for Supplementary Foreign Capital

Obviously if the period of transition were extended beyond five years, foreign capital investment would also have to be increased. However, this is not the only determining factor. Given the rate of expansion desired, and the duration of the period of transition, the greater or lesser requirement for foreign investment would depend on the extent to which consumption rises during the period of transition. This aspect must now be studied considering the same period of five years and a moderate rate of growth of 4.5 per cent annually. The same calculations could be made for the relatively high rate of growth of 6.4 per cent, but this would imply an excessive number of calculations when one series is sufficient to develop the analysis. The 173 million dollars of investment calculated for the transition period, is based on the assumption that consumption would rise at the annual rate of 3 per cent over this period. The raising of this rate to 3.6 per cent as an annual average for the five years of transition, would make it necessary to raise the [illegible] requirement for foreign capital from 173 million dollars to 451 million (at 1950 princes).

This fact alone is sufficient to confirm the outstanding importance of the rate of expansion of consumption. There are social factors at play. The annual increment of per capita consumption in Chile was only 1.1 per cent between 1940 and 1952, so that it becomes necessary to determine whether or not the country could avoid inflationary pressures unless it is able to relieve the constant pressure placed on consumption. Naturally, a programme which assumes so small a rate of consumption for the five years of transition

/would require

would require a much lower amount of foreign capital than the indicated 173 million dollars. However, greater practical difficulties would be encountered together with the risk of sharpening the inflationary process, which would hamper the application of the programme to an even greater extent.

For this reason, the calculations were based on the hypothesis of an annual average expansion of 3 per cent in consumption during the transition period, which is equivalent to an average per capita increase of 1.6 per cent, as compared with 1.1 per cent during the period 1940-52, as has already been pointed out. Having completed the period of transition, and attained the necessary coefficient of domestic saving which would permit the gross product to grow at a rate of 4.5 per cent, consumption too could rise at this rate. That is to say, an annual average increment of 3.1 per cent per capita would be feasible since there would no longer be any need to raise the coefficient of domestic saving which would equal the coefficient of investment. An alternative hypothesis of the expansion of consumption at the rate of 3.6 per cent during the transition period, would be closer to the overall growth goal of 4.5 per cent, but would involve too great an increase in the requirement for foreign capital.

From what has been said above, it will be seen that the possibility of attaining a higher rate of growth without a supplement of foreign capital would be quite difficult. Above all it would mean lowering the present level of consumption. If the coefficient of saving is raised in this way, in order to cover the total coefficient of investment which would enable the gross product to rise at a rate of 4.5 per cent annually, then per capita consumption in 1953 would have to fall by 2.9 per cent, as compared with 1952, and that of 1954 would have to drop 1.7 per cent. During the next three years consumption would then increase more rapidly than with the foreign capital inflow since there would be no added burden of remittances of profits and interest.

This more rapid increase of consumption, after 1954, would amply compensate for the decrease in the first two years. In this case, the average annual increase in consumption would be 3.2 per cent as against 3 per cent in the case of an inflow of 173 million dollars.

9. The Difficulty of Restricting Consumption

The restriction of consumption seems quite simple on paper but, in fact, obstacles might be encountered which might be practically impossible to eliminate. The restriction of consumption during the early years will be essential in

/order to

order to effect a sharp increase in investment which, in turn, gives rise to an increment in the import of capital goods. To effect this increase it would be necessary to cut down consumer imports sharply if the development of the domestic economy is not to be affected by substantial decreases in imports of raw materials and fuels. A shortage of foreign exchange would compel Chile to effect a sharp reduction in its imports of finished consumer goods. Indeed, per capita imports os such goods would have to be lowered by 47.5 per cent in 1953 and 48.2 per cent in 1954, as compared with the 1952 level. In the following years this pressure would be reduced so that by 1957, the end of the transition period, the reduction in relation to 1952 would be equivalent to 7.4 per cent.

Chile is perhaps an extreme example, but for that very reason it reflects the type of difficulties which are encountered to a greater or lesser degree in most of the countries of Latin America when an attempt to increase the coefficient of investment is made. In the best of cases, inflation may raise the coefficient of saving to the detriment of popular consumption, but the transfer of such savings abroad, in order to obtain capital imports, is often hampered by obstacles such as those described above.

Consequently, the acceleration of the rate of growth, as was pointed out in the first chapter, would be limited by difficulties in increasing the domestic saving and in transferring this abroad when foreign capital is required. When this is done, the limiting factor affects the volume of such capital, and the amount rises proportionately with the rate of expansion of the gross product and the increment of consumption, at the expense of private savings during the period of transition.

Even if these obstacles can be removed, there still remain other difficulties in the substitution of imports in a measure with the improvement in the per capita product.

10. Projection of the Growth of the Capacity to Import and Demand for Goods which are at Present Imported

With this purpose in view, an attempt was made to compare the rates of growth of the two hypothesis of development of the gross product used above and different hypotheses concerning the capacity to import. This was done with a view to indicating the effort of substitution which would be required in each case. These comparisons are made purely for illustrative purposes and should only

/be used

be used in order to suggest the changes in the structure of foreign trade and of the economy which will be essential in order to render economic development compatible with the tendencies of the capacity to import.

In the chapter dealing with foreign trade a detailed analysis is made of three hypotheses of expansion of the capacity to import, based on given assumptions of foreign demand for Chilean products. In the case of maximum growth, the capacity to import would increase from 298 million dollars in 1950 to 432 million dollars in 1962, that is, an annual average rate of increase of 3.1 per cent. In the moderate hypothesis of expansion, which was adopted as a basis in the above mentioned chapter, that capacity would attain a level of 381 million dollars by 1952, that is, its expansion would be at an annual average rate of 2.1 per cent. In the case of the minimum hypothesis of development, the average rate of growth of the capacity to import would be 1.2 per cent annually, thus reaching a total of 343 million dollars by 1962.

These estimates of the capacity to import must be compared with the growth of demand for imported consumer goods, providing no substitution whatsoever takes place until 1962 in order to determine the proportion in which it must be substituted, and in this case, this demand is projected for consumer goods and raw materials which are at present imported, in the following chapter. In order to estimate requirements for capital goods imports, it may be assumed, as a working hypothesis, that they will not be replaced by domestic output, so that in 1962 they would retain the same proportion to total investment as in 1950. On this basis, total demand for goods which are at present imported would rise from 247.3 million dollars in 1950 to 512 millions in 1962. That is an increase of 6.2 per cent on the assumption of moderate growth of the gross product at an annual rate of 4.5 per cent. Moreover, the different services which must be paid abroad would amount to 62 million dollars. On the assumption of accelerated growth of the product, that is, at 5.1 per cent annually, total demand for imports, for which no substitution was envisaged, would rise to 757 million dollars, thus exceeding the 1950 level by 206 per cent.

The lowest degree of substitution would be that obtained from a combination of maximum growth in the capacity to import and moderate growth of the gross product. It would then be necessary to substitute 24 per cent of the goods which are at present imported in order to make the hypotheses compatible with one another. On the other hand, by combining the minimum hypothesis of growth of the capacity to import with accelerated expansion of the gross product, 67

/ /per cent

per cent of the goods presently imported would have to be substituted. This example could be carried to an extreme by assuming that the capacity to import would remain at 1950 level thereby requiring a substitution of 72 per cent of goods presently imported. The remaining combinations are shown in the following table.

Table 7. Efforts of Substitution Required in the Different Hypothesis of Growth of the Gross Product and the Capacity to Import

(as a percentage of total demand for goods which are at present imported, in the event of there being no further substitution prior to 1962)

Growth of the capacity to import	Growth of the gross national product	
	Moderate	Accelerated
Maximum	24	56
Moderate	34	62
Minimum	42	67
Nil	51	72

Source: United Nations, Economic Commission for Latin America.

It is evident that changes in structure of output (and, to a great extent, that of consumption) which are required in order to substitute 20 per cent of imports, are less numerous than those required to replace 72 per cent of foreign goods. The efforts required in the latter event would be more than three times greater since the changes in the structure will give rise to increasingly complex problems involving the adoption of new techniques, the utilization of scanty natural resources and the adoption of foreign trade controls. Strictly speaking, a simple calculation would prove the incompatibility of the hypothesis of a constant capacity to import with a maximum growth of the gross product. Imports of raw materials and foodstuffs which technically cannot be substituted in Chile (coffee, cacao, cotton, etc.) would be equivalent to 55 per cent of possible imports over and above which services would have to be substracted from the capacity to import. Even assuming that it were possible in this case to substitute 70 per cent of the requirement for capital goods imports, nothing would remain to meet imports of raw materials and foodstuffs which cannot opportunely be substituted, nor

/for any

for any other type of consumer commodities.

A reduction in the capacity to import stemming either from a decrease in the quantum of exports or from a deterioration in the terms of trade, would increase the obstacles to development to a greater extent, not only because they would call for a higher rate of substitution than is indicated in Table 7, but because of their depressive effect on the output-capital ratio.

It will now be advisable to make a short reference to the problems arising from the different alternatives of substituting imports or increasing exports and the effect of these measures on the rate of growth. A more detailed reference would be found, in another chapter, on the general criteria and their application to concrete cases in the Chilean economy. Let it suffice here to indicate the nature of these criteria.

In fact, the criteria of priority applicable to substitution of imports and to the expansion of exports, are not strictly comparable. There is naturally a general standpoint, described in the first chapter, which consists in the maximum increment of the gross product obtained by means of a given increase in investment. However, the application of this criterion in the case in question, in addition to requiring the determination of the output-capital ratio at full capacity operation, would also involve a study of the prospects of utilization and yield of that capital in terms of the projections of demand and of the terms of trade. However, foreign demand is more difficult to forecast than that of the domestic market and, above all, it is practically uncontrollable. This is the reason why investment for the expansion of exports differ completely from all the remaining categories, including those required to substitute imports. Given the volume of substitutions compatible with a fixed rate of growth, the choice of substitution of imports would depend on the criterion selected as is explained in detail in the above mentioned chapter.

CHAPTER IV. PROJECTIONS BY SECTORS, OF ALTERNATIVE HYPOTHESIS OF GROWTH

1. Analyses and Projections of Demand

Introduction

In the preceding chapters, the problem of growth of the economy was discussed in terms of the gross product, that is to say, in its widest aspect. However, the basic objective in formulating a programme is to ascertain the form of expansion of each sector of economic activity in a given hypothesis of development, since this is the only way of assessing the total investment requirement which the economy should absorb in each branch of activity. In the aggregate analysis estimates were made of the gross and net investment which the economy would require, provided certain conditions obtained, in order to reach a certain rate of development. The problem now arises of setting aside the aggregate estimate in favour of an assessment of the approximate investment requirement in individual sectors of activity.

The present chapter will show how it is possible to progress from the global estimates and projections to estimates and projections for individual sectors or groups of economic activity. As was shown in detail above, the technique of development programme-formulation consists in combining global projections of the gross product, of investment and consumption, with a study by sectors of the dynamic of demand, of current trends and of development potentialities. The study by sectors is naturally closely connected with the global analysis, since the projection of demand by sectors is based on an aggregate projection of the available goods and services for consumption. However, once a hypothesis is established concerning future demand in a given sector, the means of satisfying such demand will be found in an individual study of the possibilities of the development of output in that sector and of the need and advisability for substituting imports. Having ascertained the needs which may be supplied by domestic output, concrete production conditions must be studied in order to assess investment needs in a given sector.

Projections by sectors are therefore derived from aggregate projections insofar as the expansion of demand is concerned. However, they are entirely independent of the aggregate projections as regards meeting demand

by domestic output or imports, and also as regards the evaluation of investment requirements to increase production. This being the case, in order to begin the study by sectors, a hypothesis is essential concerning the probable development of available goods and services for consumption, from which can be obtained the projections of demand for products placed in the hands of the final consumer.

It has currently been observed that when any increase takes place in the volume of the goods and services available for consumption, demand for different categories of goods and services does not rise commensurately. However, economic analysis enables the establishment of correlations (based on economic experience) between the expansion of available goods and services for consumption and the changes in demand for each category of final goods. In this way a series of demand elasticity-coefficients can be obtained in terms of the available consumer goods and services, which can be used as a basis for the special projections of demand for final goods and services.

It should be pointed out that projections based on coefficients of the type indicated above, involve a series of simplifications, particularly as regards relative future prices and possible changes in the distribution of income. While recognizing the importance of a wider study of these two aspects of the problem, this work will be based on the hypothesis that the relative prices paid by the final consumer do not change[1/] to any significant degree, and that the alterations in the distribution of available goods and services are not sufficiently great to modify to any extent the structure of consumption.

However, there is a more important difficulty which cannot be side-stepped, and that is, that there is a large volume of goods and services which do not reach the final consumer since they are absorbed in the intermediary stages of the productive process. This, for instance, is the cases of capital goods, raw materials and semi-manufactured products, as well as a large proportion of transport and energy services which are negotiated as between producers. Demand for these products is determined largely by demand for

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1/ As was shown elsewhere, the relative prices paid by the producer will change in some cases, but improvements of this kind are due to differences in the increment to the physical productivity of labour.

the final product in which they are incprporated, but in this case it would not be sufficient to ascertain the available goods and services for consumption in order to project demand. It is also essential to know approximately what proportion of demand for the commodity in question can be met by domestic output.

The projection of demand by sectors is therefor based on two general criteria: a) the probable pattern of consumption in the case of products which reach the final consumer; and b) approximate estimates, based on such consumer habits and studies of the interrelation of economic activities in the case of goods absorbed by the productive process. Thus, in the case of agricultural products, demand for foodstuffs was based on coefficients of income-elasticity and demand for raw materials on estimates of future output in the sectors in which they are absorbed. In the case of industries, the projection of demand for consumer manufactures was based on coefficients of income-elasticity, and for intermediary products and raw materials it was based on coefficients of product-input, as in the case of agricultural raw materials. The projection of demand for capital goods is a question apart, which must be discussed later. However, it may be stated now that the projection of demand for capital goods is based on an estimate of equipment requirements for replacement and on coeffcients relating the productive capacity with the respective net product for each activity.

Lastly, reference should be made to the price levels considered for the different products. The price paid by the final consumer for a given product is equivalent to the sum of the incomes added by the factors of production organized in a series of productive units. It is essential to break down this series into its component parts in order to identify the sectors in which output will have to be increased in the event of an expansion of demand. An increase in the demand for clothing, for instance will have repecurssions in industrial sectors engaged in garment-making, textile manufactures, chemicals, crop and livestock produce, transport, commerce, the production of energy etc. It is essential to determine the volumen of value added in each of these sectors, incorporated in the final value of each unit of clothing, in order to ascertain the relation between an expansion in the demand for clothing and the corresponding increment of demand in each sector. As will be shown below, it was impossible, owing to

the analysis of consumption, to use data relative to consumer expenditure in order to break them down to obtain the component parts in terms of value added. However, indirect methods were employed to achieve this objective.

Demand for Crop and Livestock Produce

The characteristic principle of this demand is the tendency of its income-elasticity coefficient to decline as the per capita product rises. It has currently been observed that the proportion of individual income spent on foodstuffs tends to decline as income rises. This comment, however, is limited to demands for foodstuffs, since that for other agricultural products stems from the final products incorporated therein.

The low income-elasticity of demand for foodstuffs can be attributed to the fact that the proportion of the gross product applied to crop and livestock products tends to decline. In the United States this proportion fell from 34 per cent in 1870 to 17 per cent in 1900 and to 11.6 per cent in 1939. A preliminary calculation for Brazil showed a decline from 25 to 16 per cent between 1919 and 1949.

The tendency in the demand for foodstuffs to increase less than the real per capita product, is of fundamental importance from the standpoint of the dynamics of development. It explains why agriculture should only play a dynamic role in development when it responds to the incentives offered by foreign demand. An independent increment of agricultural output for the domestic market unrelated to changes in output in other economic sectors would tend to be reflected in a decline of agricultural prices, since increased output in this sector cannot create its own demand.

If the supply of foodstuffs increases and the prices remain stable, there would be no reason for consumers to increase their expenditures on foodstuffs in which case the increment of agricultural output would remain unsold. The second hypothesis would be one of an increased supply of foodstuffs and a decline in their prices. The probable attitude of consumers in this case would be to increase the amount purchased for the same outlay in money or, alternatively, to maintain the volume purchased thereby reducing their expenditure in this sector. The former attitude would be the most likely in the case of consumers in low income groups, while the second would be representative of higher income groups. This explains the substantial difficulties in development programmes of the agricultural

/sector, when

sector, when the rate of growth of the economy as a whole, is not taken into account..

Another consideration of a general nature, which must be made from the outset, concerns the fact that demand of foodstuffs is not uniform throughout a country or region. It is necessary to take into account conditions of climate, of labour activities, etc. This type of study will have to be carried out for the different regions of each country. The Food and Agriculture Organization of the United Nations[1/] carried out a preliminary survey of this type, the results of which are shown in Table 1, insofar as they affect the Latin American countries.

Table 1: Availabilities and Requirements of Foodstuffs in Selected Latin-American countries

	Recent Level	Requirements	Percentual difference
	(in calories)		
Argentina	3,190	2,600	22.7
Brazil	2,340	2,450	- 4.5
Chile	2,360	2,640	-10.6
Mexico	2,050	2,490	-17.6
Uruguay	2,580	2,570	0.4

Source: United Nations Food and Agriculture Organization (FAO).

The data presented in Table 1 are evidently an approximation and conceal regional discrepancies within the same country. They are, likewise, an approximation in that they refer to availabilities and not to actual consumption of foodstuffs. Whereas it is essential to take into account that waste is greatest where foodstuffs are relatively cheapest. Lastly, attention should be drawn to the fact that calculations of this type refer to national averages. If the unequal distribtution of income is borne in mind together with the fact that medium and high income groups will not content themselves with satisfying basic needs, it will be understood why it would not be enough to cover the deficit in order to provide basic data for the whole population. Even in countries where the supply of foodstuffs far exceeds the aggregate needs of the population, a fair proportion of the inhabitants are inadequately nourished.

1/ Food and Nutrition, "Preliminary Report on the Social Situation" (E/CN.5/267), April 25, 1952.

/In beginning

In beginning the study of demand for foodstuffs in a given country, it is essential to consider the problem as a whole, and to determine an average diet of the population in calories. Moreover, it is essential to determine the relation of that diet to the average income of the population. This has been done in Chart 1, where per capita levels of income and average diets, in terms of calories, are compared with different countries. Two general observations arise from this chart. First, the diet of certain countries is apparently below the level which could be expected from their per capita income. The second observation is that the income-elasticity of demand for foodstuffs (measured in terms of calories) differs greatly in countries where the level of income is low (A), medium (B) and high (C).

In analysing the demand for foodstuffs, these two observations should be borne in mind. If the average diet of a country is below its level of income, it would be advisable to determine the causes of this anomaly. They may lie in the availability of natural resources — relative shortage of arable land — or in the organization and utilization of such resources, including disequilibrium between the system of land tenure and the availability of capital for investment in it.

A further comment should be made concerning changes which can be foreseen in the coefficients of elasticity. An increase of 50 per cent in the per capita product, established by a programme, may exercise totally different effects on that coefficient according to whether the basis is 200 or 300 dollars.

Again, glancing at the chart, attention is drawn to the typical pattern of demand for foodstuffs in certain countries. In Argentina, for instance, there was a high income-elasticity, although average diet was perhaps among the most abundant during the basic period.

These observations are of importance in the calculation of the income elasticity coefficient of the demand for foodstuffs, which is generally based on established consumer habits. In setting the problem as has been done, new dynamic elements may be introduced into this calculation.

After projecting aggregate demand for foodstuffs on the basis of the indicated coefficients, the next step consists in determining its composition. It has been observed that the income-elasticity of demand for foodstuffs differs according to the commodity considered. After certain per capita limits on

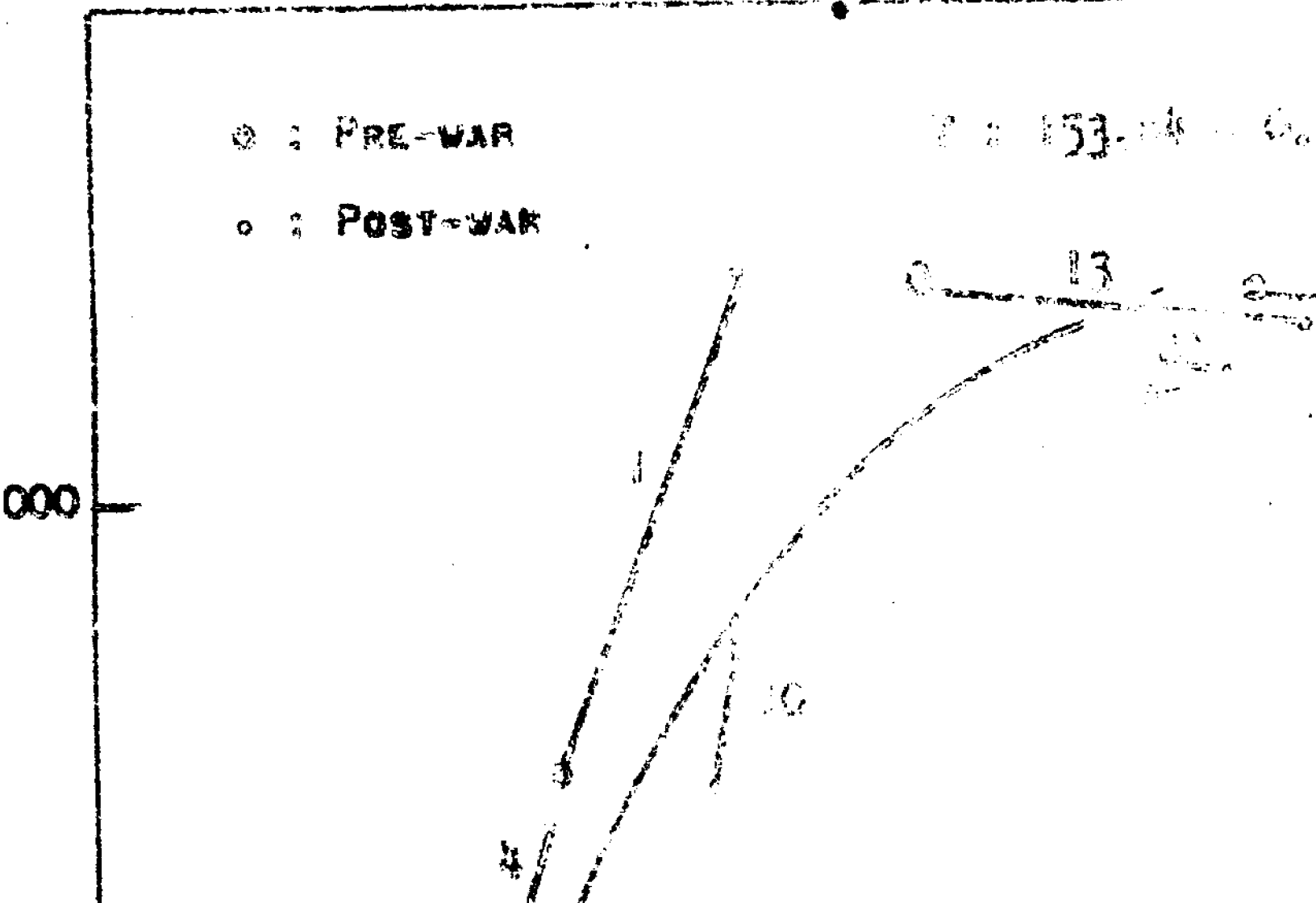
/income have

RELATIONSHIP BETWEEN [illegible]

1. Argentina
2. Brazil
3. Colombia
4. Cuba (?)
5. Chile (?)

[illegible]
6. [illegible]
7. Peru
8. [illegible]
9. [illegible]
10. [illegible]

Y CALORIES PER CAPITA



income have been attained, demand for certain foodstuffs appears to decline proportionately in inverse proportion with the increment to the gross product. A process of substitution of low price foodstuffs by other more expensive articles thus begins. Hence, certain foodstuffs which are barely consumed by high and medium incomes have a high degree of income-elasticity, which is frequently above unit, whereas others which are more popularly consumed, tend to have a negative elasticity as development progresses.

The process of substitution of low quality food products by those of a better class during periods when real income rises, may however be entirely altered by changes in relative prices. In Brazil, for instance, a decline of 20 per cent in per capita meat consumption was experienced between the pre-war and recent years, despite the appreciable expansion in per capita available goods and services. This decrease was offset by an increment of 20 per cent in per capita consumption of cereals and tubers, 20 per cent in sugar, and other varying percentages in other foodstuffs. Thus, this is the reversal of what might have been expected, that is, a high quality foodstuff has been replaced by others of a lower quality. Indeed, in relation to the price of meat that of rice dropped 21 per cent, that of sugar 24 per cent, that of manioc 44 per cent and bread 45 per cent during the same period.

In view of this, one might well inquire as to which is in fact the normal position, that prevailing now or that observed in the pre-war period. This question could only be answered on the basis of a careful study on the current supply situation. Theoretically the two situations might be normal, providing structural changes had taken place in supply. Let it be assumed, for instance, that available land no longer enables extensive stock raising, or requires transport over longer distances and which also call for substantial investments in order to raise the productivity of these activities. Under these conditions changes in the relative costs of foodstuffs would probably be inevitable.

The coefficients of income elasticity of demand are, therefore, of limited use in dealing with highly substitutive articles when the real conditions of supply are known. However, they are undoubtedly of importance if it is borne in mind that in order to study supply a prior notion must be obtained of the total expenditure of the population in this sector and also a

first approximation of consumer spending habits.[1] The changes indicated by an analysis of supply will be introduced in the first plan.

Demand for Manufactures

The dynamic of demands and manufactures differs entirely from that of foodstuffs. Contrary to what occurs on expenditure on food, that on consumer manufactures rises proportionately with the growth of the gross product. From what has been pointed out above, the data available for Brazil show that the proportion of national income corresponding to agricultural produce declined from 25 to 16 per cent between 1919 and 1949, while that used for consumer manufactures, computed at factory cost, rose from 15 to 19 per cent. The same is applicable to both past and present expense of countries in a state of development.[2]

The high income elasticity of demand for manufactures is due to industry's dynamic role in economic development. Contrary to what occurs with agriculture, the expansion of the industrial sector creates a fair proportion of its own demand. Considering the theoretic example of a closed economy, in which the income-elasticity of demand for manufactures is 1.5 and represents 40 per cent of total consumer expenditure, at market prices. The remaining demand, 60 per cent of consumer expenditure, would have an income-elasticity of 0.66 if private savings are discounted, since the weighted average of the elasticities would have to be 1. Let it be assumed that an independent process of growth begins in the industrial sector and that its output and that of dependent services rise by 25 per cent. There would thus be an increment of 10 per cent[3] in the real gross product, 15 per cent in demand for manufactures and 6.6 per cent in remaining demand. In addition, if agricultural produce expands 6.6 per cent, the real gross produce would rise by 4 per cent (6.6 per cent of 60), thus enabling an additional increment of 6 per cent for demand for manufactures. In brief, a 25 per cent increase of manufacturing

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1/ An analysis of this kind, but carried out for different purposes, was made in Great Britain. See H.S. Houthakker, Estimates of the Free Demand for Rationed Foodstuffs, and J. Tobin, The Economic Journal, March 1952.

2/ Colin Clark calculated the share of manufactures, at factor costs in relation to the gross national product of a number of countries. From the beginning of the century to the years immediately preceding the second World War this proportion rose from 18 to 22 per cent in Germany and from 12 to 17 per cent in Austrialia, etc. It should be remembered, however, that these data do not refer to the demand for consumer manufactures, since they exclude industrial processing of foodstuffs and include the output of equipment and export manufactures. See The Conditions of Economic Progress, Second Edition.

3/ In order to simplify this, the gross national product would be made equivalent to consumer expenditure computed at factors cost.

output would raise demand for consumer manufactures by 21 per cent, enabling 84 per cent of the new output to be absorbed. As a part of that output would consist of capital goods, demand for which would also have to rise, it may be assumed that the stimulus of growth arising from the expansion of manufacturing output would be able to proceed.

It would be interesting to observe what occurs if instead of the 25 per cent independent expansion of output being located in the manufacturing and dependent service sectors it were to occur in the remaining activities among the most important of which are agriculture. A 15 per cent increment to the gross national product would be obtained together with a 22.5 per cent rise in demand for manufacture and 10 per cent in demand in the remaining sectors. It will be easily seen that the disequilibrium will be produced in the sector which first expanded its output, since a substantial part of this new production would be unsaleable.

Demand for manufactures, contrary to what occurs to foodstuffs, cannot be considered as a whole since it must supply very different needs. Consequently, an initial aggregate projection of such demand would be of little use. Demand must be analysed sector by sector so that by means of process of integration the behaviour pattern of aggregate demand can be determined. There is much less likelihood of certain consumer manufactures being replaced by others than applies in the case of foodstuffs. Hence, the changes in the relative prices of manufactures are of less importance in the pattern of demand. The pattern of demand for manufactures has hardly been studied and available information is very fragmentary. Moreover, the great variety of consumer goods complicates their classification into categories, which would facilitate the measurement of their physical consumption. The difficulties might be overcome if adequate price indices were available for each group of articles. However, the information concerning price changes in manufactures is scarce, even as regards their consumption.

In view of the lack of adequate price indices and the precariousness of the income-elasticity coefficients based on expenditure as instruments of projection of demand, a more precise analysis was attempted for certain manufactures, the consumption of which was known. The known durable typical manufactures were used in the first place, namely textiles and paper. In the analysis of demand for textiles certain difficulties were encountered owing to the indices rate of substitution as between the different fibres. This substitution arises both from alterations in their relative prices and also in the real gross product. Taken as a whole, the coefficient of income-elasticity of the main fibres was shown to be 1.3 for Argentina and Chile, and

1.2 for Brazil.[1] The lower coefficient of Brazil may possibly be due to the country's climatic conditions. In the case of demand for paper very small coefficients were obtained, namely, between 2 and 2.5 for Brazil, Colombia, Cuba, Chile and Mexico. Argentina's coefficient is extremely low reflecting the abnormal paper supply conditions of the past few years.

The analysis of demand for durable consumer goods is even more complex owing to the variety of the products involved and the abnormal conditions charactersitic of their supply during the past ten years. The analysis began with the demand for furniture as being representative of domestic output. A coefficient of 2.7 was computed for Brazil and a higher one, namely, 3.0 for Argentina. Demand for motor vehicles was thus analysed as typical of durable imported consumer goods. Brazil's coefficient was extremely high, namely, 6 whilst that of Cuba was 3.3. Chile's coefficient was very low and that of Argentina negative.

The abnormality of the pattern of demand for imported durable goods is sharply defined in many Latin American countries. For instance, the high purchasing power of Brazilian currency abroad has gradually strenghthened demands for motor vehicles. In Argentina and Chile quantitative import controls have drastically restricted supply. However, the data shown for Cuba is representative of a market on which supply and demand are free of any control.

Demand for Intermediary Goods

In the two preceding sections the dynamics of demand for finished consumer goods was examined. The technique of projecting such demand was shown to rest on the fact that such demand depends on the real volume of available goods and services for consumption.

However, there is an appreciable volume of goods which are used in the productive process and demand for which is only indirect and is much less visibly affected by the changes in the real product. These are the commodities which the productive process absorb in the intermediary stages.

Some of them closely followed demand for finished goods. For instance, by observing the trend of real product, it is possible to determine demand

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1/ As was pointed out above, all these estimates are based on the expansion of available goods and services for consumption.

for the pulp required in the manufacture of paper practically as accurately as demand for paper itself. Barring technological changes which may modify the input of pulp required to manufacture one ton of paper, demand for pulp simply reflects the demand for the finished product.

It is more difficult to solve the problem of intermediary products used for multiple purposes in productive activities. It is not sufficient to determine the rate of expansion of real product in order to project future demand of industrial chemicals. Perhaps a forecast of the expansion of manufacturing output as a whole might provide a better approximation. However, even in this case little accuracy could be ensured particularly within relative short periods of time.

The more diversified the use of an intermediary product, the more complex is the forecast of its demand. It has been seen that there is no particular difficulty in foresseing demand in the product used for a single purpose, such as pulp in the manufacture of paper. The same is true of cotton and of oil, and to a lesser extent of leather, rubber, lumber, etc. However, other products must be taken into account such as caustic soda which is used in the manufacture of rayon, paper, cotton textiles, pharmaceutical products, building materials, etc. Demand for these products is not only influenced by the expansion of manufacturing output, but also by changes in the structure of that output.

Perhaps the most complex of these is the demand for metallurgical products, which will be studied in the form in which they leave the steel and rolling mills. Then basic demand arises from the building industry and the mechanical industries. The output of building industry, insofar as residential structures are concerned — is a finished product since it is used to render direct service to the consumer. However, the products of mechanical industries may be finished goods (durable consumer goods) or intermediary goods and are used in almost all economic activities, including the mechanical industry itself. The analysis of demand for metallurgical products for purposes of projection would, therefore, have to be based on a study of:

a) demand for finished goods in which metals are used as a main raw material;

b) demand for building materials; and

c) demand for equipment of all types.

The projection of demand for finished consumer goods is fairly simple

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and has already been commented upon. Once output of refrigerators, byciles, automobiles, etc. has been projected, it is relatively easy to determine the amount of metal and the types of iron and steel products required.

The second group (b) gives rise to greater difficulties. On the one hand it is essential to consider residential building, demand of which depends on the growth of the population and of the real product, as well as building for productive activities, demand for which is determined principally by investment in the different sectors. Lastly, there is the demand for structures for public works which depends on the government's investment programme. The third group, comprising demand for equipment involves the greatest difficulties. The forecasting of demand for equipment as will be indicated below, requires an analysis of expansion projects in practically every productive sector. This is, undoubtedly, one of the most difficult problems encountered in formulating a programme.

Demand for services

If the income arising from industrial and agricultural activities is subtracted from the geographic income at cost factors, the remainder will be found to be equivalent to domestic output of services. The value of this output does not necessarily correspond with service expenditures within the country, since in practice every country imports or exports a given net amount of services. However, the difference even though it may be significant in the sector by sector analysis, is not so when the problem is studied as a whole. Hence, it will be assumed that demand for services is equivalent to the total output thereof.

The share of services in the gross product tends generally to rise with economic growth and the amount of the per capita real product. However, it is difficult to measure this tendency since services rendered cannot be measured in view of the variety and the importance of the subjective elements in their valuation. Consequently, the analysis is generally based on general expenditure for services which, from the dynamic standpoint does not correspond to the volume of services rendered.

In comparing the changes which have occurred during the given period of time in expenditure on services with those for other purposes, it will be necessary in the first place to study the possible alterations in the items of trade of that sector with others. Secondly, the possible difference

between the increment in the physical productivity of the labour force rendering services must be compared with that of labour force in other sectors.

The example of the first of these differences is to be found in the trend of railway rates and housing rentals in certain Latin-American countries during the past few years. The price of these services arbitrarily remain below the general price level and, consequently, there was a decline in their contritubion to the gross product. This is a different phenomenom but its effects resemble those of the relative decline of agricultural prices during periods of prolonged depression and perhaps for even longer periods in certain countries. A deterioration in the terms of trade of one sector of economic activity implies that the remuneration of the factors - some or all of them - engaged in this sector, has decreased in relation to the remuneration of identical factors used in other sectors. For instance, by not allowing transport rates to rise adequately during periods when prices as a whole are being raised, lowers the real remuneration of the labour and capital engaged in transport undertaking. In these cases since it is more difficult to lower the remuneration of the labour factor, the mobility of which is higher, the full impact falls on the remuneration of capital. This explained the need for subsidies and the fact that equipment is not renovated, both of which phenomena has been frequently observed in the recent past.

The problem of the disparity in the increment of the physical productivity of labour is different. If this productivity rises more in the production of the goods than in the production of services, it is essential that its share in the gross product should rise likewise[1/] in order not to reduce the remuneration of labour in this sector relatively. That is to say, that the price per unit of services rises in proportion with the price per unit of goods. In fact, since one hour of labour to-day produces twice the volume of goods obtained 50 years ago, and only one and a half times as much service, it is to be expected that the change in the ratio of the price of the goods to services shoulf be favourable to the latter. In this case if total relative consumption of goods and services were still the same, the proportion on services would necessarily have increased.

1/ This increase could not occur if the aggregate amount for the service in question were to contract as a result of its higher price.

An analysis of this type was carried out by Colin Clark over a long period and for a good many countries. This study showed that productivity per man-hour has generally risen to a greater extent in manufacturing than in services. 1/ This phenomenom partly explains the expansion of the share of services in the gross product as may be seen from the data concerning the several countries. In the United States, for instance, this rose from 57 to 71 per cent between 1870 and 1939-41. 2/

However, available information is insufficient to allow for any generalization on this subject. It is conceivable that an economy which is beginning to develop and which has a frontier that can be rapidly displaced and into which a substantial foreign capital is flowing, should use its transport equipment insufficiently and have excessively high relative marketing costs, in view of a comparatively low density of population. During the next period of development, which is featured by progressive improvement in the utilization of the transport system and by lower marketing costs, productivity of labour engaged in these services may perhaps rise to the same extent or even more than that engaged in the manufacture of goods. This may have been the case in Australia where the share of services in the gross product declined from 70 to 67 per cent between 1913-14 and 1938-39.

The comments made above referred to services as a whole. However, it is a very general grouping and of little use in projections of demand. It is essential to carry the analysis further into homogeneous groups where demand can easily be determined. From the standpoint of the pattern of demand, services can be broken up as follows: a) demand for services rendered to the final consumer, b) intermediary services, and c) government services. These will be considered separately.

The Services Rendered to the Final Consumer. Demand for these services is of the same kind as that conneted with consumer goods. The gross product

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1/ The Conditions of Economic Progress, Second Edition, page 320.

2/ A recent study on the changes in economic efficiency in the United States revealed that between 1869 and 1929 the productivity of the North American economy as a whole expanded at an annual rate of 1.09, whereas in the output of commodities the rate was 1.23. In the agricultural sector productivity rose at an annual rate of 1.1 which would indicate that the aggregate productivity of services not only rose far less than in industry, but also less than in agriculture. See Jacob Schmookler "Changing Efficiency of the American Economy, 1869-1938", The Review of Economics and Statistics, August 1952.

per capita minus the proportion saved, is distributed between the purchase of foodstuffs, manufactures and services. It should naturally be remembered that the latter are far from playing a residual part in consumer habits, since certain services such as housing, have a very high priority in consumer expenditure. As in the case of consumer goods, final services vary considerably and frequently it is difficult to substitute one by another. In studying the substitution elasticity, goods and services should be considered together since demand for a service connected with one article often competes with that of another service. Lastly, it should be remembered that certain services play a complementary role in consumer demand.

Although demand for services is not a residual in consumer preferences, future aggregate demand for final services is necessarily estimated after the demand for foodstuffs and manufactures is projected, and the probable volume of domestic saving estimated. In fact, consumer expenditure on services is assessed as a residual since it depends on the determination of the composition of consumption of foodstuffs, manufactures, and services in the basic period, and the projections of the consumption of foodstuffs and manufactures. The coefficient of income-elasticity of the demand for services as a whole can be determined by the same method.

Once total probable consumer expenditure on services has been estimated, it is then necessary to calculate the approximate composition of such expenditure. The most important items are housing, professional services, entertainment and domestic services. The demand for each requires special analysis prior to projection.

Demand for houses is evidently determined by the movements of the population and the changes in the gross product. This second factor is of importance insofar as the quality of the houses are concerned, and it is, therefore, important to obtain a classification of existing structures according to their quality. There can be no income-elasticity in demand for housing other than for high and average quality houses. There is generally a considerable maladjustment between the purchasing power of the population and the rate of return on the capital required for housing construction, in the lower and middle income groups, including those which contain only the minimum requisites of habitability. The problem in connection with these houses must be considered from the standpoint of supply which is influenced by the amount of capital which the State and social security institutions

/direct to

direct to this purpose.

Demand for professional services rendered by doctors, dentists, lawyers, etc. has a high elasticity in the medium and high income groups. With respect to the mass of the population, however, consumption of these services is determined by the conditions of supply. As in the case of demand for houses, the projection of demand for professional services must be separated into high and medium income groups, on the one hand, and low income groups, on the other.

Entertainment and amusements are another item of growing importance, with respect to consumer expenditure. The elasticity of demand is high whatever the level of income. This results from the growing trend of urbanization and the relatively low price of many public entertainments which has been facilitated by the modern technology in this field. In contrast with services as a whole, labour productivity in this sector has increased substantially, thus lowering relative prices.

An estimate made for Brazil used an income-elasticity of 4.5 in the demand for amusements by the urban population. This coefficient is more than twice as high as that of the demand for durable consumer goods and more than three times greater than that for services as a whole.

Demand for domestic services used by the community depends fundamentally on their supply condition. These services compete, to a certain extent, with the services which the individual can render to himself. As the price of one hour of domestic services rises, a larger proportion of persons tends to increase the number of hours of self service, occasionally sacrificing hours of remunerated labour and at times giving up hours of leisure. On the other hand, the rising price of domestic services causes a progressive substitution of services rendered individually by others rendered collectively outside the home. This is the case of restaurants, laundries, etc.

Since rendering of domestic services does not require skilled training, nor equipment, the analysis of its demand is of little interest from the standpoint of programming. However, the analysis of these services is of fundamental importance in studying the general utilization of the labour force within the economy.

Intermediary services. These are required by producers of finished goods or services. Demand stems from demand for the finished products in which the

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value of the services are incorporated. However, the share of these services in the market value of the finished products is quite substantial and at times even the main item so that they may be the determining factor of supply conditions.

Among the intermediary services the most outstanding from the standpoint of programming are transport and energy. The major difficulty in the projection of demand for transport lies in the fact that it calls for a regional analysis of development. It is not sufficient to know the total volume of goods to be carried per unit of time, but it is also necessary to estimate that amount for each physiographic unit of the territory.

The formulating of a development programme for transport is a very complex task, not only due to the difficulties involved in projecting demand for these services, but also because of the effect of the supply of such transport facilities on demand itself. The increased efficiency of transport services directly affects productivity in a great number of activities. Hence, it is not possible to project the demand for transport within the dynamics of development on the basis of the analysis of past conditions alone, particularly if there is a deficit in the supply of this service.

This does not exclude the fundamental fact that the transport plan should be based on a careful projection, region by region, of the movement of goods. On the basis of a regional analysis, projected demand for transport in the country as a whole may be integrated. The analysis should include basic capital investment sector by sector and cost of installation, transport and other services and should be renewed with a view to accelerating the integration of the domestic economy in a single market.

The projection of demand for energy is similar to that of transport requiring a regional analysis of development which is all the more important in this case since the location of the sources of energy is an important factor in locating other production activities.

Demand for energy by the transport system, by industry, and by agriculture can be computed from the projections of corresponding demand in these sectors. However, it is essential to take into account the probable changes in the structure of output of each of them not only in order to project aggregate demand, but also to determine its composition. Experience indicates that industrial demand for energy generally rises more intensively than output itself. However, the given rate of manufacturing output may

involve different demands for energy and even greater differences in the growth of the distinct types of energy.

Government services. It is indeed difficult to determine the optimum volume of government services required by an economy at a given moment since its solution does not depend solely on economic criteria. However, in a development programme certain economic aspects of this problem must also be studied.

There is an interplay of forces of a different nature as between the government sector and other sectors of the economy. This derives from the fact that the price of government services is not fixed by the mechanism of the market. However, the factors of production used by the government to obtain these services are generally acquired on the open market in competition with private enterprise. Some of the consequences of this fact should be considered.

If the government decides to raise wages and salaries of its employees, financing this by means of tax increases which affect personal income, the State will have transferred a share of the product from one sector of the population to another. The real amount of services rendered by the government will not change, but they will become more expensive to the population, thus increasing their share in the gross product. Since there is no competition between the public and private sectors, the situation will tend to stabilize providing the groups affected adversely accept the reduction of their real product.

It is assumed that the government absorbs a number of factors of production formerly used by private enterprise. If these factors now provide a higher rate of productivity, the real product of the community will rise. In this case the government share of the gross product will also increase, but there would be no reduction in the real renumeration of the factors employed by private enterprises.

On the basis of an analysis such as this, it can be stated that from the economic standpoint the transfer of factors from the public to the private sector can be justified provided that it results in raising the product of the community. However, in practice this cannot be easily carried out. In many government activities such as in teaching and scientific and technological research, it is difficult to estimate the rate of productivity. The best

means of increasing the future profitability of agriculture or industry may perhaps consist in withdrawing product from these activities and even factors of production in the current stages in order to use them in research on the technical training. However, since the results of these measures would not be immediate, the apparent short-term effects of that transfer would raise the relative cost of services rendered by the government.

From the standpoint of the formulation of a development programme, it is of less interest to define the boundary between the private and public sectors than to project demand for the services rendered by the State. Such demand can be currently expressed by the decisions of political organisations but it is to a great extent influenced by collective needs which can be considered in an economic analysis. This is a case of requirements for urban improvements, teaching, public health, etc. In a development programme different hypotheses may be formulated regarding the probable absorption of resources by this and other State activities.

2. The Substitution of Imports

Introduction.

Having projected demand for a product or series of products, the next stage consists of determining the means by which such demand can be covered. From the standpoint of the projection of demand, it would be advisable to consider finished consumer goods apart from those goods absorbed in the production process. The former are designated of final goods, while the latter are intermediate goods. The importance of making this division lies in theffact that in projecting demand for finished products only one hypothesis is required concerning future expansion of the volume of goods and services available for consumption, while for the projection of demand for intermediate products it is necessary to determine the interdependence of economic activities and the estimates of future output of all these activities in which these products are used. The method of calculation should, therefore, begin by projecting demand for finished goods and then continuing with estimates of future output of finished goods in order ultimately to project demand and for intermediate products. Indeed the method is actually more complicated since to project demand for certain intermediate products it is essential to

obtain estimates of future output of other intermediate goods. Sometimes the dependence is reciprocal so that the work involves a series of successive approximations.

Whenever demand for a product can be partially or totally supplied by foreign trade, the problem of imports enters into demand projections and estimates of output. The problem of foreign trade, therefore, appears to be an integral part of the sector by sector analysis. Its basic elements are: a) the capacity to import is determined by a series of factors, the most important of which cannot be controlled from within the economy; b) a considerable part of imports of primary goods cannot be substituted or could be substituted only with difficulty for reasons of climate, lack of adequate natural resources, etc.; and c) an important proportion of the capacity to import is required to cover rigid items in the balance of payments.

Having formulated the hypothesis concerning the capacity to import and the expansion of imports, one of the most important tasks in formulating a programme consists in determining the necessary adjustments between the different sectors of the economy in order that these hypotheses may be compatible with each other in practice. This is one of the most difficult problems in programming economic development, and must be considered in detail.

Adjustments of the Capacity to Import on the Basis of the Hypothesis of Growth

If investment is to be appropriately guided, the substitution of imports must be planned and coordinated with other elements in the programme. It is then necessary to determine what criterion should be used as a basis for projecting substitutions, or the guiding policy for substitution. Similarly a decision must be taken on what will be most useful to the economy, either substitution in the agricultural or the manufacturing sector; and similarly whether consumer goods or capital goods are to be substituted.

/While recognising

While recognizing the need for detailed study of this problem, a simple procedure was used in the present work to reach a preliminary solution for this problem. Having assumed a hypothetical rate of growth for the gross product and another for the capacity to import, probable imports which could not be substituted were estimated together with other unchangeable items in the balance of payments. By this means, the capacity to import goods potentially substitutable was determined.

An estimate was then made of the probable quantum of such imports in the hypothesis of their unsubstitutability, that is to say, in the event that imports which could be substituted were to expand at the same rate of demand for them, such demand being projected on the basis of the hypothesis of the growth of the gross product. Thus, an approximation was obtained for the margin of substitution of essential imports compatible with the hypothesis of the rate of growth of the product and of the capacity to import.

Having determined the magnitude of the efforts of substitution, the analysis by products was begun in connexion with the possibilities of substitution. It was applied initially to consumer goods including raw materials and fuels. In this case the element of adjustment would have to be imports of capital goods or, as will be explained below, imports of equipment. The logical course of the analysis was as follows: having determined the possibilities of domestic industries to substitute in the sector of consumer goods, an estimate was made of residual imports in this sector. Having projected these consumer imports, they were subtracted from capacity to import, the remaining margin being the capacity to import capital goods. Having determined this capacity, it was subtracted from demand for these goods, thus giving the volume of demand which must be met by domestic production.

The first stage of analysis, therefore, consists in a detailed study of possibility in each group of industry or in each sector of agricultural activity to continue and intensify the process of import substitution. An analysis of this type would indicate the branches in which domestic producers have accumulated experience or in which the country's possibilities are more clearly defined, as regards the abundance of raw materials, the potentialities of the domestic market, etc. In the agricultural sector, the initial phase of the study may be limited to consultation with experts and the utilization of existing data concerning certain products as, for instance, the survey

/carried out

carried out by the Corporación de Fomento de la Producción on the output of sugar in Chile. In the manufacturing sector, projects being studied or implemented must be borne in mind and use must be made of the available statistical material in order to determine recent import substitution tendencies.

In the second stage of analysis, the form of utilization of the capacity to import capital goods must be examined. The element of adjustment in this sector - in the case of Chile - was the output of equipment, since the cement industry supplies the domestic market entirely and the iron and steel industry, which has already been installed in the country, supply a relatively large proportion of the domestic demand for these products. The experience obtained, the advantages which may be foreseen in raising the volume of output, favourable conditions in the country, and the existence of expansion plans ensure possibilities of expansion in the near future for the manufacture of iron and steel independently of probable fluctuations in the capacity to import. The mechanical industry - the principal item in the manufacture of capital goods - remains as an element of final adjustment since the advisability of expanding its output will depend largely on the capacity to import. In adopting this criterion the following factors were borne in mind: a mechanical industry is a principal means of incorporating technical progress into the production process; the possibility of obtaining equipment from the source of the latest improvements in technology is one of the means whereby under-developed countries may obtain the benefits of the experience gained and of scientific progress in the traditional industrial countries. Certain considerations might be mentioned regarding the size of the market, the shortage of experts and skilled labour etc., which on the one hand explain the small degree of development in the heavy mechanical industry and the precision tools industry in Latin America and, at the same time, lead to the conclusion that substitution in this sector would probably be more difficult than elsewhere.

The General Criteria of Substitution

The solution adopted concerning the problem of substitutions is fundamentally empirical, but it does not exclude the introduction of certain general criteria into the analysis. Presented in its widest terms, the problem of substitution resembles the fundamental problems of the guiding principles of investment in a development programme. However, while the general problem

/of directing

of directing investment can be resolved by the principles of social marginal productivity, 1/ the problem of imports is rendered more complex by projections of the pattern of foreign demand, which is a basic factor in the capacity to import. It would be interesting, for instance, to consider which is the most appropriate for Chile, either investment in nitrate industry in order to increase the capacity to import, or investment in textile industries with a view to substituting imports. Similarly, it might be useful to consider whether investment should be placed in the manufacture of paper with a view to raising the volume of exports or whether the production of meat should be increased in order to eliminate imports. Any number of similar alternatives might be put forward and very probably few cases could be resolved by empirical means alone. It is, therefore, essential to adopt certain general criteria even when the available data is inadequate, in practice, in a systematic form.

In the present work it was decided to adopt the criterion of forecasting foreign demand in terms of the capacity to import. Different hypotheses were formulated concerning the future pattern of that demand, but having chosen one of these, the capacity to import will be considered as an independent variable. It was assumed that if foreign demand prospects are favourable, the necessary investment to increase these exports will be made. However, no comparison was drawn between the relative advantages of a unit of investment in each activity which might be expanded and the unit of investment in activities which it is hopted will eventually substitute imports.

A comparison of this type would require a study of the advantages of investment in export activities in the different alternative patterns of foreign demand. Moreover, the amortization period of these investments is generally long so that short-term estimates of these advantages would be inadequate, given the rate of probability of the existence of idle factors in the sector producing goods for exports. Were such a comparison to be made, it would have to be limited to the following terms: investment of a unit of capital in an export activity, such as the nitrate industry for instance, would cause the gross product to rise by X units in a given hypothesis of foreign demand trends.

1/ The conception of social marginal productivity differs from the current conc of marginal productivity in that the former refers to the effect of the last unit of investment on the gross aggregate product of the community, while the latter is concerned with the effect of that unit of investment on the profitability of the undertaking which applies such investments.

/The social

The social marginal productivity of that unit of investment in the nitrate industry, provided foreign demand reacts favourably, would be greater than in the case of alternative investments to substitute imports. However, it is also possible that the advantage obtained in the initial period would be entirely lost in the following stage owing to a contraction of foreign demand. Under the circumstances any comparison of relative advantage would be hazardous. It was found possible to work with aggregate data for the capacity to import derived from certain hypothesis concerning the trend of foreign demand. There is even greater justification for this assumption when export activities are mainly financed by foreign private capital since in this case it would be wrong to consider alternative investments. 1/

The comments made above refer to the possibility of increasing exports or substituting imports. The solution adopted consists, as was pointed out, in estimating the capacity to import on the basis of a general hypothesis of foreign demand and calculating the effort of import substitution required by the hypothetical rate of growth. The second aspect of the problem of substitutions is that of the alternatives between the different possibilities of substitution.

In this case the solution should be found in a comparison of social margin productivity of the different alternatives, providing that the terms of trade of the imported goods do not change in the future. If the investment of the unit of capital in the paper industry gives rise to an increment of X in the gross national product, and an identical investment in the labour force, industry shows an increment of X-1 when domestic output in both cases is substituting imports, then the most appropriate substitution is that of paper. However, it should be remembered that if in the future the price of imported paper were to fall or that of rubber to rise, as compared with that of current rubber imports, the situation would change. It is, therefore, likely that a substitution which is effected at present on the basis of the most economic

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1/ This item could be applied to the case of large foreign undertakings, such as Chilean copper mines which by not investing their profits in the copper industry itself would tend to tranfer them abroad and not seek other investment products within the country.

/criterion may

criterion may become uneconomic in the near future. However, problems such as these are practically inevitable since the structure of cost may develop along different lines in different countries.

The adoption of a criterion such as that of marginal social productivity gives rise to a series of practical problems, many of which are caused by the deficient operation of the price mechanism. It will be sufficient to consider the effect of multiple rates of exchange and of quantitative import controls on the terms of trade of imported goods in order to realize the difficulties involved in a general criterion of this order. If this were a case of mere comparing domestic costs of production with the price of imported goods, these difficulties might be easily overcome. However, a comparison of this nature is far too simple. What is required is a comparison of the total gross product generated directly or indirectly by the unit of investment in the different alternatives.

The empirical criterion of analysing product by product in order to determine current tendencies in the process of substitution indirectly leads to the question of marginal social productivity. Generally spontaneous substitution is effected where it is least resistent, that is to say, preferably in those sectors where there are greater possibilities of economic development. These possibilities generally consist in the relative advantage of wage levels, accessibility and abundance of raw material, low output-capital ratio, etc. Industries with these characteristics should also have a high level of social margin productivity since their installation implies idle production factors, unemployed labour, or unexploited sources of raw material.

The foregoing suggests the complexity of formulating a rational policy of import substitutions. The criteria adopted in the present work are a first attempt to find a practical solution for the problem. However, the need to investigate the general basis of the problem has not been overlooked, nor has the need for finding wider practical criteria than those used in the present study.

The Application of the Method

In order to illustrate the method adopted, an example will be provided with data obtained in Chilean economy and developed in Part II of this study. This example is summarized in Table 2, which shows estimates of imports of consumer goods, raw materials and some manufactured goods, including fuels in the theoretical hypothesis of moderate economic development in Chile, which is

considered in Part II of this work, in which, however, no provision is made for the substitution of imports. Imports would tend to expand proportionately with the gross product and in accordance with the income-elasticity of demand for them in the case of finished goods and according to the rate of growth of certain sectors in the case of intermediate products. This table shows that consumer imports would increase by 96 per cent in the hypothesis of no substitution, indicating that their income-elasticity is 1.86. Since the capacity to import would only rise by 24 per cent in the working hypothesis adopted, economic development under such circumstances would involve a substitution of 71 per cent of capital goods imports. The table also shows the results of the analysis of substitution possibilities on the assumption of moderate development, sector by sector, according to the criteria outlined in Part II. It will be seen that imports of consumer goods - including raw materials and fuels - would rise by 25 per cent as against 96 per cent in the event of no substitution. The most significant difference is that in imports of consumer manufactures which, were demand to increase for them, would expand by 89 per cent, whereas current tendencies and substitution possibilities would enable a reduction of 48 per cent to be effected.

/Table 2:

Table 2 Chile: Expansion of Imports in the Hypothesis of Substitution and Non Substitution of Consumer Imports

	1950	1962		Increase or decrease	
		Substitution	No substitution	Substitution	No Substitution
	(in millions of dollars at 1950 prices)			(percentage)	
Consumer goods:	138.1 a/	151.6	269.2	25	96
Foodstuffs	16.8	19.2	22.1	14	32
Raw materials	42.8	63.5	88.9	48	108
Fuels	20.6	33.6	49.6	63	141
Manufactures	57.9	30.1	108.6	-48	89
Unspecified:	15.1 b/	5.2	10.7	-66	-29
Capacity to import	247.3	307.0	307.0	24	24
Reaminder for imports of capital goods	94.1	155.4	27.1	65	-71
Demand for capital goods (indices)	100.0	227.0	227.0 c/	127	127

Source: United Nations Economic Commission for Latin America.

a/ Does not include extraordinary imports of wheat.

b/ Includes extraordinary imports of wheat.

c/ It is assumed that demand for capital goods would be identical in the two hypotheses since the rate of growth is the same.

According to the assumptions made in Table 2, imports of capital goods could could expand by 65 per cent, but as demand for such goods, according to the hypothesis of growth of the gross product, 1/ would increase by 127 per cent, the process of substitution would also have to be expanded to these sectors. Imports of capital goods can be divided into two groups, namely, industrial metals and equipment. The former consists almost entirely of iron and steel imports which have been increasingly substituted during the past two years. If the development plans established for Chile's iron and steel industry

1/ The estimate of demand for capital goods, according to this hypothesis is shown in Part II of the present text.

materialize, a substantial reduction may be expected in iron and steel imports.[1/] Table 3 shows an hypothesis of broad substitution of these imports and the resulting estimate of the capacity to import equipment.

1/ Given the variety of iron and steel products imported, it is impossible to conceive total substitution in this sector. When this problem is studied in Part II of the present document, the hypothesis is adopted involving elimination of net imports.

/Table 3

Table 3 Chile: Growth of Capital Goods Imports on the Assumption of a Substitution of Iron and Steel Imports

(in millions of dollars at 1950 prices)

	1950	1962	Increment (as a percentage)
Capacity to import capital goods	94.1	155.4	65.0
Iron and steel imports	22.2	4.4	- 81.0
Capacity to import equipment	71.9	151.0	110.0
Demand for equipment (indices)	100.0	236.0	136.0

Source: United Nations Economic Commission for Latin America

The substitution of imports would thus allow for an increase of 110 per cent in equipment imports while total imports would only rise by 24 per cent. The composition of imports would change radically since those of equipment would rise from 29 to 49 per cent of the total and would represent 97 instead of 76 per cent of imports of capital goods. However, despite this sharp increase, the proportion of imported equipment to total equipment supplies would have been reduced, since the latter were expected to rise by 136 per cent. Though to a lesser degree, it would be necessary for domestic output in this sector to expand at a higher rate than demand to substitute for imports.

3. Projections by Sectors

The projection of the gross product by sectors is obtained from the analyses of demand and the plan for import substitutions. Having determined the volume of demand, the proportion to be met by imports and the probable development of output for export, the basic elements are available to project the different sectors of the gross product.

The projection of the different sectors of economic activity is, therefore, based on hypothesis of growth of the product, and of the capacity to import, the analysis of the demand-elasticities, and the relation between the different sectors of the economy, as well as the criteria of import substitution by domestic output. The alteration of any of these basic elements would cause a change in the respective projections. It is, therefore, evident that each hypothesis of growth would show a series of combinations of projections by sectors.

/In Part 2

In Part 2 of the present text only one hypothesis or combination of hypothesis was used in projecting the gross product by sectors since simultaneous development of two or more hypotheses without any change in the method would create additional complexities. The results obtained may, therefore, be considered the result of a simple working hypothesis, but they do not preclude other alternative solutions.

The method indicated above, and used in projection of the industrial and agricultural sectors, may be simplified in the case of the projection of services given the low proportion of foreign trade in their supply. In the latter case it would be sufficient to project demand in order to determine the needs to be covered by domestic output. However, demands to be met by domestic output cannot always be estimated on the basis of a projection of demand. In some cases, including services which play a relatively passive role in economic development, it is impossible to proceed beyond the analysis of probable changes in the structure of the labour force and of the relative prices paid to the factors engaged, by sectors.

Combining the projections of demand with the pattern of external trade in the hypothesis of moderate development, shown in Part II, it was calculated that agricultural production would increase by 39 per cent and that of manufacturing by 101 per cent up to 1962. These estimates are shown in detail in the chapters referring to agricultural and manufacturing output. The projection of mining activity was based on the analysis of foreign demand prospects (see the chapter on foreign trade) and the expansion of domestic demand, particularly in the case of coal (see the chapter on energy). The increment shown by these calculations was 35 per cent. The estimate for the expansion of demand for transport and energy is largely the result of a study of current requirements in these sectors and an analysis of their interdependence with the output of goods. The calculations shown in the relevant chapters concerning the required increment in output of these sectors are approximations. Demand for housing has certain special aspects, which are discussed in the pertinent chapter. Expansion in residential building was estimated to be 40 per cent. Lastly, government services do not respond to demand by consumers expressed in market terms, so that their projection is a mere expression of a hypothesis concerning future development of State activity.

/In order to

In order to project all the basic items of the gross product, commercial services and personal services would still have to be computed, although they play a relatively passive role in development. The physical productivity rises more slowly than that in economic activity taken as a whole, so that the wage level paid in these sectors is influenced by that in the more dynamic sectors of the economy, particularly manufacturing. On the basis of an expected expansion in total output of goods, a hypothesis of commercial activity was formulated, whereby the volume of services rendered in this sector would rise 10 per cent more than the gross product. From a survey made, it was seen that commercial activities rise at a higher rate than the expansion of the gross product due to the growing complexity of the production process which tends to increase the number of stages in proportion with the progress of economic development. It was borne in mind, however, that the expected growth of foreign trade would be less than half of that of the gross product.

The projection of personal services gave rise to a number of questions which, when examined, throw light on the general aspects of projection by sectors. It is well known that in under-developed economies there are great differences in the remuneration of labour in the different sectors. These differences are largely due to the expansion of a labour surplus which in the concrete case of Chile would appear to have accumulated in agricultural, personal services and construction. The size of this surplus and the intensity of its absorption, are fundamental elements in the calculation of projections by sectors, since capital requirements in the different activities, changes in the physical productivity of labour, and trends in wages in the different sectors are influenced by these factors.

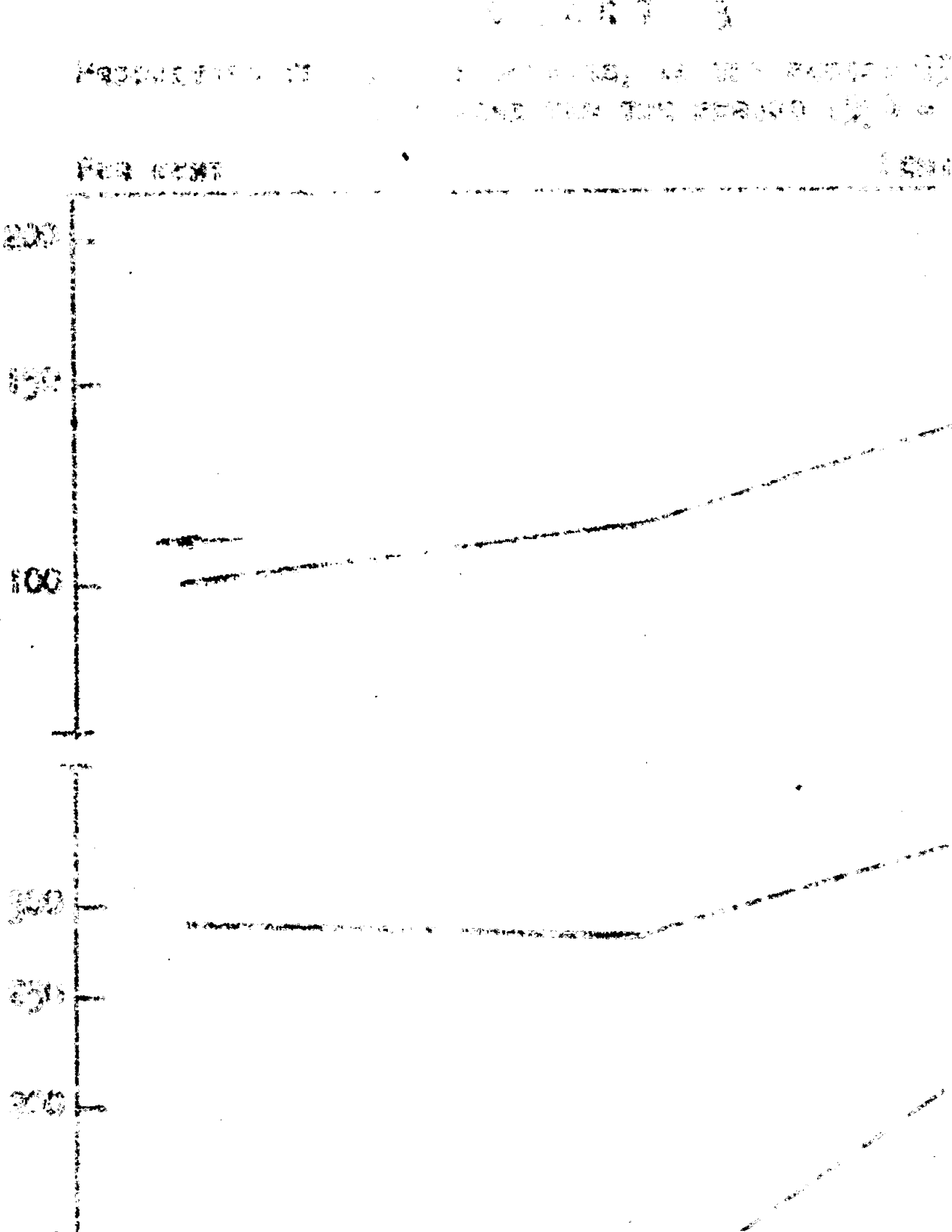
If no changes in the structure of the labour force were made in the course of economic development, that is to say, if there were no absorption of the labour surplus, the quantity of capital required would naturally be greater. Sectors such as manufacturing which are expected to expand at a much higher rate than the labour force, would have to expand capital stock per work considerably.

In the following section the problem of the stock of capital required by sectors will be studied with regard to the attainment of a given rate of economic growth.

/The hypothesis

The hypothesis formulated in this connexion will determine the displacement of labour from one sector to another. Since personal services are largely residual, the quantity of labour remaining there will depend on the intensity with which certain other sectors absorb the labour force, and the degree to which other sectors - particularly agriculture and building - free labour. The projection of personal services was based on the increment of the labour force remaining in this sector, but it would be a mistake to expect that the volume of services rendered in this sector would expand at the same rate as its labour force. By inverting the argument concerning the manufacturing sector, it can be shown that by decreasing the labour surplus in personal services there will be greater incentives to develop the investment per worker engaged in this sector. It may, therefore, be expected that real output will rise more than proportionately with the increase in the amount of labour used in personal services. Even if the real volume of personal services to be supplied could be determined, it would be impossible to estimate an amount of value added in this sector without a hypothesis concerning the relative prices paid to the factors engaged in it. It would be a mistake to estimate that relative prices would remain stable while a radical change takes place in the structure of the labour force. If a considerable proportion of the labour surplus is withdrawn from personal services and the remaining labour force increases its physical productivity as a result of an increase in investment in that sector, a relative improvement of wages and, therefore, of costs, may be expected. Only by determining the influence of two factors, namely, the increase in labour's physical productivity and the relative rise of costs can a precise projection be made of the gross product generated. However, the residual nature of personal services and the small amount of capital absorbed, justify the margin of approximation in the hypothesis formulated. By combining this hypothesis concerning the physical productivity of labour and the remuneration paid to the factors in the different sectors, the corresponding product for personal services was calculated to increase by 75 per cent until 1962. Table 4 contains the rates of development and projections of the gross product by sector. The rate of the gross product does not reflect the real volume of goods or services produced; it is influenced on the contrary by changes in the terms

/of trade of



of trade of the different sectors. The building industry is an extreme example of the difference between the growth of the product and real output. From the data in the above-mentioned table it will be seen that the rate of the annual increase of the gross product in this sector declines from 4.8 per cent to 4.3 per cent between 1940-50 and 1950-62. However, between 1940 and 1950 the value added in industry and building rose by 60 per cent, whereas the indices of activity of the industry increased only 12.5 per cent. There was, therefore, a sharp improvement in the terms of domestic trade to the advantage of the factors engaged in building. The annual rate of expansion of building between 1940-50 was 1.2 per cent while the rate foreseen for the period 1950 to 1960 rose to 2.8 per cent.

Table 4 also includes the rates of annual expansion of real output for the principal groups of activities during the period 1940-50 and 1950-62. Charts 2 and 3 show the trend lines of real output for the period 1940-50 for the main groups of activities and the respective projections up to 1962.

Table 4 Chile: Annual Rates of Increase of the Gross Product and of Real Output during the eriod 1940-50 and Projections for 1950-62 on the ssumption of oderate evelopment

	The Gross product		Real output		Changes in the terms of domestic trade	
	1940-50	1950-62	1940-50	1950-62	1940-50	1950-62
Agriculture	1.1	3.5	1.1	3.3	0.0	0.2
Mining	-2.3	2.6	- 0.2	3.1	- 2.1	- 0.5
Manufacturing	4.1	6.4	3.1	6.0	1.0	0.4
Building	4.8	4.3	1.2	2.8	3.6	1.5
Total output of Goods	1.7	5.6	1.6	5.5	0.1	0.1
Total output of services	3.9	4.0	4.0	4.1	- 0.1	- 0.1
Grand total	2.9	5.1	2.9	5.1	-	-

Source: United Nations Economic Commission for Latin America

4. Phases of a Development Programme

Projections shown in the preceding section refer to the period up to 1962. As will be seen below, in the majority of cases the bases of the calculations were rough estimates for 1951 and 1952, so that the projections

/are founded

are founded on data for 1950. However, whenever this year seemed inappropriate - as in the case of agriculture and the iron and steel industry - the necessary adjustments were made and are indicated in the proper place.

Although the projections are based on 1950, investment requirements for the economy to attain the rate of growth implied in the hypothesis formulated, were projected for the ten year period 1953-62. The hypothesis presented in this study could, therefore,be referred to as a ten-year programme of investment, which designation brings up the time factor in a development programme. Some general aspects of this problem will be dealt with in the present conclusion together with the form in which it affects the concrete example outlined in Part II.

In examining the present situation of many Latin-American economies, it is observed that there is a fundamental deficit of production capacity in certain basic sectors, particularly with respect to transport and energy. For an economy to increase its rate of development it is essential that, in the initial stage, these basic sectors should expand more than proportionately in relation to economic activity as a whole. The reason for this lies in the fact that the growth of most activities depends on the existence of a certain flexibility in the basic sectors since transport and energy installations cannot always develop gradually with the increase in demand for such services. For this reason economies in a process of development often alternate between over-capacity and deficits in the basic sectors.

At the start of the formulation of a programme, it is therefore essential to focus attention on the basic sectors. If these sectors are already working to full capacity, there is more reason to believe that the development of dependent activities will be hampered. Also, if there is a deficit in certain basic sectors of the economy, it is essential to bear in mind that sufficient time must be allowed in the programme for these sectors to expand. It is evidently not only a question of covering the deficit, but it is also essential to provide the sector in question with the necessary flexibility so that the hampering element may be transformed into an incentive for development of dependent activities.

/However, transport

However, transport and energy services are not the only basic sectors of an economy in the process of development. Capital goods industries are in a very similar position, although in this case imports may be used to ease short-term critical shortages. Considering the problem from the standpoint of a development programme - in which the capacity to import plays the role of an independent variable - capital goods industry plays as strategic a part as transport and energy. Having determined the capacity to import capital goods, the possibility of obtaining an adequate supply of such goods depends directly on the capacity of domestic industry to produce them. This being the case, the acceleration of the rate of growth of consumer manufactures requires a previous expansion of productive capacity in the capital goods industries.

It is necessary to understand the important position of this problem in a development programme. Having formulated the hypothesis concerning the capacity to import capital goods over a given period, it is evident that the growth of total production capacity (total accumulation of capital in the economy) could be estimated on the basis of projected imports and of domestic output of capital goods. It will now be assumed that all imported capital goods, together with those produced during the period under review- and the essential replacements - are used in expanding the economy's capacity to produce consumer goods. This being the case during the last year of the period the flow of capital goods would be identical to that of the first year (regardless of the possible increment in the capacity to import). If in the hypothesis adopted the expansion of the capacity to import does not play a dynamic role in order to raise the rate of expansion of domestic consumer goods industries - that is to say, to raise the volume of capital goods incorporated in these industries - it will be necessary for the productive capacity of capital industries to be increased beforehand.

This problem is of appreciable importance in a development programme emphasizing the need to begin by expanding the capacity base of the economy if the rate of growth is to be accelerated. The same problem, presented in another form, was considered above, when an attempt was made to determine the effects on the economy if the development programme were to begin by accelerating the rate of consumption.

In the hypothesis of development studied more fully in Part II, there are two different phases in the projections. One comprises the period

1953 to 1956, inclusive, and the other, 1957 to 1962. The first phase might be regarded as that of accelerated development. During this period consumption rises at a lower rate than investment, indicating that the base of the economy is expanding. In this stage it would be necessary to eliminate the fundamental deficiencies in the economy and capital goods industry would be strengthened in order to enable a high rate of expansion of consumer goods industries to take place during the second phase. As will be shown in due time, during the first phase the expansion of capital goods industries will be 3.2 times higher than that of consumer goods. While in the latter phase the two groups would attain the same rate of growth.

The high rate of expansion of consumption after 1957 results from the broader expansion of the base of the economy, that is, the higher rate of development of production capacity of transport, energy and capital goods industries achieved in the first phase. It must be stressed that the duration of the first phase is not arbitrary, being influenced by the degree of intensity of economic development in the second phase and by the rate of growth of the capacity to import capital goods. By altering these basic assumptions, the preliminary phase of adjustment can be increased or reduced. It should be remembered that the fundamental characteristic of that phase is the acceleration of the rate of growth.

Another characteristic of the phase of acceleration foreseen in the hypothesis adopted, is the difference between the volume of investment and domestic saving. In order to accelerate growth without adversely affecting consumption, the inflow of foreign capital was admitted during the first three years, that is, from 1953 onward. This foreign capital has a dual function. On the one hand, it should intensify investment without compelling the economy to counterbalance it with saving, and it should also provide greater flexibility for the economy during the initial period of adjustment, by raising the capacity to import.

The second phase is featured by an intense but constant rate of expansion and by equivalent rates of growth of the gross product and of consumption. Doubts might arise as to the use of a programme during this second phase. In contrast with the first, its expansion is more or less arbitrary, although by prolonging it for a more extensive period a margin

of error would be created which in some cases might render the projections useless. The use of the second phase lies in the fact that to plan the expansion of certain sectors it is essential to have a very wide perspective. It has been pointed out that in view of the strategic part they play in the process of development, a margin of excess production capacity should be allowed to certain sectors. In programming the increment of capacity in these sectors, it is almost always essential to consider the possibility of subsequent expansion. A period of 4 or 5 years is inadequate to study the utilization of energy resources or to consider the suitability of installing an iron and steel industry in a country in Latin America.

In order to avoid the usual simple extrapolations in a study of demand in the basic sectors, it was found preferable to extend the projections to the period 1962. The value of these long projections, therefore, lies in the fact that they provide a method of projecting demand in those sectors in which it is essential to have a wider perspective. It would be entirely wrong to attribute any greater scope to these projections, particularly insofar as demand of consumer goods is concerned.

5. Investment by Sectors

In the preceding sections it was shown that starting from an initial hypothesis concerning the growth of an economy, projections by sectors can be made and these constitute the real content of a programme. On the basis of these projections by sectors investment requirements for the expansion of production capacity can be assessed and, by adding these partial requirements, the total volume of investment can be determined and the compatibility between the partial projections and the initial aggregate projection can, thus, be ascertained.

The central theme of a development programme is the determining of investment needs by sectors. In fact, the minimum object of the programme is to provide some idea of the composition of investment, so that the economy can attain a given rate of growth. The knowledge that in a concrete case of a given economy, a specific rate of growth would require a certain composition of investment - over a specified period - undoubtedly provides a strong instrument for the formulation of development policies.

As will be seen in Part II, alternative methods were used to estimate investment needs by sectors on the basis of the information available. In

the case of agricultural activities, use was made principally of estimates formulated by experts. A procedure of this type would have been impossible in manufacturing activities in view of the scanty information available at present, since it would be necessary to prepare new projects affecting the different branches of industrial output. The method adopted consisted in formulating coefficients of investment, that is to say, output-capital ratios for the principal groups of manufacturing activities. The value of the method evidently depends on the accuracy of the data available concerning the stock of capital in different industries and the possibility of obtaining data concerning the replacement value of that stock of capital. Comparisons can always be drawn between the coefficients obtained and those of other countries with fairly similar economies or with theoretical coefficients in the case of well-defined industries. At all events the data shown in Part II for groups of industries are approximations and are no more than a point of reference for more detailed research.

In estimating capital requirements for the remaining sectors, as may be seen below, a combination of the two methods was adopted.

Having ascertained the volume of net investment to be made in each sector this result must be compared with the data obtained from the initial projection. This would confirm the validity of the assumptions made in the aggregate projection which were a point of reference for the whole work. This must then be checked, but only for the gross investment placed during the period covered by the projections. A year by year estimate of investment by sectors would be excessively complex and of little use. In practice, the implementation of a programme requires detailed projections of investments for short periods of two or three years and only projections of basic sectors for long periods. As may be seen in Part II, year by year evaluations of investments in manufacturing were made strictly for the purpose of obtaining data to project a demand for industrial equipment.

Table 5 shows the data concerning net investment in the economic sectors and is reviewed in Part II. This table also contains figures for commerce and financial activities which show a net investment of 8,700 million pesos. This was calculated on the basis of the depreciable assets in this sector, which were estimated at 12.5 thousand million pesos in 1950, of which 6.5 million are fixed capital, and 6 million represent inventories.

/It was assumed

It was assumed as a working hypothesis that the volume of assets would expand at the same rate as the total volume of goods and services, that is to say, 70 per cent. The depreciated assets of commercial and financial activities in 1962 would, therefore, rise from 21.2 thousand million pesos at 1950 prices, thus calling for a net investment of 8.76 million pesos, which would be completed during the period 1953-63, in view of the relative static level of activity in 1951 and 1952.

Table 5 Chile: Integration of the Net Investment Estimated for the Different Sectors on the Assumption of Moderate Development

	In millions of pesos at 1950 prices	Percentage composition
Manufacturing industries	52,075	33.1
Crop and live-stock produce	20,882	13.3
Transport	22,100	14.0
Energy	18,200	11.6
Residential building	15,950	10.1
Commerce and financial services	8,700	5.5
Total	137,907	88.0
Investments foreseen in the programme of moderate development a/	157,200	100.0
Difference	19,293	12.4

Source: United Nations Economic Commission for Latin America

a/ Total net investments foreseen on the assumption of moderate development of Chilean economy. See Table 1, Chapter I, Part Two.

The net investment foreseen in Table 5, amounts to a total of 137.9 thousand million pesos at 1950 prices. This total is approximately 88 per cent of the net investment foreseen in the initial projection. The remaining 12 per cent would be absorbed by activities which have not been studied, such as certain public services (water and telephones) education, research, public health, religion, administrative government activities, including security and, lastly, among economic activities such as export mining, fishing and forestry. In the case of export mining, it was assumed that

/normal replacement

normal replacement investment would be made and that obsolete equipment would be substituted by one of the leading undertakings so that output could reach the levels projected in the chapter on foreign trade without requiring further investment. At all events, new investment in this sector would not adversely affect other investments projected in the general programme, since they would probably be obtained through reinvestment of profits by the mining companies. Alternatively, these profits would be sent abroad or foreign investors would have to supply the required amount. Forestry and fishing were excluded owing to the shortage of data concerning them.

Apart from export mining, the sectors not included in the investment estimate contributed approximately 10 per cent of the gross product in 1950. Assuming that this residual sector taken as a whole has an output-capital ratio equivalent to that of the remaining sectors, and that its share in the gross product would not change during the period covered by the programme, it may be concluded that the difference between the results of the analysis by sectors and that of the data in the original projection, is 2 per cent.

PART TWO

APPLICATION OF PROJECTIONS BY SECTORS: A SELECTED EXAMPLE

CHAPTER I. PRESENTATION OF AN HYPOTHESIS FOR DEVELOPING THE CHILEAN ECONOMY

1. Introduction

In Part One, Chapter III, different hypotheses of growth for the Chilean economy were described, in order to illustrate the process of accelerating economic development. In addition to other reasons, Chile was selected because of the accessibility and relative abundance of its economic statistics, showing that in Latin America there are sufficient data to use programming techniques as practical working instruments. Part Two contains a detailed application of such techniques to the example selected.

In Chapter III, four hypotheses of growth of the gross product were analysed. Of these, one was selected only for illustrative purposes, without implying that it was either the most probable nor the best for Chilean economic development. Furthermore, different hypotheses for the growth of consumption were presented, based on expansion of the gross product, each assuming that foreign capital would be used to supplement the financing of development. One of these hypotheses was also chosen for illustrative purposes, covering consumption and foreign capital. Table 1 shows the fundamental data of the hypothesis concerning gross product and consumption. The figures include actual data for 1950-51, preliminary estimates for 1952, and annual projections for subsequent years.

Table 2 indicates the projected structure of Chile's economy in 1962, based upon the fundamental hypothesis of "moderate development", with comparisons given for 1940, 1950, and 1953. Table 3 shows a similar comparison, based upon another hypothesis of growth of the gross product analysed in Chapter III of Part One. In this case it was assumed that development would be accelerated by raising the rate of gross investment to 20 per cent and the output-capital ratio to 0.60. This hypothesis will be used in certain other cases to compare the rate of growth in a given sector of the economy with that of the hypothesis selected. When comparisons are made in this and succeeding chapters, the fundamental hypothesis selected will be that of "moderate development" while the other will be "accelerated development".

/Table 1.

Table 1. Chile: Hypothesis of Moderate Development

(thousands of million pesos at 1950 prices)

Years	Stock of capital	Net product	Depreciation and changes in stocks	Gross product	Gross Investment	Net Investment	Output capital ratio	Consumption	Gross saving	Exeess of exports(+) or imports(-) a/	Rate of gross investment
1950	275.0	135.1	9.9	143.3	16.3	6.4	0.52	123.2	20.1	-3.8	11.37
1951	283.0	135.7	10.7	144.0	18.7	8.0	0.51	123.5	20.5	1.8	12.99
1952	292.0	138.5	10.5	147.0	19.5	9.0	0.50	125.0	22.0	2.5	13.26
1953	302.0	138.9	13.6	151.0	23.6	10.0	0.50	128.1	22.8	-0.8	15.63
1954	315.2	145.0	13.6	157.6	26.8	13.2	0.50	131.3	26.4	-0.4	17.00
1955	329.4	151.5	14.2	164.7	28.4	14.2	0.50	134.7	30.0	1.6	17.24
1956	344.2	158.3	13.3	172.1	28.5	15.2	0.50	138.9	33.2	+4.7	16.57
1957	359.7	165.5	13.0	179.9	28.9	15.5	0.50	145.7	34.3	5.3	16.06
1958	375.9	173.0	14.2	188.0	30.4	16.2	0.50	152.3	35.7	+5.3	16.17
1959	392.8	180.8	15.1	196.4	32.0	16.9	0.50	159.1	37.3	+5.3	16.29
1960	410.5	188.8	15.8	205.2	33.5	17.7	0.50	166.3	38.9	+5.4	16.32
1961	429.5	197.3	16.7	214.7	35.7	19.0	0.50	173.8	41.2	+5.5	16.63
1962	448.3	206.1	17.6	224.1	36.9	19.3	0.50	181.6	42.5	+5.6	16.46

Source: United Nations Economic Commission for Latin America.

a/ Geographic balance of payments on current account.

/Table 2

Table 2 Chile: Hypothesis of Moderate Development (Summary)

	1940	1950	1953	1962	Annual rate of fluctuation in percentages 1940-1950	1950-1962
Basic resources						
Population (in thousands)	5,024	5,770	6,030	6,820	+ 1.4	+ 1.4
Labour force (in thousands)	1,723	2,250	2,411	2,898	+ 2.7	+ 2.1
Percentage of workers in relation to total population	34	39	40	42	+ 1.4	+ 0.6
Hypothetical goals						
Gross product per capita (in thousands of pesos at at 1950 prices	21.6	24.8	25.0	32.8	+ 1.4	+ 2.4
Gross product per worker (")	63.1	63.7	62.6	77.3	+ 0.1	+ 1.6
Capital per worker (")	124.1	122.2	125.2	154.7	- 0.2	+ 2.0
Basic Needs						
Gross product (in thousands of million pesos at 1950 prices)	108.7	143.3	151.0	224.1	+ 2.8	+ 3.8
Capital stock (" ")	213.8	275.0	302.0	448.3	+ 2.6	+ 4.2
Output-capital ratio	0.51	0.52	0.50	0.50		
Gross saving (as a percentage of the gross product)	17.2	14.0	15.2	19.0		
Consumption (" ")	82.8	86.0	84.8	81.0		
Investment (" ")	11.5	11.4	15.6	16.5		

Source: United Nations Economic Commission for Latin America.

/Table 3

Table 3 Chile: Hypothesis of accelerated Development

	1940	1950	1953	1962	Annual rates of fluctuation in percentages 1940-1950	1950-1962
Basic resources						
Population (in thousands)	5,024.0	5,770.0	5,950.0	6.820,0	1.4	1.4
Labour force (")	1,723.0	2,250.0	2,385.0	2,900.0	2.6	2.1
Percentage of workers in relation to total population	34.0	39.0	40.0	42.0		-
Hypothetical goals						
Gross product per capita (in thousands of pesos at 1950 prices)	21.6	24.8	25.8	45.3	1.1	5.1
Gross product per worker (")	63.1	63.7	64.5	112.5	0.1	4.8
Capital per worker (")	124.1	122.2	126.5	177.6	-0.2	3.2
Basic Needs						
Gross product (in thousands of million pesos at 1950 prices)	108.7	143.3	153.8	309.0	2.4	6.4
Capital stock (" ")	213.8	275.0	301.6	515.0	2.1	5.3
Output-capital ratio	0.51	0.52	0.51	0.60	-	-
Gross saving (as a percentage of the gross product)	17.2	14.0	15.8	21.3	-	-
Consumption (" ")	882.8	86.0	84.2	78.7	-	-
Investment (" ")	11.5	11.4	16.4	19.5	-	-

Source: United Nations Economic Commission for Latin America.

/2. Projections

2. Projections of Demand by Sectors

Assuming a given growth in gross product and consumption, the increased demand for different goods and services may be calculated in terms of their respective income elasticities. This procedure has been outlined in Chapter IV of Part One, but it would be advisable to briefly summarize the changes in structure of output, and in imports, created by the increased demand. For this purpose it is also necessary to bear in mind, as was pointed out in Chapter IV, the most likely growth of the capacity to import, with a view to determining the magnitude of the substitutions which will have to be made in imports.

Assuming an expansion of 56 per cent in the gross product and 28 per cent in the capacity to import, it would be necessary to substitute 24 per cent of total demand for imports.[1/] Detailed analysis indicates that the margin of substitution fluctuates between 75 per cent for consumer manufactures, and 14 per cent for foodstuffs.[2/]

As a result of the greater demand, and the need for substituting a varying degree of imports in each sector, output tends to increase at different rates. The increase of value added or received by each sector would not necessarily coincide with the increases in real output of goods and services, because of changes in the terms of trade. The projected demand for finished goods established in Chapter IV of Part One, presupposes constant consumer prices. It is possible, however, that relative prices for transport and distribution services may be reduced and the product accruing from these sectors would rise at a lower rate than their output. On the other hand, remuneration in the production of goods, namely, agriculture, industry and building, would improve. The relative prices for personal services in contrast with other services would more likely rise in the hypothesis analysed, as will be seen when the problem of utilization of the labour surplus is considered later. On this basis changes in relative prices, and in the ratio to the gross product, were assumed as follows:

1/ See Chapter III of Part One to compare this sizable degree of substitution with other hypotheses concerning the growth of gross product and of the capacity to import.

2/ See Part One, Chapter IV.

/Table 4.

Table 4 Fluctuations in Real Output, Relative Prices and Value Added: by Sectors

(in percentages)

	Changes in output	Changes in relative prices	Changes in the gross product
Agriculture	37	10	51
Mining	35	1	36
Manufacturing	101	5	111
Building	40	20	68
Transport and public services	100	- 11	78
Commerce and finance	70	- 18	40
Personal Services	35	21	73

Source: United Nations Economic Commission for Latin America.

It will be noted that the preceding projections do not refer to the expansion of government services since they depend to a very slight degree on market demand-elasticities.

Movements of these services, however, are not independent, but are determined by the growing needs of a developing community. Furthermore, some of them, such as defense and policing expenditures have no direct relation with economic development.

The projection of government services is difficult because of the statistical problems involved in measuring the volume and relative prices of services, as well as assessing the economic and social role of the State. A study of political decisions is outside the scope of this analysis. As a result, a projection will be based partly on recent public expenditures in Chile, and partly on assumptions concerning future needs for government services and the possibilities of improving their efficiency and reducing their relative price.

Between 1940 and 1950 current government expenditures in Chile rose at an annual rate of 5.5 per cent, while consumption expanded only at 2.8 per cent. Thus, consumption as a whole increased 3.2 per cent, while current fiscal expenditures in relation to the total increased from 11.7 to 14.6 per cent. Existing data do not indicate whether this involved an increase in real services rendered or higher remuneration for public services in relation to labour engaged in other activities, since indices for

deflating total fiscal expenditures and the salaries of public employees are inadequate. Consequently, they were deflated by the same index as was used for the gross product, implying tacitly that real services rose to the degree indicated.

There are several hypotheses concerning the expansion of fiscal expenditure. On the one hand it may be assumed that current fiscal expenditure would rise at the same rate as the gross product. On the other hand, it may also be assumed that it will continue to rise at the same rate as during the ten-year period 1940-1950. Lastly it might be assumed that between 1953 and 1962 certain important improvements can be made in the efficiency of the public administration, eliminating unnecessary services and improving coordination in essential services in order to raise productivity. In the latter event the relative prices of government services might also be reduced. As a result of these changes fiscal expenditure would rise more slowly than the gross product, but, even so, the growing needs of the population would be fully covered. This last hypothesis was used as a working basis as it was assumed that between 1950 and 1962 government expenditure would rise by 37 per cent, that is at an annual rate of 2.7 per cent, as may be seen from the following table.

Table 5 Initial Hypothesis of Expansion of Public Services

(hypothesis used)

	1950	1953	1957	1962	Rate of expansion 1950-1962
Current government expenditure	18.0	20.5	22.5	24.7	2.7
Current government expenditure in percentages of the gross product	12.6	13.5	12.5	11.0	-
Personal expenditure on consumption	105.2	107.7	122.5	156.9	3.4
Total consumption	123.2	128.1	145.0	181.6	3.3
Inflow (+) or amortization (-) of foreign capital	1.0	4.9	-1.0	-1.0	-
Foreign capital accumulated since 1953	-	4.9	12.1	12.1	-

Source: United Nations Economic Commission for Latin America

/It would,

It would, nevertheless, be advisable to compare this hypothesis of expansion of fiscal expenditure with the remaining two in order to determine its effects on the growth of the rest of consumption. In the second hypothesis fiscal expenditure would rise between 1953 and 1962 at the same rate as the gross product, that is, more rapidly than consumption as a whole. This would imply that the increase would be made at the expense of personal expenditure on consumption, which could not exceed an annual rate of 3.1 per cent between 1950 and 1962, as compared with 3.4 per cent in the preceding process. This may be clearly seen in Table 6.

Table 6 Second Hypothesis of Expansion of Growth of Public Expenditure

(at the expense of personal expenditure on consumption)

	1950	1953	1957	1962	Rate of expansion 1950-1962
Current government expenditure	18.0	20.5	24.3	30.3	4.4
Current government expenditure in percentages of the gross product	12.6	13.5	13.5	13.5	-
Personal expenditure on consumption	105.2	107.7	120.7	151.3	3.1
Total consumption	123.2	128.1	145.0	181.6	3.3
Inflow (+) or amortization (-) of foreign capital	1.0	4.9	- 1.0	-1.0	-
Foreign capital accumulated since 1953	-	4.9	12.1	12.1	-

Source: United Nations Economic Commission for Latin America.

In the third hypothesis shown in Table 7, personal consumption would be even more sharply affected as a result of the growth of public expenditure at the rate absorbed during the past decade (5.5 per cent annually). In this case personal consumption expenditure would only rise at an annual rate of 2.9 per cent.

/Table 7

Table 7 Third Hypothesis of the Growth of Public Expenditure

(at the expense of personal expenditure on consumption)

	1950	1953	1957	1962	Rate of expansion 1950-1962
Current government expenditure	18.0	21.1	26.2	34.2	5.5
Current government expenditure in percentages of the gross product	12.6	14.0	14.6	15.3	-
Personal expenditure on consumption	105.2	107.0	118.8	147.4	2.9
Total consumption	123.2	128.1	145.0	181.6	3.3
Inflow (+) or amortization (-) of foreign capital	1.0	4.9	- 1.0	-1.0	-
Foreign capital accumulated since 1953	-	4.9	12.1	12.1	-

Source: United Nations Economic Commission for Latin America

It is now necessary to determine what would occur if an attempt were made to cause personal consumption and State expenditure to rise concurrently. This would imply a greater expansion of aggregate consumption than was foreseen in the hypothesis of moderate development. In order to render such consumption compatible with the investment required for the growth of the gross product, an additional inflow of foreign capital would be needed over and above the amount estimated in Chapter III of Part One. If the expansion of consumption in the basic hypothesis is combined with the expansion of public expenditures in proportion with the gross product, between 1953 and 1962, foreign capital requirements would amount to 29.5 thousand million pesos, that is 17.4 thousand millions more than in the basic hypothesis of moderate development. If public expenditure rose at the rate prevailing during the past ten years without proving detrimental topersonal consumption, as foreseen in that hypothesis, a total of 50.5 thousand million pesos of foreign capital would be required, that is, 38.4 thousand millions more than in the assumption adopted. Both of these examples of growth of public expenditure, without detriment to consumption, are shown in Tables 8 and 9.

/Table 8

Table 8 Fourth Hypothesis of the Growth of Public Expenditure

(without detriment to personal expenditure on consumption)

	1950	1953	1957	1962	Rate of expansion 1950-1962
Current government expenditure	18.0	20.5	24.3	30.3	4.4
Current government expenditure in percentages of the gross product	12.6	13.5	13.5	13.5	-
Personal expenditure on consumption	105.2	107.7	122.5	156.9	3.4
Total consumption	123.2	128.1	146.8	187.2	3.6
Inflow (+) or amortization (-) of foreign capital	1.0	4.9	0.8	4.6	-
Foreign capital accumulated since 1953	-	4.9	14.9	29.5	-

Source: United Nations Economic Commission for Latin America

Table 9 Fifth Hypothesis of the Growth of Public Expenditure

(without detriment to personal expenditure on consumption)

	1950	1953	1957	1962	Rate of expansion 1950-1962
Current government expenditure	18.0	21.1	26.2	34.2	5.5
Current government expenditure in percentages of the gross product	12.6	14.0	14.6	15.3	-
Personal expenditure on consumption	105.2	107.7	122.5	156.9	3.4
Total consumption	123.2	128.8	148.7	191.1	3.7
Inflow (+) or amortization (-) of foreign capital	1.0	5.6	2.7	8.5	-
Foreign capital accumulated since 1953	-	5.6	20.8	50.5	-

Source: United Nations Economic Commission for Latin America

3. Capital Requirements Arising from Growth of the Different Sectors

Before indicating investment requirements to raise the production capacity in the different sectors with a view to attaining the level of output indicated in the preceding section, it would be advisable to summarize the relation between the rate of investment, the output-capital ratio and the rate of growth of the gross product.

Let it be assumed that the gross product measured in monetary units of constant value is equal to 100 in a given year, that the output-capital ratio is 0.50, and that the real rate of capital depreciation is 3 per cent annually. In order to raise the product by 5 per cent, capital would have to be increased by 10 units, and to replace the stock of capital, an additional 6 units of investment would be required. Therefore, a gross investment of 16 per cent would be required, equivalent to a net investment of 10 per cent. It will be seen that the rate of net investment (10 per cent) multiplied by the output-capital ratio (0.50) gives the rate of growth of output (5 per cent). An improvement in the output-capital ratio, equivalent to 5 per cent, would enable the same rate of expansion of output to take place without need for further investment other than required to replace capital stock, for which a 6 per cent rate of investment would be sufficient. In contrast, a decline of 5 per cent in the output capital ratio would neutralize the effects of an investment rate of 16 per cent. This indicates the favourable or adverse influence of the output-capital ratio in accelerated development.

It should be remembered that the hypothesis of moderate development assumes the maintaining of the output-capital ratio. This is due to the fact that more intensive utilization of installed capital and resources, as well as the effects of technical progress, would be compensated by the need for substantial investment in the basic sectors where capital productivity is low. A fuller utilization of equipment and resources would, in turn, require better distribution of the labour force. The economy as a whole would make better use of its capital availabilities if labour substitution were more intense in sectors where its productivity is lower and if the absorption of displaced labour occurs in sectors in which installed capacity is less efficiently used. This, in turn, would solve the problem of surplus population and the difference in labour productivity as between the different activities. Naturally, the output-capital ratio would have to increase in certain sectors

/and decrease

and decrease in others, although it would remain constant for the economy as a whole. The figures shown below explain this concept more clearly.

Table 10. Changes in the Output-Capital Ratio by Sectors

	1950	1962	Percentage increase
Agriculture [a/]	0.39	0.39	0
Mining	0.89	0.96	8
Manufacturing	0.62	0.62	0
Transport and public services	0.20	0.23	17
Others	0.60	0.53	-11

Source: United Nations, Economic Commission for Latin America.

[a/] Capital includes live-stock inventories.

It will be seen that the maximum increase of productivity obtained from the hypothesis formulated in the present text could be achieved in two of the strategic economic sectors, namely, transport and energy. These are precisely the sectors in which the output capital ratio is necessarily lower, both for technical reasons and owing to the fact that production capacity must exceed the maximum projected requirements over a certain period. Moreover, the increase in productivity in this sector would reduce investment requirements since if the output-capital ratio of 1950 were maintained for energy and transport, the necessary resources to attain projected out-put would exceed the figures calculated by 15 thousand million pesos, (see relevant chapters).

The maintaining of the output-capital ratio in agriculture would be achieved by a substitution of capital for labour to a greater extent than in other activities. The moderate improvement of the output-capital ratio in mining would result from technological improvements (coal mining) and better use of existing capacity. The productivity of investment in manufacturing activities would remain at the same level since more intensive utilization of equipment and technological improvement will be offset by a relatively greater expansion of the capital goods industry which require more fixed equipment than the average. In the remaining sectors, grouped under "Others" in Table 10, capital productivity would decline as a result of intensified

/density of

density of equipment per worker. In order to obtain the increases of output indicated in Table 4, given the changes in the output-capital ratio shown in Table 10, it would be necessary to raise net capital investment as follows in the different sectors:

Table 11 Capital Requirements by Sectors

	Increase of capital Percentage
Agriculture	37
Mining	25
Manufacturing activities	100
Transport and Public services	721
Others	58
Total	56

Source: United Nations Economic Commission for Latin America.

4. Changes in the Composition of Labour

It was pointed out in the preceding section that better utilization of resources for production would involve substituting labour in those sectors where there is a larger surplus of underemployed workers and absorbing it in the sectors where the installed capacity is inappropriately utilized. Labour productivity would, therefore, tend to increase to a less extent where it is high and where the output-capital ratio is low and viceversa. In addition to this difference in the improvement of labour productivity in different activities, labour requirements would be determined by the different degree to which respective outputs expanded. Taking into account these two factors, the intensity of the movements of the labour force occuring in the hypothesis of moderate development, can be understood. These are shown in the following tables.

Under present economic conditions in Chile, there would appear to be a surplus population in agriculture and, to a lesser extent, in personal services and in building. Of these two sectors, the former is the only one in which there would appear to be a possibility of substantial improvement of labour productivity by capital investment without lowering its productivity appreciably. The opposite case is that of transport and energy, where for

/technical reasons

technical reasons the output-capital ratio is low. It could, however, be raised by improvements in efficiency where a small amount of investment per worker would achieve an appreciable improvement in labour productivity. These tendencies and those of productivity in other sectors are shown in Table 12.

Table 12 Fluctuations in the Physical Productivity of Capital and Labour by Activities from 1950 to 1962

(percentage)

	Increase in the output -capital ratio	Capital increase per worker	Labour productivity increase
Agriculture	0	37	37
Mining	8	- 2	6
Manufacturing activities	0	23	24
Building	a/	a/	12
Transport and public services	17	7	25
Commerce and Finance	a/	a/	9
Government and personal services	a/	a/	14

Source: United Nations Economic Commission for Latin America.

a/ Not available.

Comparing the figures for the improvement in labour productivity with the of projected output data, the growth of labour force by sectors may be obtained, as is shown in the following table:

Table 13 Fluctuations in Real Output and Labour Force by Activities, from 1950 to 1962

(percentage)

	Increase in output	Increase in labour force
Agriculture	37	0
Mining	35	28
Manufacturing	101	62
Building	40	25
Transport and public services	100	60
Comerce and finance	70	56
Government and personal services	35	29

Source: United Nations, Economic Commission for Latin America.

/The volume

The volume and trend of labour displacements between the different sectors may be indicated from the above data. It is assumed that the rate of vegetative growth of the labour force is equal in all sectors, and the difference between that rate and the increase in labour force projected represents the inflow or outflow of labour from or to other occupations. These movements are show in Table 14.

Table 14 Growth of the Labour Force

(thousands of persons)

	Labour force in 1950	Growth 1950-62 Vegetative	Migratory	Total	Labour force in 1962	Annual rate of growth 1950-62 percentage
Agriculture and fishing	754	218	-218	0	754	0.0
Mining	86	24	0	24	110	2.1
Manufacturing activities	394	114	130	244	638	4.1
Building	70	8	- 3	5	75	1.8
Transport and public services	108	31	34	65	173	4.0
Commerce and finance	209	60	56	116	325	3.7
Personal services	524	152	- 13	139	663	2.0
Public administration	106	30	14	44	150	3.0
Output of Goods	1,303	377	- 91	286	1,589	1.7
Rendering of services	947	273	+ 91	364	1,311	2,7
Total	2,250	650	0	650	2,900	2.1

Source: United Nations Economic Commission for Latin America.

In the preceding table attention should be drawn to the fact that the vegetative growth of agriculture would be absorbed by other sectors. On the other hand, labour force in building and in personal services would increase despite the loss occasioned by migration from these sectors. Among the activities in which labour force would increase as a result of internal migration, attention should be drawn to manufacturing activities where the

/increase may

increase may be observed, both in absolute and relative terms. Appreciable increases would also occur in transport and commerce. Public administration would absorb a relatively small amount of labour services while in mining there would be an increase equivalent to that of the vegetative increment, without gaining or losing from the internal displacements of labour.

Another interesting comparison drawn from the projection of labour migration concerns the alteration in the product per worker in the different sectors. These fluctuations result from a combination of changes in labour productivity described above and alterations in the terms of trade, as suggested in Part I of the present study. These changes are indicated in Table 15.

Table 15 Fluctuations of the per capita product and of physical productivity by sectors from 1950 to 1962

	Per capita product (thousands of pesos at 1950 prices)		Change	Increase of physical productivity	Change in relative prices
	1950	1962	%	%	%
Agriculture	23.6	35.7	51	39	10
Mining	97.7	104.5	7	6	1
Manufacturing activities	64.7	84.1	30	24	5
Building	34.3	46.0	34	12	20
Transport and public services	76.9	85.0	11	25	-11
Commerce and finance	159.3	142.2	-11	9	-18
Personal services	25.4	35.1	38)	14	21
Government	74.5	80.7	8)		- 5
Output of goods	41.5	60.5	46	37	7
Rendering of services	66.3	73.5	11	17	- 5

Source: United Nations Economic Commission for Latin America.

It may be seen clearly that certain differences in per capita product would persist, but would, nevertheless, be attenuated by this hypothesis. The greatest increases in per capita product would be in the most poorly remunerated sectors, namely, agriculture, personal services and building. In contrast, where the level of remuneration is better, the per capita product

/would rise

would rise less and may even decline in the case of commerce. The ratio of the per capita product in commerce to that of agriculture, which are the two extremes, would decline from 6.8 to 4. It is interesting to observe that remuneration per worker in production of goods would rise 46 per cent, while in the rendering of services it would expand 11 per cent.

5. Changes in the Distribution of the Product by Activities

The changes in the distribution of product, resulting from the projections considered above, will now be studied. This pattern is shown in Table 16.

Table 16: Projection of the Distribution of Geographic Income by Activities

	Thousands of million pesos		Distribution (percentage)		Annual Rate of Growth (percentage)
	1950	1962	1950	1962	1950-62
Agriculture and fishing	17.8	26.9	15.2	14.0	3.5
Mining	8.4	11.5	7.0	6.0	2.6
Manufacturing	25.5	53.7	21.9	27.9	6.4
Building	2.4	4.0	2.0	2.1	4.3
Transport and public service	8.3	14.7	7.1	7.6	4.9
Commerce and Finance	33.3	46.2	28.6	24.0	2.8
Personal services	13.3	23.3	11.4	12.1	4.8
Public services	7.9	12.1	6.8	6.3	3.6
Output of Goods	54.1	96.1	46.1	50.0	4.9
Rendering of services	62.8	96.3	53.9	50.0	3.6
Total	117.0	192.4	100.0	100.0	4.2

Source: United Nations Economic Commission for Latin America.

In relation to 1950, there would be increases in certain sectors, namely, industry, building, transport and public administration. There would be a slight decrease in agriculture, mining and personal services and, to a greater extent, in commerce. The major contrast, as compared with the present structure, would be in the relative position of industry and commerce.

/In the base

In the base period 1950, commerce accounted for 29 per cent of the gross product which proportion is higher than that of the remaining sectors. The share of industry was then 22 per cent. However, in 1962 the position will be inverted, so that industry would be contributing 28 per cent of the gross product and commerce 24 per cent.

Another interesting comparison drawn from Table 16 shows the relative changes in the distribution of the product as between the sectors producing goods and those rendering services. The production of goods accounted for 46 per cent of the gross product in 1950, whereas in 1962 it was expected to show 50 per cent. The proportion of services would thus decline from 54 to 50 per cent.

6. Alternatives for the Financing of Economic Development

In order to study the compatibility of the different alternatives for financing of public and private investments as between each other and with the growth of the gross product and consumption, it would be advisable to establish a system of national accounts. This system divides the economy into four sectors, that of enterprise or production sector; the personal or consumer sector; the government sector including fiscal undertaking, and a capital sector covering also the remittance of profits and interest on foreign investments. All inflows and outflow from each of these sectors to the remaining ones, should be recorded by this system. Each sector receives from the other three sufficient income to finance its expenditure, which, in turn, consists in payments to other sectors. The consolidations of these accounts is shown in the accounts of the volume of available goods and services and its utilization (Table 17). Since certain payments or receipts depend on the hypothesis adopted concerning the growth of the product and of consumption, of investment requirements and the remainder in the balance of payments, this instrument would be very useful in helping to determine rapidly the effect of a given hypothesis of public or private investment on the remaining sectors of the economy. These facts must be borne in mind in considering the projections of the different alternatives of financing development.

/Table 17:

Table 17 Consolidated Account of Available Goods and Services and their Distribution

(thousands of million pesos at 1950 prices)

INCOME	1950	1962
Wages and salaries	50.7	96.2
Profits	25.3	38.4
Interest and rent	10.1	15.4
Proprietors' income	30.9	42.4
Geographic income	117.0	192.4
Depreciation reserves	4.1	9.2
Indirect taxes	12.9	14.5
Income of public enterprises	9.3	8.0
Gross Geographic product	143.3	224.1
Remittances of interest and profit	-4.8	-4.6
Inflow (+) or amortization (-) of foreign capital	1.0	1.0
Available goods and services	139.5	218.5

EXPENDITURES	1950	1962
Personal consumption	105.2	156.9
Government current expenditure	18.0	24.7
Total Expenditure on consumption	123.2	181.6
Private Investment	9.9	22.4
Public Investment	6.4	14.5
Total gross investment	16.3	36.9
Utilization of available goods and services	139.5	218.5

Source: United Nations Economic Commission for Latin America.

In order to project the share of the State and of the private sector in financing development, it would first be advisable to determine how both sectors have contributed to investment and financed their expenditure for this purpose.

Public Investment and its Financing

In 1940 public investment amounted to 4 thousand million pesos at 1950 prices, as compared with gross investment of 12.5 thousand million pesos, that is to say, 32 per cent of the total. In 1950 this proportion has risen 39 per cent, representing 6.4 thousand million pesos. However,

/financing of

financing of these investments changed substantially between the two dates. Thus, in 1940 the budgetary surplus on current account, equivalent to 9 thousand million pesos, was used to finance government investments and allowed for a remainder of 2.5 thousand millions. In 1950, on the other hand, the surplus was only 5.2 thousand million pesos, so that 1.2 thousand million of State investments had to be financed by loans. To simplify the hypothesis it may be assumed that both public and private sectors would tend to finance their investments with their own sources. Consequently, development financing would be determined by the share of each sector in total investment.

Since the hypothesis of moderate development requires heavy initial investment in the basic sector of economy, and would involve more rapid replacement of deteriorated or obsolete equipment,[1/] it is logical to assume that the State would undertake most of such investments. Since in this initial period it was assumed that foreign assistance would be required, the share of public investment in relation to the total would probably rise, and its finance would be partly provided by the current fiscal surplus and partly by foreign loans referred to in Chapter III of Part One. In this hypothesis, public investments would account for 47 per cent of gross investment in 1953. Even though there would be good reasons for maintaining this high proportion of State investment, a more conservative hypothesis was adopted, whereby private investment would reacquire its present importance after the period of foreign loans. Consequently, 1962 State investment would onece again represent 40 per cent of the total.

On these assumptions, public investment would rise from 6.4 thousand million pesos in 1950 to 11.1 thousand millions in 1953 and 14.5 thousand millions in 1962. In 1953, 4.9 thousand million pesos in foreign loans would be available to the Government, so that only a current surplus of 6.2 thousand millions would be required (19 per cent more than in 1950). In 1962, on the other hand, the fiscal surplus would be sufficient not only to financeState investments, but also to amortize foreign loans and would have to attain a total of 15.5 thousand millions, that is three

1/ For this reason it was assumed that the real rate of depreciation of capital stock in Chile would rise from 3 to 4 per cent (see Table 1).

times higher than the 1950 figure.

In order to obtain a fiscal surplus required for this hypothesis, and given the projection of current expenditure, as shown in sector 4, the government revenue will have to rise from 31.9 thousand million pesos in 1950 to 35.7 thousand million in 1953 and 51 thousand million in 1962.

The alternative means of financing the Government budget constituted one of the most important aspects of programming economic development. In short, it is a question of choice between direct and indirect taxation. It might be advisable to consider the possible results of both methods before establishing any hypothesis as to future trends. For this purpose, some idea should be given of the relative significance of the different current forms of taxation.

In 1950 indirect taxes contributed 40 per cent of total fiscal revenue. Direct taxes, including those levied on foreign mining, produce only 17 per cent of the total. Taking a comparison in another field, indirect taxes were equivalent to 12.5 per cent of private expenditure on consumption, whereas direct taxes constituted only2.8 per cent of such expenditure and profits taxes (including those on foreign firms) were equivalent to less than 5 per cent of total profits.

On the basis of the present situation, certain broad comments could be made on the effects whichan increase of indirect taxes would have on consumer demand. These effects would have to be studied in the light of their repercusions on costs and prices, on the one hand, and on the distribution of income on the other.

For this purpose, three alternative methods of financing public expenditure were considered. They are shown in Table 18, compared with the present structure of fiscal revenue. Table 19 contains certain relationships which indicate the effects of each of these alternatives on the structure of consumption, costs and the distribution of income.

/Table 18

Table 18 Three Alternatives for Financing Public Expenditure

	1950		First Alternative 1962		Second Alternative 1962		Third Altern. 1962	
	Thousands of million pesos	per-centage	Thousands of million pesos	per-centage	Thousands of million pesos	per-centage	Thousands of million pesos	per-centage
Income of Government enterprises (minus subsidies to private sectors)	9.3	29.2	9.0	17.6	14.9	29.2	0.0	0.0
Direct taxes on enterprises	1.1	3.4	2.5	4.9	1.7	3.4	2.8	5.5
Indirect taxes	12.9	40.4	14.5	28.4	20.6	40.4	2.5	4.9
Taxes on foreign mining	1.2	3.8	3.0	5.9	1.9	3.8	3.4	6.7
Direct taxes on private individuals	3.1	9.7	16.0	31.4	4.9	9.7	35.7	70.0
Social security taxes	4.3	13.5	6.0	11.8	6.9	13.5	6.6	12.9
Total revenue	31.9	100.0	51.0	100.0	51.0	100.0	51.0	100.0

Source: United Nations, Economic Commission for Latin America

Note: First alternative: hypothesis adopted
Second alternative: the maintenance of the present structure of fiscal revenue.
Third alternative: increase in the share of taxes on private income up to 70 per cent of fiscal revenue.

Even though the first alternative was selected as an example in the formulation of the projection, it was found advisable to consider the other two also. The second alternative consists in maintaining the present revenue structure. The third assumes that direct taxes on private individuals would rise from 9.7 per cent of total revenue to 70 per cent and that other direct taxes on enterprises and on foreign mining would rise from 7.2 to 12.2 per cent

/ of the

of the total. These increases would be effected at the expense of indirect taxes and the revenue of fiscal enterprises. Indirect taxes would decline from 40.4 to 4.9 per cent, while the revenue of fiscal undertaking would drop to zero, indicating that a fair proportion of the services would be rendered freely and that the remainder would be exactly compensated by subsidies paid to the private sector. The hypothesis adopted is midway between these extremes. Indirect taxes and revenue from fiscal enterprises would also decline relatively but not to the same extent as may be seen from the preceding table. Direct taxes on private income would become the main source of revenue but barely representing 31.4 per cent of the total.

/Table 19

Table 19 Some Effects of the Three Alternatives of Fiscal Financing on the Structure of Consumption, Costs and Distribution of Income

	1950	I Alternative 1962	II Alternative 1962	III Alternative 1962
Direct taxes on private individuals as a percentage of dividends, interest and rent received	5.7	21.3	6.5	43.3
Indirect taxes as a percentage of private consumer expenditure	12.2	9.2	13.1	1.6
Indirect taxes as a percentage of total sales by enterprises	9.9	7.0	10.0	1.2
Indirect taxes as a percentage of salaries and wages	25.4	15.1	24.0	2.4
Revenue of Government enterprises[a] as a percentage of private consumer expenditure	8.8	5.7	9.5	0.0
Revenue of Government enterprises[a] as a percentage of total sales of the enterprises	7.1	4.4	7.2	0.0
Revenue of Government enterprises[a] as a percentage of wages and salaries	18.1	9.4	18.3	0.0
Dividends, interest and rent as a percentage of private income	50.0	42.8	45.4	42.0
Wages and salaries as a percentage of private income	46.1	54.4	51.6	56.1

Source: United Nations Economic Commission for Latin America

a/ Net paid to the private sector.

/It would now

It would now be appropriate to consider some of the repercusions of the three alternatives. An increase of indirect taxes would tend to affect prices and costs of production. If one of the causes for slow development recently was the inadequacy of demand, any increase in costs and prices would tend to slow it down even further. Even the maintenance of the current fiscal structure would mean that indirect taxes would rise from 12.2 per cent to 13.1 per cent of private consumer expenditure and would continue to represent 10 per cent of total sales of the enterprises. On the other hand, the third alternative would reduce the payment of indirect taxes to 1.6 per cent of private consumer expenditure and 1.2 per cent of the sales of enterprises. This would tend to stimulate demand which is all the more important since an increase in indirect taxes to finance investment perhaps would not allow demand to expand compatibly with the growth of the gross product. In other words, although the productive capacity would tend to increase, as indicated in the first section of this chapter, inadequate demand would result in unsatisfactory utilization of capacity; therefore the output-capital ratio would decline, thereby retarding development. There are ample indications that this inadequacy of demand is associated with the prevailing structure of the distribution of income. Indirect taxes would tend, if not to deteriorate, at least to leave that structure in its present position. If the volume of indirect taxes are compared with the part of private income constituted by wages and salaries, (which would be equivalent to the assumption that the full burden of taxation falls on the wage earning classes) in the second alternative a 24 per cent tax would be levied on such remuneration and on the third only 2.4 per cent.

The revenue of fiscal enterprises could be treated in the same way as may be seen in table 19.

An increase of direct taxes would meet with perhaps greater resistence on the part of groups whose incomes are seriously affected. Apart from this difficulty, an increase of direct taxes would give rise to problems of control and administration which will be more serious than those arising from higher indirect taxation.

With a view to simplification, reference will be made only to direct

/taxes on

taxes on private individuals. The present system of taxation absorbs only 2.8 per cent of total private income and there would, therefore, appear to be a margin for heavier levies. Assuming that direct taxation would fall entirely on dividends, interest and rent, it may be seen from Table 19 that in 1950 only 5.7 per cent of these items were absorbed by the State. The hypothesis of maintaining the present structure of fiscal revenue would only raise this proportion to 6.6 per cent. On the other hand, the third alternative would raise it to 43.3 per cent, which does not appear excessive, as compared with the prevailing situation in other countries, if it is borne in mind that part of these taxes is actually paid by salary and wage-earning classes. Nonetheless the change in the burden taxes would perhaps appear to be too abrupt.

Moreover, progressive taxation on private income would contribute to improving income distribution, thus suppressing one of the obstacles to development. By comparing the latter two items of the table, in the second and third alternative, the effects of the different financing schemes on the distribution of income can be perceived clearly.

Alternative I selected, solely for purposes of illustration, is midway between the two extremes. It will be described briefly in order to have a clearer notion of the financing of public investment in the hypothesis of moderate development.

Total fiscal revenue would rise in this hypothesis from 31.9 to 51 thousand million pesos between 1950 and 1962, that is about 60 per cent. Indirect taxes would only increase 12.5 per cent and their proportion in relation to the total would decline from 40 to 29 per cent. This would enable a reduction to be effected in the 12.2 per cent tax at present applied to consumer expenditure, so that it would drop to 9.2 per cent, thus stimulating aggregate demand.

Direct taxes would be almost four times higher and their share in fiscal revenue would rise from 17 to 43 per cent. The highest rate of growth (slightly more than 5 times) in taxes on private income would be that of income tax which would rise from 10 to 32 per cent of fiscal revenue. However, the proportion of income absorbed by the tax would only rise from 2.8 to 9.1 per cent. Profit taxes and taxes on mining would rise from 7.2 to 11 per cent of fiscal revenue, but would not absorb

/more than

more than 14.3 per cent of total profits in 1962, as compared with 9.1 per cent in 1950. Considered separately, taxes on foreign mining enterprises which in 1950 absorbed 20 per cent of foreign investment, would represent 40 per cent thereof by 1962. It should be pointed out that the highest proportion was that in 1940 when taxation absorbed 25 per cent of profits.

These hypotheses explain the origin of the 72 per cent of fiscal revenue required to finance investment and current expenditure forseen. The remainder would have to be provided by two items which in 1950 supplied 43 per cent of total revenue, namely, the profit earned by state enterprises (minus subsidies paid to the private sector) and revenue for social security services. It may be assumed that these facilities would tend to expand with development, although with less intensity than private income. As a working hypothesis it may be assumed to increase 40 per cent between 1950 and 1962. It may also be assumed that the revenue of fiscal enterprises would progressively tend to flow into the private sector in the form of subsidies, involving lower consumer prices. However, since the revenue obtained from other sources would be inadequate to reach the expenditure foreseen, this goal could not be achieved until 1962. At all events the total sum in both relative and absolute terms, would decline considerably. In the hypothesis considered here it would decline by 14 per cent and its share in State revenue would drop from 29 to 16 per cent.

All the preceding hypotheses are combined in the projection of the structure of fiscal revenue and expenditure shown in the national accounts and those of fiscal enterprises (Table 20).

/Table 20

Table 20 Government and Public Enterprises Account

(Public Sector)

(thousands of million of pesos at 1950 prices)

REVENUE	1950	1962	EXPENDITURE	1950	1962
8. Profits from State enterprises	9.3	9.0	15. Wages and salaries paid	13.1	17.3
11. Direct taxes on enterprises	1.1	2.5	2a Purchases of goods and services on current account	4.9	7.4
12. Indirect taxes	12.9	14.5	16. Consumption transfers	8.7	11.0
13 Taxes on foreign mining	1.2	3.0	20. Surplus on current account	5.2	15.5
18. Direct income taxes	3.1	16.0		31.9	51.2
17 Revenue derived from social security taxes	4.3	6.0	Differences arising from rounding of figures.	0.0	- 0.2
Total income	31.9	51.0		31.9	51.0

Source: United Nations, Economic Commission for Latin America.

Private Investment and its financing

In the hypothesis analysed, private investment would rise from 9.9 thousand million pesos in 1950 to 22.4 thousand million in 1962, which figure added to public investment shown above, would give the total investment figure projected for that year. There are numerous alternative methods of financing such private investment. For purposes of simplification the analysis will be limited to domestic sources, that is to say, the private savings and the retained earnings of interprises.

In the present economic structure personal savings play a secondary role as a source of funds for investments. It has already been pointed out that there was a net personal dissaving which was equivalent to 3.3 thousand millions in 1940, whereas in 1950 personal savings equivalent to 1.6 thousand millions, that is, 10 per cent of gross investment. This is due solely to the pattern of income distribution and the consumer habits in that sector of the population which is in a position to save. Other factors which contribute to the small role of

/personal saving

personal saving are the relatively unimportant role of intermediary finance institutions and the system of retaining profits and forming reserves followed by enterprises, with the result that the principal source of private financing is the reinvestment of profits. In 1940 revenue retained by enterprises within the country contributed about 70 per cent of private gross investment and by 1950 this figure had risen to 87 per cent.

This would lead to the conclusion that the reinvestment would be the most important means of financing private investment in the future. On the one hand, consumer tendencies in Chile indicate that there is little propensity to increase saving proportionately with the rise of income. Moreover, either the data which would enable an approximate calculation of saving to be made either do not exist or are distorted by the existence of price and import controls, etc. Appreciable changes are also foreseen in the distribution of income making it difficult to project private savings. They must, therefore, be recorded as a residual item comparing the projections for the growth of disposable personal income for consumption with private expenditure on different types of goods and services. This projection shows an increase of 130 per cent between 1950 and 1962, when personal saving should average 3.7 thousand million pesos, which would be sufficient to finance 16.6 per cent of the total private investment projected. The amount retained by enterprises within the country would then have to rise to a level of 18.7 thousand million implying an increase of 117 per cent over 1950. If it is assumed that depreciation reserves will keep the same proportion to the total real depreciation as in 1950, they would amount to 9.2 thousand million pesos, so that undistributed profits required to complete the financing of profits would be equivalent to 9.5 thousand million pesos. In this hypothesis they would increase 111 per cent over 1950 and their proportion to total profits would rise from 18 to 25 per cent.

Having completed these projections of saving and private investment, they can be related to data for the public sector, thus enabling the projection to be made of the enterprises account, the personal account and the capital account, as shown in Table 21, 22, 23.

/Table 21

Table 21 Enterprises Account (Productive Sector)

(thousands of million pesos at 1950 prices)

INCOME	1950	1962	EXPENDITURE	1950	1962
1. Sales to private individuals	105.2	156.9	5. Wages and salaries paid	37.6	78.9
2. Sales to the government			6. Proprietors income	30.9	42.4
a) On current account	4.9	7.4	7. Distributed profits	13.8	17.8
b) On capital account	6.4	14.5	8. Income of Government enterprises	9.3	9.0
3. Sales to enterprises on capital account	9.9	22.4	9. Undistributed profits		
4. Net exports of goods and services	3.8	5.6	a) Within the country	4.5	9.5
	130.2	206.8	b) Remitted abroad	4.8	4.6
Difference obtained by rounding the figures	0.1	0.0	10. Rents and interest	10.1	15.4
	130.3	206.8	11. Direct taxes	1.1	2.5
			12. Indirect taxes	12.9	14.5
			13. Taxes on foreign mining	1.2	3.0
			14. Depreciation reserves	4.1	9.2
				130.3	206.8

Source: United Nations, Economic Commission for Latin America.

/Table 22

Table 22 Private Individuals Account (Consumer Sector)

(thousands of million pesos at 1950 prices)

INCOME	1950	1962
5. Wages and salaries paid by enterprises	37.6	78.9
15. Wages and salaries paid by the government	13.1	17.3
6. Management salaries	30.9	42.4
7. Distributed profits	13.8	17.8
10. Rents and interest	10.1	15.4
16. Consumption transfers	8.7	11.0
17. Social security deductions	-4.3	-6.0
Private income	109.9	176.8

EXPENDITURE	1950	1962
1. Private consumer expenditure	105.2	156.9
18. Direct taxes	3.1	16.0
19. Personal saving	1.6	3.7
Private saving and expenditure	109.9	176.6
Difference obtained by rounding the figures.	0.0	0.2
	109.9	176.8

Source: United Nations, Economic Commission for Latin America

/Table 23

Table 23 Capital Account and Remittances of Profits and Interest on Foreign Investment

(thousand of million pesos at 1950 prices)

INCOME	1950	1962
9. Saving: of enterprises in the form of undistributed profits		
a) Within the country	4.5	9.5
b) Remitted abroad	4.8	4.6
14. Depreciation reserves	4.1	9.2
19. Private saving	1.6	3.7
20. Fiscal surplus on current account	5.2	15.5
	20.2	42.5

EXPENDITURE	1950	1962
2. [b] Public Investment	6.4	14.5
3. Private investment	9.9	22.4
4. Net exports of goods and services	3.8	5.6
	20.1	42.5
Difference obtained by rounding the figures	0.1	0.0
	20.2	42.5

Source: United Nations, Economic Commission for Latin America

7. Composition of Consumption During the Base Period

Part One contains a general outline of the method used to estimate rates of growth of the different economic sectors, compatible with the hypothesis of development. This method is based on aggregate projections. Before undertaking the analysis of the different sectors, it would be advisable to describe the methods used to determine the present composition of Chilean consumption which is the basis of the projections by sectors shown in the following chapters. It has already been pointed out that it is not enough to ascertain the volume of private expenditure on any given group of products. It is essential also to know the volume of the gross product accruing from each productive sector that is incorporated in the price budget by the consumer. Having attained this objective and the projected demand for a given consumer product, the increment for each group of activities concerned in the manufacture of that product can be determined. The method adopted in the present work consisted in first determining, during the base period, what percentage of consumer expenditure was involved in the gross product accruing from manufacturing, what percentage from agriculture, mining and services respectively. The data thus obtained were used for the analysis by sectors. The object of the present section is to study the relative data for consumption and describe the method used in calculating them. The data, as may well be understood, are the basis of the demand projections which, in turn, constitute the first link in the general projections formed in the programme.

Consumer Manufacturers. In order to determine the volume of consumption of manufactures, the available data for Chilean industrial output,[1] were reclassified. A breakdown of the group shown in Chilean statistics had to be made so as to separate consumers industries from capital industries. Among the latter were: building industries, the production of equipment and of the goods necessary for manufacturing. Thus, in classifying paper as a consumer article, it was considered that consumer industries are all those participating directly in the paper manufacturing process, such as the paper industry itself, the manufacture of chemical and mechanical pulp, the production of caustic soda etc.

1/ 1948 data were used since this was the last year for which complete statistics were available.

/The major

The major difficulty encountered in an analysis of this kind lies in the classification of certain industries which, at the same time, are subsidiaries of consumer industries and of capital industries. This is the case of chemical industries. A sulphuric acid plant can send the product either to an iron steel factory or to a textile factory. Another case which is difficult to identify is that of metallurgical industry, the products of which are distributed between the output of equipment, building and durable consumer goods. In the case of tin plate, the iron and steel industry produce directly for the manufacture of non durable consumer goods.

If detailed statistics were available of sales by chemical and metallurgical industries, the problem could be solved more easily. The share of the chemical and metallurgical industries which is directed to the manufacture and repair of equipment and structures, would be classified as capital industries. However, in studying Chilean industrial statistics, it will be observed that in view of expanded level of development in the production of durable consumer goods, the absorption of metal by the consumer industries is still very low. On the other hand, given the nature of existing capital industries in the country (building materials repairs, etc) chemical products would be mainly absorbed by consumer goods. Therefore, it was decided that for the purposes of a first classification, chemical industries should be grouped together with consumer goods, while metallurgical industries would be classified together with those of capital goods.

Having adopted this classification, the conclusion is reached that 82.6 per cent of 1948 industrial production in Chile (gross product accruing from the manufacturing process) was produced by consumer goods and industries as may be seen from the following table.

/Table 24

Table 24 Structure of Manufacturing Production in Chile in 1948

	Percentage
Manufacture of capital goods	17.4
Building materials a/	6.4
Metallurgical and mechanical goods	11.0
Manufacture of consumer goods	82.6
Durable goods	11.3
Non durable goods	67.6
Chemical goods	3.7
Total	100.0

Sources: Official Chilean statistics and United Nations Economic Commission for Latin America.

a/ Not including building materials provided directly by the metallurgical industries which were included in the next item.

Attention was drawn to the method adopted for assuming the consumption of manufactures, emphasizing the simplifications which may be introduced into the conclusions.

The first problem consisted of weighting 1948 data to make them comparable with those of 1950 which was used as a basis for all the projections. From the indices of output of principal industries it will be seen that capital goods developed more intensely than consumer goods between 1948 and 1950, owing to the beginning of operations at Huachipato at the end of that year. On the basis of this analysis, it was estimated that the share of consumer industries in total manufacturing output in 1950 was probably not higher than 80 per cent.

The second problem lies in determining the value in terms of gross product accruing from the total of manufacturing production in 1950. The Chilean industrial statistics data shown in the analysis of the structure of production does not cover the full volume of manufactures existing in the country, which, moreover, have not been ascertained for 1950. It was, therefore, decided to make use of the "gross" product data calculated by the Corporación de Fomento for the manufacturing sector. The total value of manufacturing output in 1950, according to their estimate, was 25,862 million pesos.

/Lastly, the.

Lastly, the possibility was considered of adding domestic production to net imports. The greatest difficulty lay in separating from c.i.f. value of imports the corresponding share of the gross product added by the manufacturing process. On the basis of certain studies which have been carried out, it was estimated that 20 per cent of the value of imports consists of services which are added to factory prices; 80 per cent of the c.i.f. value was decreased by the corresponding amount for agricultural raw materials and services which in the country of origin are added to the value of the merchandise during the manufacturing process. The data used in this study consists of coefficients prepared on the basis of input-output studies of the principal industries in the United States in 1947. With respect to exports of items of relatively small importance, a similar method was used as that indicated in the above instance assuming that the average difference between the factory price and the f.o.b. price in Chilean port, would be 10 per cent. The final data for this analysis are shown in Table 25.

Table 25 Consumption of Manufactured Articles in 1950

(in millions of pesos)

Domestic output	20,690	a/
Imports	3,585	b/
Exports	315	c/
Total consumption	23,960	

Sources: Official Chilean statistics and United Nations, Economic Commissi for Latin America.

a/ Equivalent to 80 per cent of the value at factor cost of manufacturing activity (data obtained from the national income calculations)

b/ 80 per cent of the c.i.f. value of imports of consumer manufactures minus agricultural raw materials (53 per cent of foodstuff industries, 22 per cent of textiles and 11 per cent chemical) minus services added in the country of origin during the manufacturing process (7 per cent).

c/ 90 per cent of the f.o.b. value of exports of consumer manufactures with similar reductions to those indicated in the above note.

Consumption of Crop and Live-Stock Products In order to calculate the volume of consumption of the crop and live-stock products (measured in terms of gross product accruing in these activities) a similar method was adopted based on the value of agricultural products plus that of fishing in accordance with the national income data, and subsequently adjusted for foreign trade. As regards imports, it was considered that the c.i.f. value of

/agricultural

agricultural products was reduced by 20 per cent for the above mentioned reasons, and agricultural raw materials incorporated in manufactured imports are also taken into account; 10 per cent of the f.o.b. value of exports was deducted following the same criterion as that in the case of manufactures. Table 26 shows consumption data for crop and live-stock products. As will be seen below, a wider basis was used, namely three years on which to project demand for these products, largely because of the abnormal conditions of agricultural production in 1950. The estimate shown would be used only for determining the composition of the total consumption.

Table 26 Consumption of Agricultural Products in 1950

(in millions of pesos)

Agricultural and fish production	18,220	a/
Imports	2,941	b/
Exports	2,027	c/
Total consumption	19,134	

Sources: Chilean Official Statistics, and United Nations Economic Commission for Latin America

a/ Based on national income data

b/ 80 per cent of the c.i.f. value of agricultural imports as a whole plus 42.4 per cent of the c.i.f. value of imported processed foodstuffs, plus 17.6 per cent of the c.i.f. imported textiles, plus 8.8 per cent of the c.i.f. value of chemical imports.

c/ 90 per cent of the f.o.b. value of agricultural exports.

Consumption of Mining Products. It is difficult to determine the direct contribution of mining to consumption. One estimate of gross output for domestic purposes in 1950 totals 2,763 million pesos. If it is taken into account that 30 per cent of the gross value of mining production consists of fuels, explosives, depreciation expenses etc., that quantity is reduced. It was estimated, for purposes of projection, that mining products are distributed between the manufacturers of consumer and capital goods, according to the relative importance of each of these groups, that is to say, 80 per cent for consumer goods and the remainder for capital goods. This being the case, the direct contribution of mining to domestic consumption would have been 1,547 million pesos in 1950. If the value of imported mining products distributed between capital and consumer goods is added to that amount, the contribution of mining to consumption would be seen to rise

/1,982 million

1,982 million pesos, as shown in Table 27.

Table 27 Value of Mining Products Consumed directly or Incorporated in Consumer Goods in 1950

(in millions of pesos)

I.	Mining output for domestic use	1,934
II.	Proportion incorporated in capital goods	387 a/
III.	F.o.b. value of imported mining products	544 b/
IV.	Proportion of imports incorporated in capital goods	109 c/
V.	Value of mining products consumed directly or incorporated in consumer goods	1,982 d/

Sources: Official Chilean statistics and United Nations Economic Commission for Latin America

a/ 20 per cent of item I

b/ 80 per cent of the c.i.f. value

c/ 20 per cent of item III

d/ Item I + III - II - IV

Consumption of Services. Direct participation of services in consumption cannot be accurately computed since no data are available to support some of these services, such as commerce, transport, energy, etc. rendered to consumers or directly incorporated in consumer goods from the proportion incorporated in the value of capital goods.

In order to obtain some idea of the proportion of these services incorporated in the investment process, the following method was used: the value of domestic production of capital goods (manufacturing, building and mining for domestic consumption) was added to the c.i.f. value of imports of the same type of goods. This value was then substracted from the gross value of investment and it was assumed that the remainder consisted of the value of services incorporated in capital goods, whilst the impact of indirect taxation on capital goods was nil. The result of this estimate is shown on Table 28.

/Table 28

Table 28 Calculation of the Value of Services Absorbed in Investment Process in 1950

(in millions of pesos)

Output of manufactured capital goods	5,172	a/
Value of building	2,400	b/
Value of mining goods incorporated in capital goods	523	c/
Imports of capital goods	3,040	d/.
(A) Total	11,135	
(B) Gross value of investment	15,700	
(A) - (B)	4,545	

Sources: Official Chilean statistics and United Nations Economic Commission for Latin America.

a/ 20 per cent of the total value of manufacturing output, as per the national income estimates

b/ Data obtained from national income estimates

c/ 20 per cent of the value of mining output for domestic purpose plus 20 per cent of the c.i.f. value of imported mining products.

d/ c.i.f. value

The total value of services 1/ in 1950 according to the national income calculations was 53.5 thousand million pesos. Subtracting from that amount the 4.6 thousand million pesos of the investment sector, a total of 48.9 thousand millions would remain to be considered in the estimate of composition of consumption.

Integration of consumption Data. Table 29 shows the above data for consumption supported by activity of origin in Chile for 1950.

/Table 29

1/ This does not include the so-called governmental services which are covered by current government expenditure.

Table 29 Composition of Consumption by Activity of Origin in 1950

	In millions of pesos	Percentage
Manufactured goods	23,900	25
Agricultural and fishing products	19,130	20
Mining products	1,980	2
Internal services	48,900	51
Services incorporated in imported goods	2,160 a/	2
Total	96,130	100

Sources: Official Chilean statistics and United Nations Economic Commission for Latin America.

a/ Freight, insurance and services incorporated in the country of origin of consumer imports.

It is necessary to determine to what extent the estimate of the value of consumption by activity of origin at factor cost, shown in Table 29, is compatible with the data for private and public expenditure on the available goods and services in Chile.

Private consumption expenditure in 1950, amounted to 105,790 million pesos. 1/ A further 4,887 million pesos, representing government expenditure on goods and services on current account, should be added to this amount. The total of 119,677 million pesos corresponds to private and public expenditure on consumer goods and services at market prices.

Subtracting a total of 12,900 million pesos in indirect taxes (the estimates in Table 29 are measured at factor cost) there still remains a total of 97,777 million pesos. If this amount is compared with that in Table 29, the difference would be 1,647 million pesos, which correspond to consumer expenditure of Chilean residents abroad and to statistical discrepancies

Tables 30, 31 and 32, show details of the analysis of Chilean imports using the calculation of consumption by activity of origin as shown above.

1/ Estimated by the Institute of Economy of the University of Chile.

/Table 30

Table 30 Imports of Manufactured Products in 1950 a/

(in millions of pesos)

	c.i.f. value	f.o.b. value	Value of agricultural raw materials	Value of services incorporated in the country of origin	Remainder
Manufacture of foodstuffs, beverages and tobacco	913	730	387 b/	51 c/	292
Textile goods	786	629	138 d/	44 c/	447
Chemical goods	1,710	1,368	150 e/	137 f/	1,081
Other consumer goods	2,373	1,898		133 c/	1,765
Total consumer goods	5,782	4,625	675	365 c/	3,585
Capital goods	3,040	2,432		170	2,262
Grand total	8,822	7,057	675	537	5,847

Sources: Official Chilean statistics and United Nations Economic Commission for Latin America.

a/ The criteria for the break-down were obtained from the study on insumption-output in the United States economy, 1947.

b/ 53 per cent of the f.o.b. value

c/ 7 per cent of the f.o.b. value

d/ 22 per cent of the f.o.b. value

e/ 11 per cent of the f.o.b. value

f/ 10 per cent of the f.o.b. value

/Table 31

Table 31 Imports of Agricultural Products in 1950 a/

(in millions of pesos)

	c.i.f. value	f.o.b. value	Remainder
Non-processed products	2,832	2,266	2,266
Processed products			
a) Incorporated in manufactured foodstuffs			387
b) Incorporated in textile products			138
c) Incorporated in chemical products			150
Total			2,941

Sources: Official Chilean statistics, United Nations Economic Commission for Latin America.

a/ See Table 30, note a/

Table 32 Classification of Chilean Imports for 1950 by Origin of Activity

(in millions of pesos)

Imports of goods	9,332
Agricultural products	2,941
Consumer manufactures	3,585
Capital manufactures	2,262
Mining products	544
Imports of services	3,002
Incorporated in agricultural products	566
Incorporated in consumer manufactures	1,522
Incorporated in capital manufactures	778
Incorporated in mining manufactures	136
Total	12,334
Statistical differences	438
Real total of imports	11,896

Sources: Official Chilean statistics and United Nations Economic Commission for Latin America.

CHAPTER II. INTEGRATION OF FOREIGN TRADE IN THE PROGRAMMING OF DEVELOPMENT

1. Introduction

The fundamental purpose of this chapter is to explain the method used in determining the possibilities of foreign trade for Chile and to evaluate its capacity for external payments during the period 1953-62.

As will be seen below, different hypotheses were formulated for the growth of the capacity for external payments. One of these, the one which has been most thoroughly developed, was used as a basic element in the projections by sectors shown in the remaining chapters of the present work.

Among the many assumptions required to simplify the task, reference should be made to those concerning the terms of trade and the receipts and outflow of invisible trade. It was assumed that during the period under consideration the terms of trade for exports and imports would maintain their 1950 level. This hypothesis seems all the more feasible if, during the next ten years, foreign demand for Chile's principal exports remain at the assumed level and if no disproportionate additions are made to world copper output outside Chile. In this connexion, it should be recalled that the terms of trade were more favourable to Chile in 1950 than in the seven preceding years, but less favourable than in 1951, and considerably lower than 1952.

At all events, the decision to maintain relative prices at the 1950 level does not imply ignoring the effects which the deterioration of the terms of trade may exercise on the capacity for external payments. In fact, it was borne in mind that a deterioration of the terms of trade in 1962 to the level prevailing in 1947-49, would totally annul the effects of the increment in the quantum of exports, assuming the maximum hypothesis of growth of the latter. In other words, if the terms of trade deteriorate to the level prevailing in 1947-49, Chile's capacity for external payments, in the event of the most favourable hypothesis of growth of the quantum of exports, would be equal to that corresponding to the moderate hypothesis of growth in the export quantum providing that in the latter instance the 1950 level of the terms of trade prevail.

/The second

The second assumption made for purposes of simplification consisted in projecting the balance of receipts and outflow of invisible trade instead of projecting each item separately. This procedure was made necessary by the lack of adequate information on which to base independent projections of receipts and outflow. At all events, the balance of this account was small in the course of the past few years[1/], and does not include expenditures abroad by the large mining companies.

The Three Hypotheses of Expansion of Exports.

The calculation of foreign exchange resources available to Chile in the next ten years was based on the consideration of three hypotheses of expansion of exports of which one was chosen for detailed analysis to demonstrate methodology. In the following paragraphs a brief reference will be made to the outstanding features of each of these.

Hypothesis of minimum growth. This hypotheseis was based on two assumptions: the maintenance of the general composition of Chilean exports in 1950, and their increase in proportion with a moderate expansion of real income in the United States. In this hypothesis, the increment of exports at the end of the period 1950-62 is equivalent to 15.0 per cent, that is to say, an annual average rate of growth of 1.19 per cent.

Hypothesis of moderate growth. The basis for this hypothesis is explained below in greater detail. This hypothesis was chosen because it is the more realistic within the scheme of moderate development of Chilean economy. In the following table, the annual rates of growth of Chile's principal exports are shown.

1/ The balance amounted to + 0.6 million dollars in 1949 and -1.0 in 1950, whereas in 1951 it was -3.0 million dollars.

/Table 1.

Table 1: Projected Annual Rates of Growth of the Volume of Exports of Selected Products for the Period 1950-62

	Annual rate of growth (Percentage)
Copper	2.6
Nitrate	0.8
Iodine	1.0
Iron	2.6
Manganese	1.8
Other ores	2.6
Agricultural foodstuffs	4.0
Wine	1.5
Fish	6.0
Lumber	2.5
Wool	0.5
Hides	0.5
Fibres	0.0

Source: United Nations Economic Commission for Latin America.

It is sufficient here to indicate that the increase in exports between 1950 and 1962 will total 28.6 per cent, equivalent to an annual rate of 2.1 per cent.

Hypothesis of maximum growth. This hypothesis differs from the preceding one in that, in addition to the greater expansion of nitrate exports, it assumes the introduction of new exports, namely, paper and wood pulp. An annual increase of 1.6 per cent is foreseen as the rate of expansion of nitrate exports, that is, twice as large as in the preceding case, but less than the probable rate of increase of world demand.

The projection of paper and wood pulp exports is based on the factors detailed in the section on individual commodities. In this connexion, it should be noted that the estimates of the volume of paper and wood pulp exports do not consider the country's maximum potential capacity but rather an evaluation of feasible possibilities during the period covered by this report. Indeed, the country's potentialities far exceed the figure shown. By 1962, according to conservative estimates made in a recent investigation[1/], Chile should be in a position to produce between

1/ Economic Commission for Latin America, Preliminary Study of the Possibilities for the Development of a Paper and Pulp Industry in Latin America, (document E/CN.12/294), 1953.

/532,000 and

532,000 and 719,000 tons of wood pulp, that is, more than twice the amount estimated here.

Thus, it may be seen that the hypothesis of maximum growth is based on assumptions which are by no means excessively optimistic.

Comparison of the three hypotheses. In Table 2 the projections of exports are shown at 1950 prices, for each of the hypotheses described above.

Table 2: Projection of the Value of Exports in the Three Hypotheses of Growth

(millions of dollars at 1950 prices)

Year	Hypothesis			Difference between the Hypotheses		
	Maximum	Moderate	Minimum	Max. & Mod.	Max. & Min.	Mod. & Min.
1950	297.9	297.9	297.9	-	-	-
1953	318.4	313.6	308.6	4.8	9.8	5.0
1954	325.9	320.2	312.3	5.7	13.6	7.9
1955	333.4	326.9	316.0	6.5	17.4	10.9
1956	340.8	333.9	319.8	6.9	21.0	14.1
1957	348.8	340.9	323.6	7.9	25.2	17.3
1958	366.6	348.2	327.4	18.4	39.2	20.8
1959	383.0	355.6	331.3	27.4	51.7	24.3
1960	399.4	363.2	335.2	36.2	64.2	28.0
1961	415.9	371.0	339.2	44.9	76.7	31.8
1962	432.2	383.0	343.2	49.2	89.0	39.8

Source: United Nations Economic Commission for Latin America

It is of interest to note that the accumulative difference between the values of the maximum and the moderate hypothesis is almost equivalent to the external contributions foreseen on the assumption of moderate development. It can therefore be assumed that, in principle, the objectives of the scheme of moderate development can be attained without foreign assistance, providing that exports increase at the rate indicated for maximum development.1/

1/ This statement should not be taken in its wider sense since foreign exchange requirements to be met from external sources would be concentrated in the first three years (1953-55), while the cumulative difference would reach its maximum in 1962. Moreover, it should be remembered that the greater increase of exports, corresponding to the hypothesis of maximum development, would call for greater investments in the export sector than those foreseen for moderate development.

/An equally

An equally interesting contrast is that between the annual rate of growth of the different hypotheses and the rate of increase of Chilean exports at different periods. The figures shown in Table 4 indicate that both the rate of 2.1 per cent, in the hypothesis of moderate development, and that of 3.11 per cent for maximum development, are higher than the rate obtained by comparing the first and last years of the period 1925-1950. Only the rate corresponding to the cyclical recovery of exports, that is, between the period 1930 and 1950, is higher than the rate of moderate development, while the only rate which is higher than that of the hypothesis of rapid development is the rate of expansion from the minimum of the cycle to its peak (1930-34 and 1946-50).

Table 3: Annual Rates of Expansion of the Quantum of Exports in Selected Periods

Year or period			Annual rates of expansion
Initial	Final		
1925	1950		1.38
1925-29	1946-50		0.67
1930-34	1950		2.50
1930-34	1946-50		3.39
1950	1962	Minimum hypothesis	1.19
1950	1962	Moderate hypothesis	2.10
1950	1962	Maximum hypothesis	3.11

Source: United Nations Economic Commission for Latin America

Note: The calculation was made by comparing the quantum of exports in the years or periods shown in the table, without taking into account the fluctuations which occurred during the intervening years.

Hypothesis of moderate expansion of exports. Tables 4 and 5 contain a summary of the projections of Chilean foreign trade until 1962. These figures show how it was possible, by a process of elimination, to calculate the volume of foreign resources available for imports of capital goods into Chile during the period 1953-62.

With the exception of invisible trade the projection of the different items shown individually in these tables, was made by estimating each component separately. It should be pointed out that an aggregate projection for exports was not made but a separate projection for each of the principal

items which Chile sells on the foreign market.

Elsewhere in this chapter a detailed explanation is given of the methods used for the projections of the items considered separately in Tables 4 and 5. The order suggested for setting out the items of these tables is shown below.

Table 4. Projection of the Total Capacity to Import

(millions of dollars at 1950 prices)

	Receipts			Outflow							Total	Available for Imports
					Capital services			Movement of Capital				
Years	Exports	External credits & foreign investments	Total	Invisible trade balance	Remittance of profits	Interest on capital	Total	Amortization of loans (a)	Amortization of direct investments	Total		
1950	297.9	49.1	347.0	3.7	36.2	16.0	52.2	33.9	4.8	38.7	94.6	252.4
1953	313.6	101.0	409.6	3.2	39.1	10.1	48.3	26.4	5.0	31.4	82.9	331.7
1954	320.2	95.1	410.3	2.9	40.1	10.5	49.7	24.8	5.0	29.8	82.4	332.9
1955	326.9	66.8	388.7	2.6	41.1	9.6	50.1	25.3	5.0	30.3	83.0	310.7
1956	333.9	23.0	351.9	2.3	42.2	8.8	50.7	22.6	5.0	27.6	80.6	276.3
1957	340.9	17.1	353.0	2.0	43.3	14.9	58.1	27.5	5.0	32.5	92.6	265.4
1958	348.2	16.7	359.9	2.1	44.4	14.2	58.5	26.1	5.0	31.5	91.7	273.2
1959	355.6	11.7	362.3	1.9	45.6	12.4	58.0	21.0	5.0	26.0	85.9	281.4
1960	363.2	10.1	368.3	1.5	46.8	12.7	59.5	19.4	5.0	24.4	85.4	287.9
1961	371.0	10.1	376.1	1.5	48.0	12.0	60.0	19.4	5.0	24.4	85.9	295.2
1962	383.0	11.1	389.1	1.5	49.2	11.6	60.8	19.8	5.0	24.8	87.1	307.0

Source: United Nations Economic Commission for Latin America

a/ Includes provision made by the large copper and iron mining firms for the payment of taxes outside Chile.

/Table 5

Table 5 Projection of the Utilization of the Capacity to Import, in the Hypothesis of Moderate Development

(Millions of dollars at 1950 prices)

Years	Available for Imports	Unprocessed foodstuffs	Raw Materials	Fuels	Manufactured consumer goods	Total	Available for imports of capital goods a/
1950	249.8	21.2	41.4	20.6	57.9	141.1	94.1
1953	331.7	21.0	44.0	25.0	49.7	139.7	179.9
1954	332.9	20.8	44.5	23.9	47.2	136.4	185.3
1955	310.7	20.6	45.6	23.9	44.8	134.9	165.4
1956	276.3	20.4	47.0	25.1	42.6	135.1	131.7
1957	265.4	20.2	49.0	26.4	40.5	136.1	120.6
1958	273.2	20.0	51.3	27.6	38.5	137.4	128.0
1959	281.4	19.8	53.7	28.9	36.6	139.0	135.4
1960	287.9	19.6	56.3	30.3	34.8	141.0	140.8
1961	295.2	19.4	59.0	31.6	33.1	143.1	146.8
1962	307.0	19.2	62.0	33.6	32.4	147.2	155.4

Source: United Nations Economic Commission for Latin America

a/ The sum of the components is not equivalent to the total in view of the fact that there is a group of unclassified imports which have not been taken into account in preparing the above table.

The capacity to import capital goods would rise rapidly during the first stage, as may be seen from the figures in Table 5, reaching by 1954 a level 97 per cent higher than that of 1950. In 1954 capital goods would represent 55.7 per cent of the total capacity to import.

After 1954, the capacity to import capital goods would decrease until 1957, when it would reach its lowest point, only 28.2 per cent above imports of capital goods in 1950. The annual average of this capacity during 1953-62, however, would be 58.3 per cent above that of the corresponding figure in the base year of the projection. Relatively speaking, foreign exchange available for capital goods purchases should average

/about 50 per

about 50 per cent of total value of resources for imports during the period under consideration.

Finally, it should be pointed out that the cumulative value of imports of capital goods foreseen for the ten-year period 1953-62 is almost equivalent to the cumulative value of imports of those same goods during the 24-year period from 1927-50. Between 1927 and 1950, Chile acquired 1,606.1 million dollars worth of capital goods (at 1950 prices), while during the period 1953-62 it is estimated that the imports of such goods should amount to 1,489.3 million dollars (at 1950 prices).

Changes in the Composition of Imports

From the projections for the period 1953-62, it may be surmised that many changes will take place in the composition of imports. The data in the three following tables give an idea of these modifications. The ratio of imports of manufactured consumer goods to total imports will continue to decline, but more sharply than in the past while imports of raw materials will increase at a slower pace.

Contrary to what might have been expected some years ago, imports of fuels will tend to maintain almost the same relative position as in the period 1946-50. This expectation derives from the current and prospective development of petroleum production and other sources of energy.

Imports of unprocessed foodstuffs would return to their relative proportion during the twenties since it is foreseen that imports of beef cattle will be stabilized at the relatively high 1950 levels, offsetting the prospective elimination of the high 1950 level of wheat imports.

Table 6 Composition of Imports in 1925-29 and 1946-50 and Projections for 1962

(as a percentage of total imports)

Year	Unprocessed foodstuffs	Raw Materials	Fuels	Manufactured consumer goods	Capital goods	Non-classified
1925-29	6.2	4.4	5.4	43.4	33.8	6.8
1946-50	11.2	13.7	10.0	26.0	34.6	4.4
1962	6.4	20.1	10.7	10.4	51.2	1.2

Source: United Nations Economic Commission for Latin America

/Lastly,

Lastly, capital goods would become the predominant group of imports, representing 50 per cent of the total. The changes in the composition of these imports would be equally important, as may be seen from the following table:

Table 7 Composition of Imports of Capital Goods in 1925-29, 1946-50 and projections for 1962

(as percentages of total imports of capital goods)

Year	Iron & Steel	Building Materials	Equipment					Total
			Mining	Manufacturing	Transport	Agriculture	Others	
1925-29	19.5	9.3	17.0	8.0	17.2	2.1	26.9	71.2
1946-50	24.5	1.9	4.6	16.9	15.1	5.2	31.7	73.5
1962	2.7	-						97.3

Source: United Nations Economic Commission for Latin America.

Imports of iron and steel, as may be seen in Table 7, amounted in 1946-50 to one quarter of the total value of imports of capital goods. During the period under review, imports of these products should follow the same relative declining trend as building materials during 1925-1950. In fact, they would drop from 24.5 per cent of the total in 1946-50 to 2.7 per cent in 1962.

/Table 8

Table 8 Proportion of imports of unprocessed foodstuffs and raw materials which cannot be substituted, those which can be partially substituted, and those which could be entirely substituted, in relation to total imports, for the period 1925-29, 1946-50 and projections for 1962

(as a percentage of total imports)

	Food-stuffs	Raw Materials			Grand Total
		Non-processed	Semi-processed	Total	
		Non-substitutable			
1925-29	2.2	0.1	2.1	2.2	4.4
1946-50	4.7	5.7	3.8	9.5	14.2
1962	4.4	11.4	6.7	18.1	22.5
		Partially substitutable			
1925-29	3.1	0.2	0.6	0.8	3.9
1946-50	5.9	1.1	1.1	2.2	8.1
1962	2.0	0.9	1.1	2.0	4.0
		Entirely substitutable			
1925-29	0.9	0.7	0.6	1.3	2.2
1946-50	0.5	0.3	1.7	2.0	2.5
1962	-	-	-	-	0.0

Source: United Nations Economic Commission for Latin America.

Note: The basic data are in constant values at 1950 prices.

Another outstanding aspect among the many changes foreseen, is the increasing relative importance of imports of processed food and non-substitutable raw materials. The relative share of the two items in 1962 should rise to 22.5 per cent.

Remaining imports consist principally of capital goods and fuels. The problematic nature of the substitution of fuel imports indicates that, i n the future, virtually the only area for import substitutions in Chile would be that of capital goods. Once this is attained, and unless there are possibilities of increasing foreign trade, economic development would require a substantial expansion in the iron and steel industries, and a somewhat lesser relative growth in the equipment sector, in order to enable the relative share of imports of foodstuffs and unsubstitutable raw materials to increase.

/2. Projection

2. Projection of Export Earnings and the Foreign Capital Inflow

Copper

Production capacity in Chile. The annual production capacity of the Chilean copper industry fell during a period of four years (1948-52) from 513,000 tons to about 415,000 tons.[1/] It is expected, nevertheless, that output will increase again, with the completion of the installation, by stages, of a plant at Chuquicamata, with a new process for smelting and concentrates. The first unit of this new plant began production at the end of 1952. Between 1960 and 1962, when the installation is expected to be completed, the capacity will have reached 460,000 tons, distributed, as is shown in Table 9. It is evident, therefore, that within ten years the production capacity of the industry would be lower than in some years of the '40s. In 1944 production totalled 495,000 tons.

Table 9 Copper Production and Projected Capacity for selected Years.

(thousands of metric tons)

	Output				Capacity		
	1948	1950	1951	1952a/	1948	1953	1960-62
Foreign-owned holdings	424.8	350.6	326.8	366.0	493.0	395.0	430.0
Chuquicamata	207.9	161.0	129.6	171.2	240.0	215.0	245.0
El Teniente	149.0	143.4	155.6	149.4	158.0	155.0	155.0
Potrerillos	67.9	46.2	41.6	45.4	95.0	40.0-50.0	30.0
Domestic Producers	19.9	12.2	42.9	8.8	20.0	20.0	30.0
Total	444.7	362.8	379.7	374.8	513.0	415.0	460.0

Source: United Nations Economic Commission for Latin America, op. cit. pages 69 et seq.; Banco Central de Chile, Monthly Bulletin No. 294, August 1952.

a/ Provisional. Total output was calculated with data for the first six months and output by enterprises was estimated on the basis of data for the first four months.

The relative stagnation of Chile's copper mining is not due to the exhaustion of available natural resources. Although the deposits of the smallest foreign undertaking are gradually being exhausted, proved

1/ Economic Commission for Latin America, Recent Trends and Events in Latin-American Mining (document E/CN.12/217/Add.12). This document contains a detailed analysis of the causes for this decrease.

reserves of the other two companies are sufficiently large to double the present production for at least a century. The experts agree that by reason of their size, Chile's reserves, together with those of British Africa and the Belgian Congo, are the three zones in which production can be expanded to the greatest degree.

There are, therefore, other causes for stagnation. It might be assumed that one of them lies in the opinion held by the managers of the undertakings in Chile regarding the likelihood that prospects for world demand for copper will not continue to be favourable. This view would appear to be in contradiction with the policy, adopted outside Chile by these and other companies, of increasing production capacity substantially during the past few years. In this connexion it should be pointed out that while capacity was decreasing in Chile, it increased in other zones, as is shown in Table 10. This table shows that the average expansion of capacity in the regions or countries indicated was 51.9 per cent for the period 1948/53.[1/]

Table 10 Copper Production in 1948 and Probable Production Capacity in 1953

(thousands of metric tons)

	Production 1948	Production capacity 1953	Increase of the capacity in 1953 as compared with production in 1948
			(Percentage)
British Africa	248.0	460.0	85.4
Canada	218.0	293.0	34.4
Belgian Congo	155.0	252.0	62.6
Europe	84.0	119.0	41.7
Latin America a/	103.0	128.0	24.3
Others b/	70.0	82.0	17.1
Total b/	878.0	1,334.0	51.9

Source: United Nations Economic Commission for Latin America, op. cit. page 78; United States Bureau of Mines, Yearbook of the American Bureau of Metal Statistics, 1948; United Nations, Monthly Bulletin of Statistics (October 1952).

a/ Excluding Chile and including Bolivia, Cuba, Mexico and Peru.
b/ Ecluding the United States, the Union of Soviet Socialist Republics, China and the Southern European countries.

1/ It is possible that the actual increase was less intense since the comparison was drawn between output in 1948 and planned capacity for 1953. Isolated data which have become available indicate that some of the expansion plans are not as far advanced as might be expected.

/The scanty

The scanty information available indicates that copper mining has ceased to expand in Chile, because the companies have chosen to direct their investments to countries or regions which for different reasons, such as low wage levels, low taxes, etc., offer better profit prospects.

World demand. According to a reliable source[1/], if the real gross product in the United States would double between 1950 and 1975, and the population would increase from 151.7 to 193.4 million inhabitants (that is, if these two concepts increase at an annual average rate of 3 per cent and 1 per cent respectively), demand for virgin copper in the United States and the rest of the world[2/] might develop, as shown in the following table:

Table 11 Projection of Demand for Virgin Copper

(thousand of metric tons and percentage increase)

	1950	1975	Rate of increase
United States	1,133.5	1,632.9	43.4
Rest of the world	1,218.3	1,873.3	53.8
Total	2,356.8	3,506.2	48.8

Source: The President's Materials Policy Commission, op. cit., (Vol. II) pages 114 and 133.

The same source foresees that during the period indicated production of virgin copper in United States will decline from 822,600 to 725,600 tons unless additional ore reserves are discovered. If this estimate is accurate, it implies that the United States would have to increase its metal imports from 315,000[3/] to 907,000 tons annually in order to meet demand.

1/ The President's Material Policy Commission, Resources for Freedom, (Washington, D.C., June 1952).

2/ Excluding the Union of Soviet Socialist Republics, China and the Eastern European countries.

3/ 1950 imports of virgin copper in the United States were greater than the difference between current output and consumption in the rest of the world. This would appear to be due to the fact that the rest of the world exported 75,000 tons of accumulated stocks to the United States.

/From what

From what has been said above, it may be inferred that output outside of the United States will have to expand from 1,458,000 to 2,778,000 tons, that is, approximately 90 per cent, in order to balance world supply and demand at the foreseen level.

If the annual rate of expansion shown in the above figures is applied, copper output for 1962 outside the United States would reach 2,066,000 tons, exceeding the level of 1950 by 41.7 per cent.[1/]

Chilean production, however, cannot develop at this rate. As was seen before, present expansion plans will enable the country to attain a production capacity of 460,000 tons by 1962. If not alterations are made, the maximum increase in output which may be expected between 1950 and 1962 is 29 per cent (from 363,000 to 460,000 tons.)

This would not prevent Chilean copper exports from rising at the same rate as copper output outside the United States. In other words, Chile might well be able to maintain its relative position as a copper exporter. For this to occur, it would be sufficient for the industry to work at full capacity during the period 1953-62, accumulating, for some years, a larger than normal volume of stock. The following table illustrates how this might develop. The annual rate of expansion of Chilean copper exports - 2.61 per cent - would be slightly lower than the rate of increase of output outside the United States.

1/ The increase is 41.7 per cent and not 36.2 per cent, owing to the fact that the figure obtained by applying the annual rate of expansion was increased by 75,000 tons of copper, corresponding to exports in 1950 from the rest of the world to the United States, drawn from stocks.

/Table 12

Table 12: Projection of Consumption, Exports and Production of Copper in the period 1950-62, in the given hypothesis

(thousands of metric tons)

Years	Production	Exports	Domestic Consumption	Stocks
1950	363.0	339.0	10.0	..
1953	415.0	365.0	11.0	39.0
1954	415.0	375.0	12.0	67.0
1955	415.0	385.0	13.0	84.0
1956	415.0	395.0	13.0	91.0
1957	415.0	405.0	14.0	87.0
1958	424.0	417.0	15.0	79.0
1959	433.0	428.0	16.0	68.0
1960	442.0	439.0	18.0	53.0
1961	451.0	450.0	19.0	35.0
1962	460.0	462.0	20.0	15.0

Source: United Nations Economic Commission for Latin America.

The prospects for demand and output of copper in the next 25 years differ in certain basic aspects from the position prevailing in the last twenty-five years. It is, therefore, of interest to consider in detail some of the changes which may be expected.

Considering the first and last years of the period 1925-50, it will be seen that total copper consumption in the United States increased by 85.6 per cent, over that interval, while consumption of virgin copper increased by 95.8 per cent. The gross national product, at constant prices, in turn rose by 111.9 per cent. This suggests that during this period copper consumption tended to expand almost proportionately with the gross product, at least when the level of employment was high. In contrast, as has been suggested, it is expected that in the next quarter of a century the improvement in the gross product will be more than double the increase in the demand for virgin copper.

Various factors will contribute to this modification, but only two are worth mentioning in detail, namely, the change in the structure of d demand for goods and services in the United States and the substitution of other materials in place of copper in some of the most important uses.[1/]

1/ The President's Material Policy Commission, op.cit., Volume II, pages 33 to 38 and 111 to 120.

/During 1925-50

During 1925-50, gross private investment in equipment and installations, in addition to consumer expenditure for durable goods, in the United States averaged about 18 per cent of the gross product. In 1950, for reasons which need not be explained here, this proportion has risen to the unprecedented level of 27 per cent. Experts believe that during 1950-75 the causes for this distortion will have disappeared and that, consequently, the lower rate of producer and consumer durable goods expenditure prevailing in the preceding period will recur. Hence, it was calculated that gross private investment and demand for durable consumer goods would expand by 40 per cent during the next 25 years.

In addition to this factor, which reduces present day copper consumption, reference has also been made to the substitution of this metal by others, in certain uses. According to the document to which frequent reference has been made, copper would be displaced by aluminium, as a basic material in the manufacture of transmission lines and energy distribution and for the windings of electric motors. It is also believed that it would be supplemented by other metals, particularly steel in the manufacture of munitions.

Table 13. Projection of United States Production of Certain Articles and of the Copper Required in their Manufacture, 1950-75.

	Copper Consumption in 1950 for the purposes indicated	Copper Consumption in 1975	
		Assuming Proportionate increase with end products	In function of forecast substitution
	(thousands of tons)	(Percentual increase in relation to 1950)	
Electric motors a/	275.0	200.0-300.0	60.0
Transmission lines for energy	91.0	260.0 b/	50.0
Munitions	64.0	100.0	50.0

Source: The President's Material Policy Commission, op. cit.

a/ Includes other electric machines.
b/ The data refer to the increase in the capacity to generate electric power.

/The figures

The figures in the table show that copper consumption will expand at a lower rate than output of the selected products. The copper used in their manufacture would increase from 430,000 to 705,000 tons. Should this substitution not take place, it is probable that the volume of copper used for these purposes would rise from 430,000 to 1,290,000 tons.[1/] From a comparison of the two projections, it will be seen that the displacement of copper by aluminium and steel would lower the level of consumption to about 585,000 tons of copper.

Fortunately, for the copper producing countries, the substitution foreseen will take place in items whose output is expected to expand more rapidly than that of other durable goods and even faster than the gross national product. Hence, copper consumption for the above purposes will rise despite the substitution at least as rapidly, if not more so, than in the case of the remaining durable goods.

Conclusions. The projection of the copper exports is based on a debatable assumption, namely, the rate of expansion of the real gross product in the United States for the period 1950-75. The aggregate figures of the Paley Report, assume a cumulative annual rate of growth of 3 per cent in the gross product. Analysis of past events in the United States since the twenties to the present lead to the conclusion that the assumed rate of expansion is too optimistic for the period of 25 years.

Another disputed assumption which, however, exercises little influence on the projections for the period under review, is the decline of output in the United States. Some entrepreneurs in that country maintain that the volume of virgin copper mined in the United States, at least during the next few years, will increasee rather than decrease. This may occur if the price of copper provides an incentive for producers to raise the volume mined, even at the risk of exhausting their reserves in a shorter period, or if new copper deposits are discovered. With respect to the latter, it should be pointed out that in December 1952 one firm announced that subsidiary reserves had been found at Butte in the State of Montana, which were believed to be appreciably greater than the existing workings. At all

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1/ The calculation was made assuming that the amount of copper consumed will increase at the same rate as output of each of the final goods indicated in Table 13.

events, it seems unlikely that, with known reserves, output in the United States could exceed a total of 850,000 tons in 1962. This maximum figure is 75,000 tons greater than that used in the projection. Such a difference exercises very little influence on the estimated volume of world output and for Chile implies exports only 18,000 tons below the estimate for 1962.

If production capacity outside the United States continues to expand in 1954-62 at a rate comparable with that of the past six years, the copper industry will have a part of its capacity idle by 1962.[1/] It should, nevertheless, be pointed out that during two years of the post-war period (1947-48) for which data are available, real output was less than 80 per cent of the theoretical capacity.

If in the future it is found that the production capacity far exceeds the output required to meet demand, Chilean copper exports will depend largely on their capacity to compete on the world market. This may also involve a strong unfavourable pressure on the international price of copper, which would probably tend to deteriorate the terms of trade of the countries dependent on exports of this metal.

Nitrate

The demand for nitrogenous fertilizers, measured in terms of consumption, rose sharply between the pre-war period and 1950. According to available data, between 1938 and the agriculture year 1950-51, world consumption appears to have risen from 1.9 to 3.6 million tons, that is, at an annual rate of 5.5 per cent. Demand in the United States far surpassed that of the rest of the world. Available information shows that the annual increase in that country averaged about 14 per cent (see Table 14). It is of interest to note that between 1938 and 1950, Chilean nitrate production rose by 20 per cent, that is, an annual average of only 1.5 per cent.

1/ It is of interest to point out that work has begun in Peru on installations which will enable 150,000 tons of copper to be produced in 1956 from a deposit which, thus far, has not been worked.

/Table 14.

Table 14 Consumption of Nitrogenous Fertilizers and Chilean Nitrate Output

(nitrogenous content in thousands of tons)

	Consumption				Output	
	United States	Annual rate of growth	Other Countries a/	Annual rate of growth	Chile	Annual rate of growth
1938	240.0	-	1,720.8	-	223.5	-
1950-51 b/	1,166.0	14.0	2,457.0	3.0	268.1	1.5

Source: United Nations Food and Agriculture Organization, Yearbook of Food and Agricultural Statistics, Part I (Washington 1951); United Nations Food and Agriculture Organization, Fertilizers, a World Report on Production and Consumption, (Rome 1952).

a/ Does not include the Union of Soviet Socialist Republics, China and the Eastern European countries.

b/ The agricultural year ends on June 30, 1951.

No information was available on which to base a projection of world demand for nitrogenous fertilizers. However, according to an estimate made in the United States, if agricultural output in that country were to rise by 40 per cent over a period of 25 years and if the former ratio of fertilizer consumption relative to agricultural output were to prevail, nitrogenous fertilizer demand would rise by at least 150 per cent, as compared with the 1950 level.1/ Thus, in 1975 total consumption of nitrates would be approximately 2.8 million tons. The annual rate of expansion calculated from this data is 3.5 per cent, which figure is exceptionally low by comparison with the corresponding figure for the United States during the period 1938 to 1950-51. There is another fact which indicates that the expansion of world demand may be more intense than the one computed

1/ The President's Material Policy Commission, op.cit., (Vol. V), page 76.

/from the

from the American projection. Agricultural produce in many underdeveloped countries will have to expand substantially in order to meet growing domestic demand for foodstuffs and raw materials arising from the process of industrialization. In most cases this increase can be best achieved by increasing the yield rather than by employing new land, which is not always available. It would seem redundant to add that fertilizers play an important part in improving the yield. In this connexion, reference should be made to developments in Brazil. This country is in a more favourable position than others, since it has available a large area of virgin arable land. Since 1938, fertilizer consumption has risen in Brazil at an annual rate of 14 per cent. Although this expansion may be the result of factors which will not prevail throughout a long period, viz: the reduction in the relative price of fertilizers, it seems likely that future demand will continue to rise substantially although at a lower rate than during the period 1938-50.

In short it is quite probable that during the next ten years demand will continue to provide a power incentive for the production of nitrogenous fertilizers. Yet in order to increase Chilean nitrate exports appreciably, two conditions would have to be fulfilled, namely, an expansion of production capacity and a price reduction which would place this product on a level comparable with that of synthetic nitrogenous fertilizers. If both requirements cannot be met, it is possible that during the next few years the difference between the expansion of world demand and that of world output, and consequently, that of nitrate exports, will be even greater than during the period 1930-50.

The present maximum capacity of the industry barely exceeds the level of output during the past few years. According to expert opinion, the maximum capacity is 1.8 million tons of ore annually, equivalent to approximately 290,000 tons of nitrogen. There is little hope of raising that capacity by merely extending the methods used at present, namely, the Guggenheim process, owing to the shortage of mineral reserves with the content required for that process. One of the nitrate firms has, nevertheless brought its expansion plans up to date and should thus increase production capacity by 150,000 tons.

/The so-called

The so-called solar evaporation process is one of the most interesting methods of expanding output and, at the same time, of reducing unit costs. By applying this process it is hoped to extract 25 per cent more nitrate per unit of ore (caliche), and also certain by-products, such as sodium sulphate and borax, which are not recovered at present. The evaporation method also enables 6 per cent content ores (calichos) to be worked, which cannot be done with the Guggenheim process. Lastly, a substantial proportion of total output, in fact 40 per cent, would consist of potassic nitrate - a fertilizer which brings a higher price than the one currently obtained.

The introduction of the new system[1/] throughout the nitrate industry would require 72 tanks, of which four are already in operation. Annual capacity, once the new process has been extended to all production sectors, would then be as follows: 2,250,000 tons of nitrate, 300,000 tons of sodium sulphate and 100,000 tons of borax.

The projection of the volume of nitrate exports, however, was made on the assumption that the capacity of the industry would not be substantially modified between 1953-62. With an annual average rate of growth of 0.8 per cent , the industry should be working at full capacity by 1962.

Iodine

The iodine exported by Chile is a by-product of the nitrate industry, and can be recovered at the most at the rate of one metric ton per 1,000 tons of nitrate ores. Potential output in Chile has always exceeded world consumption, the latter remaining low owing to the limited use of iodine. During the past few years consumption rose very slowly as a result of a gradual replacement of this substance by others for one of its most important uses, namely, as an antiseptic. Hence, exports were assigned an annual rate of growth of 1 per cent.

In the future there is a possibility, however, that maximum iodine output in Chile will no longer meet more than a small proportion of world demand, if it is only produced as a by-product of nitrate. This possibility of increasing world consumption of iodine is closely connected with the results of research being carried out to discover a process for mass

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1/ This, in fact, is a technical improvement to the method already in use. The innovation consists in the discovery of a mixture of clays, permitting large tanks to be built on the deserts of the nitrate pampas.

production of titanium.[1]

One of the methods considered, namely, the de Boers, which has already been been adopted on a laboratory scale, involves the use of iodine in the processing of that metal. This system has several advantages over the one being used at present: the metal is obtained in a compact form appropriate for subsequent processing and is purer; moreover, it is sufficiently ductile to be handled cold and, lastly, during the reduction operations, only one element need be recirculated, namely, the iodine, instead of recirculating magnesium and chlorine.

However, it has disadvantages. The process is slow and the raw material,(unrefined titanium) required is expensive. Consequently, it is inappropriate for mass production purposes. The processing of the metal by the methods studied must await "the finding of a cheaper source of titanium and, above all, a continuous or at least semi-continuous process". Research is still under way and it would seem that an efficient and practical procedure might be found.[1]

Total iodine consumption in the manufacture of titanium will depend on the ratio between the cost of iodine recovery during the production of titanium and the price of virgin iodine on the market. In other words, the higher the cost of recovering iodine, the greater the consumption of virgin iodine. In the above mentioned publication, the consumption of 10.8 kilos of iodine per metric ton of titanium was considered reasonable and costs of 4,070 dollars per ton of iodine and up to 2,200 dollars per ton of metal were also regarded as acceptable.[2]

If a continuous cheap process is found, that is, one which will make commercial use of the de Boers procedure possible, and if the price of titanium drops to a level enabling it to compete with stainless steel, United States output of titanium in 1975 may vary between 0.5 million and 2 million tons. This would presuppose an iodine consumption of 5,400 to 21,600 metric tons, according to the data mentioned above.

With so sharp an increase in demand, Chilean iodine exports might well increase by 5 to 20 times the average level for the period 1946-51, if

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1/ President's Material Policy Commission, op. cit. (Vol.IV) pages 68 and 69.
2/ The price of iodine is for the first six months of 1952; that of titanium, however, is 1/5 of the price prevailing on that date for sponge titanium produced by the Kroll method.

Chile retains its quasi-monopoly. Even if other producers enter the field, a substantial increment to Chile's production may be expected.

Paper and Pulp

The best information available indicates that the country has the necessary resources to establish a large-scale paper and pulp industry.[1/] No definite data are available concerning the total area on which "Pinus Insignes" (Pinus Radiata)[2/] are planted, although recent surveys by the Corporación de Fomento disclosed that in 1951, it amounted to 150,000 hectares.[3/] Moreover, the rate of expansion was estimated to be 8,000 hectares[4/] per year, according to expert opinion.

Under normal working conditions, the average yield per hectare of pine in Chile is 20 solid cubic metres annually. However, it could be raised to 25 cubic metres by efficient handling of the plantings.[5/] Experts estimate that potential output of these plantations would vary during the next ten years, as shown below:

Table 15 Potential Output of Pine Plantations

(thousands of solid cubic metres)

Average	For lumber	For paper and cellulose	Total
1954-56	300.0	175.0	475.0
1957-59	680.0	230.0	910.0
1960-62	1,350.0	1,150.0	2,500.0

Source: International Bank of Reconstruction and Development and United Nations Food and Agriculture Organization, op. cit. page 303.

1/ Economic Commission for Latin America, Preliminary Study of Development Possibilities for a Paper and Pulp Industry in Latin America, (document E/CN.12/294), 1953. This problem is carefully studied in the above mentioned document.

2/ Recent information indicates that three months before concluding the census made by the Corporación de Fomento de la Producción, that is in February 1953, the existence of 211,000 hectares of grown pines was learned. It is estimated that the total area may well be about 250,000 hectares.

3/ This figure is mentioned in The Agricultural Economy of Chile, International Bank for Reconstruction and Development and Food and Agriculture Organization of the United Nations. (December 1952), page 300.

4/ Ut supra, page 301.

5/ Ut supra, page 300.

/This estimate

This estimate is actually one of minimum prospects since it assumes the felling of only 45,500 hectares in 1957-59 and 125,000 hectares in 1960-62, with an average yield per hectare of only 20 cubic metres. A more optimistic estimate of the country's possibilities places the area to be felled in 1957-59 at 50,000 hectares and at 145,000 hectares for the period 1960-62, with a yield of 25 cubic metres per hectare. Total timber output in this case would be 1.2 and 3.6 million solid cubic metres, respectively.

There is a plan to expand the paper industry, thus enabling Chile to make use of this potential, if the appropriate investments are made opportunely. Broadly speaking, the plan involves the establishment of seven factories with an individual capacity of 35,000 tons of pulp and 45,000 tons of paper, mainly newsprint, daily.

In order to match the installed capacity of the industry with raw material availabilities, three factories of the type indicated would have to be built in 1953[1/], and the four remaining plants in each successive year.[2/] The productive capacity for paper, according to the plan, would be 150,000 tons in 1958 and 350,000 in 1962, whereas that of pulp would be 105,000 tons and 245,000 tons, respectively.

Table 16 The Output of Chemical Pulp, Mechanical Pulp and Paper, and Input of Wood

Years	Chemical Pulp	Mechanical Pulp	Paper	Input of Wood
	(thousands of tons)			(millions of solid m^3)
1958	90.0	90.0	150.0	0.6
1959	130.0	135.0	200.0	0.9
1960	170.0	180.0	250.0	1.2
1961	210.0	225.0	300.0	1.5
1962	245.0	265.0	350.0	1.7

Source: United Nations Economic Commission for Latin America.

1/ This statement is based on the fact that normally 5 years elapse between the time building starts and the moment the factory begins operating.

2/ Indeed it will only be necessary to increase productive capacity for paper by 300,000 tons since existing facilities produde about 50,000 tons of paper annually.

/The actual

The actual output of chemical pulp, mechnical pulp and paper, will begin to increase in 1958, as shown in Table 16. This table also indicates the volume of wood required to produce these commodities in the above mentioned quantities.1/

Not all the paper and pulp output would be available for exports. Table 17 shows that in an apparent total consumption of 66,600 tons, 21,800 tons were imported. With the expansion of the gross product foreseen, paper consumption should increase to about 116,000 tons2/, of which 45,000 would be newsprint and the remainder other types of paper. Imports would be reduced so that by 1962 they would be limited to special types of paper.

1/ Wood requirements were determined by assuming that in Chile 4.5 and 2.5 solid cubic metres of wood per ton of chemical pulp and pulp, respectively, are used. The figure for mechanical pulp was taken from Forest Industries Plan for Chile, Corporación de Fomento de la Producción, 1946, page 68.

The following data were used to convert paper to terms of raw materials:

Input of Mechnical Pulp and Chemical Pulp in Processing the Products Listed a/

Products	Mechanical Pulp	Chemical Pulp
Newsprint	92.0	13.0
Other paper	9.0	68.0
Cardboard	7.0	32.0

Source: Basic data from the Yearbook of the Forest Products Statistics, 1951; Food and Agriculture Organization, (Rome 1951), page 179.

a/ Input per 100 tons of product.

2/ In the Preliminary Study of the Development of Paper and Pulp Industry, prepared by the United Nations Economic Commission for Latin America (document E/CN.12/294-Annex II, Table 11), a more accurate projection of total paper consumption in made. From the data contained in that report it is assumed that newsprint consumption in 1962 will amount to 45,000 tons whereas consumption of other types of paper will be approximately 85,000 tons assuming that the gross product increases at an annual average rate of 3 per cent. The projection published in the current study, therefore, underestimates consumption of other papers by about 10,000 tons. This difference, however, in no way alters the general conclusions indicated.

/Table 17

Table 17 Projection of Imports, Consumption and Output of Paper and Cardboard for the Domestic Market

(thousands of metric tons)

	1950		1962	
Total output	44.8		350.0	
Newsprint		11.0		280.0
Other papers		33.8		70.0
Total imports	21.8		0.5	
Newsprint		19.0		-
Other papers		2.8		0.9
Total consumption	66.6			
Newsprint		30.0	115.9	45.0
Other papers		36.6		70.9

Source: United Nations Economic Commission for Latin America.

The increment of paper consumption in Chile involves an increase from approximately 36,600 to 83,000 tons of chemical pulp. In 1950 the majority of the chemical pulp consumed in Chile was provided by imports; in 1962 the situation would be entirely reversed since Chile would be able to to meet domestic demand from its own output and still have an appreciable exportable surplus available.

The exportable surpluses of chemical pulp and newsprint were projected on the basis of the above data. The value of exports was calculated at f.o.b. prices for similar Canadian products in 1950.

Table 18 Projection of the Volume and Value of Chemical Pulp and Paper Exports

Years	Volume		Value	
	Chemical Pulp	Paper	Chemical Pulp	Paper
	(thousands of tons)		(millions of pesos at 1950 prices	
1958	42.0	55.0	4.8	5.3
1959	73.0	100.0	8.4	9.7
1960	103.0	145.0	11.8	14.0
1961	133.0	190.0	15.3	18.4
1962	163.0	235.0	18.7	22.7

Source: United Nations Economic Commission for Latin America.

/None of the

None of the preceding estimates include the chemical pulp consumed in the manufacture of explosives, rayon and tires, which in 1950 amounted to 7,100 tons. Although there are prospects of such consumption increasing sharply, at least in the case of rayon and tires, it hardly seems likely that they would absorb more than 20,000 tons annually in 1962. This figure represents less than 10 per cent of the estimated volume of output, indicating that the inclusion of these products would by no means alter the general picture described.

Iron

Total iron reserves in Chile, according to one source[1], amount to 100 million tons of ore, the metal content of which varies between 60 and 65 per cent. According to another,[2] the correct figure for reserves is 262 million tons, with a 58 per cent metal content.

During the three year period 1948-50, the average annual output was 2.7 million tons, almost all of which was exported. In 1951, the highest level of output was recorded, namely 3.2 million tons. However, there was little change in the volume exported, that is 2.7 million tons, as compared with 2.6 million in 1948-50, owing to the fact that domestic manufacturing activities using iron and steel absorbed about 14 per cent of output. Average exports during these three years exceeded those of the period 1937-39 by about 66 per cent.

To judge only by external factors, the prospects for increasing Chilean iron ore exports in the next ten years as intensively as in the past decade are not very good, although an unparalleled expansion of demand outside the United States is foreseen. The main obstacle to the growth of Chile's export is undoutbedly the development of alternative sources of ore supplies in other American countries which have the advantage of being closer to the steel manufacturing centres.

It is estimated that the potential annual output available to the United States in 1955-65 would be equivalent to 169 million tons of ore, of which 64 million tons would be obtained from sources outside the United States. (See Table 19.) Within the general programme, South America,

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1/ President's Materials Policy Commission, op. cit. (Vol. I) page 94.
2/ United Nations, World Iron Ore Resources and their Utilization (New York 1950).

/with the

with the exception of Venezuela, that is, Chile and Brazil, are expected to provide 5.1 million tons. This figure is approximately equivalent to the volume of iron ore exported annually by these two countries to the United States during the recent post-war years, plus the increment to Brazilian exports foreseen for the next two years.

Table 19 Projected Sources of Supply for the United States Iron and Steel Industries and the Potential Supplies Calculated

(millions of metric tons)

Sources:	1955-65	
Domestic	107.0	
Foreign	64.0	
Canada (Labrador-Quebec)		20.0
Venezuela		25.0
Other South-American countries		5.0
Other foreign countries		14.0

Source: Basic data from The President's Material Policy Commission, op. cit. (Vol. IV) page 41.

Assuming that this pattern of supply actually reflects the concrete programme of the United States' steel industry, it is evident that Chile will not be able to increase its exports far beyond the present level, especially since little development is expected in the iron and steel industry of the western United States.

In view of the impossibility of estimating the probable rate of expansion of iron ore exports with any degree of accuracy, they were assigned the same level as copper, although this forecast may be somewhat optimistic. It implies that in 1962 about 3.5 million tons of Chilean iron ore would flow on to the international market. Output, however, will be much higher since at that time Chile's manufacturing use of iron and steel would require more than 1 million tons of ore if it is to develop along the lines suggested in Chapter IV.

Manganese

In 1950, Chile exported 4,245 tons of ferro-manganese and smaller quantities of manganese pyroxide and other manganese ores. There is not much likelihood of these exports increasing in the next few years. While a moderate increment in foreign demand is foreseen, output is expanding rapidly in countries such as India and Brazil, which have vast resources

/of high

of high content manganese ore.

It is calculated, as may be seen from Table 20, that world demand for manganese may increase between 1950 and 1975 from 2.8 million to approximately 4.5 million tons, that is, by 62 per cent, or, in other words, at an annual rate of about 1.8 per cent.

Table 20 Projection of Demand for Manganese

	1950	1975	Rate of Increase
	(thousands of metric tons)		(percentage)
United States	1.632	2.450	50.0
The rest of the world	1.270	2.090	65.0
Total	2.902	4.540	56.0

Source: The President's Material Policy Commission, op. cit. (Vol. II) pages 118 and 132.

In order to increase these exports at the rate indicated, Chile will have to raise its output from 6,000 tons of manganese ores (46 per cent content[1]), to 10,680 tons by 1962, of which about 3,250 will be consumed by the domestic iron and steel industries.[2] In relative terms, the increment would be of about 78 per cent. To judge from the estimated reserves of 1.2 million tons of 46 per cent manganese, it should not be difficult to attain and even exceed that level of output. Since Chile is one of the minor exporters of manganese, it could expand its exports, even if only on a small scale, to the detriment of other larger producers. However, it was assumed that Chile's exports would rise at the same rate as world demand, that is, an annual average of 1.8 per cent.

Other Ores

This group consists of ores and concentrates containing molybdenum, silver and gold, which are obtained almost exclusively as by-products of copper.[3] Therefore, the volume of their exports is to a certain extent

1/ The content of Chilean ore varies between 30 and 35 per cent. Exports were converted at a common basis of 46 per cent, which is what is normally required. It was assumed that in 1950 output was equivalent to exports.

2/ The estimate was based at a consumption of 6.49 kilogrammes of 46 per cent manganese per metric ton of steel.

3/ Small quantities of ores are mined and exported which contain gold, silver and lead, silver and lead, and only gold.

/limited by

limited by the level of copper output and not by world demand for the ores. They have thus been assigned an annual rate of expansion equivalent to that of copper, which, in fact, simplifies the problem since it is assumed implicitly that the gold, silver or molybdenum content of the copper ores will not vary throughout the period under review.

It is practically certain that output of molybdenum will expand more than that of copper inasmuch as a new source for the recovery of this metal is about to be obtained, namely, the sulphurous copper ores which are being treated at the new Chuquicamata plant.[1] Since demand for molybdenum obtained from this source cannot be determined, it was decided to follow the policy indicated above, allowing output the same annual rate of expansion as that of copper, namely, 2.6 per cent.

It is of interest to point out that an increase of world demand for molybdenum of about 4 per cent annually is foreseen over the next 25 years[2], thus raising consumption from 1,633 tons to 2,615 tons in 1962.

Agricultural Products

Exports of agricultural foodstuffs from Chile have little importance, if compared with the volume of similar products entering the international market. The data in Table 21 amply illustrate this statement, showing that in 1948-50 the volume of exports of six of the seven products shown on that table did not average 2.5 per cent of corresponding world exports and that only in the case of beans did they amount to almost 10 per cent of the aggregate figure.[3] On the other hand, these constitute a substantial proportion of the total value of Chilean agricultural exports.

1/ The President's Materials Policy Commission, op. cit. (Vol. II) page 28.
2/ The basic data were obtained from the President's Materials Policy Commission (Vol. II), pages 118 and 132.
3/ Another example is that the total volume of exports of chickpeas from Chile in 1948-50 was less than 15 per cent of Cuban imports of this product.

/Table 21

Table 21 Chilean Exports in Relation to Total World Exports of Selected Agricultural Commodities, 1948-50

	Percentages
Barley a/	1.2
Oats	0.8
Rice	0.2
Beans	9.4
Onions	2.4
Apples	1.1
Grapes	1.4

Source: United Nations Food and Agriculture Organization: Food and Agriculture Statistical Annuals "Commerce" (Rome, 1952).

a/ Excluding barley for malt.

The fact that Chile supplies so small a proportion of these articles of the international market, places the country in a unique position to expand its exports at the expense of other producers. An excellent example of this is the case of beans. In the post-war period Chile's most important markets for this product were the United Kingdom and Cuba, followed by Germany, Beligum, Norway and the United States. As may be seen from the following table, with the exception of the United Kingdom, the volume of Chile's bean exports to these countries during the three year period 1948-50, did not amount to even 30 per cent of their total individual imports. Chile obviously has a wide margin to increase its supplies on these markets, even assuming that demand were not to rise.

/Table 22

Table 22 Chilean Exports and Total Imports of Beans in Selected Countries: Annual Average for the Period 1948-50

	Exports from Chile	Total Imports	Ratio of Chilean Exports to Total Imports of Beans
	(thousands of tons)		(Percentage)
Great Britain	16.4	31.0	52.9
Cuba	8.6	35.5	24.2
United States	3.4	13.2	25.8
Belgium	1.8	6.4	28.1
Germany	1.1	25.4	4.3
Norway	0.9	7.5	12.0
Total	32.2	121.0	26.6

Source: Foreign Trade Annuals and United Nations Food and Agriculture Organization, op. cit.

In the case of certain products, such as grapes and onions, the possibilities of increasing exports are smaller than might be anticipated in view of the reduced share of Chile's participation in the world market. Their perishable nature limits trade to regions or countries which are located relatively close to Chile. However, even within the limits in which Chile can compete, these exports can be expanded to some extent.

In view of the foregoing, exports of cereals and vegetables were projected on the assumption that they would increase at the same rate as domestic consumption. In other words, it was assumed that for the period 1953-62, the ratio of the volume of exports to that of output of these products would be equal to that prevailing during the three year period 1948-50. Since all exports in 1950, with the exception of rice and beans, fell well below the average for the period[1/], the projected rate of increase for the period 1950-62 may be high in some cases.

1/ Average exports for 1948-50 in most cases were not higher than those of 1934-38.

/Table 23

Table 23 Projection of Exports of Agricultural Food Products

	Volume of Exports in 1950 (thousands of tons)	Total Increase in 1962 (percentage)
Cereals:		
Barley a/	23.1	265.3
Oats	3.2	281.2
Rice	11.5	29.6
Pulses:		
Beans	41.9	21.0
Lentils	3.6	419.6
Chickpeas	1.6	43.7
Peas	3.5	193.5
Fruit:		
Apples	7.8	20.0
Grapes	2.3	4.3
Others	-	12.0
Miscellaneous:		
Onions	20.3	- 13.3
Others	-	0.0

Source: Foreign Trade Annuals, and Economic Commission for Latin America.

a/ Includes malt, converted into terms of barley.

Another basis was used for projecting fruit exports. In the case of apples, the rate of expansion was computed so that by 1962 their volume would reach the pre-war level. Since exports of grapes and other fruits[1/] in 1948-50 were much higher than during preceding years, it was assumed that from 1950- when they fell below the average for that three year period - exports would again increase reaching, by 1962, the average volume of 1948-50. The same hypothesis was applied to onions and other products, involving a reduction of 13.3 per cent in the former while the latter retained their 1950 level.

The increase of agricultural exports was calculated on the basis of the rates of expansion for each product. It was estimated that their value

1/ The most important products in this sub-group are nuts and dried plums.

/would rise

would rise from 16.4 million dollars in 1950 to 28.3 million dollars, with a total increment of 62 per cent, and an annual average rate of growth of 4.1 per cent.

Lumber

World lumber requirements for all purposes, excluding firewood, were expected to rise by 40 per cent between 1947-49 and 1970-79. On the other hand, it was estimated that world output would only increase 4 per cent during that period, unless extraordinary measures were taken to develop forest productivity in the more highly developed countries and to raise output in the underdeveloped countries.[1/] This forecast indicates that in the future, countries having an exportable surplus of lumber and wood products, will have no difficulties in placing them on the world market.

Chile is one of the Latin-American countries in which the forest resources can be most easily used. According to a recent projection,[2/] by 1960 it will be able to export about 70 million board feet of lumber, that is, about 10 per cent less than in 1950. In this estimate, a substantial expansion of plywood exports is foreseen, as well as of posts and sleepers, which in 1950 were of little importance. Even taking into account the increase in these products, the estimated volume of such exports in 1962 would be lower than in 1950 but slightly higher than the annual average for the period 1946-50. Increases in output (102.4 per cent above the level for the five-year period indicated) would be mainly consumed on the domestic market. In the projection contained in the aforesaid study, it is stated that with adequate financing, output and, therefore, exports of lumber could be intensified.

There are ample possibilities for expanding lumber exports even considering only the volume of lumber on the pine plantations not used for the manufacture of pulp and paper. As was seen in the corresponding section, it was expected that in 1960-62, 1.4 million solid cubic metres of pine could be obtained, of which not less than 195 million board feet

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1/ The President's Material Policy Commission, op. cit. (Vol. V), page 47 et seq.

2/ The Agricultural Economy of Chile, International Bank for Reconstruction and Development and United Nations Food and Agriculture Organization (December 1952), page 290.

/of lumber

of lumber could be sawn.[1] For the period 1946-50, annual average consumption of pine in the building industry and in other activities was approximately 14 million feet. On the assumption that consumption for this type of lumber will be four times greater,[2] a balance of 125 million feet would remain in 1960-62.

There is no basis on which to calculate the proportion of this volume of lumber which fulfils the specifications and quality requirements of the foreign market. On the assumption that 80 per cent of the total complies with these conditions, there will be an exportable surplus of 100 million board feet - roughly 30 per cent more pine wood exports than total lumber exports in 1950. On the assumption that exports of other types remain constant, the exportable surplus in 1962 would be 180 million board feet, that is, 130 per cent more than in 1950.

This projection, in fact, does not correspond to the hypothesis of moderate growth of exports since it is based on the development of pine plantations for large scale production of pulp and paper. It was believed that present conditions in Chile would enable that country to expand its timber exports 33 per cent above the 1950 level, using the pine not required as raw material for the paper industry which is to supply the domestic market.

Wool and Hides.

It was assumed that only a very moderate annual rate of expansion would occur in exports of these products, namely 0.5 per cent. This low rate is justified inasmuch as domestic production will not only have to meet growing demand within the country, but also provide for other partial or total substitution of similar products.

1/ Ratio between the volume of wood used for the manufacture of chemical pulp to that used for other purposes, as determined by technological and economic factors. The ratio assumed in the present paper is not, therefore, definite and unchangeable.

2/ In the above mentioned study - The Agricultural Economy of Chile - it was estimated that lumber consumption would rise from 262 million feet to 529 million between 1946-50 and 1960.

Minted Gold

This item is composed exclusively of exports of gold currently produced in Chile, either by washing or from ores of which it is a by-product.[1/]

According to the Banco Central de Chile, these exports were abnormally high in 1950. On the basis of the statements made by this Bank,[2/] and of the level of current output in Chile, during the past few years, exports of minted gold maintained a constant level of 4.4 million dollars.

1/ There is a small duplication in the value of these exports since it was impossible to determine accurately what proportion of the "other ores" consists of gold.

2/ Banco Central de Chile, Chilean Balance of Payments, year 1951 (Santiago 1952) page 34.

Table 24 Projection of Exports 1950-62

(millions of dollars at 1950 prices)

	1950	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Copper	152.0[a]	164.2	168.4	172.8	177.3	181.9	186.6	191.5	196.5	201.6	206.8
Nitrate	7.4	67.4	67.9	68.5	69.0	69.6	70.1	70.7	71.2	71.8	72.4
Iron	2.2	8.0	8.2	8.4	8.6	8.8	9.1	9.3	9.6	9.8	10.1
Iodine	2.2	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.4	2.5
Manganese	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5
Other ores [c]	6.3	6.8	7.0	7.1	7.3	7.5	7.7	7.9	8.1	8.3	8.5
Agricultural Foodstuffs	17.7	19.9	20.7	21.5	22.4	23.3	24.2	25.2	26.2	27.2	28.3
Wines	1.5	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.8	1.8
Fish	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Lumber	7.8	8.4	8.6	8.8	9.0	9.2	9.4	9.6	9.8	10.0	10.2
Wool	9.3	9.5	9.5	9.6	9.6	9.7	9.7	9.8	9.8	9.9	9.9
Hides	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5
Textile Fibres	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Minted gold [d]	9.8	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Others	14.5	17.4	17.8	18.1	18.5	18.6	19.0	19.1	19.5	19.8	24.0
Total	297.9	313.6	320.2	326.9	333.9	341.9	348.2	355.6	363.2	371.0	383.0

Sources: Foreign Trade Annual 1950; Banco Central de Chile, Balance of Payments of Chile, 1950 (Santiago 1951), and United Nations Economic Commission for Latin America.

a/ F.o.b. value of copper exported by large scale enterprises.
b/ According to the Banco Central the value of nitrate and iodine sales amounted to 68 million dollars. The value of iodine exports was taken from the Foreign Trade Annuals and by subtraction of the f.o.b. value of copper exports was obtained.
c/ This item includes concentrated copper ores exported by small scale enterprises and which contained gold, silver and lead.
d/ Includes mainly gold produced in mines and placers and which is minted for export purposes.

/External Credits

External Credits and Foreign Investments

On the assumption of a moderate expansion of the gross product, it was assumed that a supplement to domestic saving would be obtained from external resources, equivalent to 173 million dollars at 1950 prices, the servicing of which would be effected in accordance with the conditions described elsewhere in the present report.

It was believed that foreign investments of private capital would continue to be made on the scale indicated in Table 25. The volume of foreign investment would thus tend to decrease, beginning with 31 million dollars in 1953 (slightly above the average for the period 1948-51 1/), and reaching a minimum of 10.1 million dollars in 1960.

Table 25 Private Foreign Investment for the Period 1948-51 and their Projection for 1953-62

(millions of dollars at current prices until 1952 and millions of dollars at 1950 prices after 1953)

1948	14.2
1949	31.4
1950	23.4
1951	39.3
1952	..
1953	31.0
1954	29.1
1955	29.8
1956	25.0
1957	17.1
1958	16.7
1959	11.7
1960	10.1
1961	10.1
1962	11.1

Source : Banco Central de Chile, Chilean Balance of Payments 1951 (Santiago 1952), page 48, and United Nations Economic Commission for Latin America.

Private foreign investments in Chile during the past few years were mostly those made by the copper companies. The projections are mainly based on the assumption that these investments would continue,

1/ Strictly speaking the comparison should only be made by transforming the whole series into dollars at 1950 prices.

/although at

although at a decreasing rate, as installations are gradually completed. It is probable that by about 1960, copper producers will cease to bring capital into the country, but it was assumed that moderate investments would be made, from other sources, in the final years of the period under review.

3. Projections of Outflow

Imports of Merchandise

Introduction. For purposes of their projection, Chilean imports were classified into five categories, namely, unprocessed foodstuffs, raw materials, fuel, consumer manufactures and capital goods. The first two were sub-divided into three sub-groups, according to degree of substitutibility. (See Table 26 which contains illustrations.)

In the sub-group of products which cannot be substituted were included all foodstuffs or raw materials which the country cannot produce because it lacks essntial natural resources, such as cotton and tin.

Some imports, such as lubricants, were classified as unsubstitutable, even though they may be domestically produced in the distant future when the domestic market expands. Lastly, this sub-group also includes products, such as aluminum and special steels, of a highly specialized manufacture and limited by the size of the market, as indicated above. 1/

1/ Certain chemical products were recorded as having no substitutes, that is, those for which the raw material cannot be produced in Chile.

/ Table 26

Table 26 Classification of Imports of Unprocessed Foodstuffs and Raw Materials

	Unsubstitutable	Partially substitutable	Substitutable
Unprocessed foodstuffs	Coffee Mate Tea Bananas Pineapples	Cattle	Wheat
Raw materials	Cotton Jute Rubber Cork Tin (ores)	Wool Dolomite	Tallow Cow hides Pine wood
Semi-processed raw materials	Aluminum Quebracho extract Prepared asbestos Essential oils Mineral oil for machinery Toll oil Lubricants Chrome yellow Special steels for tools Alloys of nickel iron and chrome iron Synthetic resins	Dyes Printing inks Paints	Lead (ingots) Caustic soda Sodium bi-carbonate and carbonate Lithopone Carbon black Carbon sulphide Ferrosilicon Glycerine for explosives Cresilic acid

Source: United Nations Economic Commission for Latin America.

/Whenever adequate

Whenever adequate information was available, demand for each product was projected individually in the list of imports which can be substituted. The volume of demand for raw materials was raised proportionately with that for the finished product in which such materials are contained. When it was impossible to follow this method, it was assumed that imports would expand at the same rate as industrial output. Among the imports which can be partially substituted were included goods which the country produces in limited amounts, the output of which cannot be increased, due to limitations of natural resources. In the case of foodstuffs included in this sub-group, the level of imports was established in accordance with estimates of agricultural output. In the case of raw materials, it was assumed that the 1950 level would prevail.

Foodstuffs

a) Bananas. Demand for bananas expanded in the past few years, principally because of the low relative price. One of the factors accounting for this was the granting of a preferential rate of exchange for banana imports.

The suspension of this rate would involve a reduction of per capita consumption. The expansion of the gross product during the next ten years might well counteract the depressive effect of the increase of the relative price on the demand since, according to trends observed in other countries, the income-elasticity of demand for fruit is one of the highest among foodstuffs.

It was, therefore, assumed that an annual increase in the volume of imports of 2 per cent would be registered over and above their level in 1950. In 1962 Chile would, therefore, import about 31,700 tons of bananas.

b) Tea, Coffee and Mate. The data on the volume of imports of stimulants indicate that their post-war per capita consumption experienced sharp yearly fluctuations.[1/] These fluctuations should not be taken as an indication of real changes in their demand since they reflect only the country's greater or lesser foreign exchange availabilities.

1/ The changes in consumption may have been less intense than appears in import figures owing to possible stock fluctuations.

/Table 27.

Table 27 Tea, Coffee and Mate Imports in 1947-51

(thousands of metric tons)

Years	Tea	Coffee	Mate
1947	0.9	9.7	8.6
1948	0.9	2.4	6.3
1949	1.5	15.6	7.2
1950	1.5	6.6	12.9
1951	5.3	4.3	7.9

Source: Foreign Trade Annuals

An attempt was made to ascertain the income elasticity of demand for each of these products, based on available figures, considering its effects individually or as a whole; however, no satisfactory conclusion could be obtained. In fact, statistical estimates suggest a conclusion which appears quite absurd and that is that aggregate demand for these stimulants has a negative income-elasticity.

This might be the case, however, for mate, considered independently. In Chile, Mate is only consumed in the lower income groups, particularly among those living in the rural areas. There is reason to believe that consumption is higher among the rural population than in urban areas, and that as the real per capita product increases in both areas mate will tend to be substituted by tea or coffee.

This being the case, per capita demand for mate may well decrease[1/], as the per capita product rises and the rural population is displaced. This, however, would not occur with coffee and tea, the consumption of which is relatively low in Chile.

It is not possible to determine to what extent the expansion of demand for these stimulants may or may not counterbalance the assumed decrease in mate consumption. However, it was believed that it would compensate for that decrease and, therefore, total imports of these three products were assigned an annual increase of 1.7 per cent, which is slightly higher than the growth of the population.

c) Sugar. Per capita consumption of refined sugar fluctuated btween 26 and 28 kilogrammes during the past ten years. This level is quite high

1/ It is interesting to observe that in 1950 mate consumption was abnormally high owing to the fact that its price increased substantially less than that of its substitutes, coffee and tea.

/when compared

when compared with countries where the real per capita product is approximately the same as that of Chile; however, its advantageous position derives from the fact that the relative price of the product was comparatively low over a period of years. The phenomenon can be explained also by a Government subsidy, paid in the form of a preferential rate of exchange for sugar imports.

The income elasticity of demand for sugar is low. Withal, if the relative price of the article rises in proportion with the suspension of the subsidy, per capita consumption will probably not increase.

There are reasons to believe, moreover, that per capita consumption will be lower than in 1950 when to judge by imports, it rose sharply above its pre-war level, reaching the highest point in the past two decades.

Table 28 Per Capita Volume of Raw Sugar Imports During Peak Years of the Period 1930-51

(kilogrammes)

1939	28.3
1942	30.9
1950	35.3

Source: Foreign Trade Annual

This expansion was, certainly, not brought about by changes in the real per capita product, but by other causes. It was, therefore, assumed that the regulation of the market and the elimination of the subsidy would tend to re-establish the level of average consumption prevailing during the past few years, that is, approximately 26 kilos of refined sugar per capita. The increment to consumption arising from the growth of the population would not raise the level of imports in view of the prospects that domestic output would become adequate to meet increased demand. Consequently, sugar imports would retain a constant level for the period 1953-62. The absolute level, calculated on the basis of the above data, would be equivalent to that of 1950 when per capita consumption was 26 kilogrammes of refined sugar. In terms of raw sugar, imports would average 165,000 tons, that is, 38,880 tons annually less than in 1950.

/d) Cattle.

d) Cattle. Cattle imports for consumer purposes would remain at the 1950 level throughout the period 1953-62 for the reasons detailed in Chapter III.

Petroleum

The volume of petroleum imports and those of its sub-products - petrol, kerosene, fuel oil and diesel oil - was estimated by taking into account two factors, namely, the future level of demand for these products and the probable output of the refinery being built at present.

Demand was projected on the basis of the annual rates of expansion shown in Chapter VII. In this case demand for fuel oils in the Central and Southern parts of the country was also taken into account and it was, therefore, necessary to make an independent estimate for future consumption of this type of fuel in the North. Since the mining companies are the predominant factor in establishing the level of consumption in the latter region, the projection was limited to estimating future requirements of the copper and nitrate mining enterprises. It was concluded that consumption would tend to increase less than the output of these two ores, owing principally to technical improvements which are now being introduced in the copper refining process. It was, therefore, assumed that an annual expansion of 2.5 per cent would take place which is slightly lower than that of nitrate production. There is a likelihood that this figure may be excessively high since the expansion of nitrate output would be less than that of copper. However, it was preferred to adopt this method, owing to the lack of data on which to base a more accurate estimate.

Table 29 Annual Rate of Expansion of Demand for Petroleum and its Sub-products 1950-62

	Percentage
Petrol	9.5
Kerosene	4.1
Fuel and diesel oils (Southern and Central zones)	8.4
Fuel and diesel oils (Northern zone)	2.5

Source: United Nations Economic Commission for Latin America.

/After establishing

After establishing the annual increment, the share of the northern zone in total fuel and diesel oil consumption in Chile was estimated. For this purpose the volume of these products imported in the North, through the port of Coquimbo (during 1948, 1949 and 1950) was compared with total imports. It was found that during these three years about 80 per cent of the total imports were consumed in the Northern zone.

The projection of demand was not based on the figure for the volume of fuel oil imports shown in the Foreign Trade Annual for 1950, which was considered abnormally low. (See Table 30.) Even though mining output declined substantially in 1950, this decline was not sufficiently great to justify so sharp a contraction of fuel oil consumption.

Table 30 Total Imports of Fuel Oil

Years	Thousands of metric tons
1947	203.0
1948	881.0
1949	838.0
1950	496.0
1951	905.0

Source: Foreign Trade Annuals.

As in the case of other fuels, consumption figures shown were those provided by the Empresa Nacional de Petróleo rather than those of the Foreign Trade Annuals. Discrepancies between both sources are small, if fuel oil is excluded.

On the basis of the data shown above, the following projection of demand for petroleum sub-products was made.

/Table 31

Table 31 Projection of Demand for Petroleum and its Sub-products

(thousands of metric tons)

Years	Petrol Total	Kerosene Total	Diesel and Fuel Oil Total	(Central and Southern zone)	Northern zone
1950	243.3	53.6	857.4	169.5	687.9
1953	319.4	60.5	920.9	215.8	705.1
1954	349.7	63.0	956.6	233.9	722.7
1955	382.9	65.6	994.3	253.5	740.8
1956	419.3	68.3	1,034.1	274.8	759.3
1957	459.1	71.1	1,076.2	297.9	778.3
1958	502.7	74.0	1,120.7	322.9	797.8
1959	550.4	77.0	1,167.7	350.0	817.7
1960	602.7	80.2	1,217.5	379.4	838.1
1961	660.0	83.5	1,270.3	411.3	859.0
1962	722.7	86.9	1,326.3	445.8	880.5

Source: United Nations Economic Commission for Latin America.

The output data for 1953 and 1954 were provided by the Empresa Nacional de Petróleo[1/]. The calculation for the period 1955-62 was based on the public statements made by one of the company's officials[2/], who stated that within 5 to 10 years after 1952 domestic crude output of petroleum would entirely supply the refinery. It was conservatively estimated that this would occur in the maximum period. The annual rate of expansion of output according to this assumption should, therefore, be approximately 14 per cent annually. In fact, it is not possible to forecast the future trend of Chilean petroleum output accurately, owing, among other reasons, to the fact that no information is available regarding reserves.[3/]

1/ Comunique No. 1169 forwarded by the Empresa to the Economic Commission for Latin America as of November 12, 1952.
2/ Lecture delivered by the General Manager of the Empresa.
3/ See Second Annual Report, Empresa Nacional de Petróleo (Chile, 1952) page 7.

/Table 32

Table 32 Projection of Crude Petroleum Output

Years	Thousands of tons
1950	83.5
1953	195.0
1954	240.0
1955	274.8
1956	314.6
1957	360.2
1958	412.4
1959	472.2
1960	538.4
1961	616.5
1962	705.9

Source : Empresa Nacional de Petróleo and United Nations Economic Commission for Latin America.

The projection of the volume of imports of petroleum and sub-products was based on the assumptions outlined above and on the fact that the annual capacity of the refinery now being built will be as shown below:

	(metric tons)
Petrol	370,000
Kerosene	50,000
Diesel oil	100,000
Fuel oil	150,000

It was assumed, moreover, that in the first year of operation, the refinery would only work for nine months.

Table 33 Projection of the Volume of Imports of Petroleum and Sub-Products

(thousands of metric tons)

Years	Petrol	Kerosene	Crude Petroleum	Diesel & Fuel Oil		
					Central and Southern Zone	Northern Zone
1950	243.3	53.6	-	857.4	169.5	687.9
1953	319.4	60.5	-	670.9	-	670.9
1954	73.7	25.5	348.8	706.6	46.7	722.7
1955	12.9	15.6	430.2	744.3	3.5	740.8
1956	49.3	18.3	390.4	784.1	24.8	759.3
1957	89.1	21.1	344.8	826.2	47.9	778.3
1958	132.7	24.0	292.6	870.7	72.9	797.8
1959	180.4	27.0	232.8	917.7	100.0	817.7
1960	232.7	30.2	167.4	967.5	129.4	838.1
1961	290.0	33.5	88.5	1,020.3	161.3	859.0
1962	352.7	36.9	-	1,076.3	195.8	880.5

Source: United Nations Economic Commission for Latin America.

/Raw

Raw materials

a) Cotton. The projection of the volume of cotton imports was made in two stages. First, the amount of cotton required to produce the type of articles manufactured in the country at the inception of the programme was estimated. The resultant annual rate of development is similar to that of textile output.

To this figure was added the raw cotton equivalent of imported yarn and fabrics which it was assumed would be substituted during the period under review, but making the necessary adjustments required by the increase in demand for such goods.

According to expert opinion, the country is in a position to manufacture most of the different types of cotton goods which at present are imported, with the possible exception of high quality cloths and the finer threads.

To give some idea of the possible substitution, the following table shows in detail the volume and value of the leading imports in this field in 1950.

Table 34 Volume and Value of Cotton, Thread Yarn and Textile Imports in 1950

	Volume (tons)		Value (thousands of dollars)	
Thread and yarn:	834.1		2,750.4	
Crude, mercerized		339.3		996.1
Bleached, mercerized		98.6		304.0
Dyed, mercerized		69.5		218.3
Others		326.7		1,232.0
Fabrics:	1,074.6		4,288.0	
Sheetings		130.7		389.8
Other crude fabrics		48.6		128.0
Poplin		23.3		217.7
Other bleached fabrics		78.7		357.0
Handkerchief cloth		31.2		302.7
Percale		44.0		277.8
Other dyed cloth		152.1		945.7
Osnaburg		310.3		462.3
Cotton velvet		50.1		270.0
Others		161.1		507.2

Source: Foreign Trade Annuals.

/b) Jute

b) Jute. Imported jute sacking is used for nitrate and potatoes. The volume of jute imports was therefore based on the expansion of nitrate exports and potato output. It was estimated that the country could import the raw material and make new sacks locally, instead of purchasing the latter abroad.

c) Tin. This metal is of importance in the manufacture of tinplate. In the manufacturing process adopted by the Chilean iron and steel industry, that is, the immersion process, 16.2 kilogrammes of tin are required per ton of tinplate. Hence, it was assumed that imports would expand in a measure with probable production of tinplate.

Consumer Manufactures

a) Motor vehicles. Statistically, it is impossible to determine the income-elasticity of demand for motor vehicles in Chile; hence, they were assigned an elasticity of 3.0 which appears reasonable, judging from countries with a similar product.

The figures for motor vehicle imports in 1950 were not used as a basis in this projection, since it was estimated that, at that time, the threat of a heavy deficit in the balance of payments had compelled the authorities to limit imports of these and other durable consumer goods to a level well below the country's requirements. Therefore, instead of this figure, the average for the period 1947-51 was used, that is, 3,1000 units annually.

Based on the hypothesis formulated in connexion with the income elasticity of demand for motor vehicles, the trend of imports was computed below.

Table 35 Projection of the Volume of Imports of Motor Vehicles for the Period 1953-62

Years	Units
1950	3,100
1953	3,844
1954	4,142
1955	4,452
1956	4,774
1957	5,043
1958	5,518
1959	5,952
1960	6,386
1961	6,882
1962	7,378

Source: United Nations Economic Commission for Latin America.

/The dollar

The dollar value of imports at 1950 prices is not parallel to actual quantity because it is assumed that in 1957 partial assembly of imported motor vehicles would begin. In this way, a savings of 20 per cent in foreign exchange would be secured.

b) Other consumer manufactures. An estimate of imports of other consumer manufactures was made considering the possibility of substituting them with domestic goods. The analysis of these possibilities is shown in Chapter IV. Taking consumer manufactures as a whole, the share of imports in relation to total supply would decrease from 18 to 6 per cent between 1950 and 1962.

Movement and Servicing of Capital

a) Introduction. This includes the exchange resources directed to amortization and the servicing of foreign loans contracted by public and private institutions. The emittance of profits earned by foreign enterprises within the country and the amortization of their capital is included as well.

It was considered advisable to classify the different sections of this item into long and short-term public and private credits.

Long term public credits consist of the following:

1. Loans contracted abroad by the Government, Municipal authorities, State-owned railways and the "Caja de Crédito Hipotecario" (Mortgage Credit Fund) during the period from 1885 to 1930. These obligations are known as the foreign public debt.

2. The loans granted since 1940 to the State Railways and to the Corporación de Fomento de la Producción and its subsidiary enterprises, by the Export Import Bank and the International Bank of Reconstruction and Development. The loans granted by these organizations have been grouped together as long-term obligations, although some of them, for a small amount, have a very short amortization period.

The short-term public debt consists of:

1. Loans granted by purveyors to the Corporación de Fomento de la Producción and the State-owned railways.

2. Credits granted in 1947 by the Argentine Institute for the Promotion of Trade (IAPI) to the Corporación de Fomento and to the Instituto de Economía Agrícola, to finance imports of oil and wheat and also the credit granted, and used in 1951 for the purchase fo wheat.

/3. The loans

3. The loans in foreign currency granted to the government for short periods by banking institutions and other organizations. These and the above credits together form the short-term public debt.

The balance of the obligations in the public sector, as of 31 December 1951, is shown in the following table. It will be seen that the nominal value of these debts was 311.6 million dollars. In order to obtain the total of the foreign obligations, it is necessary to add to this figure the sum of 4.3 millions arising in theprivate sector. It should be pointed out that this latter figure does not include the debts contracted by the nitrate enterprises and other private companies. The 4.3 millions, therefore, are in fact only the balance of two compensation accounts. It is of interest to point out that the market value of the public debt was 190.6 millions.

Table 36 Nominal value of the Total Public Foreign-held Debt as of 31 December, 1951

(millions of dollars)

I. Long-term obligations:	283.2	
1. Public debt		190.3
2. Owed by the Corporación de Fomento:		
a) Export Import Bank		79.8
b) International Bank for Reconstruction and Development		9.7
3. Owed by the State-owned Railways to the Export Import Bank		3.4
II. Short-term obligations:	28.4	
1. Public debt		7.0
2. Corporación de Fomento to its purveyors		4.0
3. Owed to IAPI and the debt contracted by the Instituto de Economía Agrícola		15.5
Total	309.7	

Source: Official Chilean publications.

b) Public Sector

Medium and long-term debts

Public debt. In 1948 the government of Chile established a new plan for servicing the foreign debt designed to overcome the difficulties created in preceding periods. With this purpose in view, it ordered the floating of new bonds to replace those in circulation, so that the State

/became a

became a direct debtor for all the obligations derived from loans contracted previously.

According to the law governing the service of the debt in 1948-53, including both years, 2.5 million dollars were to be set aside annually for amortization, this sum representing approximately 1 per cent of the nominal value calculated for the debt at the time the law was put into effect. The mechanism for amortization consists in the purchase of bonds on the corresponding stock markets. The law also establishes the payment of an annual interest of 2 per cent in 1950 and 2.5 per cent for the three-year period 1951-53.

After 1954 it was proposed to regulate the servicing on the basis of a quota fixed annually, equivalent to 4 per cent of the nominal value as of 31 December 1953 of the balance of the bonds. The fixed interest is 3 per cent and amortization is cumulative.[1/]

Table 37 Nominal Balance of the Public Foreign Debt as of 31 December of the Years Indicated

Obligations	1948	1951	1948	1951
	(Nominal value in millions of the original currencies)		(Nominal value in millions of dollars)	
In sterling	22.7	20.4	91.6	57.1
In dollars	125.7	112.3	125.7	112.3
In Swiss Francs	106.8	89.4	25.1	20.9
Total	-	-	242.4	190.3

Source: Banco Central de Chile, Foreign Investments in Chile in 1948 (Santiago, 1950) page 36 and official data.

The nominal balance of the foreign debt in 1948 amounted to 242.4 million dollars distributed as shown in the above table. The real balance, however, amounted to 56.5 million dollars, as may be seen from Table 38.

From 1948 to 1951, after which no data are available, amortization of the debt was effected in accordance with the law, a total sum of 10 million

1/ For more details see Foreign Investments in Chile in 1948, Central Bank of Chile (Santiago, 1950) page 36.

/dollars being

dollars being used for this purpose during that four-year period. As the bonds were redeemed at a market rate which accelerated rapidly from 23.3 per cent of the nominal value in 1948 to 27 per cent in 1949, and 37.7 per cent in 1951, the real value of the debt outstanding was not reduced, but, on the contrary, rose until by the end of the period indicated it amounted to 69.3 million dollars. The dollar increase would have been even greater, had the pound sterling not been devaluated. It should be pointed out, incidentally, that devaluation accounted for an appreciable proportion of the reduction in the nominal value of the debt calculated in dollars.

Table 38 Rate of Redemption and Real Market Value of the Foreign Public Debt in the Years Indicated

Obligations	Rate of Redemption		Market Value			
	1948	1951	1948	1951	1948	1951
	(percentages)		(millions of national currency)		(millions of dollars)	
In sterling	18.8	34.5	4.3	7.0	17.2	19.6
In dollars	27.4	37.9	34.4	42.5	34.4	42.5
In Swiss francs	19.6	34.7	20.9	31.0	4.9	7.2
Average	23.3	35.7	-	-	-	-
Total	-	-	-	-	56.5	69.3

Source: Banco Central de Chile, Chile's Balance of Payments, 1949 (Santiago, 1950), page 43 and official data.

It is quite probable that in 1952 and 1953 the rate of redemption will exceed that of 1951 in view of the servicing maximum established by the new law. The projection of the annual amount of payments which Chile would make was based on the assumption that it would reach 37 per cent of the nominal value in 1952 and 40 per cent in 1953, which assumption appears quite reasonable, taking into account the improvement during the four-year period 1948-51. If this assumption is correct, the nominal value of the debt would drop to 177.3 millions in 1953, but the real debt would exceed its 1951 level by 1.6 millions.

/Table 39

Table 39 Projection of the Rate of Redemption and the Nominal and Real Market Values of the Foreign Public Debt

Years	Rate of redemption	Amount for amortization	Nominal value of the debt as of 31 December in the years indicated	Real value of the debt
	(Percentages)		(millions of dollars)	
1952				
1952	37.0	2.5	183.5	67.9
1953	40.0	2.5	177.3	70.9

Source: United Nations Economic Commission for Latin America

As indicated above, according to the law a fixed quantity would be set aside, from 1954 onward, for regular servicing, equivalent to 4 per cent of its nominal value in 1953, or in other words, 7.1 million dollars according to the projections in the study. Of this sum, 5.3 millions must be set aside for payment of interest and the remaining 1.8 millions for amortization. These estimates are only valid for the first year of regular servicing (1954), since it is impossible to forecast the distribution of the payments in subsequent years as between amortization and interest, which will depend largely on the rate of redemption established for each year.

As regards the latter, there is nothing to prevent new increases being made after 1954 if Chile's capacity for external payment does not deteriorate. Moreover, it would be enough for annual expansion to exceed 1 per cent for the real volume of the debt to continue rising even after the year 1962.

At all events, a projection of the debt was made based on the redemption price prevailing in 1954, relative to the nominal value, that is, 42.5 per cent, and the 45 per cent which would prevail in 1955 and afterwards.

/Table 40

Table 40 Projection of the Servicing of the Foreign Public Debt, 1953-62

(millions of dollars)

Years	Amortization	Interest
1953	2.5	4.6
1954	1.8	5.3
1955	1.9	5.2
1956	2.0	5.1
1957	2.2	4.9
1958	2.3	4.8
1959	2.5	4.6
1960	2.7	4.4
1961	2.9	4.2
1962	3.0	4.1

Source: United Nations Economic Commission for Latin America

Debt of the Corporación de Fomento and the State Railways. Until 31 December 1951 the Corporación de Fomento had contracted loans from the Export-Import Bank and the International Bank for Reconstruction and Development for the equivalent of 112.1 and 17.3 million dollars respectively, of which total slightly more than 115 millions had been disbursed. On the date indicated, the balance of the debt with the Export-Import Bank amounted to a total of 80.1 millions, while that with the other institution was 5.9 millions, as of 30 June of the same year.

Table 41 Loans Obtained by the Corporación de Fomento for the Export-Import Bank and the International Bank for Reconstruction and Development

(millions of dollars)

Date	Export-Import Bank			International Bank for Reconstruction and Development		
	Credits		Debit Balance	Credits		Debit Balance
	Granted	Disbursed		Granted	Disbursed	
Dec. 31 1950	112.1	105.9	81.4	16.0	.. a/	.. a/
June 30 1951	112.1	107.0	80.6	16.0	6.4	5.9
Dec. 31 1951	123.3	108.6	80.1	16.0	..	..
June 30 1952	123.3	110.5	79.8	17.3	10.2	9.7

Sources: Export-Import Bank, various issues of the Semi-Annual Report to Congress (Washington, D.C.) and International Bank for Reconstruction and Development, Annual Report (Washington D.C.).

a/ The credits granted and the debit balance as of 30 June, 1950 were 5.5 millions dollars.

The State-owned Railways obtained loans from the Export-Import Bank for 14 million dollars, of which 13.5 were disbursed and 0.5 million dollars

/cancelled

cancelled. By the end of 1951, the Railways owed the Export-Import Bank a total of 4.4 million dollars.

Table 42 Loans Contracted by the State Railways from the Export- mport Bank

(millions of dollars)

Date	Credits		Debit balance
	Granted	Disbursed	
Dec. 31 1950	14.0	13.0	6.2
June 30 1951	14.0	13.0	4.8
Dec. 31 1951	14.0	13.5	4.4
June 30 1952	14.0	13.5	3.4

Source: Export-Import Bank

The basic data for the projection were taken from a publication issued by the United States Department of Commerce.[1/] This publication shows a calendar of the interest and amortization payments of the loans granted by the Export-Import Bank until 30 June, 1951. The initial figures were completed by adding the payments required for servicing the loans granted by that institution between 30 June and the end of 1951.

The projection for the servicing of the International Bank loan was used without alteration. It should be pointed out that unlike the preceding case, this projection is not based on the loans granted. Instead, the profits and the loans which it is assumed will be disbursed before 30 June, 1951 were considered.

Table 43 shows the detailed projection.

1/ U.S. Department of Commerce, "Debt Service Projections", Supplement to Foreign Transactions of the U.S. Government (Washington, D.C. December 1951).

/Table 43

Table 43 Projection on the Servicing of the Debts of the Corporación de Fomento de la Producción and the State Railways with the Export-Import Bank and the International Bank for Reconstruction and Development in 1953-62

(millions of dollars)

Years	Export Import-Bank		International Bank for Rec. and Development		Total	
	Amortization	Interest	Amortization	Interest	Amortization	Interest
1953	6.0	2.8	0.8	0.6	6.8	3.4
1954	6.7	2.6	1.2	0.6	7.9	3.2
1955	7.9	2.7	1.0	0.6	8.9	3.3
1956	7.6	2.5	0.7	0.5	8.3	3.0
1957	7.5	2.1	0.8	0.5	8.3	2.6
1958	7.9	1.9	0.8	0.4	8.7	2.3
1959	4.9	1.7	0.8	0.4	5.7	1.1
1960	2.9	1.4	0.8	0.4	3.7	1.8
1961	3.0	1.3	0.9	0.3	3.9	1.6
1962	3.1	1.2	0.9	0.3	4.0	1.5

Source: U.S. Department of Commerce, op.cit., pgs. 6 and 16.

In practice, payments will exceed the sum shown since it is possible that in the future Chile will use immediate credits granted by the International Bank, which had not been disbursed until 30 June, 1951 and the servicing of which should begin before 1962. Moreover, Chile may obtain additional loans, some of which would begin to be amortized during the next ten years.

Development loan. This loan is the external supplement to savings accruing within Chilean economy. The need for such assistance and the corresponding amount, in accordance with the hypothesis of moderate development, was studied in Chapter I. It is sufficient to indicate that the total amount should be 173 million dollars, distributed in three successive annual quotas of 70, 66 and 37 million dollars, respectively, to be paid in the period 1953-55.

It was assumed that the loan would involve an annual interest of 4 per cent and that amortization would be extended over a period of 20 years as from 1957. It was assumed, moreover, that a fixed annual amount of 12.1 million dollars would be set aside for servicing and amortization. The projection was made taking into account these assumptions.

/Table 44

Table 44 Projection of the Servicing of the Development Loans

(millions of dollars)

Years	Amortization	Interest
1957	5.2	6.9
1958	5.4	6.7
1959	5.6	6.5
1960	5.8	6.3
1961	6.1	6.0
1962	6.3	5.8

Source: United Nations Economic Commission for Latin America.

Short-Term Credits

Public debt. By the end of 1951 this debt amounted to 7 million dollar No accurate data are available to make a projection of the payments arisen fro this obligation and it was, therefore, assumed that it would be cancelled withi five years, that is, by 1956, and that it would require annual interest of 3 per cent.

Debt of the Corporación de Fomento and the State Railways. As pointed ou above, this credit comprises the pending obligations of the abovementioned organizations with their purveyors. Table 45 shows the statement of account of 31 December 1951 indicating that the State Railways had not yet received the full credits granted by their purveyors.

Table 45 Credits Granted to the Corporación de Fomento and the State Railways by their Purveyors; Credits Disbursed and Debit Balance as of 31 December, 1951

(millions of dollars)

	Credits		Unutilized balance
	Granted	Disbursed	
Corporación de Fomento	19.9	13.9	6.0
State Railways	19.6	-	19.6
Total	39.5	17.0	25.6

Source: Official data.

In the event of the unutilized balance accruing to the Railways and the 6 millions of the Corporación being employed by the respective institutions, the aggregate servicing would be as shown in Table 46. Unfortunately, it was impossible to obtain detailed information for each year in respect of the payment of interest and amortization. The data

/available

available comprise both interest and amortization, as can be seen from the following table:

Table 46 Projection of Amortization and Servicing of the Credits Granted to the Corporación de Fomento de la Producción and to the Railways by their Purveyors in 1952-58

(millions of dollars)

Years	Corporación de Fomento a la Producción	State-owned Railways	Total
1952	5.3	-	5.3
1953	4.0	0.4	4.4
1954	2.0	3.0	5.0
1955	-	5.6	5.6
1956	-	5.2	5.2
1957	-	4.7	4.7
1958	-	2.5	2.5

Sources: Official publications and United Nations Economic Commission for Latin America.

Debt Owed to the Instituto Argentino para la Producción del Intercambio (IAPI) and Debt of the Instituto de Economía Agrícola. The debit balance owing to the former in 1951 amounted to 7.6 million dollars, which was lower than the 1948 level of 14.2 millions. In other words, Chile had used about 417 million dollars for amortization of that loan during the period 1949-51. It was believed, in view of the lack of adequate data, that 4.7 and 2.9 million dollars, respectively, would be used for amortization in 1952 and 1953, thus cancelling the loan. It was assumed, however, that the payment of interest would be equivalent to 0.2 and 0.1 millions.

In 1951 the Instituto de Economía Agrícola borrowed 8 million dollars to purchase wheat abroad. Although the terms of the loan have not been made public, it was expected that it would be cancelled within four years, as from 1952, and that the rate of annual interest was 3 per cent.

Table 47 Projection of the Servicing of the Debt Owed to the Instituto Argentino para la Promoción del Intercambio and the Debt Owed by the Instituto de Economía Agrícola.

(millions of dollars)

Years	Owed to IAPI		Owed by the Instituto de Economía Agrícola		Total	
	Amortization	Interest	Amortization	Interest	Amortization	Interest
1952	4,7	0,2	2,0	0,2	6,7	0,4
1953	2,9	0,1	2,0	0,1	4,9	0,2
1954	-	-	2,0	0,1	2,0	0,1
1955	-	-	2,0	-	2,0	-

Source: United Nations Economic Commission for Latin America.

Credits extended to the nitrate companies. According to the balance sheet[1] of the nitrate Companies, which together produce 93 per cent of total output, the nominal value of their obligations in foreign currency, as of June 30, 1951, amounted to 15 million dollars and 8.4 million pounds

1/ See Balance Sheet and Annual Report 1950-1 of the Tarapacá and Antofagasta Nitrate Company; Annual Report and Balance Sheet 1950-51 of the Anglo-Lautaro Nitrate Company, and Fifteenth Annual Report of the Iquique Nitrate Company.

/sterling, which

sterling, which sums were equivalent to a total of 37.5 million dollars.2/

The four loans into which the total is divided, are serviced by different systems. One of them, amounting to 7.7 million dollars, yields 5 per cent and can be amortized in 17, 18 and 20 years. Another of 0.2 million pounds sterling and 6.2 million dollars matures as of 31 December 1960, with an annual interest of 4 per cent. The third is in the form of non-interest bearing bonds worth 8.2 million pounds sterling and 0.7 million dollars, to be amortized by the profits accruing from the sale of nitrate and iodine produced by one Company and only when such profits are obtained. The last of these obligations totals 0.3 million dollars, but no further information is available concerning it.

The calculation of the approximate amount of payments in the period 1953-62 was based on the data concerning the methods of servicing shown above, in addition to the assumption that redemption of the nitrate Company bonds would be effected at par and that total amortization of the debt of 7.7 million dollars would require 18 years, while the non-interest yielding bonds would be redeemed for a similar value as that in the period 1950-1, that is, 0.1 million dollars.

1/ In fact, payment by these Companies was pending during the fiscal period 1951-52 of the amounts due to the Corporación de Venta de Salitre y Yodo, corresponding to the final amortization quota of the so-called "5% Income Debentures" issued in 1934 by that Corporation on behalf of the industry. During the fiscal year 1950-1, the Corporación advanced the necessary amounts to redeem the Income Debentures entirely. The original debt amounted to 2.7 million pounds sterling and 38 million dollars.

The ra te of 2.80 dollars was used in converting pounds sterling into dollars.

/Table 48

Table 48 Projection of the Servicing of the Nitrate Company Credits, 1953-62.

(millions of dollars)

Years	Amortization	Interest
1953	1,2	0,5
1954	1,2	0,5
1955	1,2	0,5
1956	1,2	0,4
1957	1,2	0,4
1958	1,2	0,3
1959	1,2	0,2
1960	1,2	0,2
1961	0,5	0,2
1962	0,5	0,2

Source: United Nations Commisssion for Latin America.

In this case, as in others, it is very probable that the actual amounts used for servicing foreign obligations, would exceed those projected. The explanation for this lies in the possibility that the nitrate companies may obtain foreign resources during the next ten years, with a view to extending and improving their installations. This would take the form of direct loans or the issue of bonds, the servicing of which might well begin before 1962.

CHAPTER III. CROP AND LIVE-STOCK PRODUCTION

1. Projection of Demand for Foodstuffs in Chile, 1952-1962

In making a projection of demand for foodstuffs difficulties are encountered both in the insufficiency and purely estimative character of the basic data, and the interpretation of previous price and income trends, owing to the distortions of Chilean economy caused by inflation.

The per capita foodstuff consumption series, prepared by the Corporación de Fomento de la Producción (Chilean Development Corporation) were used as basic data. 1/ These figures were calculated by dividing the total available supples (i.e. production plus imports minus exports) of food products by the estimated population for each year. Variations in stocks have thus not been taken into account, and consumption for years of good harvests therefore tends to be over-estimated, while years of bad crops are under-estimated. There may also be a slight under-estimate of the data for the last few years, owing to the use of demographic figures calculated on an annual rate of increase which is too high in the light of the last census (April 1952). In spite of these reservations, the Tables mentioned are sufficiently accurate for the purposes of the present paper.

This series includes a large number of commodities, and refers to the period 1940-50. Table 1 summarizes the data contained therein.

1/ Corporación de Fomento de la Producción, Geografía Economica de Chile, Vol. II, Santiago, 1950, pages 234-237.

/Table 1

Table 1 Per Capita Foodstuffs Consumption

Product	Per capita consumption: Kilogrammes 1940-1941	Kilogrammes 1948-1950	Calories a/ 1940-1941	Calories a/ 1948-1950
Meat	40.7	35.6	122.6	107.3
Fish and seafood	8.0	13.1	12.2	20.1
Milk and all milk products b/	78.0	114.4	132.5	194.3
Fats c/	4.2	7.9	92.6	172.8
Cereals	130.8	131.3	1,232.6	1,237.3
Fruit	42.6	42.7	51.6	51.8
Potatoes (incl. sweet potatoes)	71.2	81.2	136.9	156.1
Sugar	18.0	25.0	260.4	260.4
Pulses	11.4	7.2	112.0	70.8
Fresh vegetables	57.2	55.8	47.6	46.5
Eggs	2.2	2.2	7.0	7.0
Wines and ciders	52.6	56.1	154.2	164.4
Beer	15.0	15.6	15.2	15.8
Spirits	0.6	0.8	5.8	7.7
Total			2,383.2	2,512.3

Source: Corporación de Fomento de la Producción and Dirección General de Estadística.

a/ The calory content of the different foodstuffs is that estimated by the Corporación de Fomento de la Producción, with the following exceptions (calories per 100 grammes): milk, 62; fats, 800; wines and ciders, 107; beer, 37; spirits, 350.

b/ Milk produced divided by total population.

c/ Includes imported butter.

A study of the above table leads to the conclusion that there has been very little improvement in the Chilean diet since before the war, and that there has been a deterioration in many items, e.g. meat and pulses. It should be noted that the figures for fruit and vegetables are much less reliable than those for the other commodities and the true tendency may thus have been the reverse of that on the table. Milk and milk products are the only items showing substantial improvement.

Table 1 also shows the low level of consumption for protective foods. For example, in 1948-50 the amount of meat figuring in the Chilean diet

(35.6 kg.) was equal to less than a third of Argentine consumption and slightly over a half of that of France, where the low post-war consumption was the basis for comparison. As regards milk and milk products, the 114 litres in Chile compares very unfavourably with the 200-350 in the United States, the British Dominions and the Scandinavian countries, in spite of the marked increase during the last ten years. Although cereal consumption is high (131 kg.) the total daily intake of calories per person is hardly more than 2,500. If the consumption of alcoholic beverages is excluded, this total is reduced to just over 2,350 calories.

The above comparisons are still more significant if they are correlated with the per capita income in countries whose development is comparable to that of Chile. Thus, the differences in diet between Cuba or Brazil, for example, and Chile, seem to be more unfavourable to the latter than the difference in per capita income. This would seem to suggest that food is costly as compared with other items of consumption.

Table 2 Annual Cost of Diet, 1948-1950

(in pesos at 1950 prices)

Product	Total cost		Yearly cost per calory per day
	$	%	
Meat	1,223.57	16.32	11.40
Fish	394.83	5.27	19.64
Milk and cheese	1,574.14	20.99	8.10
Fats	419.33	5.59	2.43
Cereals	1,066.16	14.22	0.86
Fruit	130.24	1.74	0.25
Potatoes (incl. sweet potatoes)	475.83	6.35	3.05
Sugar	414.25	5.53	1.59
Pulses	41.54	0.55	0.59
Fresh vegetables	627.75	8.37	13.50
Eggs	136.14	1.82	19.44
Wines and ciders	699.00 a/	9.32	4.25
Beer	255.07 b/	3.40	16.14
Spirits	40.00	0.53	5.20
	7,497.35	100.00	

Source: Economic Commission for Latin America.

a/ Calculated at Santiago price for red wine.

b/ Calculated at Santiago prices.

/The two

The two first columns of Table 2 show the estimated average diet per capita at 1950 prices. It may be seen that in 1948-1950, foodstuffs with a high value in calories, i.e. cereals, starches, sugar and fats, absorbed 31 per cent, and alcoholic beverages 13 per cent of the total cost. The data in the last column was obtained by correlating the figures in the first column with those for the daily calory content of each one of the various items of food. From this it may be seen that the cheapest sources of calories are cereals, dried vegetables and sugar. However, consumption of these products is already very high, and it is hardly probable that it will increase, unless the consumption of the other items of diet were reduced.

On the basis of the above data, nutrition experts have reached the conclusion that any per capita rise in income in Chile would tend to increase the calory contents of the diet as well as its protein, vitamin and mineral salts content, providing the relative prices of the different foodstuffs remain the same. In order to determine the influence of a rise in income upon diet, a calculation of the income-elasticity of demand for the various food components has been attempted.

The income-elasticity of demand for all the foodstuffs taken together was first determined, correlating the variations in per capita calory intake with those of income. The coefficient obtained was 0.55, which according to the analysis made in Chapter IV of the First Part, corresponds to what might be expected for a country whose levels of income and diet are similar to those of Chile.

The calculation of the income-elasticities for each separate type of foodstuff is more difficult than that of the over-all coefficient. This is partly due to deficiencies in the basic data, but mainly because of the comparatively wide possibilities for the substitution of one foodstuff by another, which in turn is particularly influenced by changes in the relative prices of the various foodstuffs. These relative prices themselves vary according to climatic conditions affecting production, alterations in the supplies of imported foodstuffs and price controls.

These considerations make it necessary to use a different method for determining individual elasticities, consisting mainly in dividing the expansion of consumption for each foodstuff by the increase in the per capita

/gross product.

gross product. The results obtained were then examined and the factors that might have influenced them were analysed. This enabled the initial calculation to be adjusted so as to eliminate factors as far as possible. In some cases the adjusted figures were compared with those obtained from actual experience in other countries. In the following paragraphs detailed indications are given as to the application of the results in individual cases.

The initial calculation showed coefficients of 5.6 for milk, 8.5 for fats, 0.0 for wheat and sugar and negative elasticities for meat, fish, potatoes, wine and pulses. Owing to lack of data, other commodities (fruit, vegetables, eggs, and various alcoholic beverages) could not be calculated.

The results obtained for sugar and wheat appear to reflect the real situation; according to nutrition experts, consumption of these products in Chile has almost reached saturation point and is thus unlikely to be affected by any change in the level of income. This impression was borne out by the fact that the relative prices for these commodities have not tended to diminish their consumption. (Even in the case of sugar, the opposite might have occurred due to its very low price.)

The extremely high coefficients obtained for milk and fats reflect the low relative prices and a growing availability of supplies. The elasticity resulting from the elimination of the price factor was still very high, compared with the actual results obtained in other countries. It was noted that per capita consumption, where it was less than 200 litres annually, tended to increase at the same rate as income. Milk was thus given an income-elasticity of demand of 1.0. The demand for fats was presumed to be as elastic as that of milk, consumption in Chile being still very low; however, the rapid increase observed during the last few years is largely the result of their low relative price and use as a meat substitute.

The negative coefficients for potatoes, meat and pulses are obviously the result of their substitution by other products, as a result of supply difficulties and high relative prices. This last factor is clearly shown in the case of pulses. Beans and rice are readily interchangeable and it can therefore be deduced that the increase in price of the former as compared

/with that of

with that of rice, would explain the apparent inelasticity. The data contained in Table 3 were therefore drawn up in order to confirm or correct this impression. This table was used as a basis for Plate 1. A study of both shows that the per capita consumption of beans tends to vary in inverse proportion to its price expressed in terms of rice, and the previous conclusions are thus confirmed.

Table 3 Per Capita Consumption of Beans and its Relative Price as Compared with Rice.

Year	Relative price of beans compared with that of rice (1940=100)	Indices for per capita consumption of beans (1940=100)
1940	100.0	100.0
1941	199.1	82.2
1942	211.0	53.3
1943	165.2	87.8
1944	152.2	101.1
1945	191.2	42.2
1946	369.8	44.4
1947	232.5	74.4
1948	157.1	56.6
1949	157.4	51.1
1950	233.0	47.8

Source: United Nations, Economic Commission for Latin America.

The appropriate adjustments having been made, the elasticities appearing in Table 4 were calculated. The resultant average elasticity for the foodstuffs taken as a whole would thus be 0.5, i.e., slightly below the figure calculated in terms of total per capita calory intake (0.55). The small discrepancy is explained by differences in the methods of calculation.

/Table 4

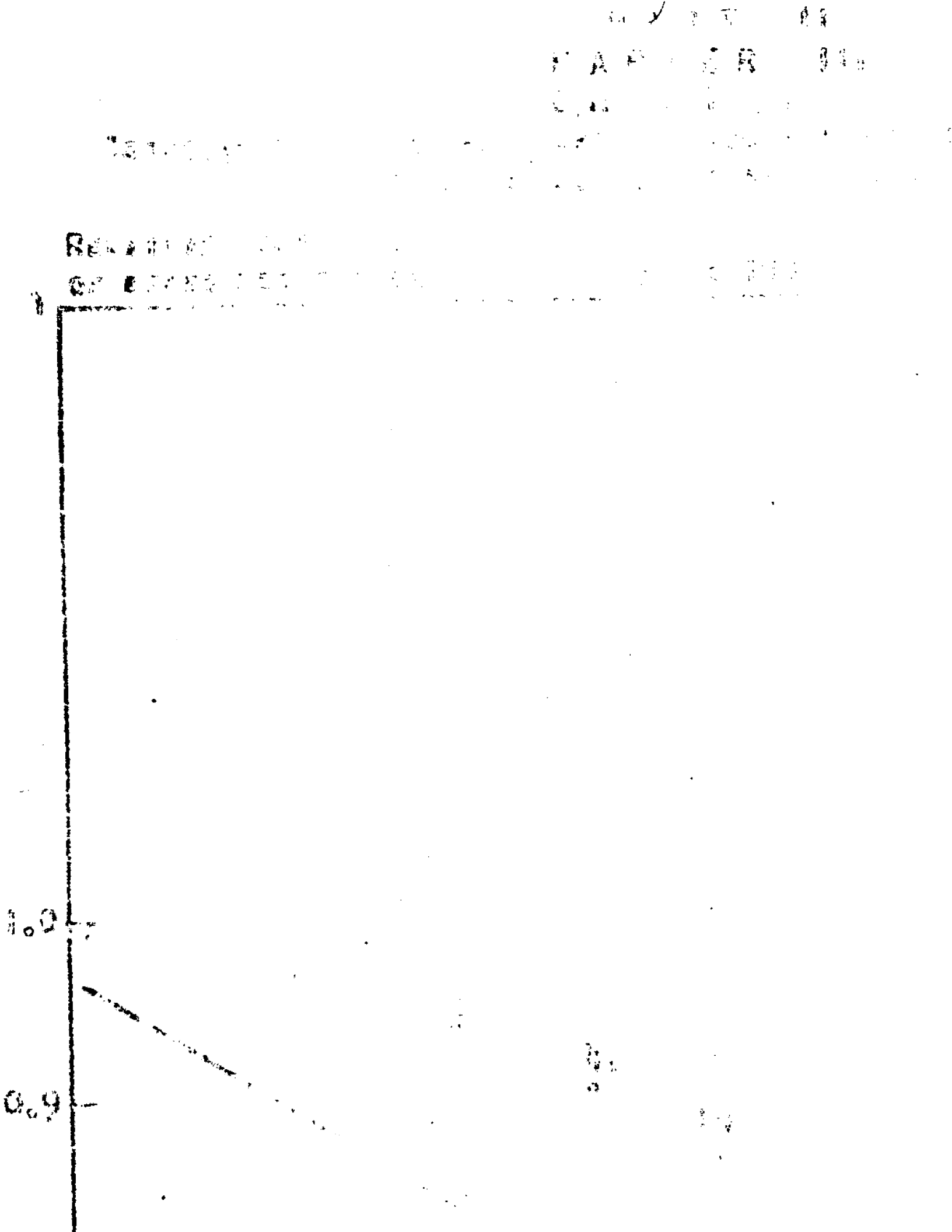


Table 4 Income-Elasticity of Foodstuffs Demand and Maximum and Minimum Estimates of Per Capita Consumption

Product	Per capita consumption (1948-50) kgs/ year	cals/ day	Income elasticity	Estimated minimum 1962 a/ kgs/ year	cals/ day	% increase over 1948-1950	Estimated maximum 1962 b/ kgs/ year	cals/ day	% increase over 1948-1950
Meat	35.6	107.3	0.7	44.5	134.1	25.0	51.9	156.4	45.8
Fish and seafood	13.1	20.1	0.8	16.4	25.2	25.0	20.1	30.8	53.5
Milk	114.4	194.3	1.0	150.6	255.7	31.6	196.1	333.0	71.4
Fats	7.9	172.8	1.0	10.3	227.4	30.4	13.5	296.2	70.9
Cereals	131.3	1237.3	0.1	135.0	1269.5	2.8	141.1	1330.1	7.5
Fruit	42.7	51.8	0.8	53.5	65.0	25.8	65.7	79.7	53.9
Potatoes (incl. sweet potatoes)	81.2	156.1	0.0	81.2	156.1	-	81.2	156.1	-
Sugar	25.0	260.4	0.0	25.0	260.4	-	25.0	260.4	-
Pulses	7.2	70.8	0.5	8.3	81.9	15.3	9.5	93.0	31.9
Vegetables	55.8	46.5	0.8	70.0	58.3	25.4	85.9	71.6	53.9
Eggs	2.2	7.0	0.8	2.6	8.8	18.2	3.4	10.8	54.6
Wine and ciders	56.1	164.4	0.0	56.1	164.4	-	56.1	164.4	-
Beer	15.6	15.8	0.5	18.0	18.2	15.4	20.5	20.8	31.4
Spirits	0.8	7.7	1.0	1.1	10.0	37.5	1.4	13.2	75.0
Total		2512.3	0.5		2735.0	8.9		3016.5	20.0

Source: United Nations, Economic Commission for Latin America.

a/ Based on conservative rate of development.

b/ Based on maximum rate of development.

A number of observations on the estimated maximum and minimum demands for 1962 may now be made. In both cases the different income-elasticities of demand for the various commodities lead to a marked variation in diet and on obvious improvement in quality, which at present are far more important than the increase in calory value alone. Thus, the main sources of calories (cereals, starches and sugar) having a zero income-elasticity remain constant in both cases,[1/] while the proportion of high-quality food, (milk, eggs and fruit), the coefficient of which is equal or nearly equal to 1.0, shows an increase.

1/ The small increase in per capita cereal consumption appearing in Table 4 is due to the growing use of certain animal feeding-stuffs, which were not separately specified in its basic data.

/It will

It will also be noted that the conservative projection gives a figure slightly exceeding the 2,650 calories daily which experts consider to be the absolute minimum for Chile. Moreover, the proposed changes in composition have some bearing on the present situation. For example, fats would provide more calories than potatoes. On the other hand, even if per capita consumption of milk increased over 30 per cent, the total amount consumed would only just reach 150 kilogrammes. Taking into account the growth of the population, the projections of the total demand for milk and fats call for an increase of 52.5 per cent of aggregate consumption in 1948-50. The anticipated 20 per cent increase in total demand for cereals, fats and sugar arises almost exclusively from the growth in population.

The maximum estimate of 3,016 calories daily is based on the calculation of a higher proportion of per capita income available for expenditure on food than was the case in the minimum estimate, though using the same income-elasticity coefficients. This would place Chile in the category of countries with a reasonably high standard of diet, although it would still remain below the pre-war standard of almost all European countries. A diet with this calory content would presumably be more than adequate since it would be 12 per cent higher than the norm of 2,700 calories recommended by food experts for countries similar to Chile. However, it should be remembered that the average diet envisaged includes all social classes, and the low-income groups would most likely fall below the level of this maximum. Analysis of this projection reveals that per capita milk consumption would register a 71 per cent rise over the 1948-50 level, making it a more important source of calories than any other food with the exception of cereals in general. Fats would also increase proportionately, thus supplying more calories than sugar. Per capita consumption of meat would increase to 46 per cent, accounting for the same number of calories as starches, consumption of which would not alter since their income-elasticity is zero. The effort to reach the projected level can be surmised from the fact that to increase per capita consumption of milk and fats, and compensate the growth of the population, the supply of these two commodities would have to be more than doubled. In the same way the 46 per cent increase per capita for meat would imply a total increase of 75 per cent aggregate in consumption.

/Once the

Once the dietary needs which have to be met are known in terms of quantities, it is then necessary to express them in terms of the value of agricultural produce for the basic period, so as to correlate them with the estimated growth of the economy as a whole. This is done in Table 5, which contains the basic projection of demand for foodstuffs in the light of the moderate development hypothesis.

Consumption was calculated on the basis of the wholesale prices obtaining in 1950. The discrepancies in the data of Table 5 and Table 2 respectively are due to the fact that in Table 2, the cost of the diet was naturally based on the consumer prices.

/Table 5

Table 5 Projection of Foodstuffs Demand, Based on a Moderate Rate of Development

(millions of pesos at 1950 wholesale prices)

Product	1948-1950	1962	Total increase %
Cereals	5,227.1	6,359.8	21.7
Wheat	4,214.4	5,038.8	19.6
Barley	112.2	151.5	35.1
Oats	217.2	293.4	35.1
Rice	302.9	362.1	19.6
Maize	380.4	514.0	35.1
Pulses	465.7	629.0	35.1
Beans	327.4 a/	442.2	35.1
Lentils	73.1 a/	98.8	35.1
Chick-peas	28.4	38.4	35.1
Peas	36.8	49.6	35.1
Potatoes	1,947.9	2,328.8	19.6
Wines and ciders	1,603.2	1,916.7	19.6
Live-stock and animal products	8,252.1	12,057.7	46.1
Cattle	3,350.9	4,753.1	41.8
Sheep	884.1	1,254.2	41.8
Hogs	710.1	1.007.2	41.8
Milk	3,307.0	5,043.2	52.5
Sugar	1,275.5 b/	1,525.2	19.6
Others	4,500.0 c/	6,538.5	45.3
Total consumption	23,271.5	31,356.0	34.7

Source: United Nations, Economic Commission for Latin America.

a/ 1950 production.

b/ 1950 consumption calculated on the basis of costs of sugar-beet production as estimated by the Corporación de Fomento de la Producción.

c/ Estimated.

Although the growth of consumption is not shown year by year in Table 5, it should be pointed out that only products with a zero elasticity increase at the same rate throughout the period. Where elasticity is greater than zero the rate of growth will increase in 1956, and even further in 1957, in conformity with the expected behaviour of consumption on the assumption of moderate development.

/The increase

The increase in each of the items listed in the "Total Increase" column corresponds to the moderate hypothesis of food consumption given in Table 4, after allowances have been made for the growth of the population. This estimate forms the basis for the next step, i.e., the calculation of the levels which must be reached by production.

2. Projections of Agricultural and Pastoral Produce for 1962

In calculating these levels, it should be remembered that Chile is not self-supporting, not only in the sense that it is unable to produce certain commodities, but also because the volume of its agricultural exports is less than corresponding imports, which include items that could be replaced by domestic production. The foreign trade deficit for agricultural products was 1,270 millions of pesos at 1950 prices during the basic period 1948-50 1/. The prospects for maintaining this deficit at the same level, must first be examined, together with the possibility of its rise or reduction. These three possibilities will now be analysed, the conclusions drawn being incorporated in Table 6.

There are two ways of maintaining the deficit at the same level, i.e. either by reducing imports of items which can be substituted, or by increasing exports. The second of these alternatives was considered as the more likely, since the prospect for expanding exports exists, while experts consider that live-stock development and the introduction of a domestic sugar industry would do little more than to prevent any increase in meat and sugar imports. Only in the case of oilseeds could a sufficiently high rate of expansion be reached to enable total substitution of imports to take place. In another part of this report (Chapter II) an analysis of the possibilities for raising the level of agricultural exports was attempted. According to this analysis, exports of a number of cereals, pulses and fruits (the most important of agricultural exports) would expand at least at the same rate as has been assumed for total consumption of these commodities in the ten years covered by the projection. The possibility of meeting the increase in meat consumption from domestic sources would mean that domestic production would have to rise more rapidly than demand, since a part of the increment

1/ c.i.f. value of imports minus f.o.b. value of exports.

at present consists of imports. In order to keep the trade deficit at the same level by this alternative, total production would have to expand more than consumption. Once domestic consumption is covered, surplus production could be exported to meet the increase in imports of tropical fruit, coffee, cocoa, etc. These products cannot be substituted from domestic sources, and demand for them must necessarily rise in proportion with the growth of the population and per capita income. In short, this alternative shows that an increase of 34.7 per cent in total food consumption would require an increase of 36.8 per cent in production in order to keep the foreign trade deficit in the agricultural sector at its present level. This solution is shown in column A of Table 6. Columns B and C deal with the remaining possibilities.

Solution B assumes that increased meat consumption would be covered entirely by domestic production. This is an interesting example pointing to the considerable effort necessary to compensate for meat shortage in Chile. An increase of no less than 62 per cent in domestic production would be required to raise the present level of consumption by 42 per cent, at the same time eliminating all cattle imports. This solution, however, cannot be considered as compatible with a hypothesis of moderate development owing to the high level of investment it would require.

Solution C is of merely theoretical interest. It suggests what would occur if future consumption could be met at the expense of agricultural exports. In this case, production would only have to increase by 33.9 per cent. This solution is of interest in showing that if production were to increase only in a measure with consumption, the agricultural sector would lose practically its entire capacity to export.

/Table 6

Table 6 Estimate of Foodstuffs Production in Relation to Various Foreign Trade Hypothesis

Product	Average 1948-50	A 1962	A Increase Absolute	A Increase Per cent	B 1962	B Increase Absolute	B Increase Per cent	C 1962	C Increase Absolute	C Increase Per cent
Cereals	5,563.3	6,810.3	1,247.0	22.4	6,810.3	1,247.0	22.4	6,591.2	1,027.9	18.5
Wheat	4,214.4	5,038.8	824.4	19.6	5,038.8	824.4	19.6	5,038.8	824.4	19.6
Barley	382.9	517.3	134.4	35.1	517.3	134.4	35.1	382.9	0.0	0.0
Oats	256.6	346.7	90.1	35.1	346.7	90.1	35.1	293.4	36.8	12.5
Rice	329.0	393.5	64.5	19.6	393.5	64.5	19.6	362.1	33.1	9.1
Maize	380.4	514.0	133.6	35.1	514.0	133.6	35.1	514.0	133.6	35.1
Pulses	965.1	1,303.8	338.7	35.1	1,303.8	338.7	35.1	965.1	0.0	0.0
Beans	743.0	1,003.8	260.8	35.1	1,003.8	260.8	35.1	743.0	0.0	0.0
Lentils	102.7 a/	138.7	36.0	35.1	138.7	36.0	35.1	102.7	0.0	0.0
Chickpeas	46.8	63.2	16.4	35.1	63.2	16.4	35.1	46.8	0.0	0.0
Peas	72.6	98.1	25.5	35.1	98.1	25.5	35.1	72.6	0.0	0.0
Potatoes	1,947.9	2,328.8	320.9	19.6	2,328.8	380.9	19.6	2,328.8	380.9	19.6
Wines and Ciders	1,653.5	1,977.6	324.1	19.6	1,977.6	324.1	19.6	1,916.7	263.2	15.9
Livestock and animal products	7,471.3	11.276.9	3,805.6	50.9	12,057.7	4,586.4	61.4	11,276.9	3,805.6	50.9
Cattle	2,586.4	3,988.6	1,402.2	54.2	4,753.1	2,166.7	83.8	3,988.6	1,402.2	54.2
Sheep	871.9	1,242.0	370.1	42.4	1,254.2	382.3	43.8	1,242.0	370.1	42.4
Hogs	706.0	1,003.1	297.1	42.1	1,007.2	301.2	42.7	1,003.1	297.1	42.1
Milk	3,307.0	5,043.2	1,736.2	52.5	5,043.2	1,736.2	52.5	5,043.2	1,736.2	52.5
Sugar		250.0	250.0	-	250.0	250.0	-	250.0	250.0	
Others	4,400	6,138.5	1,738.5	39.5	6,538.5	2,138.5	48.6	6,138.5	1,738.5	46.3
Sunflower	303	667.0	364.0	120.0	667.0	364.0	120.0	667.0	364.0	120.0
Various	4,097	5,471.5	1,374.5	33.5	5,871.5	1,774.5	43.3	5,471.5	1,374.5	33.5
Total	22,001.1	30,085.9	8,084.8	36.8	31,266.7	9,265.6	42.1	29,467.2	7,466.1	33.9

Source: United Nations, Economic Commission for Latin America; Dirección General de Estadística.

a/ Production for 1950.

/Solution "A"

Solution "A" of Table 6 was taken as the basis for establishing the 1962 levels of production to meet foodstuffs demand, estimated on the hypothesis of moderate development, and also to maintain the foreign trade deficit in agricultural produce at the same level as in the basic period 1948-50. For this purpose, imports of meat and sugar would have to remain at their present level, oilseed imports would be eliminated by the substitution of domestic production, and exports of a number of cereals, vegetables and fruits (the latter included under the heading of "Others") would have to rise proportionately with imports of non-substitutable foodstuffs. The relative increase in the production of live-stock would thus exceed the relative growth of demand. The same would occur in the case of sugar, the anticipated expansion of consumption being met by domestic production, which at present does not exist. The aggregate increase of agricultural produce would amount to 36.8 per cent. Table 7 tabulates figures for output, consumption and surpluses or deficits in the foreign trade of various agricultural products in 1948-50 together with the corresponding projections for the same commodities, (to be attained by 1962) under solution "A".

/Table 7

Table 7 Estimated Production, Consumption and Foreign Trade Surpluses for 1962

(in millions of 1950 pesos)

Product	1948-50 Production	1948-50 Consumption	1948-50 Foreign trade surplus	Estimates for 1962 Production	Estimates for 1962 Consumption	Estimates for 1962 Foreign trade surplus	% Increase on 1948-50 Production	% Increase on 1948-50 Consumption
Cereals	5,563.3	5,227.1	↑336.2	6,810.3	6,359.8	↑450.5	22.4	21.7
Wheat	4,214.4	4,214.4	-	5,038.8	5,038.8	-	19.6	19.6
Barley	382.9	112.2	↑270.7	517.3	151.5	↑365.8	35.1	35.1
Oats	256.6	217.2	↑39.4	346.7	293.4	↑53.3	35.1	35.1
Rice	329.0	302.9	↑26.1	393.5	362.1	↑31.4	19.6	19.6
Maize	380.4	380.4	-	514.0	514.0	-	35.1	35.1
Pulses	965.1	465.7	↑499.4	1,303.8	629.0	↑674.8	35.1	35.1
Beans	743.0	327.4	↑415.6	1,003.8	442.2	↑561.6	35.1	35.1
Lentils	102.7	73.1	↑29.6	138.7	98.8	↑39.9	35.1	35.1
Chick-peas	46.8	28.4	↑18.4	63.2	38.4	↑24.8	35.1	35.1
Peas	72.6	36.8	↑35.8	98.1	49.6	↑48.5	35.1	35.1
Potatoes	1,947.9	1,947.9	-	2,328.8	2,328.8	-	19.6	19.6
Wines and ciders	1,653.5	1,603.2	↑50.3	1,977.6	1,916.7	↑60.9	19.6	19.6
Live-stock and animal products	7,471.3	8,252.1	-870.8	11,276.9	12,057.7	-780.8	50.9	46.1
Cattle	2,586.4	3,350.9	-764.5	3,988.6	4,753.1	-764.5	54.2	41.8
Sheep	871.9	884.1	-12.2	1,242.0	1,254.2	-12.2	42.4	41.8
Hogs	706.0	710.1	-4.1	1,003.1	1,007.2	-4.1	42.1	41.8
Milk	3,307.0	3,307.0	-	5,043.2	5,043.2	-	52.2	52.2
Sugar	-	1,275.5	-1,275,5	250.0	1,525.5	-1,275.5	-	19.6
Others	4,400.0	4,500.0	-100.0	6,138.5	6,538.5	-400.0	39.5	45.3
Total	22,001.1	23,271.5	-1,270.4	30,085.9	31,356.0	-1,270.1	36.8	34.7

Source: United Natinns, Economic Commission for Latin America, based on data published by the Dirección General de Estadística.

From the above table it may be seen that in order to raise consumption by 34.7 per cent, production would have to rise by 36.8 per cent. The difference of 2.1 per cent would go to cover the value of non-substitutable

imports and to compensate for increased meat and sugar consumption; imports of these items remaining at 1948-50 levels.

The next step is to express the estimates of production for the selected solution as units of weight, as was done in Table 8.

Table 8 Estimates of Foodstuffs Production by Weight, on the Assumption of Moderate Development

Product	Units	Average 1948-50	1962	Increase	
				Absolute	Per cent
Cereals					
Wheat	Tons	1,017,014	1,215,986	198,954	19.6
Barley	Tons	88,283	119,265	30,982	35.1
Oats	Tons	73,863	99,795	25,932	35.1
Rice	Tons	85,628	102,421	16,793	19.6
Maize	Tons	66,560	89,973	23,377	35.1
Pulses					
Beans	Tons	66,254 a/	92,209	23,955	35.1
Lentils	Tons	12,530	16,922	4,392	35.1
Chick-peas	Tons	4,690	6,337	1,647	35.1
Peas	Tons	15,433	20,850	5,417	35.1
Potatoes	Tons	516,840	617,901	101,061	19.6
Wines and ciders	Kilolitres	317,367	379,569	62,202	19.6
Sugar	Tons	-	40,000	40.000	-
Sunflower	Tons	50,400	110,800	60,400	120.0
Garden Produce	Tons	196,000	286,700	90,700	46.3
Live-stock and animal products					
Cattle	Tons	95,966	147,994	52,028	54.2
Sheep	Tons	30,577	43,555	12,978	42.4
Hogs	Tons	22,045	31,322	9,277	42.1
Milk	Kilolitres	651,500	993,538	342,038	52.5
Others			-	-	33.0

Source: United Nations, Economic Commission for Latin America; basid data for 1948-50, Dirección General de Estadística.

a/ 1950.

/3 Possibilities for

3. Possibilities for Increasing Crop and Live-stock Production

Having established the requirements for domestic production, the prospects of attaining these objectives must be considered. There are three possibilities, viz., an increase in the area under cultivation, better use of the area now in rotation and the raising of yields. The probable contribution of each will be determined for a given estimate of development. For this purpose it was first necessary to make an analysis, which, although not complete, included a series of alternative solutions, but at the same time created a number of problems demanding detailed consideration by experts, if the work is to be of practical value. The three possibilities mentioned are examined seperately hereunder.

Expansion of the Area Under Cultivation

From the information available, incorporated in Table 9, it may be inferred that a total of 29 million hectares, can be utilized for agricultural, pastoral and forestry development, i.e. 40 per cent of the total area of Chile. The central zone, made up of the provinces from Santiago to Bio-Bio, and the southern zone, comprising those from Bio-Bio to Chiloé, have the largest proportion of utilizable land, equivalent to 76 and 69 per cent of their respective areas.

/Table 9

Table 9 Land Utilization, 1949

Zone a/	Total area	Utilizable area	Area in rotation	% utilizable of total	% in rotation of total	% in rotation of utilizable area	Maximum area able to be put into rotation: thousands of hectares	Maximum area able to be put into rotation: % of utilizable area
Total	74,177	29,000	5,931	39.1	8.0	20.5	9,350	32.2
Northern	31,368	4,200	477	13.4	1.5	11.4	700	16.7
Central	8,317	6,300	2,362	75.7	28.4	37.5	2,950	46.8
Southern	12,052	8,300	3,003	68.9	24.9	36.2	4,200	50.6
Far South	22,440	10,200	90	45.5	0.4	0.9	1,600	15.7

Source: United Nations, Economic Commission for Latin America, Corporación de Fomento de la Producción and Dirección General de Estadística.

a/ The Northern zone comprises the provinces of Tarapacá to Aconcagua and Valparaíso inclusive, the Central zone from Santiago to Concepción inclusive, the Southern zone from Bio-Bio and Arauco to Chiloé inclusive, and the Far South zone the provinces of Aysen and Magallanes.

Of the area which can be utilized for agriculture throughout the country nearly 6 million hectares are under rotation with various crops, artificial and natural pastures and fallow land, apart from a certain proportion covered by permanent vineyards and fruit plantations. The possibilities for making a better use of the land now under rotation, will be examined later, since, for the time being it is more convenient to analyse the prospects of extending the cultivated area at the expense of the remaining arable areas, representing rather more than 23 million hectares.

Not all the area considered as arable can be cultivated although it figures as such above. Owing to topographical and other unfavourable conditions, rendering some soils susceptible to erosion, as well as delays in the progress of agricultural extension services and the

requirements of forestry production, a large part will have to remain covered with woods, undergrowth or natural pasture, whether seasonal or perennial. In all, it should be possible to extend the cultivated area by 3.4 million hectares, as far as is known at present. The measures which would have to be taken, either singly or in combination, in order to put this area under rotation comprise the cutting down of forests and shrub-land, irrigation and drainage.

Table 10 Area Which Can Be Made Arable

(thousands of hectares)

By clearing of forest land	2,450
By irrigation a/	791
By drainage	90
By drainage and clearing	88
Total	3,419

Source: Dirección General de Agricultura, Departamento de Riego and Corporación de Fomento.

a/ Does not include 213,000 hectares of insufficiently irrigated land, plans for improving which are being studied by the Departamento de Riego (Irrigation Department).

The possibilities may be even proved to be greater since the total area which could be irrigated has not yet been completed; moreover, there has been very little research on the drainage of wet soils. It is also possible that the resources outlined above may actually be less, since the figure for the area considered suitable for cultivation by cutting down forest and scrub land is the result of rough estimations only. Detailed reconaissance would really be necessary in order to class the area as arable land, and at the same time to specify the most adequate crops to be grown there. Similarly, there is a complete lack of information correlating the costs of such incorporation, i.e. for the clearing of forests, construction of roads and railways, dredging of rivers etc., with potential soil productivity and eventually with the system of land tenure, so as to obtain a resonably accurate perspective concerning efficiency of the investments involved. Such surveys are

/essential for

essential for establishing priorities, in the light of production requirements, for the incorporation of the main zones of areas where there is still forest land suitable for cultivation.

On the assumption that no other means of increasing food production exist other than the extension of the area in rotation, at the same time maintaining the existing relationship between crops, artificial and natural pastures and fallow land, would always be available to secure the desired objectives. Thus, among the alternative solutions provided by Table 6, the one selected assumes that production in 1962 would be 36.8 per cent higher than in 1948-50. As the area in rotation during the latter period was about 6 million hectares, the required increase would be slightly less than 2.3 million hectares, a figure well within that of the previously estimated availability of 3.4 million hectares.

The last two columns of Table 9 show the geographical distribution of the land in rotation which would result from optimum utilization of available agricultural resources. As may be seen, the margin for increase, both absolute and relative, would be much greater in the southernmost zone, comprising the provinces of Aysén and Magallanes. If the mainland sector of the province of Chiloé, (not separately indicated in the basic data utilized) were included, the absolute and relative margin of expansion in the southernmost zone would be raised by some 700,000 hectares and 7 per cent respectively, reducing the southern zone by the same extent. However, except in small areas, ecological conditions in the regions to be incorporated in the southernmost zone are not generally favourable for many of the crops cultivated in the other zones of the country. The greater part of these regions, which are at present forest areas, can only be used for artificial pastures, green fodder-crops and as natural pasture land, i.e., for predominantly pastoral activities.

In the southern zone, the areas for incorporation could be used mainly to grow wheat, oats, potatoes, sugar-beet, flax, vegetables, certain pulses and artificial pastures, as well as various kinds of fruits. In the central and southern zones, all the crops of a temperate climate could be grown, if the expansion in the cultivated areas were achieved by means of irrigation. In areas where expansion would require the clearing of forests, rotation would be limited to certain

types of cereals and pulses, and artificial and natural pastures.

Before examining the amount of irrigation and clearing necessary to secure the crop acreages required, the relative advantages of the two methds should be studied, comparing them, where possible, with those offered by the drainage of wet soils, which is itself a method of bringing substantial areas into cultivation. Although detailed surveys are lacking, it is generally considered that clearing is the better method, both as regards the area available and the cost per hectare. Irrigation, however, offers the advantage of opening areas with a higher level of productivity, and which can be used for more intensive types of cultivation. Some of these areas are already cultivated without irrigation and thus incorporate a number of basic improvements generally lacking where the land has to be cleared. The greater accessibility of soil which can be cultivated by irrigation is another factor in its favour, not only considering freightage facilities of the present transport system, but also because of investment in new comunications.

However, the information available, (which would have to be confirmed) leads to the conclusion that the higher productivity of areas under irrigation would not justify the greater investments required. Furthermore, it is calculated that the productivity of cleared lands in Chile would be 1.5 times that of irrigated areas. The clearing of land can also be carried out gradually, and this can only be done with irrigation when small projects or mechanical irrigation are envisaged. The importance of these advantages is diminished in the case of an integrated development programme. Another advantage in favour of clearing forest land is the fact that the largest areas which can readily be incorporated by this method lie in the Southern zone, and that the general agricultural standard in that region appears to be considerably higher than in the Central zone, where the new areas would mainly be under irrigation. The figures in Table 11, referring to the degree of utilization of areas actually in rotation, would appear to support the above statement.

Priority would thus be given to the clearing of forest land as a method of obtaining the additional areas required for the expansion of production. However, before assessing the areas which should be cleared

/or irrigated,

or irrigated, it is first necessary to analyse the possibilities of raising the level of production by means of a better use of the actual land under rotation.

Better Use of Area in Rotation

Table 11 shows that of the total amount of cultivated land, amounting to nearly 6 million hectares, only 44.7 per cent are actually sown with various crops or artificial pastures. Of the remainder, 48.9 per cent are under natural pastures, covering 2.7 million hectares, and 6.5 per cent are fallow. If the Southernmost zone, which is of negligible importance as regards cultivated land, is excluded, it is the Central zone which has the lowest coefficient of land under crop (36.9 per cent), a further 57 per cent being made up of natural pastures. In this zone, there are 871,000 hectares actually under cultivation, including both dry and irrigated farms, which is less than the total irrigated area, namely 937,000 hectares.

The information set out in Table 11 indicates that the irrigated area consists of only 60.3 per cent of land under crop, the remaining 39.7 per cent being natural pastures. The country as a whole has 66.9 per cent of its irrigated areas under crop and 33.1 per cent under natural pastures. Other regions also use a considerable proportion of the land in rotation for natural pastures, although better use of the irrigated areas is made than in the Central zone.

/Table 11

Table 11 Area Under Cultivation, by Zones and Types of Cultivation, 1950

(thousands of hectares)

Zone	Crops	Artificial pastures	Total cultivated	Natural pastures	Fallow	Total under rotation	% cultivated to total under rotation	Irrigated area	Irrigated areas under natural pastures: Total	Irrigated areas under natural pastures: % of total irrigated
Total	1,538.0	1,110.0	2,648.0	2,700.0	583.0	5,931.0	44.7	1,292.0	427.0	33.1
Northern	145.0	80.0	225.0	238.0	13.5	476.5	47.2	231.0	33.0	14.3
Central	706.0	165.0	871.0	1,347.0	143.5	2,361.5	36.9	937.0	372.0	39.7
Southern	683.0	839.0	1,522.0	1,055.0	426.0	3,003.0	50.7	124.0	22.0	17.7
Far South	4.0	26.8	30.0	60.0	-	90.0	33.0	-	-	-

Source: United Nations, Economic Commission for Latin America.

/Thus, of

Thus, of almost 6 million hectares of land in rotation, 2.7 million are under natural pasture, 427,000 hectares of which are irrigated. Little information is available as to the extent to which these areas could be turned to better advantage, by putting them under crop or artificial pasture.

The long and extremely dry summer prevents better use of the dry-farming areas in the Northern and Central zones, and entails the reversion of a large proportion of such areas to natural pastures when not under crop. The exact extent of such areas, which may be as much as 50 per cent, is not known, although it should be useful to consider it more carefully. The difficulty could perhaps be overcome by adequate agricultural research and the wide-spread extension services. The same problem allied to excessive sub-division of property in many sectors of the Cordillera de la Costa (Coastal Range), has become the greatest hindrance to large-scale improvements in eroded areas falling within the total under rotation. Similar problems affect important sectors in the provinces of Bio-Bio, Arauco and Malleco, in the Southern zone. On the other hand, there does not seem to be any technological difficulties in the way of making a better use of land under natural pastures in the remaining provinces of the South and Southernmost zones.

The area under natural pasture in irrigated areas is estimated at 427,000 hectares, of which 220,000 have a permanent supply of water and could therefore be utilized more intensively. The remaining 207,000 hectares would appear to be composed of semi-irrigated areas, or those having an unreliable water supply.

To sum up, over a million of the 2.7 million hectares of natural pastures could be used more intensively, mainly by putting them under artificial pastures.

Of the alternative solutions examined, priority should therefore apparently be given to better utilization of the land actually in rotation rather than the incorporation of new areas by clearing forests, irrigation and drainage. This is because: a) the areas actually in rotation are already improved to a large extent; and b) in view of the present level of technique and that anticipated, if the essential estimated productive increases are to be obtained, use could be made of a large proportion of the land at present cultivated with relatively little investment. Before

considering what areas should be put into cultivation, the third solution, envisaging the expansion of production by means of an increase in the yields, will be examined.

Increase in Yields

The possibilities for increasing yields depend on a series of measures designed to raise the standard of agricultural technique, including improved seeds, more extensive use of fertilizers and pesticides, improved crop rotation, rational use of irrigation, the introduction of soil-conservation practices, efficient pasture management, increased production of green-fodder crops, silage, substitution of natural by artificial pastures, use of improved breeding cattle, improved handling and protection of the herds against the effects of climate, disease etc. Generally speaking, such measures do not require fixed investments or installation, while the slight increase in circulating capital per unit area actually needed would increase the productivity of the existing capital to a considerable degree. Moreover, almost all these measures, with the exception of large-scale use of improved seeds and breeding stock can be applied, and will give results, within a very short period.

Another means of increasing live-stock yields consists in slaughtering the animals in the production centres and transporting the frozen or chilled meat to the consuming centres. Similarly, the surplus milk should be processed in plants established in the actual production areas.

Table 12 shows the average yields of the main crops now grown, together with those which could be achieved by means of a substantial improvement in agricultural technique, according to various experts of the Ministry of Agriculture consulted on this point.

/Table 12

Table 12 Marginal Increase of Yield of Principal Products

Product	1948-50 yield (metric quintals/ hectare)	Possible increase		Increased yield (metric quintals/ hectare)
		Absolute	Percentage	
Cereals				
Wheat	11.9	6.0	50.0	18.0
Barley	16.4	8.2	50.0	24.6
Oats	7.9	4.7	60.0	12.6
Rice	32.9	16.5	50.0	49.5
Maize	14.2	8.5	60.0	22.7
Pulses				
Beans	9.1	1.8	20.0	11.0
Lentils	6.1	1.2	20.0	7.3
Chick-peas	5.2	1.0	20.0	6.2
Peas	7.3	2.9	40.0	10.2
Potatoes	93.3	49.6	50.0	150.0
Wines and ciders [a]	3,313.0	331.0	10.0	3,644.0
Live-stock and animal products				
Cattle	0.97	0.32	40.0	1.11
Sheep [a]	0.21	0.06	30.0	0.27
Milk [a]	2,029.0	1,136.0	56.0	3,165.0
Others				
Sunflower	12.7	5.1	40.0	17.8
Garden produce	70.0	21.0	30.0	91.0

Source: United Nations, Economic Commission for Latin America, and estimates of Chilean agricultural experts.

a/ Litres.

/These reasons,

These reasons, together with others detailed below, lead to the conclusion that this method should be given priority over better use of the areas in rotation or their extension.

The estimated increases are based on the results of research made on the various agricultural stations established throughout the country and on private farms, most of which have already been published [1]. A summary of these results provides a more comprehensive outlook on the possibilities of increasing production by improved yields.

a) Use of Fertilizers. Experiments using different proportions of nitrogen, phosphorus, potash and calcium, have increased wheat yields as much as 267 per cent above unfertilized controls. In general, the formulae which gave significant results had the effect of raising yields from 15 to 117 per cent. It may also be inferred from these experiments that all four components have a positive result on yield, but that the greatest increase is obtained with phosphorus and nitrogen. Table 13 embodies the results of some of these experiments.

The experiments covered five consecutive years of field trials over an area extending from Santiago to Llanquihue, i.e. practically the whole of the Central Valley. Experiences with potatoes conducted at the Centinela Experimental Station, near Lake Llanquihue, and typical of the potato-growing region of the Southern zone, using fertilizers containing the four basic components, have resulted in doubling the average yield of unfertilized controls. Phosphate is the fundamental component. It leads to substantially higher yields if applied alone, whereas, no increases are noticeable when using formulae excluding it. Nitrogen and potash also produce favourable effects, but these appear to be conditioned by the presence of phosphates.

Field trials with barley show a very favourable nitrogen reaction as well as a marked response to phosphorus.

1/ Dirección General de Agricultura: Departamento de Investigaciones Agrícolas, Siete Años de Investigación Agrícola, 1950.

/Table 13

Table 13 Results of Fertilizer Experiments on Wheat

Experimental Station	Formula a/	Yield of unfertilized control (metric quintals per hectare)	Increase over control (metric quintals per hectare)	Percentage increase
Paine	N-P-K	22.5	10.4	46.0
Cauquenes	N-P-K-Ca	5.8	6.8	117.0
Ninquihue	N-P	12.8	7.0	55.0
Chillán	N-Ca	16.1	6.9	43.0
Los Angeles	N-P	16.0	11.6	71.0
Collipulli	N-P-K-Ca	10.5	10.6	101.0
Victoria	N-P-K-Ca	19.9	7.6	38.0
Temuco	N-P-K-Ca	29.5	5.1	17.0
Osorno	N-P	20.6	10.5	51.0
Centinela	N-P	40.5	5.9	15.0

Source: Dirección General de Agricultura, op.cit.

a/ Symbols used in the formulae are as follows: N, nitrogen; P, phosphorus; K, potash; and Ca, calcium.

/Although not

Although not all the effective formulae were economical, a large number of them increased yields sufficiently to cover the cost of the fertilizer, and, in addition, to give rise to a volume of production equivalent in some cases to 40 per cent of the total value of the crop. Formulae for practically all the wheat zones of the country, from Santiago to the South, were found, some of which yielded profits amounting to 300 per cent of the cost of the fertilizer. A number of low-cost fertilizers were evolved, the net profitability of which was between 50 and 100 per cent 1/. Similar results were obtained with barley and potatoes. The fertilizers producing the highest increase in yield were not always those with the highest net profitability 2/.

The results of the above-mentioned experiments indicate that fertilizers are not efficiently employed in Chile. The substantial increase in their consumption during the last few years was not counterbalanced by any significant raising of the yield of the principal crops. It may thus be inferred that a more extensive use of fertilizers should be acompanied by an active campaign of demonstration and advice to the farmer on the most suitable type of fertilizer for each crop and soil, the quantities to be used, seasons for application, etc.

b) Weed Control. Studies on the effect of weeds in causing crop losses are not yet available. However, a number of controlled experiments with hand-weeding on wheat plots have shown increased yields which are 15 to 64 per cent higher than the unweeded controls 3/. Chilean farm-land is usually covered with weeds, particularly the irrigated areas, as the water of the canals provides an excellent means of dissemination. It is estimated that the presence of weeds in fields which have been sown

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1/ The residual effect which the fertilizers would have on the crops next in rotation were not taken into account in the calculation made.

2/ The above calculations were made on the basis of 1946 prices. As the price of some fertilizers seems to have risen at a different rate from that of the commodities, it is probable that some of the fertilizers which were economic to use in that year will not be so now, and vice versa.

3/ Op. cit. page 99.

/reduces yields

reduces yields by about 30 per cent. The discovery of chemical herbicides was of considerable value in solving the problem of the substantial labour force required over a very short period in order to perform these operations manually. The use of weed-killers tends to spread because of the good results obtained. Available information indicates that a single weeding operation performed at the proper season on irrigated wheat fields in the Central zone results in yield improvements of between 15 and 50 per cent, as compared with the unweeded controls. The estimated average increase for wheat, barley and oats would be about 20 per cent if weed control was extended throughout the country. It is calculated that investment in weed-killers would produce a net minimum rentability of 300 per cent [1] in the case of wheat, and similar results could be obtained for other crops. Moreover, the use of weed-killer does not harm the soil.

c) Control of Other Pests. There are a large number of pests which attack crops, but lack of information prevents an accurate assessment of the damage caused to production. Although many farmers, especially those growing grapes, fruit, tobacco and vegetables, have incorporated some degree of pest control into their ordinary routine, there still remains a wide margin for raising yields by this means of research, and technical extensive services can play an important part in this connexion.

d) Rational Use of the Soil. The spreading of erosion is one of the principal problems encountered in Chilean agriculture at present. From the available information, it appears that only 12.6 per cent of the 1.4 million cultivated hectares in the provinces of Maule, Bio-Bio and Malleco show no signs of erosion, 47.3 per cent having slight to moderate topsoil erosion, although they can still be sown, while 40.1 per cent is severely or very severely eroded.

1/ The cost of treating a hectare of wheat with weed-killer averages 400 pesos at 1952-53 prices. A 20 per cent increase is equivalent to an additional 2.36 metric quintals per hectare on the average for the period 1948-50. At 820 pesos per metric quintal an increase of half a quintal would be sufficient to cover the cost of the operation, leaving a surplus of 1.88 metric quintals, which is equivalent to an additional farm income of 1,542 pesos. In this case the net profitabilty of the investment would be 376 per cent.

Research in soil conservation, carried out on agricultural stations located in the zones listed in Table 13 and on areas of over 700 hectares, have shown a rise in wheat yields from an average of 6.5 metric quintals per hectare in 1935-36 to 21 metric quintals in 1948-49. Moreover, the application of a method which includes green-fodder crops in the system of rotation, (thus eliminating natural pastures) has enabled cattle to be maintained throughout the year, and fattened seasonally. This method must require substantial capital investments, but has resulted in a marked and relatively stable increase in yield and an appreciable reduction of production costs.

The country has other examples in the provinces of Concepción and Bio-Bio, illustrating the transformation of dry, sandy areas into good croplands through irrigation, the inclusion of green fodder-crops in the system of rotation, and the incorporation of appreciable quantities of green manure. The best yields in the country for wheat, oats, potatoes and animal products are obtained from certain areas in the provinces of Valdivia, Osorno and Llanquihue, entirely due to the fact that farmers make a rational use of the soil and manage their live-stock efficiently. As the rising curve of yields indicates, soils thus managed continue to increase in fertility.

Repeated observations made by the agricultural stations and private farms prove that merely by introducing artificial pastures into the system of rotation the succeeding crops show a 10 to 30 per cent better yield, compared with rotations which include natural pastures.

The results outlined above suggest that production could be expanded even further if adequate soil conservation practices were extended throughout the country.

e) Use of Better Seeds. The solutions to the problems confronting agricultural production go beyond the use of fertilizers, chemical or biological pest control, improved rotation practices or any other type of technical improvement. These problems are all bound up with resistance to certain diseases (especially fungus diseases), improvement in quality of the produce (baking quality of wheat, malting quality of barley, sugar content of beets, appearance and eating qualities of fruit, oil content of oilseeds, etc.), early-maturing capacity, robustness and adaptation to

/environment,

environment, standardization of quality etc. All these problems can be solved by careful plant breeding [1].

In Chile itself, wheat strains have been obtained which are early-maturing, resistant to rusts and grain-shedding, and which posses improved baking qualities. Under ordinary conditions, these varieties yield 20 to 50 per cent more than the best strains normally cultivated. The maize hybrids developed are estimated to have produced an average yield 20 per cent above normal.

Agricultural research does not bring immediate results. Plant-breeding methods sometimes require a considerable lapse of time to produce new varieties, and field and laboratory experiments must be repeated over a period of several years before valid conclusions can be drawn. Once these have been obtained, new studies have to be undertaken in order to consolidate such results or to find a solution to new problems which may have arisen. In spite of it, the use of better seeds is one of the most certain ways of raising yields appreciably.

f) Better Live-stock Technique. For reasons of methodology, it was deemed more advisable to analyse the available figures for present live-stock population and stock area in order to obtain some idea of their density, which in turn, could serve as a basis for measuring the yields per unit of area and the possibilities of improving them. This was found preferable to examining the extent to which improve technique could raise live-stock yields. The same figures were also used to establish the extension of the area under artificial pastures, required to increase live-stock production.

In order to determine the density of the cattle population, it was believed advisable to express the stock area in equivalent units. A common denominator applicable to different kinds of live-stock was adopted.

1/ The success obtained in Mexico and the United States in the cultivation of maize hybrids, and in the temperate climate countries with disease-resistant varieties of potato, is well known. Increases in the early-maturing qualities, robustness and sugar content of cane and beet, have enabled the sugar-producing countries to expand production without extending the cultivated area. Very similar results were obtained with oilseeds and cotton, in which there was a marked improvement in the quality of the fibre. Innumerable examples could be quoted, including the extraordinary results obtained from the introduction of genetic methods in live-stock raising, fruit-growing and forest products.

A hectare of articial pasture land was chosen as the unit measure. It was established that the unit was equal to four hectares of natural pasture in areas under rotation, to eight hectares of natural scrub or steppe-land pastures, and to twenty hectares of natural forest pastures. With these somewhat rough estimates which could, however, be determined more accurately with the help of further study, Table 14 was compiled, in order to establish the relationship between the various areas under stock in terms of hectares of artificial pastures.

Table 14 Areas Under Cattle Expressed in Terms of Area under Artificial Pastures

Type of pasture	Total area (millions of hectares)	Grazing Coefficient a/	Area in terms of artificial pastures (millions of hects.)
Artificial pastures	1.10	1,000	1.10
Artificial pastures in rotation	2.70	0.250	0.60
Natural scrub or steppe-land pastures	6.80	0.125	0.85
Natural wood-land pastures	8.90	0.050	0.44
Total	19.50		3.07

Source: United Nations Economic Commission for Latin America.

a/ Reciprocal numbers of the respective equivalents in terms of cattle.

In order to determine the total live-stock population, in a single unit, an average steer, under given conditions, was considered equivalent to one horse, four sheep and eight goats. Therefore, the total live-stock population in 1948-50 equalled 4.6 million units, as illustrated in Table 15.

/Table 15.

Table 15 Total Major Live-Stock Population in Units

(thousands of head)

Live-stock	Totals	Conversion Coefficient a/	Units of major live-stock
Steers	2,330	1.000	2,330
Sheep	6,600	0.250	1,650
Goats	700	0.125	88
Horses	500	1.000	500
Others b/	--	--	68
			4,636

Source: United Nations Economic Commission for Latin America.

a/ Corresponds to the equivalent major live-stock reciprocals.

b/ Includes estimates for hogs, asses and mules in pasturage.

Technical improvements designed to increase live-stock yields affect feeding, the type of animal used and the methods of marketing their products. Increases in yield can thus be effected by a rise in the live-stock population, by increasing the amount of meat per animal as well as the number of animals slaughtered and the milk and wool obtained per animal. Table 16 suggests the potential margins of increase for each of the items mentioned.

/Table 16

Table 16 Margin of Increase in Livestock Yields

	1948-50	% possible increase	T o t a l
Cattle			
Density [a]	1,51	50	2,27
Weight of meat per animal (kgs.)	245,0	20	294,0
Slaughtering rate (% of population)	16,8	20	20,1
Meat production per hectare (kgs.) [b]	79	116	171,0
Sheep			
Density [a]	6,64	40,0	8,46
Weight of meat per animal (kgs.)	19,0	20,0	22,8
Slaughtering rate (% of population)	24,4	40,0	34,2
Meat production per hectare (kgs.) [b]	28,0	135,2	65,9
Hogs			
Weight of meat per animal (kgs.)	75,	20	90,0
Slaughtering rate (% of population)	41,3	10	45,4
Milk			
Density [a]	1,51	50	2,27
Yield per cow (litres)	1.264	60	2.022
Yield per hectare (litres) [c]	1.909	140	4.582

Source: United Nations Economic Commission for Latin America.

a/ Animals per hectare of artificial pastures or their equivalent.

b/ Kilos of meat per hectare of artificial pastures or their equivalent.

c/ Litres of milk per hectare of artificial pastures or their equivalent.

/The above

The above table shows that there are considerable possibilities for raising live-stock yields, although potimum increases are below those actually obtained in countries where live-stock production generally attains a high technical standard. Further study might lead to different conclusions. It now remains to review the improvements which would have to be introduced in order to raise the present level of Chilean live-stock output.

Fodder can be improved by the replacement of natural by artificial pastures. Table 14 has already shown the substantial difference in feeding capacity existing between these two types of pastures, for the country as a whole. The contrast is equally marked as regards irrigated land where one hectare produces fodder for three or four live-stock units under normal conditions, while natural pastures require eight to ten hectares to feed the same number of units; moreover, in the latter case, no possibility exists for securing hay for dry seasons. Table 11 shows that the area of artificial pastures (either irrigated or dry-farmed) could be amply increased merely by better use of the land now in rotation under natural pastures. Attention should be drawn to the advantages of putting appreciable areas under cultivation with green fodder-crops - maize, sorgum, cabbages, sugar-beet, potatoes, etc. - having high yields (per unit of area) in foodstuffs that are rich in proteins or carbohydrates. Such crops are relatively easy to store against periods of fodder shortage, and can even be consumed in their natural state. Large scale storing of fodder of any kind by simple and economic means, is another measure which experts consider essential to avoid the marked deterioration taking place during the winter months, when climatic conditions prevent the growth of the pastures. The limitations imposed by the seasonal feed capacity in the Chilean live-stock regions has prevented pastoral production from reaching more satisfactory levels. Where feed is normally stocked, improved live-stock and year-round milk production are encountered. Where these methods are not employed, the necessity for keeping milch cows and calves alive restricts the milking season to a period of two to five months, during the period when there is substantial feed.

Improvements in feeding during the bad-weather season must be allied to measures of cattle protection against climatic conditions by providing

/shelter from

shelter from rain, hail and wind or excessive sun in the Central and Northern zones. At the same time, the cattle can be fed from the stores reserved for this period. Throughout extensive areas in the Northern and Far South zones, the cattle suffer from lack of drinking water. The cattle must be driven long distances between the water holes and grazing-grounds, with consequent loss in weight. When this supply is ended the cattle are moved to more distant fields. In such areas the subsistence capacity of the live-stock does not depend as much upon the availability of pastures as on water supply. According to expert opinion artesian wells could be drilled in many of these regions, not only to provide sufficient water for the live-stock, but also to leave a surplus for crop purposes.

Even in areas with an adequate supply of water, seasonal feed shortages and lack of protection against the weather influences the birth-rate of cattle (60 per cent of the total) and that of the greater part of the sheep. Weight losses per animal frequently appear to exceed 30 per cent, a figure of considerable importance, especially when referred to breeding animals. Sufferings involved by this loss of weight hinder development and lead to the premature old-age (skeletonal calcification of immature animals) accounting for the low quality of the stock. This in turn, necessitates a longer growth period before the animals are fit for sale.

A marked increase in live-stock density may also be obtained through efficient pasture management. To do this it would be necessary to fence the grazing areas to adequate proportions. Rotation of pastures would allow a better development of fodder crops, would ensure the permanence of the stock in each grazing area, and would offer new opportunities each year of leaving renovated pastures under seed. This last point is important when natural pastures and artificial pastures composed of annual or biennial plants are involved, since the formation of such pastures requires three to four years. Typical stock-raising countries like Uruguay are carrying out extensive programmes for increasing fodder capacity mainly by means of a reduction in the grazing area and the efficient management of pastures. These measures should contribute in a substantial degree towards arresting erosion, and even in reclaiming areas already eroded, as well as to the improvement of pastures.

/There is

There is a lack of detailed studies to facilitate more accurate estimates, both of the advantages accruing from the improvements in pastures and the disadvantages arising out of the limitation imposed on mechanized farming through reduction of the arable areas.

The composition of the live-stock population also plays an important role in connexion with yields. Of the total number of cattle in Chile - 2.3 million head - about 18.4 per cent, i.e. 430,000 are bullocks. Of the remainder, 29.8 per cent (685,000) are cows, of which 515,000 are milk producers. In order to replace 80,000 bullocks annually, from 240,000 to 300,000 steers have to be maintained. Although there are many agricultural operations for which bullocks are still considered indispensible, a large number could probably be replaced by machinery. This would increase productivity per labour unit and also liberate other productive factors, which could then be more efficiently employed in other sectors, raising the yield in meat, milk and breeding cattle. There is also a wide field for further research on the advantages of extensive substitution of bullocks, and eventually horses, by power machinery. The studies made thus far, have been limited to a comparison of the operating costs for certain tasks as between bullocks, horses and tractors, without crediting the machinery used with the benefits which could be derived from a better use of the factors freed by the elimination of bullocks or horses. The tendency of certain farmers to form stud herds has to a certain extent hindered the development of milk production.

Of the cows used for breeding purposes, one quarter are completely unfit to produce milk, and the average output of the remainder is very low, as may be seen from Table 16. The cattle population of the country contains a high percentage of "scrubs", i.e. breeding cattle of both sexes suffering from some disability or other which interferes with their reproductive qualities or causes the transmission of degenerative traits to their offspring, to the obvious detriment of live-stock economy and that of the country as a whole. This is frequently the case with cattle, and also with other types of live-stock. From this point of view, and provided that other technological measures indicated are not disregarded, there is a wide margin for increasing yields through the elimination of uneconomic stock and the extension of improved practices, such as careful selection and

/crossing with

crossing with high-grade breeding animals. At the same time, sanitary and disease and pest control measures as well as the care of sick animals and elimination of all incurable animals, which act as disease-carriers to other animals or human beings, should be followed. Some experts are of the opinion that the small birth coefficient for cattle in Chile - only 63 per cent of the total number of cows - may be partly attributed to the fact that about 25 per cent of the cows are affected with Bang's Disease or abortion fever, while a substantial proportion of the remainder suffer from tuberculosis or other diseases which limit their reproductive capacity.

Lastly, the slaughter of animals at the main production centres entails a series of advantages which are of immediate benefit to live-stock production in particular and to the country in general. The stock would thus be slaughtered when in its best condition, irrespective of season, avoiding losses in weight caused by climate or lack of fodder, or the transport of cattle on foot or by rail to the fattening pastures in the provinces surrounding Santiago and other centres of consumption. These pastures, which are generally composed of good artificial grazing, could then be turned over to milk production. Slaughtering in the production areas would also encourage producers to improve their grazing and raise the general level of live-stock raising, since they would have a firm market for suitable animals for slaughter the whole year round. Milk processing in these production centres would create permanent demand, again encouraging farmers to develop milk production throughout the year, and to endeavour to increase the numbers of milch cattle, as has already occurred in a number of milk production areas where such industries have been established.

From the market standpoint, the establishment of slaughter-houses and refrigerated warehouses at production centres would prove most advantageous. For example, the cost of transport per unit weight of meat consumed would decrease and at the same time a large number of railway wagons, which at present carry cattle on the hoof, would be freed for other purposes. Moreover, elimination of the innumerable intermediaries, handling the animals between the stock-farm and the packing plant, would appreciably reduce eventual consumer costs, improve the quality of the product, and allow the farmer a better price, naturally providing an

incentive to increase output.

Even assuming that the improved techniques described above were to be applied on a large scale throughout the country, a number of years would necessarily have to elapse before the downward trend in the cattle population, observed since the end of the thirties, could be checked. According to the available statistics, there was a net annual decrease of 25,000 head, representing a total of 303,000 head between 1938 and 1950 [1]. According to the same source, stocks decreased by almost 145,000 between 1950 and 1951. It is estimated that this trend could rapidly be checked and an upward move initiated through substantial improvements in technique and the adoption of one or more of the following measures: 1) reduction in the rate of extraction; 2) suspension of the slaughter of all breeding cattle irrespective of age; and 3) the import of good-quality heifers on a sufficiently large scale to increase the number of cows available for breeding purposes. The first of these measures is incompatible with one of the basic assumptions of the present paper, viz., that projected meat demand hence forward should be met by expanding domestic supplies, while maintaining imports of this product at the levels prevailing during the base period 1948-50. However, the other two measures do not conflict with any of the basic assumptions, and their introduction might lead to a sufficiently rapid immediate increase in animal stocks to enable the extraction rates to be raised to a level sufficiently high to meet the projected demand.

Table 17 was prepared in order to outline possible development of the cattle population on the assumption that the basic figures taken for total stocks and cows correspond to the actual position, and that the rate of reproduction and extraction prevailing during the last few years will be maintained. The same assumption as regards the reality of the conditions envisaged should be applicable to the rest of the data required to complete the table, as provided by expert opinion and the reports available. These assumptions refer to the following aspects of the problem: 1) that the rate of losses, i.e. mortality of cattle not utilized for slaughter purposes, would be about 2 per cent of the total population per

1/ Estadística Chilena, Synopsis for the year 1952.

/year. This

year. This rate would in fact be higher, except that it had to be borne in mind that the losses in calves and even part of the slaughterings of breeding cows not shown by official slaughter-house statistics would be implicitly included in the rate of reproduction, which would itself be determined only by breeding in the surviving cows incorporated in the total population; 2) that the rate of replacement of cows would be 26.6 per cent, since cows in Chile are only used for rather less than four years, though with better live-stock raising techniques, the period could be extended to five years, as in other cattle countries; 3) that only 80 per cent of the total number of heifers available would be suitable for breeding purposes.

It was also assumed that by means of improved techniques and the importation of selected heifers, these rates could be modified as follows: reproduction, from 62.8 per cent to 71 per cent; losses, from 2 to 1 per cent; slaughterings from 16.8 to 18.5 per cent; replacement of cows, from 26.6 per cent to 22 per cent; breeding heifers from 80 to 85 per cent. In order to meet the requirements for a conservative rate of increase during the period envisaged, imports of about 100,000 selected heifers would appear to be necessary. These would go to increase the number of cows, especially milch cows. The investments required for such imports will be discussed under the appropriate heading.

Columns 9 and 10 of Table 17 indicate that despite the raising of the extraction rate, the number of animals slaughtered during the first four years might decrease, owing to a decline in stocks. It is calculated that it would be possible to increase the extraction rate still further during the first few years in order to meet demand. For this purpose, a substantially higher proportion of bullocks would have to be slaughtered and substituted by machinery, for which corresponding increase of investment is foreseen in the relevant chapter. From a comparison of columns 1 and 2, it will be seen that cows represented 29.3 per cent of the total population in the base period 1948-50, while in the last year of the projection this proportion should rise to 36.5 per cent.

/The projection

The projection of cattle development, which is embodied in Table 17, is valuable as an indication of the method of investigation, presenting live-stock raising experts with a series of problems which must be solved, if this paper is to be improved.

Table 17 Estimated Development of Cattle Raising

Years	Initial population	No. of cows	Births: % on No. of cows	Births: Total births	Births: No. of heifers	Initial population births	Deductions from initial number: Losses %	Losses No.	Slaughtering %	Slaughtering No.	Deductions from initial number: Total	Stocks	Rate of replacement of cows %	Rate of replacement of cows No.	Available heifers: Domestic %	Available heifers: Domestic No.	Available heifers: Imported	Available heifers: Total	% increase in stock
1948/ 1950	2,331	685	62.8	431	215	2,762	2.0	47	16.8	392	439	2,323	26.6	182	80	172	-	-	-
1953	2,323	675	63.0	425	212	2,758	2.0	46	16.8	390	436	2,142	26.6	180	80	170	10	180	-
1954	2,152	675	64.0	432	216	2,584	1.9	41	16.9	364	405	2,179	26.3	178	80	173	15	188	10
1955	2,194	685	65.5	449	225	2,643	1.7	37	17.1	375	412	2,231	25.8	177	81	182	20	202	25
1956	2,251	710	67.0	476	238	2,727	1.5	34	17.3	289	423	2,304	25.0	178	82	195	20	215	37
1957	2,324	747	68.5	512	256	2,836	1.3	30	17.5	407	437	2,399	24.0	179	83	212	20	232	53
1958	2,419	800	69.0	552	276	2,971	1.1	27	17.7	428	455	2,516	23.0	184	84	232	15	247	63
1959	2,531	863	70.0	604	302	3,135	1.0	25	17.9	453	478	2,657	22.0	190	85	257	-	257	67
1960	2,657	930	70.5	656	328	3,313	1.0	27	18.1	481	508	2,805	22.0	205	85	279	-	279	74
1961	2,805	1004	71.0	713	356	3,518	1.0	28	18.3	513	541	2,977	22.0	221	85	303	-	303	82
1962	2,977	1086	71.0	771	385	3,748	1.0	30	18.5	551	581	3,167	22.0	239	85	327	-	327	88

Source: Basic data, Dirección General de Estadística.

/Extent to

Extent to which each Factor could be Applied in order to Increase Production

As has already been seen, any of the measures studied in connexion with increasing production could almost satisfy foodstuffs demand as projected in Table 6. However, consideration of the time within which this demand must be met, greatly limits the extent to which the required production may be obtained by means of only one solution, however efficient it may be. It is thus necessary to establish a priorities scale in each case although none may exclude any of the others. It was pointed out in preceding paragraphs, that production could be increased by improving yields by the rotation system and by expanding the area at present in rotation. The following paragraphs study the extent to which each of these factors should be applied.

a) Yield Improvements. The probable rates of increase in yields are dependant upon the techniques actually in use, or which can be adopted easily or immediately in Chile. Such techniques are the result of research, which in many cases has already been completed, while in other cases it has not yet begun. Extension of improved techniques, however, requires time, and difficulties arise when it is planned on a wide scale within the short period of time available. Thus, increases in yield which are assumed to be attainable by 1962 would be considerably smaller than the optimum results that could be secured over a longer period, or to satisfy a larger demand for foodstuffs than estimated here. Table 18 shows the yields which could be obtained by 1962. These figures have been calculated in the light of the above, and concurs with the opinions held by a number of agricultural experts of the Departamento de Investigaciones Agrícolas (Department of Agricultural Research) of the Chilean Ministry of Agriculture.

/Table 18

Table 18 Margin of Increase in Agricultural Yields Obtainable by 1962

Product	Yield per hectare 1948-50 (metric quintals)	Estimated Increase Absolute	Estimated Increase %	Yield per hectare 1962 (metric quintals)
Cereals				
Wheat	11.9	2.4	20.0	14.3
Barley	16.4	3.3	20.0	19.7
Oats	7.9	2.4	30.0	10.3
Rice	32.9	6.5	20.0	39.4
Maize	14.2	4.2	30.0	18.4
Pulses				
Beans	9.1	0.9	10.0	10.0
Lentils	6.1	0.6	10.0	6.7
Chick-peas	5.2	0.5	10.0	5.7
Peas	7.3	1.5	20.0	8.8
Potatoes	99.3	9.9	20.0	120.0
Wines and ciders a/	3,313.0	0.0	00.0	3,313.0
Others				
Sunflowers	12.7	1.3	10.0	14.0
Vegetables	75.0 b/	7.5	10.0	82.5
Live-stock and animal products				
Cattle	0.79	0.26	33.1	105.0
Sheep	0.28	0.09	32.8	0.37
Milk a/	1,909.00	821.0	43.0	2,730.00
Wool	0.15	0.03	21.0	0.18

Source: United Nations, Economic Commission for Latin America.

a/ Litres.

b/ Estimated.

/There is

There is every reason to suppose that improvements in crop yields could be achieved, owing to the beneficial effect on soil fertility of the increased number of live-stock and the specific factors affecting each crop individually.

A 20 per cent increase in wheat should not prove difficult to achieve through the wide-spread use of weed-killers, rational employment of fertilizers and seed fumigation. The use of improved seeds could be considerably extended and the mechanised methods intensified, as assumed in this report, enabling the different farm operations , especially sowing, weed control and harvesting to be carried out at the proper season and in the minimum of time. The same principles apply to barley and oats, where there is a wide field for the improvement of strains. Seed selection alone is capable of giving immediate results. The 30 per cent increase assumed for oats is explained by the fact that this crop would benefit from the residue of the wheat fertilizer as well as from that applied directly. Rice has been assumed to increase by 20 per cent through the use of fertilizers, weed-killers and the proper timing of farm operations. Improvements in the field of genetics have not been considered here, since short-term results cannot be expected from the research to be undertaken. The increase of 30 per cent for maize is explained by better farming methods, and the more wide-spread use of hybrid seeds grown by the government agricultural stations.

The estimated 10 per cent increase for beans, lentils and chick-peas, would result from improved cultivation and seed selection. Research on the development of improved varieties bagan recently and only includes beans. A substantial number of varieties of this product are cultivated throughout the country to satisfy the varying tastes of the population; thus, even if immediate results were obtained for one or two of these, it would not influence the remaining varieties. Peas, on the other hand, are assumed to increase by 20 per cent, owing to the fact that improved seeds, producing a high yielding variety which can be consumed in fresh, dried or preserved form, can be imported.

In spite of the marked increase in the potato yield by the application of fertilizer, an increase of only 20 per cent has been assumed, owing to the adverse affect of pests which have recently

/affectdd this

affected this crop. The control of these pests is dependant upon both a wide-spread use of pesticides, and on further research for securing resistant varieties which will at the same time retain the main features of the most widely cultivated variety demanded by consumer preferences.

No increases have been assumed for wines since in grape cultivation, the level of efficiency is relatively high. A change-over from the varieties cultivated at present for others with a higher yield would call for heavy investments.

Table 19 was compiled in order to give a better idea of the increases in live-stock yields.

/Table 19

Table 19 Increase in Live-stock Yield to be Attained by 1962, by Products

Product			
Cattle			
Stock (thousands of head)	2,331		2,962
Slaughtering (thousands of head)	392		548
Percentage slaughtered	16.8	10.0	18.50
Weight of meat per animal (kgs.)	245.0	10.0	270.0
Density of cattle population	1.51	10.0	1.66
Meat production per hectare (kgs.)	79.0	33.1	105.6
Sheep			
Stock (thousands of head)	6,600		7,468
Slaughtering (thousands of head)	1,610		2,091
Percentage slaughtered	24.4	15	28
Weight of meat per animal (kgs.)	19	5	20
Density of cattle population	6.04	10	6.64
Meat production per hectare (kgs.)	28	32.8	37
Wool per unit of total stock (kgs.)	2.52	10.0	2.78
Wool per hectare (kgs.)	15.28	21	18.49
Total wool production (thousands of tons)	16.67		20.76
Hogs			
Weight of meat per animal (kgs.)	75	10	82
Percentage slaughtered	40	10	44
Total increase (per cent)		21	
Milk			
Stock of milch cows	515		605
Total milk production (thousands of litres)	651,000		994,000
Milk produced per cow	1,269	30	1,643
Density of cattle population	1.51	10	1.66
Milk production per hectare	1,909	43	2,729

Source: United Nations, Economic Commission for Latin America.

/The 33.1 increase

The 33.1 increase in beef production per hectare would result from a 10 per cent increase in the slaughtering ratio, a 10 per cent in the weight of meat per animal and from a further similar increase in the density of the cattle population. These relative improvements should not be difficult to secure by means of a substantial improvement in good-quality feed supply throughout the year, efficient live-stock technique, protection against the weather, pests and diseases, the elimination of low quality heads, the raising of herd quality and the slaughter of cattle at the main centres of production. Improved feed supply would be obtained from the replacement of natural pastures by artificial pastures and green fodder-crops on a fairly large scale, and from the conservation of fodder to supply seasonal shortages.

The increase of mutton yield per hectare (about 32.8 per cent), would result from the following increments: a 15 per cent rise in slaughter rate, 5 per cent in weight of meat per animal and 10 per cent in cattle populatiom density. The technical improvements which would have to be introduced include better feed, provision of drinking-water, defence against pests and diseases, and the raising of higher quality herds.

The 43 per cent increase in milk yield per hectare would be brought about by a 30 per cent increase in yield per cow and from a 10 per cent higher density than at present. To attain these objectives the same measures would have to be adopted as in raising meat output: since the live-stock density for milk production is the same as for meat, it is assumed that the best pasture lands and highest quality feed would continue to be used by dairies. These would not only include new pasture lands, but also that are used for fattening purposes in the Central zone. Among other high-quality feeds, green fodder-crops would be absorbed almost entirely in this type of production, and also concentrated foods, based mainly on the by-products of the vegetable oils and milling industries, which would no longer be exported. The firm demand for milk, arising from the processing of this commodity at the centres of production, would allow farmers to improve their installations and secure larger milk production throughout the year, instead of the seasonal milking methods now followed.

/A comparison

A comparison of Tables 8 and 18 shows that increase in yield alone is not sufficient to achieve the required output. It will thus be necessary to fall back on an increase of the cultivated area.

b) Increase of the Cultivated Area. Before studying the extent to which better use of the land at present in rotation and expansion of the cultivated area would contribute to an increased output, it is necessary to establish the total crop acreage, assuming it would reach the levels given in Table 18. This was done in Table 20.

Table 20 Estimated Area for 1962, on the Assumption of Moderate Development

Product	Estimated production (thousands of tons)	Yields (metric quintals per hect	Area required	Area in rotation 1948-50	Increase in area
			(Thousands of hectares)		
A. Crops:			1,654	1,492	162
Cereals			1,084	1,061	23
Wheat	1,216.0	14.3	851	840	11
Barley	119.3	19.7	61	54	7
Oats	100.0	10.3	97	94	3
Rice	102.4	39.4	26	26	-
Maize	89.9	18.4	49	47	2
Pulses			152	128	24
Beans	92.2	10.0	92	75	17
Lentils	16.9	6.7	25	23	2
Chick-peas	6.3	5.7	11	9	2
Peas	20.9	8.8	24	21	3
Potatoes	617.9	120.0	52	52	-
Wines and ciders a/	379.6	3,113.0	115	96	19
Others			251	155	96
Sunflower	110.8	14.0	79	40	39
Vegetables	286.7	82.5	35	28	7
Sugar-beet	40 b/	26.7 b/	15	-	15
Various	-	-	122	87	35
B. Live-stock and by-products			3,412 c/	3,095 c/	317 c/
Cattle	148.0	1.05	1,410 c/	1,215 c/	195 c/
Sheep	43.6	0.37	1,178 c/	1,092 c/	86 c/
Hogs d/	31.3	-	-	-	-
Milk a/	993.5	2,729	369 c/	341 c/	23 c/
Wool	20.76	0.18	-	-	-
Other live-stock e/	-	-	460 c/	447 c/	13 c/

Source: United Nations Economic Commission for Latin America; basic data for 1948-50, Dirección General de Estadística.

a/ Production in millions of litres, yield in litres.

b/ Sugar content.

c/ Artificial pastures equivalent. The differences arising in the calculation of the area is based on cattle stocks and density is due to rounding off the decimals.

d/ This area is included under "Cereals" and "Others".

e/ Horses, goats, etc.

/The above

The above Table indicates that, in order to obtain the projected increased yield, 162,000 hectares would have to be added to the area for annual and permanent crops, excluding artificial pastures. Of this area, sunflower cultivation would account for 24 per cent, cereals 14 per cent, pulses 15 per cent, grapes 12 per cent, sugar-beet 9 per cent. The remainder would be used for vegetables, fruit-trees and various other crops. Table 20 also shows that grazing areas would require a net increase of 317,000 hectares of artificial pastures or their equivalent.

The increase of artificial pastures should actually exceed this area, since part of the new pastures would be provided by land now under rough grazing, which, when deducted from the over-all live-stock area would have to be compensated with other equally suitable land for grazing or its equivalent in artificial pastures. In order to calculate the gross area of artificial pastures, it is first necessary to determine what proportion of the 479,000 hectares required for increasing the crop acreage would be provided by better use of the land at present in rotation, and what proportion would correspond to new areas incorporated by means of irrigation and clearing of forests.

It has already been seen that the order of priority is as follows: first, the better use of lands at present in rotation; secondly, clearing; and lastly, irrigation. It has also been seen that in the first stage of technical improvement, the more rational use of the areas at present in rotation would not be achieved by increasing the rotation of annual crops on the same soil, but by replacing natural pastures with artificial ones. The practice of maintaining natural pastures in these areas is due to the belief that this "rests" the soil and restores the fertility absorbed by the crops. As was pointed out in another part of this report, this is doubtful, since the soil recovers more rapidly and even increases in fertility when the rotation includes artificial pastures. In other words, the better use assumed would encompass part of the increases in area required for live-stock output, so that the expansions necessary for the other crops would have to be provided by irrigation and clearing. In turn, these new areas would surpass requirements so that artificial pastures would have to be included in the rotation. These practices in areas incorporated through irrigation would consist

of three years under crop and three years under pasture, while those incorporated by the clearing of forest land would require two years under crop and three years under pasture. This means that for every hectare brought into rotation, an additional 1.5 hectares would be required if the incorporation involves clearing, and only one hectare if through irrigation.

Although clearing is preferable to irrigation as a means of incorporating new areas, there are certain crops which cannot be satisfactorily cultivated in dry-farming regions; hence the area increases required for raising production, there would necessarily have to be provided by irrigation. Bearing the data of Table 20 in mind, crops requiring an increase in irrigated land are as follows:

Table 21 Crops for which Area Increases would Involve Irrigation

Crops	Hectares
Barley	7,000
Maize	2,000
Beans	17,000
Peas	3,000
Grapes	19,000
Sunflower	39,000
Sugar-beet	15,000
Vegetables	7,000
Various	35,000
Total	144,000

Source: United Nations Economic Commission for Latin America.

It should be remembered that the country would have available a total of over 200,000 hectares of well-irrigated land which at present is under natural pasture and of which better use could readily be made. It is thus assumed that at least 40,000 hectares of the 144,000 required for irrigated crops could be obtained by better use of the areas at present under irrigation, leaving only 104,000 hectares to be added

/through

through irrigation.

With the exception of permanent crops, i.e. grapes and fruit-trees, which would increase by 19,000 and 21,000 hectares respectively, the remaining crops listed in Table 21 would require an additional area equivalent to that already covered, or a further 100 per cent increase if artificial pastures are included in the rotation. The additional irrigated areas would then be 168,000 hectares, distributed as follows:

Table 22 Distribution of Increased Area Under Irrigation

	Hectares
For extension of permanent crops	40,000
For extension of annual crops	64,000
For rotation with artificial pastures	64,000
Total	168,000

Source: United Nations Economic Commission for Latin America.

Increases in area of crops not included above would amount to 18,000 hectares and would have to be provided by the clearing of southern forest areas. To increase in the area in rotation, an additional amount of land, equivalent to 150 per cent of the area required for crops would have to be incorporated so that the total cleared area would be 45,000 hectares, distributed as follows:

Table 23 Distribution of Cleared Area

	Hectares
For extension of annual crops	18,000
For rotation with artificial pastures	27,000
Total	45,000

Source: United Nations Economic Commission for Latin America.

The net extension of artificial pastures required to increase live-stock output would be 317,000 hectares, as can be seen from Table 20, which area would be obtained by improved use of the land in rotation. However, the extension of area under annual crops involves an additional increment of 91,000 hectares, to cover rotation with artificial pastures.

/The area

The area deducted from natural pastures through irrigation and clearing would, however, be equivalent to a reduction of 23,000 hectares in the grazing area, as shown in Table 24.

Table 24 Total and Net Increases in Grazing Areas in the New Lands Under Irrigation and Clearing

(thousands of hectares)

		Irrigation	Clearing	Total
I.	Over-all increase	64	27	91
II.	Area deducted from natural pastures	168	45	213
III.	Grazing coefficient	0.125	0.050	-
IV.	Equivalent value of the area subtracted in terms of artificial pastures	21	2	23
V.	Net increase (I minus IV)	43	25	68

Source: United Nations Economic Commission for Latin America.

The net increase in grazing area would thus be 68,000 hectares. The 249,000 hectares required to complete the area would be obtained from better use of the land under natural pasture. It must nevertheless be borne in mind that the transformation of this total into artificial pastures would mean a decrease of 62,500 hectares of grazing area which would have to be replaced. Moreover, the 40,000 hectares subtracted from the natural pastures by irrigation would diminish grazing capacity by 10,000 hectares in terms of artificial pastures, and these would again have to be replaced. Thus, a total of 72,000 hectares representing the reduction in grazing capacity would have to be added to the 249,000 hectares comprising the total increase of artificial pastures actually in rotation, amounting to 321,000 hectares. The total area which will eventually come under artificial pastures would amount to 412,000 hectares.

Table 25 gives the different origins of the extensions in artificial pasture areas required.

/Table 25

Table 25 Origins of New Lands Under Artificial Pastures

	Thousands of hectares
New irrigated lands	64
New cleared lands	27
	91
Better use of natural pastures in rotation	321
Total	412

Source: United Nations Economic Commission for Latin America.

Table 26 gives a general view of the origin and use of the total cultivated area, including artificial pastures.

Table 26 Origin and Use of Total Increase in Area

(thousands of hectares)

Origin		Use	
Irrigation	168	Permanent crops	40
Clearing	45	Annual crops	122
Better use of natural pastures in rotation	361		162
		Artificial pastures	412
Total	573		573

Source: United Nations Economic Commission for Latin America.

c) Relative Importance of Each Factor. In the above two tables, priorities are assigned to the factors determining the required increase of production on the assumption of moderate development. Table 27 shows the part played by each of these factors in the projected 1962 increase of production, by commodities.

/Table 27

Table 27

Source of Increases in Estimated Agricultural and Live-Stock Production, 1962

Product	Estimated cultivated area 1962 (000 hect.)	Estimated increase in yield per hectare 1962 (met. qnt.)	Increase in prod. resulting from increased yields (000 tons.)	Estimated increase in total prod. (000 tons.)	Ratio of increase due to yield, to total increase (000 tons.)	Value of absolute increase in millions of 1950 pesos		
						Total	Yields	Areas
Cereals	1,084				92.4	1,247.0	1,152.5	94.5
Wheat	851	2.4	194.0	199.0	97.5	824.4	803.8	20.6
Barley	61	3.3	20.1	31.0	64.8	134.4	87.1	47.3
Oats	97	2.4	23.3	25.9	90.0	90.1	81.1	9.0
Rice	26	6.5	16.4	16.8	97.6	64.5	62.9	1.6
Maize	49	4.2	20.6	23.4	88.0	133.6	117.6	16.0
Pulses	152					338.7	125.7	213.0
Beans	92	0.9	8.3	24.0	34.6	260.8	90.2	170.6
Lentils	25	0.6	1.5	4.4	34.1	36.0	12.3	23.7
Chick-peas	11	0.5	0.6	1.6	37.5	16.4	6.2	10.2
Peas	24	1.5	3.6	5.4	66.7	25.5	17.0	8.5
Potatoes	52	9.9	51.5	101.1	50.9	380.9	193.8	187.1
Wines and Ciders	115	0.0	-	62.2 a/	-	224.1	-	324.1
Sunflower	79	1.3	10.3	60.4	17.1	364.0	62.2	301.8
Sugar-beets	15	-	-	40.0 c/	-	250.0	-	250.0
Live-stock and Animal Products	3,412 d/					3,805.6	3,008.1	797.5
Cattle	1,480 d/	0.26	36.7	52.0	70.6	1,402.2	990.0	412.2
Sheep	1,178 d/	0.09	10.6	13.0	81.5	370.1	301.6	68.5
Hogs	— f/	-	8.3	9.3	89.2	297.1	265.0	32.1
Milk	369 d/	821.00 b/	286.0 a/	342.0 a/	83.6	1,736.2	1,451.5	284.7
Others	251	-	-	-	40.0	1,374.5	549.8	824.7
Totals					63.0	8,084.8	5,092.1	2,992.7

Source: United Nations Economic Commission for Latin America

a/ Millions of litres.
b/ Litres.
c/ Sugar content.
d/ Area under artificial pastures or their equivalent.
f/ The area under hogs is included in "Maize" and "Others".

Table 27 shows that 63 per cent of the increase in production would result from improved yields and the remaining 37 per cent from an extension of the areas in cultivation. The proportion obtained from better use of the lands in rotation arises out of the action of the two factors applying equally to both, i.e., increase in yields and expansion of the areas under rotation.

4. Use of The Labour Force and its Productivity. Full utilization of the labour force available in the country must be examined in relation to the excess of population in the rural areas which should be absorbed.

It is difficult to determine the amount of surplus agricultural labour. However, recent findings of the Agricultural Division of the United Nations Economic Commission for Latin America in the farming media of the provinces of Santiago and Valparaiso have proven the existence of a sizeable surplus as of farm labour. In 1950 rural workers were estimated to number 714,000. It would appear that this population works, on the average, 210 days per person per year, i.e., a total of 150 million man-days. On this basis, Table 28 was drawn up, showing the distribution of effective labour in 1950 and the estimated figures for 1962, on the assumption that increases in agricultural population would be absorbed by other economic activities. In order to calculate the total amount of labour used in the various crops, an attempt was made to estimate the labour productivity in each one. The resultant data differs slightly from those appearing in the previous study published by the Economic Commission for Latin America on "Agricultural Development in Chile" 1/.

1/ Document E/CN.12/164/Annex C, page 112.

/Table 28

Table 28 Productivity and Distribution of Farm Labour in 1948-50 and Provections for 1962

Product	1948-50 Cultivated (000 hect.)	Man-days per hectare	Total man-days (millions)	Production (000 tons)	Productivity (kgs. per man-day)	1962 Cultivated (000 hect.)	Man-days per hectare	Total man-days (millions)	Production (000 tons)	Productivity (kgs. per man-day)
Cereals	1,061		26.5			1,084		18.4		
Wheat	849	25.3	21.3	1,017	47.0	851	14.9	12.7	1,216	95.7
Barley	54	24.5	1.3	88	67.0	61	17.1	1.1	119	108.2
Oats	94	20.5	1.9	74	38.5	97	11.7	1.1	100	90.9
Rice	26	59.3	1.5	86	56.0	26	20.0	1.3	102	78.5
Maize	47	53.4	2.5	67	26.6	49	43.6	2.1	90	42.9
Pulses	128		6	-	-	152	-	6.0	-	-
Beans	75	54.0	4.1	68	16.9	92	45.0	4.2	92	21.9
Lentils	23	39.1	0.9	13	15.6	25	35.2	0.9	17	18.9
Chick-peas	9	31.2	0.3	5	16.7	11	28.1	0.3	6	20.0
Peas	21	31.2	0.7	15	23.4	24	24.2	0.6	21	35.0
Potatoes	52	73.6	3.8	517	134.9	52	66.1	3.4	618	181.8
Wines and Ciders	96	135.0	13.0	317[a]	24.5[b]	115	120.0	13.8	380[a]	27.5[b]
Other crops										
Sugar-beet	-	-	-	-	-	15	80	1.2	40[c]	33.3[c]
Sunflower	40	40	1.6	51	31.9	79	30	2.4	111	46.3
Vegetables	28	220[d]	6.2	210	33.9	35	180[d]	6.3	287	45.6
Livestock and Animal products	3,095[e]	-	37.8	-	-	3,412[e]	-	51.6	-	-
Cattle	1,215[e]	11.0	13.4	96	7.2	1,410[e]	14.3	20.2	148	7.3
Sheep	1,092[e]	4.2	4.6	31	6.7	1,178[e]	4.8	5.7	44	7.7
Hogs [f]	-	-	2.1	22	10.5	-	-	2.8	31	11.1
Milk	341[e]	52.0	17.7	652[a]	36.8[b]	364[e]	63	22.9	944[a]	41.2[b]
Others	-	-	16.3	-	-	-	-	19.0	-	-
Various	-	-	36.8	-	-	-	-	27.9	-	-
Total	-	-	150.0	-	-	-	-	150.0	-	-

Source: Basic data on area and production for 1948-50, Dirección General de Estadística. Calculations and projections, United Nations Economic Commission for Latin America.

a/ Millions of litres.
b/ Litres.
c/ Sugar content.
d/ Two crops per year average.
e/ Area under artificial pasture or equivalent.
f/ This area is included under "Maize" and "Others".

As shown by the above table, only 75.5 per cent of the labour force, measured in man-days was used to grow crops, and for the care of live-stock in 1948-50. The remaining fourth was engaged in repairing and building installations, administrative tasks, planting and care of forestry plantations, the felling of timber, cutting of firewood and charcoal-burning, etc.

25.2 per cent of labour absorbed by crops and live-stock production was employed in the production of cereals, 33.4 per cent to live-stock, 27 per cent to the remaining crops, and the remnant 14.4 per cent, to industrial crops, fruit-trees, horses, poultry and other domesticated animals. The estimated productivity for 1962 was computed from the increases in yields previously tabulated and from the margin of mechanization judged to be economically justified. Productivity increases appearing in Table 28 are thus greater for crops in which production can be easily mechanized and for those with an anticipated higher rate of increase in yields. Thus, the highest increases of productivity would be those of cereals, while in the case of wheat and oats it would be more than doubled. Both these cereals can easily be mechanized in the preparation of the soil, sowing operations, weed-control and harvesting. Lesser increments in productivity are expected in the case of barley, due to the fact that it is an irrigated crop grown in fields too small to allow for advantageous mechanization; also in the case of rice, for the same reason, because it is difficult to obtain rapid increases in its yields; and in the case of maize because of the semi-intensive nature of its cultivation in small fields. A further obstacle to the use of machines lies in the cold, wet and cloudy weather conditions which usually prevail at harvesting time. Nevertheless, the possible degree of mechanization which could be applied together with the increase in yield which could be reached through improved techniques, would increase labour productivity for this crop by over 60 per cent.

There would be little increase in productivity in the case of pulses owing to the narrow margin of yield increase considered likely and the fact that the possibilities of increasing mechanization are limited, mainly because these crops are usually grown under conditions of mixed farming in small quantities and on small areas. Moreover, it would be almost

impossible to mechanise the harvesting operations owing to the reasons given for maize, as well as the difficulties presented by the plants themselves. Only the preparation of the soil, sowing and weed control could be mechanised, but the harvest would continue to be effected manually, threshing by means of stationary machines. Only in the case of peas could its productivity be raised to any appreciable degree (nearly 50 per cent), owing to the greater possibility for improving yields per unit area.

A 35 per cent rise in the productivity of potatoes would come both from a slight increase in yield and intensified use of machinery in soil preparation and pest control. A small increase in grape productivity might result from a higher degree of mechanization in weeding operations and weed control. In vegetables and sunflower production it might be obtained from greater mechanization and better yields arising from the introduction of improved techniques. Although not indicated in the table, the possibility of using weed-killers for vegetables would allow productivity in this category to be doubled. Productivity in live-stock production would not show any considerable increase since higher yields could only be achieved through better technique and more efficient pasture management. In many of these sectors it is difficult or impossible to apply mechanization at a resonable cost. This again implies a considerable increase in the labour employed per hectare. For this reason the productivity of labour would tend to rise at a much slower rate than increases in yield. The requirements involved in forming and maintaining artificial pastures, growing green fodder-crops, and fodder in times of plenty against periods of scarcity, and carrying out sanitation measures, are among the causes of the greater intake of labour. For some of these operations, e.g. the harvesting of hay, it is anticipated that there would be a higher degree of mechanization.

The margin of prouductivity for industrial crops (hemp, tobacco etc.) and fruit-trees is small owing to the fairly high level of efficiency already reached. On the whole, the comments made in regard to live-stock can also be applied to poultry.

The estimates for productivity assuming a moderate rate of development are by no means ambitious. A simple comparison with the productivity attained in more developed countries corroborates this statement. For example, wheat productivity figures of 96 kilos per man-day projected for 1962,

/compare with

compare with an average of 275 kilos in the United States. The estimate for maize is still lower: 48 kilos per man-day as against 210 kilos in the United States [1].

Thus the estimates shown here could well be exceeded. The absolute lack of fundamental research on this subject, particularly on live-stock production has been the reason for such conservative calculations.

From a comparison of the estimated productivities with those for production in the assumption of moderate development, it may be inferred that the commodities which should show the greatest increase in production are, in general, those which under present conditions offer the least margin for a productivity increase. These commodities include live-stock raising and sunflower production, the productivity of which could be increased by 10 to 12 per cent respectively. On the other hand, products for which the smallest expansion production is estimated, such as cereals, are those which show the greatest rise in productivity, amounting in this case to over 100 per cent, and resulting in important changes in the distribution of the labour force in 1962. Within the over-all total of labour absorbed by crops and live-stock production, the proportion of cereals would decline from 25.2 per cent to 15.1 per cent, thus freeing 10 million man-days which would be available for other crops. Live-stock productivity would rise from 33.4 per cent to 42.3 per cent, thus requiring 13.8 million man-days more than the 1948-50 input. Of the other crops listed in Table 8, pulses would remain at their present level, potatoes would require 400,000 man-days less, grapes and sunflower cultivation would need 800,000 man-days more each and vegetables, 100,000 man-hours. Labour input for "Others" would increase from 14.4 per cent in 1948-50 to 15.5 per cent in 1962. The following figures give a rough estimate of the present distribution of all remaining items, together with those projected for 1962, which would involve an increase of 2.7 million man-days.

1/ United Nations Economic Commission for Latin America, Document E/CN.12/64/Annex C, page 112.

/Table 29

Table 29 Labour Input for Various Types of Production

Product	Man-days per hectare 1948-50	Man-days per hectare 1962	Millions of man-days 1948-50	Millions of man-days 1962
Fruit	103	95	7.5	9.5
Industrial crops	40	30	0.6	0.9
Poultry	240 a/	240 a/	1.7	2.5
Goats	3	3	0.5	0.7
Horses	18	18	6.0	5.4
Total			16.3	19.0

Source: United Nations Economic Commission for Latin America.

a/ Per thousand head.

The 19.4 million additional man-days required by the production of live-stock and crops, as well as the introduction of sugar-beet cultivation, would not be counter-balanced by the surplus of 10.5 million man-days from cereals and potatoes. The deficit of 8.9 million man-days would therefore have to be taken from the item "Various", which would thus be reduced appreciably. In practice, the mechanization of agricultural operations would almost eliminate foremen, automatically replacing them by machine operators. In the same way, lorry transport would free a large amount of labour at present engaged in driving bullock carts, etc.

5. Investments.

It is now necessary to examine the investments required to obtain the agricultrual and live-stock production calculated for 1962. Maintaining the priorities assigned to the various methods of increasing production, the investments required to raise yields, extend the cultivated area and mechanize operations will now be examined.

a) Investments Required to Raise Yields. These fall into three main types: a) agricultural research and extension services; b) increased use of fertilizers and pesticides; and c) improvement in live-stock quality and management.

Research, as previously seen, is one of the basic requirements for agricultural development. The productivity of capital invested in research is, in the long run, the highest obtainable in expanding

/agricultural

agricultural and live-stock output. Research in Chile has attained a satisfactory technical level, but only on very reduced scale when compared with the country's requirements. Important results have already been obtained in selecting new varieties and techniques in the cultivation of wheat, maize and pastures, and in the use of fertilizers and pesticides. These results can only be applied in certain regions. There thus remains an extremely wide field for research, both as regards specific items of agricultural and live-stock production and in the various techniques of farming and cattle-raising, fields in which little or nothing has so far been done. In the opinion of experts of the Dirección General de Agricultura (Agricultural Department), agricultural research of the type indicated herein would require the establishment of one main experimental station in the neighbourhood of Santiago, four regional stations in the principal agricultural zones and a number of subsidiary establishments with experimental fields and demonstration plots. The main station, as the centre of agricultural research for the whole country, should be provided with all the appropriate facilities such as buildings, installations, laboratories, libraries, machines, live-stock, etc. The other establishments should also be provided with full facilities for carrying out the tasks assigned to them. Their cost would possibly amount to some 300 million pesos at 1950 prices, provided resonable use were made of existing installations, i.e. land and other resources actually being used by the present research services. The upkeep of these establishments would require an annual expenditure of about 120 million pesos at 1950 prices, giving a total investment over the ten years considered in this paper of 1,500 million 1950 pesos [1]. The operating costs include expenditure involved by agricultural extension. It is possible that a detailed survey of research and agricultural extension requirements, made by appropriate experts, would give higher figures than those noted above.

The investments in fertilizers were calculated on the basis of the 1950 consumption divided by the area used for permanent and annual crops

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1/ Mention will be made when using current or other year prices.

/in that

in that year. Consumption per hectare expressed in kilos of each type of fertilizer and its value at 1950 prices was thus calculated. In accordance with expert opinion, average consumption per hectare required to effect an increase in the yield projected was than calculated. Total investments from increased fertilizer consumption was integrated with the cost for the increase in consumption per hectare at present in cultivation and with that for extension in the cultivated area. These investments are shown in Table 30.

Table 30 Estimated Consumption of Fertilizers and Investment Required

Type of fertilizer	Consumption 1949-50 (Kilos per hectare)	Increase	Difference	1950 prices (pesos per kilo)	For higher consumption in present area in rotation a/ (millions of 1950 pesos)	For extension in area in rotation b/	Total
Phosphate	81.1	160.0	78.9	2.01	237	52	289
Nitrogen	25.8	55.0	29.2	2.36	103	21	124
Calcium	49.2	110.0	50.8	0.48	36	8	44
Potash	8.1	8.1	-	0.75	-	4	4
Nitrogen-potash	15.0	30.0	15.0	2.48	56	12	68
Mixed	20.8	20.8	-	2.51	-	9	9
Total	200.0	373.9	173.9	—	432	106	538

Source: United Nations Economic Commission for Latin America.

a/ 1,492,000 hectares.

b/ 162,000 hectares.

It is possible that an exhaustive study of fertilizer requirements might indicate larger quantities than those shown in Table 30, especially if yields higher than those projected in the present paper are assumed.

As regards pesticides and weed-killers, sufficient data are not available to estimate the quantities and value of the amounts used at present. Expert opinion assumes that the cost of treating pests and

/diseases in

diseases in fruit, potatoes and vegetables, together with weed control for all crops, would average about 400 pesos per hectare. It is further assumed that spraying and dusting pesticides would require an additional investment of 200 pesos per hectare under cultivation. These estimates are based on the assumption that consumption for the year 1950 could not have exceeded 50 pesos per hectare under cultivation (75 million pesos) and that the use of pesticides would not necessarily have to be extended to the whole area under cultivation. The latter is explained by the fact that many crops would not require treatment of any sort, since control would be effected by biological means or the cultivation of resistant varieties, both of which would result from research. It must also be taken into account that weed controls would be one of the lines offering the greatest possibilities for future expansion, and that its cost would be below the average of 400 pesos indicated above. Applying the value of 200 pesos to the 1,654 hectares comprising the area under cultivation (excluding artificial pastures), calculated for 1962, the figure of 331 million pesos is obtained. This total would probably be exc eded if weed control were extended to a part of the artificial pastures.

As in the case of fertilizers, the investment would only be required for the first year, since after the first application, the cost of the investments would return to the farmer through increase in yields.

It is anticipated that four different measures will have to be taken to improve live-stock yields, i.e. imports of blood stock, construction of adequate installations, extension and improved management of artificial pastures and various kinds of research and agricultural extension. A detailed examination is given below of the investment requirements for importing live-stock and for installations, followed by research, and agricultural extension etc., in both live-stock and agricultural sectors, while the investments for pasture improvement appear under the section dealing with the expansion of the cultivated area.

As has already been seen, the imp rts of breeding animals is designed to increase present stocks and to improve their quality. To attain these objectives, it is anticipated that an import of 100,000

/heifers over

heifers over a period of six, and 2,000 bulls over a period of ten years, would be required. Multiplying these numbers by their respective prices i.e. 22,000 pesos per heifer and 100,000 pesos per bull, the figure of 2,400 million pesos is obtained. In 1951, cattle imports for consumption amounted to 117,000 head, valued at 632 million pesos, while in the years 1945-47 imports exceeded 200,000 head annually. The fact that these figure were not maintained in the following years, was mainly due to restrictions in the sources of supply. It appears likely that without the help of considerable imports of breeding stock, it would be a long and difficult task to increase live-stock population to the degree required in order to avoid an increase in the import of animals for consumption.

Investment in new installations would appear to be fully justified by the present lack of facilities for protecting animals from climate, conserving fodder etc., as mentioned previously. It was estimated that in 1950 these facilities (stables, sheds, shelters, shade-trees, silos, watering places, fences etc.) represented an investment of 2,670 pesos per hectare under artificial pastures [1].

Owing to lack of basic data, it was impossible to calculate the precise degree of investment required to improve live-stock management. However, assuming that an increase of 50 per cent on the 2,670 pesos was sufficient to increase yields adequately, the figure obtained would be equivalent to 4,000 pesos per hectare. Multiplying the difference of 1,330 pesos by the area at present under artificial pastures, i.e. 1.1 million hectares, plus the additional 412,000 hectares required, a total investment for this item of 2,011 million pesos is obtained.

The remaining investments for increasing yields and general improvement in production has been roughly estimated at 400 million pesos. These investments comprise agricultural extension, artificial insemination

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1/ This data was obtained from the value of the actual capital invested in agriculture in 1950, excluding irrigation works and animal stocks. This was calculated at 29.2 thousand million pesos, of which 10 per cent was comprised in the installations mentioned. Dividing this 10 per cent, i.e., 2,920 million pesos, by the 1.1 million hectares under artificial pastures, the value indicated in the text was obtained.

centres, import of seeds etc.

The total investments required for this type of production increase would thus amount to 7,180 million pesos.

Table 31 Summary of Investments Required to Increase Agricultural and Live-stock Yields

Items	Millions of 1950 pesos
Agricultural research	1,500
Fertilizers	538
Pesticides	331
Live-stock improvement	2,400
Live-stock installations	2,011
Others	400
Total	7,180

Source: United Nations Economic Commission for Latin America.

Investments Required to Increase the Area in Rotation

To obtain these investments, an average cost per hectare was computed for each method. Costs per hectare amounted to 4,000 pesos for clearing and 20,000 pesos for irrigation, both including machinery, material, labour, etc., that is, the total investment to conclude these projects. Hence, when dealing with investments in mechanization, the machinery cost of adding lands by irrigation and clearing was not included. The total investments to increase the area in rotation amounted to 3,540 million pesos, as detailed in Table 32.

Table 32 Investments Required for Irrigation and Clearing

Item	Thousands of hectares	Cost per hectare (1950 pesos)	Total investment (millions of 1950 pesos)
Irrigation	168	20,000	3,360
Clearing	45	4,000	180
Total	213		3,540

Source: United Nations Economic Commission for Latin America.

The investments required to start production in new areas and improve existing management, were computed as described below. Using the 1950 estimates of current fixed investments given by the Corporación de Fomento

/de la

de la Producción, 42,000 thousand million pesos excluding live-stock, - the cost of irrigation improvements - was first deducted, since in the case of present cultivated areas these improvements already exist, while the cost of construction for the new areas has already been calculated above. The value of the present irrigation systems was estimated at half the cost per hectare of the projected ones, having in mind that the present areas under irrigation are those which have offered the greatest advantages or the smallest obstacles. This calculation values the present system of irrigation, which is spread over 1.3 million hectares, at 13,000 million pesos. In order to avoid duplication it was also considered necessary to deduct the value of agricultural machinery, estimated at 4,350 million pesos. Additional investments in this sector will be calculated seperately.

24,650 million pesos remain as the value of improvements and installations in use in 1950, once deductions for irrigation systems and agricultural equipment are made. On the basis of a number of economic studies carried out in various parts of the country, this sum was distributes as shown in Table 3, among the various types of land utiliaation.[1/] The distribution can doubtless be improved through further research.

Table 33 Estimated Distribution of Agricultural Fixed Assets in 1950

(excluding live-stock, irrigation systems and agricultural machinery)

Land Utilization	Millions of hectares	Millions of pesos	Pesos per hectare
Crops	1.5	18,488	12,325
Artificial pastures	1.1	2,465	2,241
Natural pastures and fallow land under rotation	3.3	2,465	747
Other natural pastures, woodlands etc.	23.1	1,232	53
Total and average	29.0	24,650	850

Source: United Nations Economic Commission for Latin America, using basic data published by the Corporación de Fomento de la Producción.

1/ Library of the School of Agriculture, University of Chile, Estudios de Tasación y Cálculo Económico de Rentabilidad.

/Multiplying

Multiplying the cost per hectare of 12,325 pesos by the additional area brought into rotation (162,000 hectares), the necessary investment would amount to 1,997 million pesos.

The sums required for operating the new areas under artificial pastures would cost 2,178 pesos per hectare for 91,000 hectares of new lands, and 1,494 pesos per hectare for the 321,000 hectares which could be added from areas already in rotation. The first of these costs is the difference in value per hectare between the improvements of artificial pastures and unimproved land. The second was obtained by deducting the value of natural pastures at present in rotation from the value of improved land under artificial pastures.

To complete the cost of initial operation, it is estimated that 1,800 pesos is the cost of sowing a hectare of artificial pastures. Although this cost appears too low because artificial pastures in Chile are invariably associated with another crop, usually a cereal, which absorbs the cost of soil preparation and other common expenses.

Table 34 summarizes the investments to obtain the new cultivated areas in order to increase production, in accordance with the assumption of moderate development.

Table 34 Estimated Investments Required for Increasing the Area Under Rotation

Items	Area (thousands of hectares)	Cost per hectare (1950 pesos)	Total cost (millions of 1950 pesos)	
Irrigation	168	20,000		
Clearing	45	4,000		3,360
Placed under cultivation a/				180
A. New lands under various crops.	162	12,325	1,997	
B. New lands under artificial pastures.	91	2,178	190	
C. Present areas in rotation under artificial pastures.	321	1,494	480	
D. Formation of pastures.	412	1,800	742	3,417
Total				6,957

Source: United Nations Economic Commission for Latin America.

a/ Includes investments in buildings, fences, equipment, plantations (except artificial pastures), roads etc.

/The following

The following maintenance costs should be added to the above investments: irrigation works, 185 million pesos; and for the remainder, 564 million pesos. These come to a total of 749 million pesos. Estimates are the basis of a 1 per cent annual depreciation of irrigation works and 3 per cent in the case of the remaining investments. Clearing is not considered to be subject to depreciation.

Investments on Mechanization

The estimated input of labour per hectare shown in Table 29, implies the following density of machinery in relation to the area in rotation:

Table 35 Estimated Density of Agricultural Machinery

Type of Machinery	Area per machine used (hectares) 1950	1962
Tractors	250	125 a/
Harvesters	965	400 b/
Seeders	170	100 c/
Harvesters (hay)	110	75 d/
Harrows	200	100 d/
Baling machines (hay)	268	200 d/
Ensilage cutters	550	300 d/
Milking machines	-	75 e/

Source: United Nations Economic Commission for Latin America.

a/ Includes annual and permanent crops, excludes artificial pastures.

b/ Includes cereals, except maize.

c/ Includes annual crops; excludes potatoes, sugar-beets vegetables and pastures.

d/ Area under artificial pastures.

e/ Area under artificial pastures devoted to milch cows.

Assumed machinery density for 1962 would represent an appreciable advance in Chilean agricultural mechanization, but would still fall short of what is considered to be an adequately high level. Furthermore, it is calculated that in order to achieve this density, labour productivity as assumed above would also have to be reached. Time reductions through

/mechaniding

mechanising agricultural operations would, to a large extent, eliminate most of the difficulties caused by climatic conditions wherever the time factor is important.

In 1950 it was estimated that 6,000 tractors were being used. 13,200 tractors would be needed to attain the density indicated in the preceding table. Improved live-stock management would also require at least one extra tractor per thousand hectares of artificial pasture land, adding up to 1,400 units. The net increase would thus be 8,600 units, valued at 2,467 million pesos. The tractors used on crop land could also be used for reseeding and harvest of artificial pastures, and consequently there would be more than one tracotr available per thousand hectares. This is due to the predominance of mixed farming in Chilean agriculture. Many of the assumptions made in this paper were made bearing in mind the convenience of intensifying farming by either increasing live-stock numbers where they already exist, or by their introduction in the opposite case.

The future density of grain harvesters has been calculated assuming that they would continue to be operated throughout the farming areas, so that their effective density of operation would be higher than what Table 35 indicates. These machines could also be appled to the harvesting of pulses and sunflower. Over-all investments required for mechanization have been estimated on the basis of present stocks of agricultural machinery published in the Estudio sobre Mecanización de la Agricultura en América Latina (Survey on Mechanisation of Agriculture in Latin America) by the United Nations Economic Commission for Latin America in 1951. Since these data refer to 1944, it was necessary to add the estimated increases for 1950. These were compared with estimated stocks in 1962, as in Tables 36 and 37.

/Table 36

Table 36 Estimates of Agricultural Machinery Required in 1962 and its Value in 1950 Prices

Type of machinery	Area a/ (hectares)	Density (hectares per machine)	Total of units	Price (thousands of pesos)	Total value (million pesos)
Tractors b/	1,486 c/	1,000	1,490	200	298
Tractors	1,654	125	13,230	300	3,969
Harvesters	1,035	400	2,600	500	1,300
Seeders	1,437	100	14,400	35	504
Harvesters (hay)	1,486 c/	75	19,800	25	495
Harrows	1,486 c/	100	14,900	20	298
Baling machines (hay)	1,486 c/	200	7,400	120	888
Ensilage cutters	1,486 c/	300	5,000	70	350
Milking machines	364	75	4,900	50	245

Source: United Nations Economic Commission for Latin America.

a/ See notes for Table 35.

b/ Tractors used on artifical pastures.

c/ Includes present area under arbificial pastures plus over-all increase.

3,496 million pesos would have to be added to the net investment of 5,297 million pesos to cover the upkeep of equipment. This figure is based on the assumption that 10 per cent of investments would be made every year, and that the rate of depreciation would be 12 per cent annually.

/Table 37

Table 37 Estimated Investment in Agricultural Mechanization

Type of machinery	Estimated 1950 stocks		Estimated 1962 stocks		Net investment required
	Number of units	Value (millions of 1950 pesos)	Number of units	Value (millions of 1950 pesos)	(millions of 1950 pesos)
Tractors and ploughs	6,000	1,800	14,720	4,267	2,467
Harvesters (grain)	1,100	550	2,600	1,300	750
Seeders	7,750	271	14,400	504	233
Harvesters (hay)	10,000	250	19,800	495	245
Harrows	5,500	110	14,900	298	188
Balling machines	4,100	492	7,400	888	396
Ensilage cutters	2,000	140	5,000	350	210
Milking machines	200	10	4,900	245	235
Other a/		727		1,300	573
Total		4,350		9,647	5,297

Source: United Nations Economic Commission for Latin America.

a/ Farm vehicles, spraying machines of all types, fertilizing machines, agricultural implements and repair tools etc.

So far, only the maintenance costs of new investments have been considered. The costs involved in maintaining the present level of investments for the next ten years, i.e. until 1962 inclusive, have therefore to be calculated. The 3 per cent annual depreciation rate has been used by experts of the Corporación de Fomento de la Producción, and adjusted by the Economic Commission for Latin America, by assigning a 1 per cent depreciation rate to irrigation works. The consequent depreciation costs amount to 8,700 million pesos for buildings and installations and 1,300 million pesos for irrigation works, adding to a total of 10 thousand million pesos.

/The same

The same procedure was used in calculating depreciation of investments made to increase the extension of the area in rotation. Although the present depreciation rate for agricultural machinery ranges between 15 and 18 per cent, only 12 per cent has been used in the case of new investments owing to the fact that the increase in the machinery density and the actual improvement of agricultural development itself will be factors enabling the equipment to be kept in better order and repair than is the case at present. The establishment of repair shops, together with the work of agricultural extension, would be a powerful contribution in this connexion.

Summary of Investments

The increase in agricultural and live-stock production projected in the assumption of moderate development, would require the following net and gross investments:

Table 38 Total Estimated Investments for Agricultural and Pastoral Production

Purpose of investment	Net investment	Depreciation	Total
	(millions of 1950 pesos)		
Improved yields	7,145	-	7,145
Extension of area under rotation	6,957	749	7,706
Mechanization	5,297	3,496	8,793
Maintenance of existing capital	-	10,000	10,000
Total	19,399	14,245	33,644

Source: United Nations Economic Commission for Latin America.

Of the total investment, 33,644 million pesos, approximately 13,600 million pesos (41.5 per cent) would require foreign exchange. This would include all sums invested in machinery, improved cattle and other items listed in Table 39 below.

/Table 39

Table 39 Investments Requiring Foreign Exchange

Item	Millions of pesos
Agricultural research	50
Fertilizers (phosphates)	300
Pesticides	320
Improved live-stock	2,400
Live-stock installations (barbed wire, etc.)	300
Irrigation (equipment)	530
Clearing (equipment)	20
Formation of pastures (seed)	150
Mechanization	9,500
Other	30
Total	13,600

Source: United Nations Economic Commission for Latin America.

Since the above calculations are only approximate, it is probable that more detailed study would result in different figures for such items as wire fencing or a number of machines and implements which could be manufactured within the country. At an exchange rate of 70 pesos (1950) per dollar, currency investments in the period 1953-1962 inclusive would amount to 194 million dollars. Average productivity of the net investments required would be 0.42, and 0.24 for the gross investments. The reciprocals of these figures, i.e. the net and gross coefficients of capital, would be 2.4 and 4.2 respectively. The 1950 agricultural output-capital ratio, excluding animal stocks, was 0.52, or, in other words, a net coefficient of capital of 1.9. If the value of animal stocks, (56,800 million pesos) is added to the capital existing in 1950, (42,000 million pesos) average capital productivity would be 0.387. In the same way, by adding the value of the estimated increase in the live-stock population[1/] (estimated at 2,300 million pesos) to the net investments already considered, a value of 21,699 million pesos is obtained. This gives the new investments a

1/ The value of the increase in livestock has been estimated at 4,700 millions 1950 pesos, from which should be substracted the investment of 2,400 million for the cattle imports in order to improve the quantity and quality of stocks, already included in the section relating to increase in yields.

productivity of 0.37. In 1962 the productivity of total capital (approximately 78,500 million pesos) would be 0.383, equivalent to a capital coefficient of 2.61, or approximately the same level as obtained in 1950.

However, if mechanization investments are considered as equivalent to the cost liberating excess agricultural labour, which would be absorbed by other activities within the assumption of moderate development, which cost could be debited against these other activities. This would relieve the agricultural sector to the extent of 5,297 million pesos, invested in mechanization. On this basis, productivity of net investments (14,102 million pesos), would be 0.57, while the ratio to gross investments would be 0.33. Resultant net and gross capital coefficients are 1.75 and 3.00, respectively. By adding the value of the net increase of animal stocks to the new net investments required, excluding mechanization, a total of 16,402 million pesos is obtained, giving a productivity of 0.49 and a capital coefficient of 2.04 for the new investments. The productivity of total capital in 1962, excluding the additional investments in mechanization, would be 0.432, equivalent to an increase in productivity of 11.6 per cent compared with 1950. On the same basis, capital productivity would be 13 per cent higher than the figure obtained with the inclusion of the new investments in mechanization.

It is instructive to compare the productivity of investments for increasing yields with that of the investments designed to extend the cultivated area. This has been done in Table 40.

Table 40 Productivity of Investments Required for Increasing Agricultural Production

Item	Increase in yield		Increase in area		Total
	Millions of 1950 pesos	Percentage of total	Millions of 1950 pesos	Percentage of total	Millions of pesos
Increase in production	5,092.1	63	2,992.7	37	8,084.8
Gross investments	7,145.0	48	7,706.0	52	14,851.0
Net investments	7,145.0	51	6,957.0	49	14,102.0
Productivity of net investments	0.73		0.43		0.57
Capital coefficient	1.37		2.33		1.75

Source: United Nations Economic Commission for Latin America.

/Investments

Investments applied for the purpose of raising yields, have a 70 per cent higher productivity than those extending the cultivated area, owing to the fact that the former type does not require additional funds to cover running costs. Calculating the relationship between production increase and the total resources required for this purpose, including costs of capital maintainance, the investments applied to increasing yields would be 88 per cent more productive than those for extending the area in rotation.

Annex: Comparison of Methods and Results Used in this paper with the Report of the Joint Mission of the International Bank for Reconstruction and Development and the United Nations Food and Agriculture Organization

When this paper was already in an advanced stage, the opportunity occurred to study the report [1/] of the Joint Mission of the International Bank for Reconstruction and Development and the United Nations Food and Agriculture Organization, headed by Dr. E. de Vries, on a development programme for Chilean agriculture. It is instructive to compare the methods used, and results obtained from the present study with those of this extremely interesting document, pointing out similarities and differences.

There are a number of similarities between this work and the Joint Mission's report. The most remarkable is the estimate of the increases required for over-all consumption, (35-36 per cent) and production (37-39 per cent). This is easily explained by the use of similar methods which have in both cases been applied to practically equal basic data and assumptions.

The Mission also used the method of income-elasticity of demand and applied it on a practically identical basis.[2/] In the assumptions regarding the growth of population, expansion of the gross product and income elasticities, there are differences which actually cancel out and thus explain the similar results obtained. Thus, the Bank assumes a growth in population of 1.7 per cent annually against the 1.5 per cent used in the present paper,[3/] and an income elasticity of 0.6 instead of 0.5. On the other hand, the Mission assumes a much lower rate of growth

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1/ International Bank for Reconstruction and Development and United Nations Food and Agriculture Organization, The Agricultural Economy of Chile, December 1952.

2/ The basis used by the Joint Mission's report is wider than ECLA's as regards number of commodities and slightly higher as regards calories.

3/ The results of the last census (April 1952) show that the latter figure is nearer the truth.

/for the per

for the per capita product (1.3 per cent) than that calculated here (2.1 per cent).

This last difference involves an important discrepancy in the methods used, rather than in the basic assumption. In the present paper, the rate of growth in income was given by the objectives which could be reached within a general hypothesis of economic development, while the Mission's data are extrapolations of historical trends and assume that the over-all economy would continue to increase at the same rate in the next ten years.

Both reports agree in maintaining the foreign trade deficit in foodstuffs at the 1950 level. For this reason, the relative increase in production in both cases is greater than that of consumption, resulting in an identical difference (a 37-39 per cent increase in production for meeting a 35-36 rise in consumption). However, the Bank assumes that the deficit will be kept at the same level by maintaining agricultural imports and exports constant, both as regards total figures and those for each commodity. This last assumption seems debatable, since the consumption of tropical fr it, coffe, cocoa etc., i.e., products which cannot be replaced by domestic production, tends to increase as population and per capita income rise. The only methods of maintaining the level of the foreign trade deficit in foodstuffs constant are either to reduce imports of commodities which can be replaced by domestic consumption or to increase exports. The second alternative has been considered more practicable in the present paper for the reasons already given. (See Section 2).

Another important discrepancy lies in the statement incorporated in the Bank's report that food in Chile is relatively cheap (Chapter II, page 36 of preliminary report). The data given therein of the low price of foodstuffs in Chile, in terms of the average per capita income, seem to be contradicted by comparisons of per capita income and daily calory consumption in comparable countries.

In the calculation of increases in consumption by commodities, there are similarities in the assumptions made regarding the income-elasticity of demand for wheat, potatoes and sugar, which both surveys consider to be equal to zero. Both reports also assume that the total increase in sugar consumption will be met by domestic consumption. Estimated increases in milk consumption are similar, although income-elasticities differ.

/There are

There are similarities or minor differences for the remaining commodities. However, in the case of pulses, the Mission assumes a negative income-elasticity of demand, based on the trend of per capita consumption of these products in recent years. In this instance, it does not seem probable that a foodstuff which not only provides an abundant calory supply, but also forms a cheap source of proteins would react to changes in income in the same way as a low-value product. The explanation lies in the alteration in relative prices of beans and rice, this last product acting as a substitute as has already been explained (Table 3 and Plate 1). The report did not take this price relationship into account and thus found a negative correlation between income and consumption.

A comparison of the figures used for the basic items of each report, together with the estimated objectives, is made in the following Table.

Item	IBRD/FAO Report		ECLA Report	
	Total	Annual	Total	Annual
Growth of the population	23%	1.7%	20 %	1.5 %
Growth of total gross product	46%	3.1%	52.5% a/	3.5 % a/
Growth of the per capita gross product	18%	1.4%	27.0% a/	2.0 % a/
Expansion of over-all foodstuffs consumption	36%	2.6%	35 %	2.5 %
Income-elasticity of foodstuffs demand	0.6		0.5	
Increase in agricultural produce	38.5%		36.8%	

Source: Mission of International Bank for Reconstruction and Development, and Food and Agriculture Organization; United Nations Economic Commission for Latin America.

a/ Income available for consumption.

Both reports agree as to the factors necessary for achieving the required increases in production, but there are differences in the order of priority and degree of importance assigned to each. In the ECLA paper, the highest priority is given to the increase in yields, from which 63 per cent of the increase in production is expected. Second and third places are given to a better use of the land at present in rotation and to the extension of the present area through irrigation and clearing, which are assumed to contribute the remaining 37 per cent. The IBRD report assumes

/that an

that an increase of 52 per cent would come from expanding the area in rotation and better use of the present cultivated areas and that only 48 per cent would be contributed by improved yields. This discrepancy is explained by differences in the amounts of investments calculated in each case.

In order to compare figures for investments, it must be made clear that those proposed by the IBRD report include investments for the extension of the cultivated area, higher yields, agricultural markets and industries, transport, plantations and forest industries. The total gross investments would amount to 49,160 million 1951 pesos, and net investments to 31,040 millions. The investments for markets, agricultural industries, transport, plantations and forest industries are substracted from these figures, the remainder would be comparable to the investments proposed in the ECLA paper. Total investments in crop and live-stock activities applied to increases in yield, expansion of the area in rotation and mechanization projects, are compared below.

	IBRD/FAO Report		ECLA Report	
	Annual (in millions of 1951 pesos)	Total	Annual (in millions of 1950 pesos)	Total
Gross investment	3,650	29,200	3,364	33,644
Net investment	2,305	18,440	1,940	19,399
Production per unit capital	0.48		0.42	

Source: International Bank for Reconstruction and Development and United Nations Food and Agriculture Organization, and United Nations Economic Commission for Latin America.

The net investments for mechanization as proposed by the Joint Mission amount to 1,200 million pesos, and to 5,300 millions as estimated by ECLA. This difference is due to the fact that the ECLA report is based on the assumption that the whole of the labour surplus in the agricultural sector would be absorbed by other types of economic activity while the Bank assumes that agricultural labour will continue to increase at the same rate as that of the last ten years. If, for purposes of comparison, this last assumption is adopted, at the same time decreasing the investments in this item shown in the ECLA report to the same level as those proposed

/by the IBRD

by the IBRD report, the production per unit capital would rise from 0.42 to 0.53.

The extension of the area in rotation projected by both reports is summarized in the following Table.

Item	IBRD/FAO Report		ECLA Report	
	Annual	Total	Annual	Total
	(thousands of hectares)			
Better use of land in rotation	10	100	36	361
Irrigation	23	180	17	168
Clearing and drainage	40	320	5	45
Total		600		574

Sources: International Bank for Reconstruction and United Nations Food and Agriculture Organization, and United Nations Economic Commission for Latin America.

The net investments required to attain these objectives would be as follows:

Item	Cost per hectare		Total investment			
	IBRD Report (1951 pesos)	ECLA Report (1950 pesos)	IBRD/FAO Report (millions of pesos)		ECLA Report (millions of pesos)	
			Total	Annual	Total	Annual
Irrigation	14,200	20,000	2,560	320	3,360	336
Clearing	1,500	4,000	480	60	180	18
Total			3,040	380	3,540	354

Sources: International Bank for Reconstruction and Development and United Nations Food and Agriculture Organization, and United Nations Economic Commission for Latin America.

The prices per hectare estimated in the ECLA report correspond to the average costs in 1950 prices as calculated by experts of the Departamento de Riego and the Corporación de Fomento de la Producción.

Where the figures are comparable, there is a considerable degree of similarity for the remaining investments, with the exception of the amounts

/devoted to the

devoted to the imports of better breeding stock. The IBRD report envisages an import of only 24,000 heifers and a small number of other breeding animals, to a total value of 400 million 1951 pesos, i.e., 50 million pesos per year, compared with the ECLA estimate of 2,400 million 1950 pesos for the import of 100,000 heifers, 2,000 bulls and other breeding animals for other types of stock.

CHAPTER IV. MANUFACTURING INDUSTRIES

1. Introduction

This chapter explains the procedures adopted for the projection of demand for manufactures, the proportion of such goods to be supplied by domestic production, and the corresponding investment requirements. The calculations shown in detail are based on the hypothesis of moderate development.

Using 1950 as a base year, the expansion of total demand for manufactured goods in 1952 would be 82 per cent. The increase in the demand for consumer goods would be 68 per cent and that of capital goods 127 per cent. Domestic production should provide a growing proportion of these goods. With respect to capital goods, despite the expansion of 75 per cent foreseen for imports, the share of domestic production would rise from 71 per cent to 78 per cent. However, substitution would be far more intense in the provision of consumer manufactures, of which domestic output would supply 97 per cent as compared with 86 per cent in 1950.

In order to meet these requirements, domestic output of manufactures would have to increase 101 per cent between 1950 and 1962. An increment of 88 per cent would be made in the output of consumer goods and of 152 per cent in capital goods. This relative expansion of capital goods industries would raise the share of the latter with respect to total manufacturing output, from 20 to 25 per cent during this period.

In order to achieve a more intense development over the period as a whole, it would be necessary to divide the programme into two stages, the first of which is marked by an intensified development of capital goods industries, and the latter by a relatively sharper expansion of consumer goods industries. On the assumption of moderate development during the first stage (1950-1956), capital goods industries would expand by 96 per cent, and by only 29 per cent in the second stage (1956-1962). Consumer goods industries, on the other hand, would increase 58 per cent during the first period and 48 per cent during the second. Taken as a whole, industrial output would expand by 41 per cent and 43 per cent, respectively, in the first and second stages.

/Table 1

PART II

CHAPTER IV

PART I

DEVELOPMENT TRENDS AND PROJECTIONS OF THE MANUFACTURING AND SERVICE SECTORS

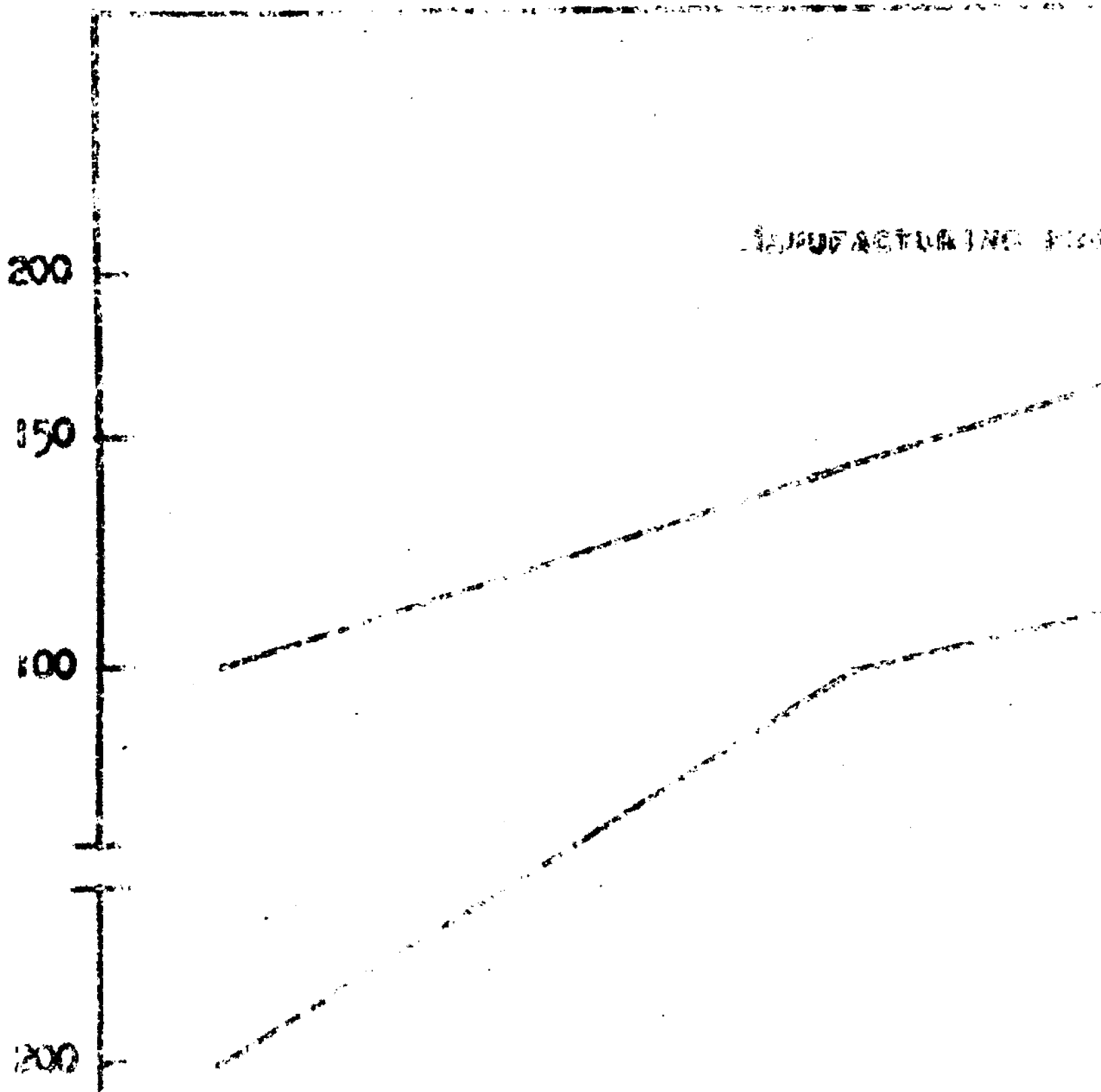


Table 1 summarizes the behaviour pattern expected for demand and output of manufactured goods. Chart 1 compares the trends of consumer and of capital goods industries during both stages.

Table 1: Demand and Output of Manufactured Goods, in the Hypothesis of Moderate Development

(millions of pesos at 1950 prices; gross product accruing from manufacturing)

	1950	1953	1956	1962
Demand	31,294	35,880	42,297	56,832
Output	25,862	29,843	36,533	52,038
Output of consumer goods	20,690	22,435	26,414	38,992
Output of capital goods	5,172	7,408	10,112	13,046

Source: United Nations Economic Commission for Latin America.

2. Manufactured Consumer Goods

The Composition of Demand for Manufactured Consumer Goods

The Chilean data available cannot be used with any degree of accuracy in determining the composition of demand for manufactured consumer goods. An attempt was made to analyse this demand from the standpoint of supply, on the basis of data for 1948, since this was the last year for which complete information was available and it was assumed, for the purpose of this study, that between 1948 and 1950 the compositions of demand for consumer manufactures has not been altered fundamentally.

A study of the composition of demand for manufactured goods, considered from the standpoint of cost-factors applied in manufacturing activities, should include the following stages:

1) Reclassification of Chilean industrial statistics, in order to differentiate consumer goods in each group from equipment and building material.

2) Analysis of the cost-structure in each group of industries in order to estimate the gross product accruing from manufacturing activity. The aggregate or net value shown in industrial statistics includes a substantial number of payments to other activities, for services such as rent, transport, advertising, publishing, etc.

/3) Analysis of

3) Analysis of the structure of manufacturing costs of imported consumer goods, in order to ascertain the proportion of different groups of manufactures, and of the primary industries and services in the c.i.f. value of each article.

4) Analysis of manufactured consumer exports on the same criterion as indicated under 3).

These last two items are included with a view to standardization of the foreign trade and output data in order to allow for their subtraction and addition.

Domestic Output. Chilean Industrial Statistics divides manufacturing output into 13 groups, on the basis of raw material employed. With the co-operation of Chilean authorities, these basic data were reclassified, partly in accordance with the criterion of the principal raw material but also separating consumer industries from capital industries. These Chilean Industrial Statistics, moreover, showed gross and net values of manufacturing output; however, the latter data include a series of transfers, such as payments to other enterprises for rent, publicity services, transport, etc. As the present study is concerned with the gross product accruing from manufacturing activity, it was found necessary to add wages, salaries, and social insurance payments by industrial undertakings, to the difference between total expenditure and the gross value of output. This difference was believed to be equivalent to other income, principally profits accruing from the productive processes of the respective industries.

Below will be found the data for the output of consumer manufactures in 1948, obtained from the foregoing analysis.

/Table 2

Table 2: Output of Manufactured Consumer Goods in 1948

(in millions of pesos)

	Gross value	Gross Product accruing from manufacturing
Non-durable Consumer Goods		
Textiles	4,472.0	1,532.6
Foodstuffs	9,638.2	1,176.8
Paper and printing	1,382.9	514.0
Tanning and footwear	1,831.4	533.6
Pharmaceutical products	1,372.3	362.6
Beverages	1,186.3	282.8
Tobacco	854.2	130.1
Clothing	1,237.5	302.0
Sub-total	21,997.2	4,844.0
Durable Consumer Goods		
Porcelain and ceramics	193.8	95.6
Glassware	267.4	116.8
Metalware	933.4	368.8
Rubber manufactures	221.8	65.7
Articles made of wood	449.6	177.2
Sub-total	2,066.0	824.2
Grand Total	24,063.2	5,668.2

Sources: Chilean Industrial Statistics and United Nations Economic Commission for Latin America.

Foreign trade. In order to obtain data comparable to that of output, import statistics were reclassified following the outline of Table 2. Moreover, since the c.i.f. values comprise the output of primary industries and services in addition to manufactures, these totals were broken down by the methods indicated in Chapter I. Although the relative importance of exports is limited, a similar method for breaking them down was adopted.

Composition of demand. Table 3 shows the consumption of manufactured goods as obtained from the analysis described in the last two paragraphs.

/Table 3.

Table 3: Composition of Consumption of Manufactures in 1948

(in millions of pesos; gross product accruing from manufacturing)

	Output (A)	Imports (B)	Exports (C)	Consumption (D)	Per cent (A)/(D)	Composition of consumption
Non-Durable Consumer Goods						
Textiles	1,532	459	12,2	1,978.8	77.4	25.8
Foodstuffs, beverages and tobacco	1,590	195	77.7	1,707.3	93.1	22.3
Pharmaceutical products	363	101	14.5	449.5	80.8	5.9
Paper and printing	514	198	0.7	711.3	72.3	9.3
Leather goods	534	4	-	538.0	99.3	7.0
Clothing	302	4	2.9	303.1	99.6	4.0
Sub-total	4,835	961	108.0	5,686.0	85.0	74.3
Durable Consumer Goods						
Ceramics	96	6	8.1	93.9	102.2	1.2
Glassware	117	18	2.7	132.3	88.4	1.7
Rubber manufactures	66	52	0.4	117.6	56.1	1.5
Articles made of wood	177	13	12.7	177.3	99.8	2.3
Metalware	369	166	2.0	533.0	69.2	6.9
Motor vehicles	-	71	0.5	70.5	-	0.9
Sub-total	825	326	26.4	1,124.6	73.4	14.5
Unclassified	577	328	46.1	858.9	67.2	11.2
Grand Total	6,237	1,615	180.5	7,671.5	81.3	100.0

Sources: Chilean Industrial Statistics, and United Nations Economic Commission for Latin America.

Income-Elasticity of the Demand for Manufactured Goods.

After ascertaining the composition of demand for manufactured goods, the immediate problem lies in analysing the dynamics of that demand in terms of changes in the level of disposable personal income. Existing data regarding the behaviour pattern of demand for consumer manufactures in Chile are limited. Statistics on personal expenditure, published recently, are inadequate for the type of demand analysis desired in this report. These statistics cover the period since 1948 which, besides being too short for a study of elasticities, is marked by a relative stagnation of real per capita disposable personal income. The greatest limitation of the data relative to consumer expenditure in connection with the

/analysis of

analysis of the elasticities arises from the lack of adequate price indices. For instance, there is no index to deflate expenditure on consumer goods, thus making it impossible to assess the effects on demand of the relative increase of the prices of these goods during the past years. Between 1948 and 1949, for instance, whereas the real per capita disposable income rose 4.2 per cent, real per capita expenditure on durable consumer goods dropped 8.8 per cent, if cost-of-living indices are used for purposes of deflation.

Given the impossibility of carrying out an adequate analysis of demand, that is of real consumer expenditure, an attempt was made to measure the real supply of consumer goods over a relatively longer period, on the assumption that supply did follow demand. An analysis of supply has the advantage of enabling the calculations to be based on the actual volume of manufactures. The final price of manufactures is determined by a series of factors, so that the measurement of expenditure of a population on these goods does not necessarily correspond to the actual volume of goods consumed. From the standpoint of the estimate of the expansion of demand, it is important to project the actual volume of manufactures which will be consumed.

Consumption series have been prepared on the basis of supply data for the principal items into which demand for consumer goods was classified in Table 3. The coefficients of income-elasticity obtained from this analysis do not actually correspond to the repercussions of demand from year to year, since these were calculated on the basis of the changes of demand between the pre-war period and the present time. These coefficients will be used to project long-term demand assuming that, in the course of the next few years, the factors which at present prevent demand for each of these groups of articles from reacting freely to the changes in the level of available goods and services for consumption will have been eliminated. However, since in the early years of the execution of the programme all the price distortions resulting from current controls, subsidies and other factors rendering the market even more imperfect cannot be eliminated, it would be necessary to adjust the coefficient of elasticity to prevailing conditions during this period of transition. For the sake of clarity, let us consider the importance of the problem created by demand for clothing.

/Comparison of

Comparison of pre-war data with current prices showed that the income-elasticity coefficient was 1.24. However, in recent years demand showed a negative elasticity. Whereas the per capita personal disposable income, deflated by the cost-of-living indices, rose 3.4 per cent between 1948 and 1951, per capita expenditure on clothing, deflated by the appropriate indices, fell 10 per cent over the same period. The explanation for this is to be found in the fact that textile prices increased 12.8 per cent in relation to the level of the cost-of-living indices in the above-mentioned period. The information available does not indicate the causes of this relative price increase. However, it might be assumed that these causes are not all structural, and that many of them can be removed. In similar cases, the elasticity-coefficient was raised progressively and adjusted, in order that the increment to consumption, foreseen for the whole period, should correspond to the coefficient originally established.

Table 4 shows the relation between the increment of demand for each of these groups of manufactured goods and the increment in real total consumer expenditure, corresponding to the income-elasticity coefficients specified therein.

The income-elasticity coefficients refer to the relation between per capita increments. In order to facilitate the projections described in the following section, the aggregate relation corresponding to the per capita relation of the elasticity coefficients was calculated. The factors shown in Table 4 refer to this aggregate relation.

/Table 4

Table 4: Factors to be Used in Multiplying the Rate of Expansion of Available Goods and Services in Order to Obtain the Corresponding Annual Rate of Expansion of Demand for Consumer Manufactures of each Group

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	Income-elasticity coefficient for the period a/
Clothing	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.5	1.4	1.4	1.24
Prepared foodstuffs	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.68
Footwear	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.2	1.2	1.2	1.03
Paper and printing	1.0	1.1	1.2	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.22
Pharmaceutical goods, Glassware, Articles made of wood, and Ceramics	1.1	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.16
Rubber and durable metal products	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.88

Source: United Nations Economic Commission for Latin America.

a/ The coefficients of elasticity refer to the full period 1950-60, since demand projections were made on the basis of 1950 data. For the period 1950-52, a moderate rate of expansion was assumed, on the basis of available data, so that the coefficient of income-elasticity would be higher if the estimate were only made for the period 1953-62.

Projection of Demand for Manufactured Consumer Goods.

Having determined the composition of consumption during the basic period, the coefficients of income-elasticity of demand for consumer goods and the annual rate of increment during the period under observation of available goods and services, only a simple operation is required to project demand for the different types of consumer goods.

As explained in the preceding section, the coefficients of income-elasticity were replaced by factors relating the increment of total income with the increase in the demand for each group of articles. Thus, knowing that the increment in personal disposable income between 1953 and 1954 is 2.5 per cent and that the relation between this increase and the

/increment to

increment to aggregate demand for durable goods is in the proportion of 1 to 2, it is evident that demand for these articles will be increased by 5 per cent between 1953 and 1954. Thus Table 5 was drawn up, showing yearly rates of expansion of demand for consumer goods, on the assumption of moderate development, and the corresponding rates for the full period, on the assumption of both moderate and accelerated development. The projections of demand shown in Table 6 are the result of the combination of the rates from Table 5 with the consumption data for 1950, which, in turn, are based on the composition data shown in Table 3 and the calculation of the volume of consumption of manufactured goods shown in Table 5 of Chapter I.

Table 5: Rate of Increment of Demand for Consumer Manufactures, in the Hypothesis of Moderate and Maximum Rates of Growth

Articles	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	Percentage of increase between 1950 and 1962	
											Moderate growth	Maximum growth
Clothing	2.5	2.75	3.0	4.55	6.3	6.75	7.2	6.75	6.3	6.3	74	133
Processed foodstuffs	2.0	2.0	2.0	2.45	3.15	3.15	3.15	3.15	3.15	3.15	36	73
Footwear	2.25	2.25	2.25	3.5	5.4	5.4	5.4	5.4	5.4	5.4	59	108
Paper and printed goods	2.5	2.75	3.0	4.55	6.3	6.3	6.3	6.3	6.3	6.3	72	131
Pharmaceutical goods, glassware, wood products and ceramics	2.75	3.0	3.25	4.55	5.85	5.85	5.85	5.85	5.85	5.85	68	123
Rubber and durable metal products	5.0	5.0	5.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	129	223
Total consumer manufactures		2.8	3.0	4.2	5.8	5.9	6.1	6.0	5.8	5.8	68	124

Source: United Nations Economic Commission for Latin America.

/Table 6

Table 6: Projection of Demands for Consumer Manufactures in the Hypothesis of Moderate and Maximum Growth

(millions of pesos at 1950 prices, gross product accruing from manufacturing)

	1950	1953	1954	1955	1956	1957
Non durable goods						
Textiles	6,182	6,624	6,806	7,010	7,229	7,791
Foodstuffs	5,319	5,616	5,728	5,842	5,985	6,173
Pharmaceutical products	1,414	1,526	1,572	1,623	1,697	1,796
Paper and printing	2,228	2,398	2,464	2,538	2,653	2,820
Leather goods	1,677	1,793	1,833	1,874	1,940	2,045
Clothing	958	1,027	1,055	1,087	1,136	1,208
Others	911	976	1,001	1,037	1,089	1,132
Sub-total	18,689	19,960	20,459	21,011	21,909	22,965
Durable goods						
Ceramics	288	310	319	329	344	364
Glassware	407	440	453	468	489	518
Rubber manufactures	359	416	437	458	490	534
Articles made of wood	551	595	613	633	662	701
Metalware	1,677	1,941	2,038	2,140	2,290	2,496
Motor vehicles	216	250	263	276	295	322
Sub-total	3,498	3,952	4,123	4,304	4,570	4,935
Unspecified	1,773	1,917	1,970	2,034	2,119	2,251
Grand total	23,960	25,829	26,552	27,349	28,498	30,151

Continuation:

	1958	1959	1960	1961	1962	Output after 1962 with maximum growth
Non durable goods						
Textiles	8,317	8,915	9,517	10,116	10,753	14,382
Foodstuffs	6,367	6,567	6,775	6,988	7,208	9,218
Pharmaceutical products	1,901	2,012	2,130	2,255	2,387	3,153
Paper and printing	2,998	3,186	3,387	3,599	3,826	5,142
Leather goods	2,155	2,271	2,394	2,523	2,659	3,492
Clothing	1,290	1,382	1,475	1,568	1,667	2,236
Others	1,200	1,276	1,339	1,400	1,458	1,989
Sub-total	24,228	25,609	27,017	28,449	29,958	39,621
Durable goods						
Ceramics	385	407	431	459	483	642
Glassware	547	579	613	648	686	908
Rubber manufactures	582	634	691	753	821	1,159
Articles made of wood	742	785	831	880	930	1,229
Metalware	2,721	2,965	3,232	3,523	3,840	5,415
Motor vehicles	351	383	417	455	495	697
Sub-total	5,328	5,753	6,215	6,715	7,255	10,050
Unspecified	2,374	2,516	2,679	2,827	2,961	3,999
Grand total	31,930	33,878	35,911	37,994	40,174	53,670

Source: United Nations Economic Commission for Latin America.

/Output of

Output of Consumer Goods.

After projecting demand for consumer goods, it is necessary to consider how such demand can be met, what part can be supplied by domestic output and what part, assuming the hypothesis presented, must depend on imports.

Requirements to be met by imports. The general method followed for determining the means for satisfying consumer demand - either by domestic manufacture or imports - were discussed in Part I. It was indicated there that in the case of consumer goods, imports which could probably be replaced, were to be determined in the first place, together with the possible expansion of domestic output required to effect such replacement. The criterion adopted in estimating the probable degree of substitution was partly subjective, in view of the impossibility of determining the real position of each group of industries and the resources of the country in that particular sector. It was borne in mind that certain manufactured articles are difficult to replace, the manufacturing process being practically integrated with the raw materials, some of which cannot be produced in certain countries. This is the case of certain chemicals. Moreover, it was considered that it would be difficult to replace various products in view of the prestige of their trade marks (certain beverages and durable consumer goods). Lastly, the size of the market was taken into account, since this is a basic limiting factor for a number of products. Although it is true that the economic development foreseen would contribute greatly to expanding the market by raising per capita product substantially, the need to secure the maximum social productivity of capital investments makes it advisable to disregard certain products which require a more complex industrial structure.

Since it is not possible in each case to measure accurately the relative advantage of substituting imported goods, a general estimate was made by approximation. It was considered, at the outset, that it would generally be more convenient to expand existing lines rather than to establish new ones. In this connexion, the manufacture of non-durable consumer goods offers considerable advantages. Leather goods output, for instance, covers consumption entirely, and foodstuffs and textiles imports are limited to special articles. It was assumed that imports of high quality distilled beverages would continue. Imports of sugar, as explained

/in the agricultural

in the agricultural section, would return to the level in the period considered as a basis.

The share of crop and livestock imports (industrial processing crop and livestock products) in the total supply would drop from 21 per cent to 7 per cent. In the textile sector, it may be expected that the development experienced in the past few years would continue and that there would be a sharp reduction in the volume imported at present. It was assumed that total substitution of dissolving pulp imports for the manufacture of rayon was possible, but it was considered that it would probably not be advisable to replace entirely high quality yarn imports only consumed on a small scale.

The substitution of durable consumer goods is a more complex problem in view of the fact that there is little or no industrial experience in certain lines of production. In extending an industry, the estimate of probable productivity of the new investment cannot always be readily calculated. However, it is much more difficult to foresee the profitability of an investment in an industry which is as yet unknown to the entrepreneurs and labourers of the country. In this case, several comparisons were made between the Chilean market and those of other countries whose population and per capita product are similar.

Imports of durable metal consumer goods were divided into groups. In some cases, such as refrigerators and other electrical appliances, it was assumed that progressive substitution of imports would take place in line with the present trend; in other cases, such as that of sewing machines for household purposes, and wrist and pocket watches, it was assumed that imports would continue to supply total demand. As regards motor vehicles it was believed justifiable to assume that a substantial part could be assembled in the country after 1956. At that time, Chile would have more than 100,000 thousand motor vehicles and replacement requirements alone would reach a total of more than 10,000 units annually.

In the case of rubber manufactures, it was assumed that domestic output of the more usual consumer goods would be possible so that imports would be limited to certain special articles, certain types of tires, etc. Imports of chemical pulp for the manufacture of paper and newsprint would be entirely replaced by domestic manufacture. It was assumed that imports

of books and magazines would expand at the same rate as demand for durable consumer goods.

The assumptions concerning the substitution of imports are based principally on events during the past twenty years of industrial development. However, it should by no means be suggested that these assumptions solve the problem of replacing imports of manufactured consumer goods without prior discussion of the problem and the possible means for its solution. The main objective is to emphasize the need of maintaining and expanding the process of replacement if an attempt is to be made to increase the rate of economic development, provided of course no other general solutions arise connected with any large-scale development of foreign trade. Table 7 shows the reduction in the proportion of total manufactured consumer goods provided by imports, on the basis of a moderate rate of growth. It was still necessary to take into account the fact that the substitution of imports of finished goods would in many cases be offset by greater imports of the corresponding raw materials. On the other hand, there are a large number of new manufactured consumer goods, used regularly in large industrial centres, imports of which are almost inevitable during the early stages. For these and other reasons, the degree to which a country can suspend imports of manufactured consumer goods cannot be ascertained with accuracy.

Table 7: Share of Imports in the Total Supply of Manufactured Consumer Goods

	1950	1962
Textiles	23.2	6
Prepared foodstuffs	11.4	8
Pharmaceutical products	22.5	5
Leather goods	0.7	0
Paper and printing	27.8	4
Ceramics	6.4	4
Glassware	13.6	5
Rubber manufactures	44.2	5
Metal products	31.1	10
Motor vehicles	100.0	80
Total	18.0	6

Sources: Dirección General de Estadística de Chile and United Nations Economic Commission for Latin America.

/Needs to

Needs to be met from domestic production. In considering the expansion to be attained by each branch of manufacturing, it would be very advisable to analyse operating conditions in existing plants. Interest should be focussed on existing productive capacity and its degree of employment. In some industries, particularly in those with high investment density, the possibility of intensifying the utilization of installed equipment by means of reorganization or the introduction of supplemental shifts should be considered.

The main causes of the low productivity of fixed capital in certain enterprises can be corrected over a short period, except where associated with structural features. Examples of the latter are the small size and inadequate location of the plants. Those difficulties can only be eliminated over the long period, but there are many factors which lower the yield of equipment and which could be corrected over the short period. They are nearly always connected with difficulties in the operating system and in the lack of skilled labour.

Another important aspect in the utilization of resources is the manner in which raw materials are employed. There is no point in establishing universal criteria in this matter, since operating conditions of each plant determine the degree in which the raw materials are being wasted. Experience indicates that a relatively brief survey is sufficient to determine the margin of waste. In studying labour productivity in the Chilean cotton textile industry, the United Nations Economic Commission for Latin America in 1950,[1/] found, for instance, that, "generally speaking, no adequate system was used to control cotton wastage".

Before assessing the required expansion of productive capacity, it is essential to conduct surveys to determine operating conditions in each important sector. The main objectives of these surveys should be: a) to determine the possibility of increasing real productivity of the equipment; b) to determine the possibility of reducing the number of man-hours per unit of output, without making new investments, or by making only small investments; c) to determine the possibility of reducing raw material and energy consumption per unit of output, without making new investments,

1/ Study on Labour Productivity of the Cotton Textile Industry in Five Latin American Countries, (Document E/CN.12/219), pages 52-53, paragraph 225.

/or by investing

or by investing only moderate sums.

Table 8 groups data regarding the production of the different groups of manufactures, for both moderate and accelerated rates of development. These data were obtained by subtracting from the demand projections such imports as are compatible with the plan of substitution discussed in the preceding section.

An increment to manufacturing output obviously cannot be secured at a constant rate. The development of certain sectors depends on the prior expansion of others. It should be borne in mind that the length of time required for building the plant or the extensions to an industry is also important. The general aspects of the problem and the criteria adopted here were discussed in Part I.

/Table 8

Table 8: Estimate of the Output of Consumer Manufacturing Activities in the Hypothesis of Moderate and Maximum Growth

(millions of pesos at 1950 prices; gross product accruing from manufacturing)

	1950	1953	1954	1955	1956	1957
Non durable goods						
Textiles	4,747	5,087	5,227	5,384	6,059	6,734
Foodstuffs	4,727	4,992	5,092	5,194	5,399	5,604
Pharmaceutical products	1,080	1,165	1,200	1,239	1,386	1,533
Paper and printing	1,610	1,733	1,781	1,834	2,097	2,360
Leather goods	1,671	1,784	1,824	1,865	1,978	2,091
Clothing	632	676	694	715	851	987
Sub-total	14,467	15,437	15,818	16,231	17,770	19,309
Durable goods						
Ceramics	265	287	296	306	329	352
Glassware	346	374	385	397	433	469
Rubber manufactures	204	236	248	260	334	408
Articles made of wood	509	550	566	584	633	682
Metalware	1,141	1,321	1,387	1,456	1,742	2,028
Motor vehicles	-	-	-	-	99	99
Sub-total	2,465	2,768	2,882	3,003	3,570	4,038
Unspecified	3,443	3,686	3,767	3,848	3,929	4,010
Total	20,375	21,891	22,467	23,082	25,269	27,357
Output for export purposes	315	356	370	383	397	411
Total	20,690	22,247	22,837	23,465	25,666	27,768
Annual increment		552	590	628	2,201	2,202
Production for accumulation of operating stocks		188	201	214	748	749
Grand total	20,690	22,435	23,038	23,679	26,414	28,517

Continuation

	1958	1959	1960	1961	1962	Output after 1962 with maximum growth
Non durable goods						
Textiles	7,409	8,084	8,759	9,433	10,108	13,519
Foodstuffs	5,809	6,014	6,219	6,426	6,631	8,481
Pharmaceutical products	1,680	1,827	1,974	2,121	2,268	2,995
Paper and printing	2,623	2,886	3,149	3,410	3,673	4,936
Leather goods	2,204	2,317	2,430	2,546	2,659	3,492
Clothing	1,123	1,259	1,395	1,531	1,667	2,236
Sub-total	20,848	22,387	23,926	25,467	27,006	35,659
Durable goods						
Ceramics	375	398	421	441	464	616
Glassware	505	541	577	616	652	863
Rubber manufactures	482	556	630	706	780	1,101
Articles made of wood	731	780	829	881	930	1,229
Metalware	2,314	2,600	2,886	3,170	3,456	4,874
Motor vehicles	99	99	99	99	99	139
Sub-total	4,506	4,974	5,442	5,913	6,381	8,822
Unspecified	4,091	4,172	4,253	4,338	4,419	6,397
Total	29,445	31,533	33,621	35,718	37,806	50,878
Output for export purposes	424	438	452	465	473	473
Total	29,869	31,971	34,073	36,183	38,279	51,351
Annual increment	2,101	2,102	2,102	2,110	2,096	-
Production for accumulation of operating stocks	714	715	715	717	713	955
Grand total	30,583	32,686	34,788	36,900	38,992	52,306

Source: United Nations Economic Commission for Latin America.

/The estimates

The estimates of production shown in Table 8 for each group of industries refer to the branch of manufacturing producing consumer goods for the domestic markets. Some of these industries exported a small proportion of their output in 1948 which, on the whole, did not amount to 3 per cent of domestic manufacturing although in some cases it far exceeded this proportion. For instance, 8 per cent of the total output of ceramics was exported, as was 4 per cent of the pharmaceutical goods produced, 7.2 per cent of wooden furniture and 4.9 per cent of foodstuffs, etc. There is no reason to believe that such exports will diminish. However, before demand is carefully forecast in each case, it would be unwise to assume that such exports would increase at the same rate as output for domestic consumption. In the chapter on the analysis of exports, the principal manufactures were studied, including the manufacture of consumer goods, the exportable surplus of which is likely to expand. Some of these industries, such as the manufacture of pulp and paper, appear to have good prospects both as regards world demand and the raw material potentialities of the country. On the assumption of moderate development of the capacity to import, which is the basis of this study, no great expansion should be expected in this sector.

Lastly, to estimate the volume of aggregate manufacturing output, it was necessary to take into account the need to increase operating stocks of the different industries. These inventories comprise everything from raw materials to fully finished goods. Their volume fluctuates in accordance with the organization of output, the productivity of the transport facilities employed by the enterprises, the time required to complete the productive process, etc. The goal of every enterprise is obviously to achieve a minimum of such inventories, particularly when they consist of perishable products. Based on 1948 data, an estimate was made of the relation between the volume of operating stocks and the value of total output. Using the increment in output which would be obtained from the factories, corresponding to the expansion of demand, supplementary needs for operating stocks were then calculated. It was assumed that the relation would remain constant, although it appears reasonable to expect a relative reduction will take place in operating stocks, to the extent that the productive process can be rationalized and dependency on imports diminished.

/Table 9

Table 9 shows the rate of increment for the whole period under consideration, in each group of manufacturing, on the assumption of moderate and accelerated demand.

Table 9: Rate of Expansion of the Output of Consumer Manufactures for the period 1950-62

(percentages)

	Moderate development	Accelerated development
Non-durable Goods		
Textiles	113	185
Foodstuffs	40	79
Pharmaceutical products	110	177
Paper and printing	128	207
Leather goods	60	109
Clothing	164	270
Sub-total	87	147
Durable goods		
Ceramics	75	132
Glassware	88	150
Rubber manufactures	282	440
Articles made of wood	83	142
Metalware, including motor vehicles	204	340
Sub-total	159	258
Others a/	45	105
Grand total	87	151

Source: See Table 7.

a/ Includes exportable surpluses, as well as operating stocks and unclassified sectors.

3. Manufacture of Capital Goods

Composition of demand for capital goods.

To determine the composition of demand for capital goods, a similar method was adopted to that used in the case of consumer manufactures. On the basis of reclassified data, obtained from the Estadística Industrial Chilena (Chilean Industrial Statistics) for 1948, the output of capital goods was calculated, and to it were added net imports computed by the same method. An analysis was thus made of the composition of demand, from the standpoint of supply, in terms of the value added by the

/manufacturing process.

manufacturing process. Having determined the composition of output and the supply of capital goods in 1948, it was assumed that no substantial alteration had taken place until 1950.

In Table 10 an estimate will be found of the composition of output and of total available capital goods in 1950.

Table 10: Output and Available Capital Goods in 1950

(gross product accruing from manufacturing)

	Production a/ (millions of pesos)	Percentage	Imports (millions of pesos)	Availability (millions of pesos)	Percentage
Iron and steel products	700	14	656	1,356	18
Mechanical industries products	2,558	49	1,516	4,074	55
Cement industries	621	12	-	621	8
Other manufactured capital goods	1,293	25	90	1,383	19
Total	5,172	100	2,262	7,334	100

Source: United Nations Economic Commission for Latin America.

a/ The total is equal to 20 per cent of the value added by manufacturing (estimates of the National Income), and its composition was calculated on the basis of reclassified data obtained from Chilean Industrial Statistics for 1948. To calculate available goods, 100 millions (from mechanical industries) was subtracted from domestic output, which amount corresponds to imports.

Projection of Demand for Capital Goods

The projection of demand for capital goods is one of the most complex tasks in formulating a development programme. This demand is given by the replacement and expansion needs of the productive capacity of all those activities employing real capital, that is equipment and buildings. It is therefore necessary to obtain estimates of the probable growth of all economic activities, in order to project the demand for capital goods. Since the manufacturing of capital goods creates markets for itself and sometimes depends on its own demand, it is necessary to determine the degree of inter-dependence of this manufacturing and to progress by means of successive approximations. The analysis will begin by reference to demand for equipment, that is to say, demand for mechanical industries producing capital goods, the market for which is wider than that of any other group of industries, since it comprises all economic activities making use of equipment.

/Mechanical

Mechanical industries. Demand for mechanical products is assessed largely by reference to replacement needs and plans for the expansion of the productive capacity of practically every other economic activity. For purposes of simplification, these activities were divided into three classes: a) the manufacture of consumer goods; b) of capital goods, and c) other economic activities.

a) Demand for Equipment for the Manufacture of Consumer Goods. The projection of demand for equipment in this sector is a simple matter, since the preceding estimates provide information regarding the rate of expansion for output of consumer manufactures. Comparing output data with the 1948 level of investments in equipment, the coefficient of the latter was obtained for the different groups of manufactures. Based on these coefficients, an estimate was made of the expansion of productive capacity required and, following thereon, of the need for new equipment in order to raise output. Equipment needs for replacement purposes were estimated on the basis of the rate of depreciation of installed equipment.

It is not always possible to distinguish these two types of demand for equipment, because when an industry is expanding, replacements are made automatically with the increase in productive capacity. It would not be accurate to assume that in countries where there is a great shortage of capital, industrial equipment is renewed when it becomes obsolete, or even that its period of utility is limited to the conventional length of service. The duration of this equipment is quite often indefinite, and replacement funds are diverted to increase productive capacity.

It should also be noted that the dynamics of demand for equipment in consumer industries is entirely different from those of demand for consumer goods. The latter may expand uniformly, while the former remain stable. The rate of the expansion of demand for consumer goods rises sharply so that demand for equipment in these industries will have to increase at an even higher rate during the period of installation of new productive capacity.

On the assumption of moderate development, it was assumed that the largest expansions of productive capacity in consumer industries would take place as from the beginning of 1956, that is to say, after completing the first stage of development in the basic sectors (1953-55). Hence, demand for equipment in a part of these industries would rise

/sharply between

sharply between 1955 and 1956. Table 11 shows that investments in this sector will increase 179 per cent, as compared with an increment of only 5 per cent between 1954 and 1955. This table also contains details of the estimates for equipment needs in consumer industries, the data shown being a combination of the investment coefficients indicated therein and the estimates of output contained in Table 8. For the intermediary period, between 1950 and 1953, an estimate was made of the increment in productive capacity, based on available data.

/Table 11

Table 11: Demand for Equipment by Consumer Industries, on the Assumption of Moderate Development

(millions of pesos at 1950 prices; gross product accruing from manufacturing)

	Coefficient of investment in equipment and installations	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Non-Durable Goods											
Textiles	1.4	7,123	7,319	7,539	8,484	9,429	10374	11319	12264	13206	14151
Foodstuffs	0.8	3,494	3,564	3,635	3,779	3,923	4,067	4,211	4,355	4,498	4,642
Pharmaceutical products	0.4	466	480	496	555	614	673	732	791	848	907
Paper and printing	0.5	867	891	918	1,049	1,180	1,311	1,442	1,573	1,705	1,836
Leather goods	0.3	536	548	560	594	628	662	696	730	764	798
Clothing	0.4	272	279	287	341	395	449	503	557	613	667
Sub-total	0.83	12758	13081	13435	14802	16169	17536	18903	20270	21634	23001
Durable Goods											
Ceramics	0.5	142	146	151	163	175	187	199	211	220	232
Glassware	0.3	113	116	120	131	142	153	164	175	1,185	196
Rubber manufactures	0.6	141	148	155	200	245	290	335	380	423	468
Articles made of wood	0.4	220	227	234	254	274	294	314	334	352	372
Metalware	0.4	528	554	582	696	810	924	1,038	1,152	1,268	1,382
Motor vehicles	0.4	-	-	-	40	40	40	40	40	40	40
Sub-total	0.4	1,144	1,191	1,242	1,484	1,686	1,888	2,090	2,292	2,488	2,690
Others a/	0.8	3,368	3,454	3,539	4,026	4,102	4,150	4,227	4,303	4,380	4,448
Total productive capacity		17270	17726	18216	20312	21957	23574	25220	26865	28502	30139
Increment in productive capacity		409	456	490	2,096	1,645	1,617	1,646	1,645	1,637	1,637
Investments for replacement (2.4% of capacity)		414	425	437	487	527	566	605	645	684	723
Total investments in equipment and installations		823	881	927	2,583	2,172	2,183	2,251	2,290	2,301	2,360
Total investments in equipment (less 10% for installations)		741	793	834	2,325	1,955	1,965	2,026	2,061	2,098	2,124

Source: United Nations Economic Comission for Latin America.

a/ Includes exportable surpluses as well as output to increase operating stocks and non-classified sectors.

/b) Demand for

b) Demand for equipment in capital industries. In this sector, it is necessary to analyse demand for equipment by the mechanical industries themselves and demand from other capital industries.

The former of these will be analysed first. In order to increase their capacity to produce equipment, mechanical industries obviously require additional equipment. It is therefore necessary, from the outset, to establi a hypothesis concerning the future output of these industries in order to estimate the increase required in their productive capacity, and thus determi the demand of plants producing equipment. With a view to solving this difficulty, two simplifications were introduced in the estimates. The first consists in assuming, initially, that total demand for equipment would expand at the same rate as demand for equipment in all sectors, with the exception of such demand as arises in the mechanical industry itself. Thus, having determined demand by consumer industries, and aggregate demand of the activities mentioned under the heading "Other Sectors", a preliminary projection of demand for equipment was made. The second simplification consisted in estimating future domestic output in a residual form, by subtracting imports from total equipment needs as calculated above and assessing imports on the basis of the estimated capacity to import equipment. The latter simplification was discussed fully in Part I, and is one of the basic links in the technique of projection adopted in this study.

In the first place, it is necessary to consider the projection of demand. Demand for equipment in consumer industries would rise from 689 to 2,124 million pesos between 1950 and 1952. During the same period demand by the group consisting of "Other Sectors" would increase from 3,277 to 7,406 million pesos, as is shown below. Total equipment for these two groups of productive activities would therefore expand from 3,986 to 9,530 million pesos, that is to say an increase of 139 per cent. It is necessary to ascertain what part of such demand can be met by imports. In 1950, a total of 1,516 million pesos was spent on imports of equipment. According to the estimate shown in Part I, this figure is likely to rise to 3,181 millions by 1962, that is by 110 per cent. However, since the estimate made was based on the c.i.f. value of imports in 1950, it would be necessary to add 778 millions for imports of services in the year and incorporated in the capital goods. (See Table 12, Chapter I.) The total value of imports in 1962 would, therefore, be equivalent to 3,959 million pesos. The remainder

/will be

will be met by domestic output which would increase in value from 2,450 to 5,571 million pesos, that is, by 127 per cent.

On the basis of this preliminary estimate, equipment needs in the mechanical industry itself were calculated. As was pointed out elsewhere, expansion of the manufacture of equipment must precede that of the industries using such equipment; hence, it was assumed that the above-mentioned increase of 127 per cent would not be obtained until 1956 and that the production of equipment would remain stable after that date. Using this assumption, Table 12 was computed, showing equipment demand in mechanical industries, on the basis of a preliminary approximation of the increase in the capacity of these industries.

There would appear to be no difficulty in assessing needs for equipment required for expansion of other groups of industries producing capital goods, i.e. the manufacture of iron and steel and building materials. However, in view of the highly specialized nature of the equipment used in producing steel and cement and the unreliability of the data available regarding the relation between the product and equipment in these industries, it was found preferable not to mention them in detail for purposes of calculating equipment demand. These industries will therefore be considered together with other sectors of economic activity in the following section.

/Table 12

Table 12 : Estimate of the Demand for Equipment in Mechanical Industries, on the Assumption of Moderate Development

(Millions of pesos at 1950 prices; gross product accruing from manufacturing)

	1950	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Production of equipment for all sectors, excepting mechanical industries	2.450	2.526	3.135	3.744	4.353	4.962	5.571	5.571	5571	5.571	5.571
Installed equipment as per preceding item a/	1.225	1.263	1.568	1.872	2.177	2.481	2.786	2.786	2786	2.786	2.786
Ditto, annual increase b/	77	305	304	305	304	252	-	-	-	-	-
Ditto, depreciation c/	31	31	38	45	52	60	67	67	67	67	67
Total new equipment for mechanical industries	108	336	342	350	356	312	66	66	66	66	66

Source : United Nations Economic Commission for Latin America.

a/ Calculated on the basis of the ratio of product to equipment equivalent to 0.5, obtained for 1948.

b/ It was assumed that the equipment installed in one year was produced during the preceding year.

c/ An annual rate of depreciation of 2.4 per cent was used.

c) Demand for equipment in other sectors. In nearly every sector of economic activity, equipment is required for the productive process. It would be necessary, however, to obtain better data than exist at present in Latin America, to determine the amount and nature of the equipment used in each economic sector and the changes in the type of equipment required to expand productive activity.

In view of the impossibility of analysing each sector seperately, they will be considered together, insofar as demand for equipment is concerned. From Table 10 it may be seen that the value of the total supply of equipment in 1950 was 4,074 million pesos. Subtracting from this amount

/the value

the value of equipment for consumer manufactures (689 millions) and for those producting equipment (108 millions), a total of 3,277 million pesos is left for the remaining sectors. It will be assumed that demand for equipment in these sectors as a whole expands in a measure with the gross investments established in the programme of moderate development. The projection of this demand is shown in Table 13.

d) Total demand for equipment. The table contains an integration of the data discussed in the three preceding items. Total demand for equipment should rise 56 per cent between 1950 and 1953, and 122 per cent between 1950 and 1956. Between the latter year and 1962, it was estimated that the rate of growth would be only 16 per cent, showing that the fundamental sectors of economy would only expand during the first stage.

Table 13 : Projection of Demand for Equipment, on the Assumption of Moderate Development

(millions of pesos at 1950 prices; gross product accruing from manufacturing)

	1950	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Estimated Demand:											
Consumer industries	689	741	793	834	2325	1955	1965	2026	2061	2089	2124
Mechanical industries	108	336	342	350	356	312	67	67	67	67	67
Other sectors of economic activity	3277	4752	5374	5702	5833	5800	6128	6423	6751	7177	7406
Total equipment	4074	5828	6509	6886	8514	8067	8160	8516	8879	9333	9597
Proportion produced by domestic manufacture	2558	2746	3135	3744	4353	4962	5571	5637	5637	5637	5637
Remainder to be imported	1516	3082	3374	3142	4161	3105	2589	2879	3242	3696	3960

Source : United Nations Economic Commission for Latin America.

Iron and steel industry. Probable demand for iron and steel products can be gauged from output estimates, for the period under review, for durable metal consumer goods, all types of equipment and the building industry. However, in order to project iron and steel demand on the basis of these factors, it is essential to ascertain the structure of such demand during the basic period. Table 14 contains an estimate of the composition of demand for iron and steel products in 1951, which was the first year of normal operations at Huachipato. This estimate is based on supply dates and coefficients input of steel per unit of output (value added) taken from the analysis for 1948.

Table 14 : Estimates of the Composition of Demand for Iron and Steel in 1951

	Thousands of metric tons
Manufacture of durable consumer goods	70,0
Manufacture of all types of equipment	60,0
Building	33,0
Pipes	19,3
Tinplate	13,5
Others	10,4
Total	206,2

Sources : Dirección General de Estadística de Chile and the Economic Commission for Latin America.

The projection of demand for iron and steel products, required for the manufacture of durable consumer goods was based on the data shown in Table 8. It was assumed that the ratio of steel insumption to value added by the manufacturing process would remain constant. This assumption may be set aside when the actual structure of industries producing durable metal consumer goods is known, together with the probable changes of that structure.

Demand for iron and steel products by equipment manufacturers is based on the projection of domestic output of all types of equipment, shown in Table 13. In this case, also, the estimates were calculated on the assumption of a constant ratio of steel insumption to value added.

/The projection

The projection of iron and steel demand for building depends on the assumption of an expansion in the built-up area, which will be discussed below and which is assumed to be 2.85 per cent annually. It was assumed that the residual group, designated by "Others", would expand proportionately with the three groups indicated above. A projection of demand for each of these groups and for total demand is shown in Table 15.

Table 15 : Projection of Iron and Steel Demand, on the Assumption of Moderate Development

(In thousands of metric tons of rolled steel products)

	1951	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Manufacture of durable consumer goods	70	77	81	85	108	125	141	158	174	191	208
Manufacture of capital goods	60	63	76	89	103	116	129	129	129	129	129
Building, including pipes	53	58	59	61	63	65	66	68	70	72	74
Others, including tinplate	24	26	33	40	50	53	55	58	60	62	65
Total	207	224	249	275	324	359	391	413	433	454	476

Source : Dirección General de Estadística de Chile and Economic Commission for Latin America.

Cement industry. Demand for cement in 1950 amounted to almost 500,000 tons of which about 200,000 are used in building. Between 1950 and 1952, demand for cement for building purposes remained fairly stable, but the amount of cement used in public works expanded remarkably, rising from 31,000 to 115,000 tons for roadbuilding alone.

The projection of demand for cement shown in Table 16 was calculated by the following procedure. The rate of 2.85 per cent of annual expansion referred to above was used in the case of residential building. In order to attain the objectives discussed in Chapter VII with reference to roads and bridges, it would be sufficient to maintain demand on its 1952 level. Lastly, the remaining demand for cement, composed principally of building and repairing ports, floating docks, irrigation works, aerodromes, urban paving, etc., was assumed to expand at the same rate as aggregate gross

/investments in the

investments in the economy as a whole. It was assumed that it would be substituted by a more precise calculation when fuller information becomes available regarding the structure of demand for cement.

Table 16 : Projection of Cement Demand, on the Assumption of Moderate Development

(In thousands of metric tons)

	1950	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Building	200	218	224	230	237	244	250	258	265	272	280
Roads and bridges	31	115	115	115	115	115	115	115	115	115	115
Others	269	381	400	420	441	463	486	510	536	563	591
Total	500	714	739	765	793	802	851	883	916	950	986

Sources : Dirección General de Estadística de Chile and Economic Commission for Latin America.

Other building materials. This group includes timber in building, plateglass, bricks, doors and windows, sanitary ware, paints and all the other products used in building houses or public works and incorporated therein. As a preliminary approximation, it may be assumed that the gross product of the manufacturing activities would expand at the same annual rate as building. Table 17 shows the projection of demand for other building materials.

Projection of total demand for capital goods. Table 17 contains the projection of total demand for capital goods, based on the data contained in the preceding items.

/Table 17

Table 17: Projection of Demand for Capital Goods on the Assumption of Moderate Development

(in millions of pesos at 1950 prices; gross product accruing from manufacturing)

	1950	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Mechanical industries	4074	5828	6509	6886	8514	8120	8160	8516	8879	9333	9597
Iron and steel industries a/	1356	1831	2034	2254	2661	2932	3204	3390	3543	3712	3899
Cement industry	621	887	918	950	987	996	1057	1097	1138	1180	1225
Manufacture of other building materials	1383	1505	1547	1592	1637	1648	1732	1781	1832	1884	1937
Total	7334	10051	11008	11682	13799	13696	14153	14784	15392	16109	16658

Source: United Nations Economic Commission for Latin America.

a/ The projections of demand for iron and steel products were based on 1951 data, when consumption was 25 per cent higher than in 1950.

The Production of Capital Goods

Having determined the probable consumption of capital goods, it is necessary to indicate, sector by sector, the proportion of such demand which can be met by domestic output. The different groups of industries will be studied in the same order as in the above section.

Mechanical industries. In projecting demand for equipment and in order to facilitate the calculations, an estimate was included of probable imports in this sector. The volume of demand which can be supplied by domestic output was therefore determined by subtraction and is shown in Table 13.

Iron and steel industry. Given the high degree of concentration which is characteristic of the iron and steel industry, the possibilities of expanding output cannot be determined unless sufficient information is available regarding operating conditions in the industry and the country's essential raw material resources. Fortunately, during the past few years, adequate data have been collected regarding Chile's iron and steel industry and the possibilities for its expansion. The information will be used in this document, but it is not proposed to go beyond the mere description of the problem arising from the need to expand the industry. Should such expansion not take place, general development, along the lines suggested in the present text, would be greatly hampered.

/Production of

Production of steel ingots in 1953 may reach a total of 300,000 tons with existing installations. Considerable progress has been made on a plan of expansion aimed to make full use of the blast furnace capacity, which appears to be 20 per cent higher than was originally anticipated. Total output from this blast furnace may reach 300,000 tons annually, so that at Huachipato 365,000 tons of ingots could be obtained, providing the existing blast furnace works at full capacity. Taking into account the small volume of the output from Corral, the total may be expected to reach 390,000 tons of ingots, by the end of the present stage.

Two assumptions will be considered in regard to future steel output. In the first instance, it will be assumed that full employment of the blast furnace capacity occurs in 1956 and that the manufacture of ingots will be maintained at a level of 390,000 tons. The second hypothesis envisages the possibility of installing a new blast furnace, as well as supplementary coke, steel and rolling installations at Huachipato. The second blast furnace would begin operations in 1956, raising the level of output by successive stages, with a view to substitute net steel imports as from 1958. As may be seen in Table 18, in the first hypothesis, imports of iron and steel products during the ten years under review would equal 770,000 tons of ingots. With the other hypothesis, exports which are already being made would tend to compensate net imports. In this case, the possibility of obtaining net exports might also be considered, making greater use of the second blast furnace immediately after its installation. However, this was not included in the assumption of moderate development.

/Table 18

Table 18: Hypothetical Production Goals for the Iron and Steel Industry

(in thousands of metric tons of steel ingots)

	1951	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
With one blast furnace a/	200	300	340	390	390	390	390	390	390	390	390
With two blast furnaces a/	200	300	340	390	390	440	489	516	541	568	595
Projected demand b/	259	280	311	344	405	449	489	516	541	568	595
Net imports c/											
1st hypothesis		-20	-29	-46	15	79	103	130	155	181	209
2nd hypothesis		-20	-29	-46	15	9	-	-	-	-	-

Source: United Nations Economic Commission for Latin America.

a/ Includes 20,000 tons of iron from the Corral blast furnace.

b/ The difference between these data and those contained in Table 15 is due to the conversion, into terms of steel ingots, by using a factor equivalent to 1.25, of the rolled products shown in the latter table.

c/ For purposes of simplifying the calculation, it was assumed that one ton of imported steel was equivalent to one ton of exported steel.

Cement industry. The cement industry has at present a wide margin of idle capacity, and it was assumed that with small investments, output could reach a total of 900,000 tons annually. This industry is therefore in a position to meet domestic demand projected on the assumption of moderate development and to export a part of its output, if conditions are favourable within the next five or six years. At all events, given the uncertainty regarding these exports, domestic output will be made to coincide with domestic demand.

Other building materials. In this residual group in 1950, imports provided 6.5 per cent of total supplies. These imports were composed partly of goods required for roadbuilding, consisting mainly of asphalt. Given the existence of a surplus productive capacity in the cement industry, it was assumed that the use of imported asphalt would be reduced and that the imports included in this item would disappear. In this case, total output of the industries comprised in this item should equal projected demand as shown in Table 16.

Total output of industries producing capital goods. Table 19 shows the output data obtained from the integration of the four groups of industries manufacturing capital goods, as described in the preceding sections. The estimate, as in the preceding case, is based on consumer industries, assuming

/constant relative

constant relative prices within each group and as between the different groups. It should be pointed out that there would be no difficulty in setting aside this assumption of constant relative prices. However, any improvement in productivity would be thus restricted to the industry itself and would not exercise any influence on prices.

Table 19: Estimates of Output in Industries Manufacturing Capital Goods on the Assumption of Moderate Development

(in millions of pesos at 1950 prices; gross product accruing from manufacturing)

	1950	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Mechanical industries	2558	2746	3324	3902	4480	5058	5638	5638	5638	5638	5638
Iron and steel industries	700	2100	2380	2730	2730	3080	3430	3612	3780	3976	4172
Cement industry	621	887	918	950	987	996	1057	1097	1138	1180	1225
Manufacturing of other building materials	1293	1505	1547	1592	1637	1684	1732	1781	1832	1884	1937
Total	5172	7238	8169	9174	9834	10818	11857	12128	12388	12678	12972
Output to increase operating stocks		170	233	251	278	246	259	68	65	73	74
Grand total		7408	8402	9425	10112	11064	12116	12196	12453	12751	13046

Source: United Nations Economic Commission for Latin America.

An increase of production to meet the requirements of the industries themselves was estimated on the basis of data available for 1948. The value of operating stocks for all industries producing capital goods in 1948 was equivalent to 25 per cent of the net output of these industries. It was believed that this ratio would not change during the period under consideration.

4. Investments

In the preceding section, the increment to industrial output compatible with the assumption of moderate development in Chilean economy was estimated. An attempt will now be made to estimate the volume of investment required to obtain that increment.

The increase of industrial output may be obtained by better

/utilization

utilization of installed productive capacity, or by means of an expansion of that capacity.

As regards better utilization of existing capacity, it should be remembered that in countries like Chile, where labour is cheap in relation to equipment, the productive capacity of machinery is generally intensely employed. This intensive employment of equipment is largely the result of low labour productivity. In the study of that productivity, in the Chilean textile industry, referred to above, it is stated that "the most important reason for the employment of a superfluous number of workers is the production policy followed by some Chilean mills, whereby the greatest possible output must be obtained from the machinery,.....The results of this policy are evident, not only in the indices showing the excess of labour, but also in those regarding the increase of production above the level considered normal"[1/]. There is reason to believe that this position is general, since the causes of the phenomenon - low labour costs in relation to equipment - are not peculiar to the textile industry alone.

However, this does not imply that equipment is being particularly well utilized in all industries. Occasionally, productive capacity is inappropriately utilized because of the size of the productive unit and at other times, owing to the lack of skilled labour, or again for reasons beyond the scope of the industry itself, such as deficient power or transport services.

Possibly by raising the real per capita income to the extent foreseen in the present study, less extensive employment of the labour factor might result. However, any general forecast on this subject is of very little value.

The lack of concrete studies on individual branches of industry leads to the assumption that the intensity of employment and equipment will not change to any great degree during the next few years. Another means of increasing output consists in raising the capacity of installed equipment, either by expanding existing plants or by building new ones. In this case it would be necessary to estimate investment needs for the increment to productive capacity in each concrete case. Thus, the level of individual projects will be reached. That is where technological problems are of great importance. However, it is essential, at this initial stage

1/ Labour Productivity of the Cotton Textile Industry in Five Latin-American Countries, (United Nations, Department of Economic Affairs, New York, 1951), page 51.

of programme formulation, to have some estimate of the magnitude of the investments required for the expansion projec ted in manufacturing. Such an indication was obtained, based on a series of investment coefficients - the ratio of real investments to the net product - calculated on the basis of 1948 data. Real investment included the value of machines and installations, furniture and appliances, manufactured products, raw materials and real estate, assuming that manufactured products and existing raw materials in the factories at the close of the financial year formed a part of the normal operating capital, that is, that there was no forced or speculative accumulation of inventories. The value of land was not excluded from real estate, owing to the inadequacy of the data available.

For consumer industries as a whole, the reinvestment coefficient was found to be 2.3, that is, for each unit value added by these industries in 1948 there were 2.3 equivalent units of real capital. The manufacture of capital goods shows a coefficient of 2.4, but there is a substantial difference between mechanical industries and the manufactured iron and steel. These coefficients cannot be considered as strictly technological, since they are influenced by transient deficiencies of the market. Since corrections could not be made for each item, it was assumed that these figures reflect the technological ratio.

Tables 20 and 21 contain data concerning investments required by consumer and capital industries, on the assumption of moderate development. The information shown in these tables was obtained from output estimates established in the two preceding sections and the investment coefficients specified for each group of industries in these tables.

/Table 20

Table 20 Estimates of Investments to be Placed in Consumer Goods in the Hypothesis of Moderate Growth

(in millions of pesos at 1950 prices)

Manufacturing activities (value of real assets)	Coefficient of investment	1953	1954	1955	1956
Non durable goods					
Textiles	3.1	15,770	16,204	16,690	18,782
Foodstuffs	2.5	12,480	12,730	12,985	13,498
Pharmaceutical products	2.0	2,331	2,401	2,479	2,773
Paper and printing	1.6	2,427	2,494	2,569	2,937
Leather goods	1.4	2,501	2,557	2,615	2,773
Clothing	2.4	1,626	1,671	1,721	2,047
Sub total	2.4	37,135	38,057	39,059	42,810
Durable goods					
Ceramics	1.6	458	472	487	523
Glassware	1.9	709	730	754	823
Rubber manufactures	2.4	567	595	625	803
Articles made of wood	2.0	1,098	1,131	1,168	1,267
Metalware	1.9	2,510	2,636	2,768	3,311
Motor vehicles		-	-	-	188
Sub total	1.9	5,342	5,564	5,802	6,915
Unspecified a/	2.3	9,720	9,998	9,735	9,954
Total	2.3	52,208	53,601	55,088	61,399
Investment					
Increment in the productive capacity		1,393	1,487	6,311	4,898
Replacements (2.4 per cent annually)		1,253	1,286	1,322	1,474
Total		2,646	2,773	7,633	6,372

Continuation:

Manufacturing activities (value of real assets)	1957	1958	1959	1960	1961	1962
Non durable goods						
Textiles	20,874	22,966	25,058	27,150	29,243	31,335
Foodstuffs	14,011	14,524	15,037	15,550	16,065	16,578
Pharmaceutical products	3,067	3,361	3,655	3,949	4,242	4,536
Paper and printing	3,305	3,673	4,041	4,409	4,774	5,142
Leather goods	2,931	3,089	3,247	3,405	3,565	3,723
Clothing	2,373	2,699	3,025	3,351	3,675	4,001
Sub total	46,561	50,312	54,063	57,814	61,564	65,315
Durable goods						
Ceramics	559	595	631	667	706	742
Glassware	892	961	1,030	1,099	1,170	1,239
Rubber manufactures	981	1,159	1,337	1,515	1,694	1,872
Articles made of wood	1,366	1,465	1,564	1,663	1,761	1,860
Metalware	3,854	4,397	4,940	5,483	6,023	6,566
Motor vehicles	188	188	188	188	188	188
Total	7,840	8,765	9,690	10,615	11,542	12,467
Unspecified a/	10,173	10,390	10,603	10,793	10,984	11,173
Total	66,297	71,109	76,001	80,267	85,739	90,595
Investment						
Increment in the productive capacity	4,812	4,892	4,266	5,472	4,856	
Replacem.(2.4 % annually	1,591	1,707	1,824	1,926	2,058	
Total	6,403	6,599	6,090	7,398	6,914	

Source: United Nations Economic Commission for Latin America.

a/ Includes output for export purposes and a corresponding surcharge of 34 per cent of the annual increment to production with a view to the accumulation of [illegible]

An estimate of investment needs of the type shown in this section should not be used unless its limitations are recognized. This estimate is based on a fixed output capital ratio, that is, on the assumption of there being no technological improvements which would tend to raise that ratio. A study such as this should be completed by specialized research on the principal groups of industries. The need for such supplementary studies becomes more urgent when capital industries are analysed, since in this case there are fewer groups but concentration within the groups is greater. Working with investment coefficients when the group to be considered contains a single productive unit implies that the industry will have to expand by creating units similar to the original one and that the conditions under which the new plants would operate would also be similar to those prevailing for the original one.

Let us consider the case of the iron and steel industry. The data available for 1948 show a technological coefficient of real investment of 1.8. However, the Chilean iron and steel industry was radically transformed after 1950 when Huachipato began production. On the other hand, it should also be remembered that this plant is not yet operating at full capacity, so that it is impossible to establish the precise ratio of real investments to value added. This difficulty becomes even more serious when it is remembered that in a plant of the size of Huachipato, optimum efficiency cannot be reached prior to the solution of a series of problems which appear during the first years of operation.

/Table 21

Table 21 Estimate of Investments to be Made in Capital Industries on the Assumption of Moderate Development

(in millions of pesos at 1950 prices)

Industries (Value of real assets)	Coefficient of investments	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Mechanical	1.5	4,119	4,986	5,853	5,720	7,587	8,457	8,457	8,457	8,457	8,457
Iron and steel	3.5	17,350	18,330	19,555	9,555	10,780	12,005	12,642	13,230	13,916	14,602
Cement	2.1	1,863	1,928	1,995	2,073	2,092	2,220	2,304	2,390	2,478	2,573
Other building materials	2.8	4,214	4,332	4,458	4,584	4,715	4,850	4,987	5,130	5,275	5,424
Total a/	2.4	17,546	19,576	21,861	23,599	25,784	28,154	28,553	29,363	30,301	31,234
Investments											
Expansion of capacity		2,030	2,285	1,738	2,165	2,390	399	810	938	933	
Replacements (2 per cent)		351	392	437	472	515	563	571	587	606	
Total		2,381	2,677	2,175	2,637	2,905	962	1,381	1,525	1,539	

Source: United Nations Economic Commission for Latin America.

a/ Includes an increase corresponding to 25 per cent of the annual increment to output for the accumulation of operating stocks.

Taking into account these characteristic features of the actual phase of transition in Chile's iron and steel industry, certain simplifications were introduced into the analysis. In the first place, the group of iron and steel industries was assumed to include only pig iron, that is to say, the output of Huachipato and Corral. Plants using scrap and the independent rolling mills in the country were grouped together with mechanical industries.

/Secondly,

Secondly, taking into account the fact that the expansion of the iron and steel industry will be effected by the addition of integrated units, it was decided to limit the use of data to those referring to Huachipato when calculating the investment coefficient. The method of calculation was as follows: real investments in the plant were estimated on the basis of data contained in the report of the Compañía de Acero del Pacífico for 1951, that is to say, 80 million dollars or 5,600 million pesos at 1950 prices converted at an exchange rate of 70. The plans at present being carried out should raise total real investments to 1,000 million pesos approximately, according to the data published in that same report. There would therefore be a total investment of 6,600 million pesos. When the output of ingots reaches 300,000 tons - which it is believed would not require further investment - the net value of total output should be 2,100 million pesos at 1950 prices, in accordance with average selling prices in 1951. Under the circumstances, the coefficient of real investments would be 3.1. However, for purposes of calculation, a reduction of 10 per cent was estimated in selling prices, in relation to the 1951 level, so that the coefficient was raised to 3.5.

A totally different problem arised in connection with the cement industry, that of the existence of a surplus productive capacity. In order to calculate the investment coefficient, it was necessary to assume a theoretical position of full employment of the installed capacity.

Data referring to the total investments in manufacturing are shown in Table 22, based on the hypothesis of moderate development. For purposes of calculation, it was assumed that any investment made in the course of one year involved an increase in output, for the following year, so that the investment to be made in 1962 were not computed.

Net total investments for the period 1953-61 show a total of 52,075 million pesos at 1950 prices, raising the value of real investment in manufacture in 1962 to 116,370 millions. Comparing this total with the estimated amount for 1950, 58,448 millions[1/], it will be seen that there

1/ This figure was obtained by multiplying the output of the different manufacturing industries in 1950 by the investment coefficients obtained for 1948. The difference between this figure and the value of reproducible assets of the industry, shown elsewhere, stems from the fact that in this case only the proportion of real assets used in manufacturing output itself were computed.

/is an increase

is an increase of 100 per cent in relation to 1950. The output-capital ratio would therefore be equal, since the increase foreseen for manufacturing output during the period, was equivalent to 101 per cent. This stability of the output-capital ratio can be partly explained by the fact that the estimates are based on fixed investment coefficients. However, it is also due to the fact that no radical changes are expected in the structure of manufacturing output.

Table 22: Investments to be Made in Manufacturing Industries, on the Assumption of Moderate Development

(in millions of pesos at 1950 prices)

	1953	1954	1955	1956	1957	1958	1959	1960	1961	Accumulated total
Manufacture of Consumer Goods:										
Net investments	1393	1487	6311	4898	4812	4892	4266	5472	4856	38387
Replacements	1253	1286	1322	1474	1591	1707	1824	1926	2058	14441
Gross investments	2646	2773	7633	6372	6403	6599	6090	7398	6914	52828
Manufacture of Capital Goods:										
Net investments	2030	2285	1738	2165	2390	399	810	938	933	13688
Replacements	351	392	437	472	515	563	571	587	606	4494
Gross investments	2381	2677	2175	2637	2905	962	1381	1525	1539	18182
Total net investments	3425	3772	8049	7063	7202	5291	5076	6410	5789	52075
Total gross investments	5027	5450	9808	9009	9308	7561	7471	8923	8453	71010

Source: United Nations Economic Commission for Latin America.

CHAPTER V. THE BUILDING INDUSTRY

1. Projection of Demand

From the specific standpoint of economic development, investments in residential building are similar to investments in consumer goods industries. There is a fundamental incompatibility between a rapid increase in these industries, and the intensified rate of growth occurring in the initial stages of a development programme. Unless investments are made in steel, cement, wood and other building material industries, or in export industries enabling a country to raise the level of imports of these materials, building can only be increased by reducing consumption or investments in other sectors. However, having decided between accelerating the general rate of development, or making an immediate improvement in consumption, it becomes necessary to consider the volume of resources which could be appropriately diverted to residential building. The higher the level of this diversion, the smaller the proportion of resources that will remain available to improve other branches of consumption. For reasons which will be explained below, it is not possible to forecast demand for housing by the same methods used in earlier chapters to project the demand for other types of products.

The demand for residential housing is determined mainly by expansion of the urban population and by an increase of real wages. However, the second factor is of little importance in countries such as Chile where the level of real wages is very low. New homes are built for middle- and upper-income groups, with a view to providing an investment income. This housing is not accessible to the mass of the population. If capital is invested in houses meeting minimum living requirements, the average rental return in the funds so utilized would far exceed the purchasing power of most of the population. Thus, projections of available goods and services for consumption, or of average real wages, cannot be used in projecting future demand for new housing facilities.

These projections should first be based on an analysis of present housing conditions, and secondly on a study of the social welfare which governments may be expected to adopt.

/The analysis

The analysis of current housing conditions would show whether the population lives in better or worse conditions than might be estimated from the average level and distribution of real income. Unfortunately, the results of the Housing Census carried out in 1952 are unavailable, and without them it is practically impossible to obtain an accurate idea of the present housing situation in Chile. In recent years, it has generally been said that housing conditions have deteriorated because of intensified urbanization. However, such statements are based on precarious estimates still to be confirmed by the Census returns.

If it is ascertained that housing conditions are definitely below expectations, given the level and distribution of per capita income, the causes of such a situation could then be examined. They may lie in the system of credit management, in the organization of the building industry, or in national conditions affecting the resources of those industries producing building materials. A study of these and other problems is essential in formulating a housing policy.

Since it is impossible at present to ascertain current housing conditions, it was assumed that on the basis of moderate development, residential building would develop in proportion to the urban population, namely, at a rate twice as high as the total growth of the country's population. This would prevent any further increase in the deficit said to exist in urban areas, and at the same time it would raise the per capita housing area for the country as a whole by 18 per cent. In order to attain this objective, it would be necessary for the total housing area in the country to expand 40 per cent between 1950 and 1962.

It remains to be seen whether the year 1950 is an adequate basis on which to project building activity. Owing to sharp yearly fluctuations in this activity it is quite probable that an increment of 40 per cent above the 1950 level must likely lead to the required expansion to a greater or lesser degree in the total stock of residential housing. In fact, 720,000 square metres of housing were built in 1950. This corresponded to an increase of 12 per cent over the preceding year, even though it was below the 1946 level.

In order to determine whether 1950 adequately represented the preceding decade, the annual rate of building was assumed to be 2.85 per cent, so as to

/obtain an

obtain an increase of 40 per cent in building during the period 1950-1962. Thus, the total housing area to be built between 1953 and 1962 (the period covered by the investment estimate) would be 8,911 million square metres. Comparing this total with that of the built-up area between 1941 and 1950 (6,375 million square metres), an increment of 40 per cent resulted thereby indicating that 1950 was representative of the preceding decade.

Non-residential building constitutes an integral part of fixed capital in various productive sectors when assessing the necessary investments for expansion and replacement in each of these sectors, the proportion corresponding to building was included. However, it is necessary to have an idea of aggregate building demand so as to compute demand for different building materials, as was seen in studying the manufacture of capital goods.

Non-residential building in Chile during the past ten years accounted for 34 per cent of the total amount of buildings completed. Fluctuations in this ratio were slight, possibly because commercial building, representing a high percentage of other building, is closely related to the development of urban residential areas.

Estimates of non-residential building can be prepared fairly easily, providing the present composition of this group can be determined. Unfortunately, the only data available indicate that during the past ten years the remaining group has consisted of 67 per cent of commercial and industrial buildings, 28 per cent of public buildings and 5 per cent other types. With the exception of industrial buildings, all these tend to maintain the same rate of expansion as that of the urban areas. Industrial building would tend to expand at a higher rate, if the forecast for expansion in the industrial area materializes. However, this type will probably not account for more than one tenth of total building activity. Even assuming that this sector were to expand proportionately with investment in industry, which implies assigning it a 10 per cent share of the aggregate, the total net increment would only be 5 per cent. Withal, since the probable expansion of this remaining group cannot be estimated item by item, it will be assumed that non-residential building continues to maintain the same share of the total as it did during the past ten years. On the basis of these estimates, the following table was drawn up:

/Table 1:

Table 1: Production of the Building Industry on the Assumption of Moderate Development

	Total for the period 1941-50	1950	1953	1962	Total for the period 1953-62
Housing	6,375	720	783	1,008	8,911
Other buildings	3,236	270	403	519	4,597
Total	9,611	990	1,186	1,527	13,508

Sources: Dirección General de Estadística de Chile and United Nations Economic Commission for Latin America.

2. Investments

In computing investments required for the growth of activities in manufacturing, agriculture and other economic sectors, as well as those for new equipment and the increase of operating stocks, account was also taken of investments for the expansion and maintenance of buildings, since they constitute an integral part of the productive system. Therefore, from the investment standpoint, only the housing sector remains to be considered.

From Table 1, it will be seen that 73 per cent of the built-up area in 1950 was used for housing purposes. Since investments in building, according to national income estimates, rose to a total of 2,400 million pesos in that year, housing must have accounted for approximately 1,752 millions. If the rate of investment in housing rises in the same proportion as the expansion of the built-up area (2.85 per cent annually), by 1962 it should reach a total of 2,454 million pesos at 1950 prices and for the period 1953-1962 will represent a total of 21,696 million pesos. Throughout the period 1951-1962, the total value of building should be 25,351 million pesos at 1950 prices.

Another method of calculating investments required for housing consists in using the total value of urban property, namely, 48.1 thousand million pesos at 1950 prices, as the basis. Assuming an increase of 40 per cent by 1962, it will be found that by that year investments in housing will amount to 67.3 thousand millions, that is to say, a net investment of 19.2 thousand millions. If 1 per cent of the total amount of housing is replaced annually, investment for maintenance and depreciation would amount to 6,924 millions over the period 1951-1962, thereby raising gross investments to 26,124 millions. This total

/shows a

shows a difference of only 3 per cent in relation to the 25,351 millions obtained by the other method of calculation.

The relation between gross investments and replacement investments will be retained from the second estimate. On the basis of this relation and the data obtained from the first estimate, Table 2 was drawn up:

Table 2: Estimate of Investments in Housing on the Assumption of Moderate Development

(in millions of pesos at 1950 prices)

	1950	1953	1962	Total for the period 1953-62
Net investments	1,288	1,401	1,804	15,947
Maintenance and depreciation	464	505	650	5,749
Gross investments	1,752	1,906	2,454	21,696

Source: United Nations Economic Commission for Latin America.

CHAPTER VI ENERGY

1. INTRODUCTION

Close correlations have recently been established in different studies between energy consumption and the degree of economic development. In one of these[1/] it was estimated that in under-developed areas, per capita consumption of the energy equivalent coal was less than 1.5 metric tons. According to this same source, average consumption in Latin America reached 0.8 metric tons; Cuba led this group of countries with 1.39 metric tons, while minima were recorded for Ecuador and Bolivia, each of which averaged only 0.33 metric tons.

The main interest of these ratios lies undoubtedly in the differences shown in the course of development. As may be seen from Chart 1, the coefficients of income-elasticity[2/] of the demand for energy declined as income increased, although they always remained above unity. Estimates computed from the regression lines[3/] of total energy to income (curve A) indicate that when per capita income was less than 200 dollars, the coefficient was 1.26, dropping to 1.05 for incomes ranging between 400 and 800 dollars, and to 1.02 for incomes above 1,000 dollars.

However, even greater importance is attached to the relationship between income and energy supplied by commercial sources, that is electricity, petroleum and coal, which receive the highest proportion of investments in energy. Regression line (B)[4/] indicates a scale of elasticity not only greater than the one for total energy, but which also shows a sharper relative decrease. Coefficients computed from line (B) confirm this statement; in fact, they reach 6.33 for incomes of less than 200 dollars and drop to 1.46 for the intermediary incomes and to 1.15 for those above 1,000 dollars.

The high elasticity of commercial sources of energy at low consumption levels is explained by the substitution of non-commercial sources when income increases.

1/ United Nations: World Energy Supplies in Selected Years, 1929-50.

2/ In this case, the work was based on the Gross National Product.

3/ The basic equation is: $Y = -8.7 + 0.39086\ X$.

4/ The basic equation is: $Y = -52.5 + 0.417\ X$.

/income increases.

income increases.

As shown by the chart, the economic development of the selected countries is based fundamentally on consumption of these commercial types of energy. It would be redundant to discuss the technological factors which determine this state of affairs. However, it should be observed that in many Latin-American countries, substitution of non-commercial sources (particularly fuel-wood) might not prove convenient since, in contrast with conditions in the United States and Europe, tropical forests can be renewed within relatively short periods using land which in many cases is unsuitable for agriculture. The fuel-wood thus obtained can be transformed into electricity or burned by locomotives or by the iron and steel industry.

But even if such uses could become generalized, the elasticity coefficients would only fluctuate to a small extent, inasmuch as it is evident that the remaining energy resources, with the exception of petroleum, have only been used on a small scale in Latin America. This is particularly true in the mountainous countries on the Pacific seaboard, where potential hydro-power capacity equals or exceeds total visible reserves of the remaining sources,[1/] which in some cases are located in the neighbourhood of extensive forests.

In connexion with the downward trend of the elasticity coefficients, changes which take place in the use of energy for home purposes and street lighting should also be stressed. The income-elasticity for both is very high in the underdeveloped countries where, generally speaking, only basic needs are supplied. A large number of small and medium size towns, for instance, have no public lighting. In countries with high income levels, elasticity is perhaps lower than unity, since, broadly speaking, these uses have been almost entirely covered. As they usually represent about one third of the total demand for energy, its coefficients are sufficiently great to produce the above-mentioned trend. However, this discussion, and the coefficients which have been computed, are only of a general value because domestic factors give rise to pronounced differences between the several countries.

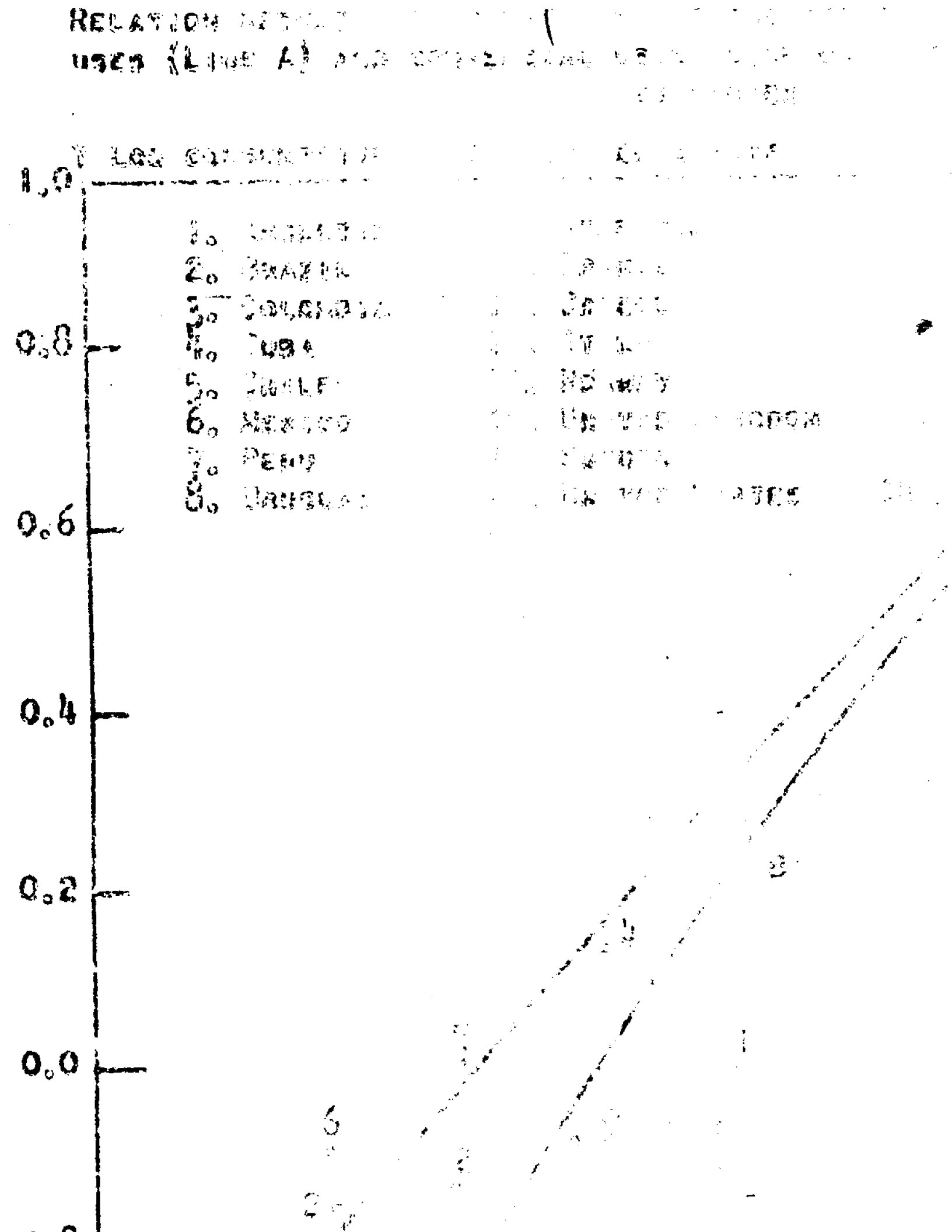
The relative proportion of the different sectors determines the

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1/ United States Department of State: Energy Resources of the World

/final volume

RELATION
USED (LINE A)



final volume of energy consumption. It is believed that any forecast of future consumption should take into account individual demand of the different sectors. Likewise, it should be remembered that extrapolation, on the basis of historical series of consumption of commercial sources, is likely to lead to appreciable errors due to the declining trend of the income-elasticity coefficients. Hence it was decided to adopt the method of projections by sectors, when estimating energy demand in Chile.

These projections, in a hypothesis of moderate development, show an annual rate of expansion of 6.7 per cent for total demand and 7.7 per cent for commercial sources of energy. These rates have higher coefficients than those of the aforementioned relations, owing to the fact that, in these calculations, the consumption of energy for export mining was eliminated, as was seen when the necessary adjustments were made.

Annual rates of expansion of 8.8 per cent for the demand for electricity[1/] and 8.6 per cent for liquid products obtained from petroleum were assumed. The estimates made by Empresa Nacional de Electricidad (ENDESA) and Empresa Nacional de Petróleo (ENAP), show annual rates of 7.7 and 6 per cent respectively. The differences arise from the use of historical trends by these organizations, whereas in the present report the rates shown indicate energy needs corresponding to a period in which economic development is more intensive than the one experienced recently by Chile.

The estimates for energy consumption in different sectors are found below:

1/ For public utility services.

/Table 1

Table 1 Projection of Net Demand for Energy by Types and Sectors [a/] Corresponding to the Hypothesis of Moderate Development (millions of kilowatt-hours)

	Manufacturing activities		Agriculture		Transport [b/]		Coal Mining		Residential [c/]		Others		Total		Rate of growth	
	1950	1962	50	62	1950	1962	1950	1962	1950	1962	1950	1962	1950	1962	1940/50	1950/62
Electricity [d/]	482	1,350	5	30	175	450	50	120	590	1,620			1,302	3,570	6.6 [e/]	8.8
Coal	668 [f/]	2,100 [f/]	-	-	665	910	281	300	196	276	50	50	1,860	3,636	-0.1 [g/]	5.8
Petroleum Sub-prod.													1,100	2,956		8.6
Oils [h/]	104	290	32	95	160	400	-	-	6	6			302	791	3.4	8.4
Kerosene	-	-	50	136	-	-	-	-	108	120			158	256	18.8	4.1
Petrol	-	-	4	29	636	1,880	-	-	-	-			640	1,909	11.8	9.5
Gas	10	150	-	-	-	-	-	-	143	470	-	-	153	620	3.7	12.4
Others [i/]	206	232	-	-	-	-	-	-	500	300	100	100	806	632	-	-
Total	1,470	4,122	91	290	1,636	3,640	331	420	1,543	2,792	150	150	5,221	11,414		6.7
Rate of Growth			9.0	10.1		6.9		2.0		5.1		0.0		6.7		

a/ Excluding copper and nitrate mining.
b/ Including private railways but excluding purchases abroad of Chilean vessels.
c/ Including public and commercial lighting.
d/ Refers to public services, thermic and hydroelectric.
e/ 1940-49. Power generated according to ENDESA's report, Power Requirements, 1950-60.
f/ Including coke.
g/ Excluding consumption by producers of gas and electricity.
h/ Diesel and fuel oil.
i/ Principally fire-wood.

Note: It was assumed that the equivalent of 1 kwh was 1 kilogramme of coal; 0.8 kilogramme of coke; 0.6 kilogramme of petroleum; 0.4 litre of kerosene or petrol; 1 cubic metre of manufactured gas and 0.4 cubic metres of refinery gas.

/2.Agriculture

2. Agriculture

According to the estimates of farm mechanization which appear in Chapter III, the 1950 number of power equipment in Chile would be tripled by 1962, although there are individual rates of increase for the different types of machinery.

After determining the rate of increase in the number of the different types of agricultural machinery, a fairly accurate estimate could be made of derived demand for energy if studies were available on the degree of utilization of such equipment. However, this has only been done in respect of tractors, so that for the remaining mechanical elements it was necessary to rely on estimates made by ENDESA, contained in a report on rural electrification co-operatives.[1/] Certain adjustments were made to compensate probable alterations of individual capacity. However, as a general rule, it was assumed that the number of hours per machine would remain constant.

Table 2 Projection of Demand for Energy in Agriculture, on the Assumption of Moderate Development

(millions of kilowatt-hours)

	1950	1962	Percentual increase
Electricity	5	30	500
Kerosene	50	136	172
Diesel Oil	32	95	197
Gasoline	4	29	625
	91	290	219

Source: United Nations Economic Commission for Latin America.

3. Manufacturing

In industrial processes, energy may be rated as a raw material, since at a given technical level the coefficient of input per unit of output does not vary. This fact allows for accurate projection of industrial demand simply by subdividing manufacturing into homogeneous groups whose individual coefficients are known. Multiplying consumption by each of these groups by their hypothetical goals of production the individual demands for the projected year can be obtained and these, added together,

1/ ENDESA: Electricidad en el campo (Santiago, 1951).

/will give

will give total demand for manufacturing activities as a whole.

This procedure was followed in the present report. In the first place, a special research was undertaken in the Industries Section of the Dirección General de Estadística, in order to determine average 1948 electricity and fuel consumption in the main manufacturing groups. The results, converted to 1950, are shown in Table 3. Following the outlined method, total demand for 1962 was obtained by multiplying 1950 groups by the respective output projections and aggregating the resultant demand forecasts.

As may be seen from Table 4 (containing details of the estimates), it is to be expected that industrial demand for energy in the hypothesis of moderate development, will increase by 241 per cent between 1950 and 1962. The highest proportion of this demand will arise from the requirements for the production of capital goods, and particularly from the iron, steel and mechanical industries. The manufacture of consumer goods, on the other hand, will only provide for an increase of 184 per cent in energy consumption. This is due to the relatively small increase in the manufacture of foodstuffs, this activity having been the largest consumer of energy, in absolute terms, in 1950.

/Table 3

Table 3 Consumption of Energy by Manufacturing, 1950

(in millions of kilowatt-hours)

Manufactures	Net total	Petroleum	Coal	Electricity purchased	Gas purchased	Others
Non-durable goods						
Textiles	144.0	19.1	53.7[a]	62.0[b]	-	9.2[c]
Foodstuffs	227.6	8.5	107.3[a]	59.3[b]	1.7	50.8[c]
Pharmaceutical goods	25.8	5.8	13.5	4.9	0.6	1.0[c]
Leather	27.7	0.1	7.0	5.2	-	15.4[c]
Paper and printing	119.0	0.8	17.8	91.6[d]	0.9	7.9
Clothing	8.6	0.1	5.1	3.2	-	0.2
Total	552.7	34.4	204.4	226.2	3.2	84.5
Durable goods						
Ceramics	20.3	4.5	10.3[a]	4.9	-	0.6
Glass	32.3	14.7	11.3[a]	6.0	-	0.3
Rubber	9.5	0.8	4.2	4.5	-	-
Wood	23.5	0.1	1.7	3.2	-	18.5[c]
Metals	85.9	11.0	43.5[e]	9.4	1.2	20.8[c]
Total	171.5	31.1	71.0	28.0	1.2	40.2
Total capital goods[f]	870.0	65.5	275.4	254.2	4.4	124.7
Capital goods						
Cement	236.3	1.2	147.3[a]	87.8	-	-
Wood	6.9	0.6	-	2.6	-	3.7
Iron and steel[g]	533.5	19.0	389.3	76.0	4.0	45.2[c]
Chemical products	63.3	5.4	24.9[a]	26.4	0.4	6.2
Total	840.0	26.2	561.5	192.8	4.4	55.1
Grand total	1,710.0[f]	91.7	836.9	447.0	8.8	179.8

Source: The data was obtained in the course of special research carried out by the Industries Section of the Dirección General de Estadística.

a/ Includes a small amount of coke.

b/ Including estimates for hydro-electricity generated in private plants.

c/ Mainly fuel-wood and charcoal.

d/ Mainly hydro-electricity generated by private plants.

e/ Mainly coke.

f/ Including unspecified consumer industries.

g/ Including estimated coal consumption for the iron and steel industry at Huachipato.

/Table 4

Table 4 Projection of Industrial Demand for Energy, on the Assumption of Moderate Development

	1950	1962	Percentual increase
	(millions of kilowatt-hours)		
Non-durable goods			
Textiles	144.0	306.7	212.9
Foodstuffs	227.6	319.3	140.3
Pharmaceutical goods	25.8	54.2	210.0
Leather	27.7	44.1	159.1
Paper and Printing	119.0	271.4	228.1
Clothing	8.6	22.7	263.8
Total	552.7	1,018.4	184.3
Durable goods			
Ceramics	20.3	35.5	175.1
Glass	32.3	60.8	188.4
Rubber	9.5	36.3	382.4
Wood	23.5	42.9	182.7
Metals	85.9	267.7	311.6
Total	171.5	443.2	258.4
Unspecified	145.8	187.1	128.3
Total consumer goods	870.0	1,648.7	189.5
Capital goods			
Mechanical industry	359.5	794.6	121.0
Iron and steel industry [a/]	174.0	b/ 1,050.0	500.0
Cement industry	236.3	466.2	197.3
Manufacture of other building materials	6.9	10.3	149.8
Chemical products	63.3	158.2	250.0
Total	840.0	2,469.3	294.0
Grand Total	1,710.0	4,118.0	240.8

Source: United Nations Economic Commission for Latin America.

a/ Only blast furnaces.

b/ The blast furnaces at Huachipato began operating at the end of 1950.

/Although total

Although total energy demand was easily projected due to the stability of the coefficient of input-output, the same does not occur when considering the different types of energy. There are numerous factors affecting consumption of each of these. Many of these factors are of a technological nature and, consequently, difficult to evaluate or to use in a forecast without detailed research on industrial needs and the conditions under which they are met.

Since any such investigation is beyond the scope of the present study, the analysis was restricted to three types of energy (electricity supplied by public utility enterprises, coal and petroleum), which in 1950, as may be seen from Table 3, accounted for practically 90 per cent of total consumption in this sector. These technological factors, however, were only set aside because the abruptness of the inter-fuel substitutions experienced in the past ten years exceeded the relative slowness of their action and must be ascribed rather to the supply and price conditions prevailing between 1940-50.

In the first place it was ascertained, on the basis of the manufacturing activities listed by the Dirección General de Estadística, that aggregate consumption of the selected types was closely related with the indices of industrial output as may be inferred when examining regression line A, of Chart 2. However, since it was assumed that fuel-wood and similar fuels had been displaced,[1/] the tendency of the relation between total energy and manufacturing output was estimated and shown in the same chart. (Regression line B.) The tendency of these lines to meet and the short distance among them during the period 1947-50 confirm the above mentioned displacement and justify the assumption that the elimination of fuel-wood from these calculations would not result in a large margin of error.

The abruptness of the substitutions between the three types of energy was caused by the supply problems discussed below.

Since 1940, the supply of energy in Chile became a limiting factor on production, and particularly on manufacturing output. Until 1946, coal production, which had been the principal source of energy, had expanded by

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1/ In the case of Chile, this includes small quantities of "yareta" and other scrap from the grinding.

/less than

less than 5 per cent and although installed capacity of public utilities (representing production of electricity) rose by 25 per cent, manufacturing output rose by 38 per cent, according to official estimates. During this period, manufacturers therefore resorted as much as possible to petroleum the only restrictions on which were import controls. Foreseeing this position, the National Electrification Plan was formulated in 1942, with a view to utilizing the country's substantial hydro-electric potentialities. Although the first plants only began operations in 1947, by 1950 they had enabled installed public utilities capacity to rise 65 per cent above the 1946 level. The increase in available supplies of electricity, was nevertheless counter-balanced by the stagnation of coal output and restrictions (on account of balance of payments difficulties) and contributing to an intensive electrification of manufacturing activity after 1947.

As may be seen from Chart 3, industrial consumption of coal was divided into three clearly defined phases in view of these events. Between 1940 and 1945, curve A, coal consumption rose more than manufacturing output. This position, however, was inverted throughout the period 1945-48 (curve B), and finally dropped in 1948-50 (curve C), to a position entirely out of relation to the latter. In the case of petroleum, Chart 4, these fluctuations are barely noticeable, since all the points follow a clearly marked regression line. This can be explained by the fact that in addition to the facilities for expanding supplies, the exchange policy practically stabilized petroleum prices, whereas those of coal, following the general price level in Chile, rose substantially. On the basis of Chart 4 alone, it may be assumed that input of petroleum per unit of output became fairly stable, thus permitting its projection in accordance with the fluctuations of manufacturing output.

The relation between industrial output and the electricity consumed between 1940 and 1950 is plotted in Chart 5. Curves A and B are not needed to ascertain the influence of the supply conditions described above. Between 1940 and 1946, the expansion of manufacturing output gave rise only to small increases in the purchase of electricity. After 1947, however, when ENDESA's hydro-electric plants began their operations, the sudden expansion of electricity consumption was far more marked than that of the above-mentioned output. It would hardly be opportune here to consider

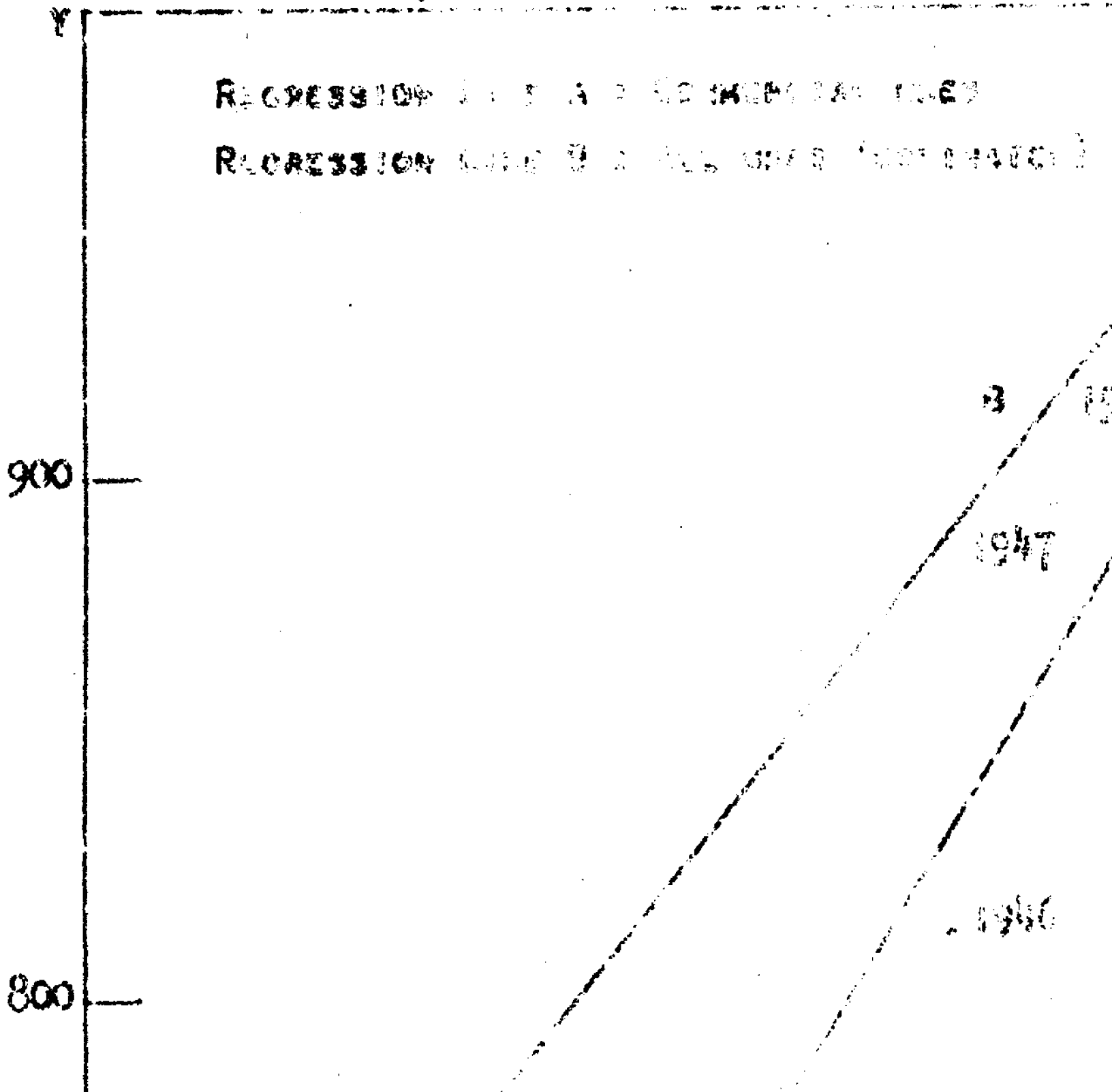
/the causes

CHAPTER VI

CHART 2

RELATION BETWEEN INDUSTRIAL PRODUCTION AND POWER

ENERGY CONSUMED IN MILLIONS OF KWH



the causes for these preferences but it should be noted that one of the main factors was price, particularly since those of electricity rose relatively less than coal, although, owing to the preferential rates of exchange, its price was slightly higher than that of petroleum.

Such substitutions cannot continue indefinitely. Nor is it theoretically possible to assume that Chilean industry would eventually use one type of energy to the exclusion of all others - the utmost degree of substitution-- since energy is used both to obtain power and to produce the heat required for certain manufacturing manipulations. Technological factors limit, thus, competition between the types of energy and restrict the process of substitution. Using the above series in a different form, three additional charts were plotted, emphasizing the fact that this process has reached, or is about to reach, its technological limits.

In the first chart, that is N° 6, input-output coefficient of petroleum was compared with the one for coal, the two fuels competing heavily. The regression line shows that the petroleum coefficient rose[1/] after 1943, with little variation shown by the coal coefficient, whereas, after 1947, the former stabilized, and there was a slight decrease in the latter. In Chart 7, in which the coefficient of petroleum is compared with that of electricity, the decrease of the latter will be observed throughout the period 1942-46, and later (1947-50) it will be seen to rise, though never displacing petroleum. This supports the foregoing assumption, namely that future petroleum input may be expected to retain the same relation to manufacturing output as has prevailed during the past few years, barring any changes which may take place in coal consumption by the iron and steel industry.

Coal, on the other hand, was substituted by petroleum prior to 1947, and by electricity since then, as may be seen from Chart 8, in which coal and electricity coefficients of input are contrasted. However, as the

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1/ In this chart and the following two, reciprocals of the input-output coefficients were used, so that the extreme points of the curves should follow the direction of their axis in order to envisage the limits of substitution more clearly. In considering the tendencies separately, it should be recalled that when the whole axis indicates an increase, a corresponding decrease in the coefficient has occurred, and vice-versa.

1946-50 tendency is a curve, or, in other words, the rate of substitution tends to decline, it would appear to have reached the afore-mentioned technological limits, which would seem to be confirmed by the various calculations made.

There is no doubt that Chile would derive great advantage from using the maximum possible amount of electricity and reducing consumption of other fuels in view of the relative abundance of hydraulic resources and the fact that petroleum has to be imported. An attempt was therefore made to complete the above analysis by specifically stressing the limits to which the substitution of fuels by electricity could be carried. Despite the inherent errors in the source and the nature of the estimate itself, it may be concluded that by 1950 Chilean manufacturing activities had reached a high level of electrification and that the remaining margin of substitution was, therefore, quite small, particularly when taking into account the scarcity of hydro-electric potentialities in the north and the abundance of timber in the south.

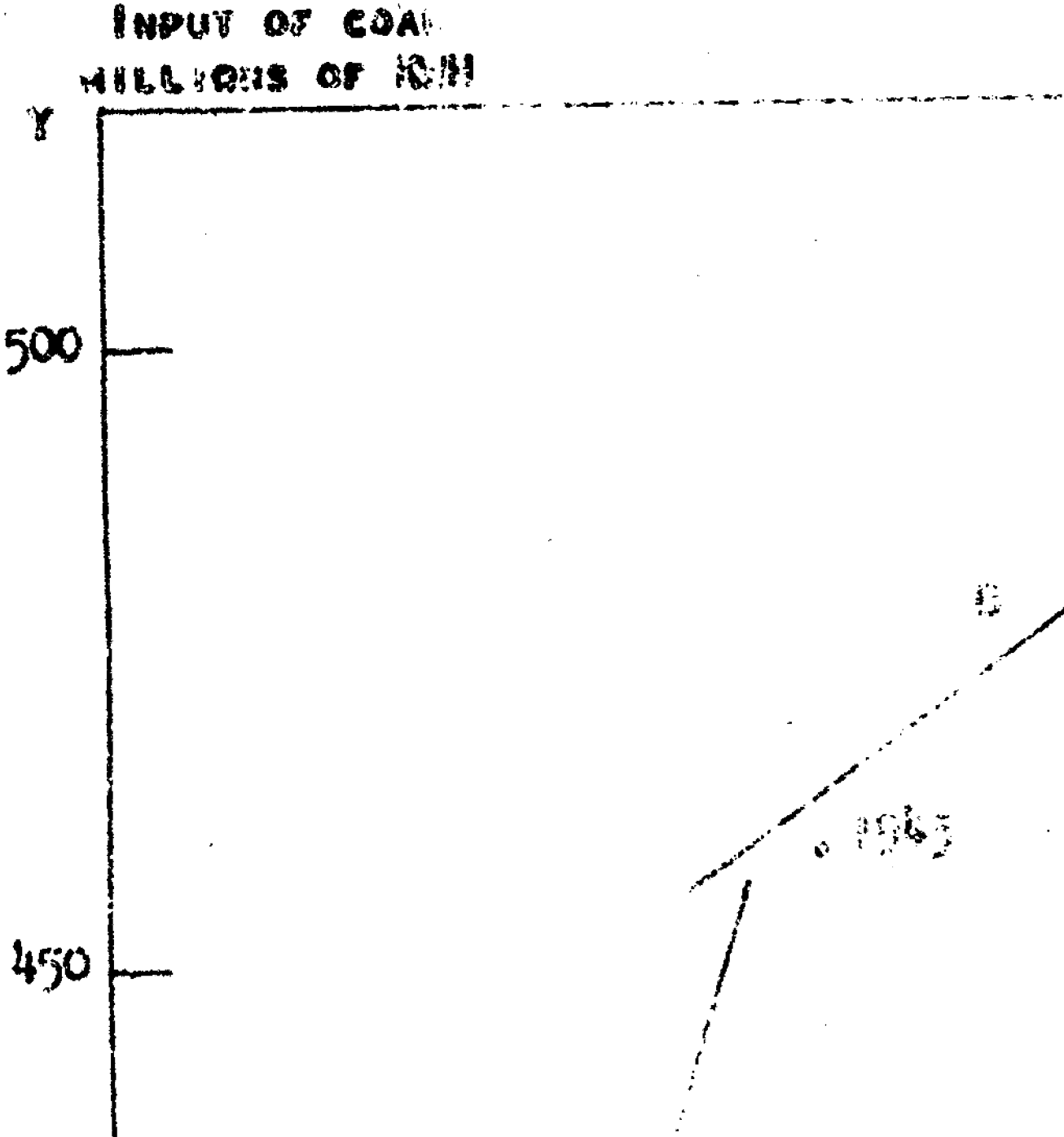
This estimate is based on the proportion of electricity generated to that purchased by industrial plants and on the ratio of primary motors to electric motors in the manufacturing activities listed by the Dirección General de Estadística. Table 5 shows that the ratio of primary motors to electric motors was reduced from 52 per cent in 1943 to 36 per cent in 1949, owing to a decrease, in absolute terms, of horse-power of the former and a sharp increase in the latter. That is to say, manufacturers find it preferable to purchase electricity rather than to generate it, as evidenced by the contraction in the proportion of generated electricity to purchased electricity, which fell from 32 per cent to 20 per cent over the period indicated. After deducting consumption by hydro-electric generators owned by industry, it was seen that not more than 18 per cent of the electricity used was produced by generating units belonging to industry itself, a percentage which would indicate the maximum acceptable substitution in the event of a projection. Although there still remains the question of steam diesel power, this ratio is quite small and consequently it would be difficult to expect that the sharp increase of electricity insumption experienced in 1947-50 could be repeated.

/Table 5

CHAPTER

CHART

RELATIONSHIP BETWEEN [illegible] OF COAL [illegible]
[illegible] OF THE [illegible]



CHAPTER VI

CHART 4

RELATIONSHIP BETWEEN INPUT OF OIL AND INDUSTRIAL
SAMPLE OF THE STATISTICAL OFFICE

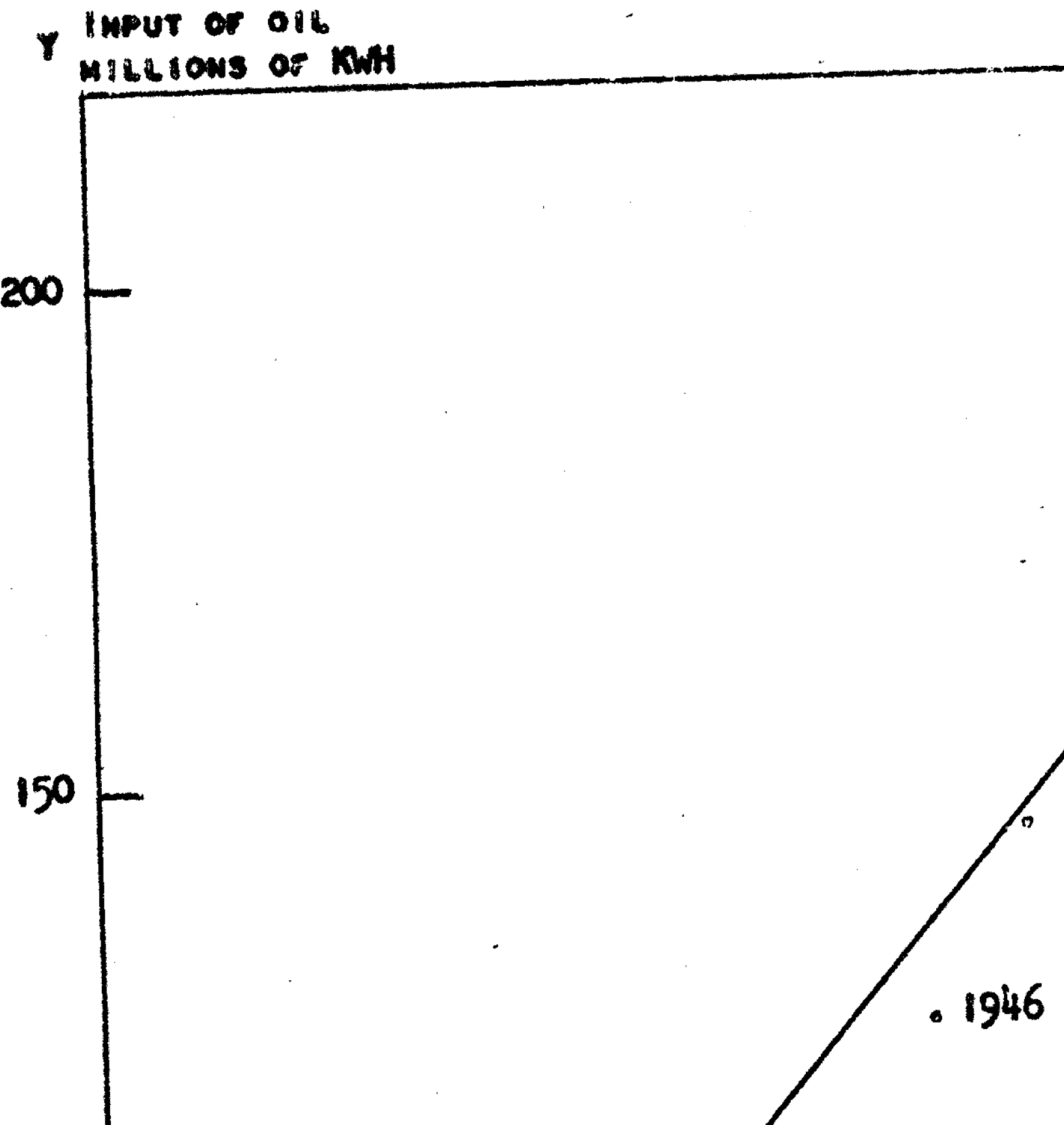


Table 5 Source of the Electricity Used and the Types of Motors in Industry, a/ from 1943-49

	1943	1949	Percentual fluctuation
Electricity	(millions of kilowatt-hours)		
Purchased	221.6	429.2	93.5
Generated	72.0	85.3	18.5
Types of motor	(thousands of H.P.)		
Electric	171.0	291.0	70.2
Primary	88.0	60.0	-31.7

Source: Anuario de Industrias, Dirección General de Estadística.

a/ Excluding public utility services.

In short, the above estimates were used as a basis for projecting the most probable proportions between electricity and the different fuels consumed in the manufacturing activities listed by the Dirección General de Estadística. For this purpose, it was assumed that there would be no supply or price problems in 1962, and that it would be to the advantage of the country to attain the maximum level of electrification in manufacturing, while making the best use possible of by-product gas from the refining of petroleum and the blast furnaces at Huachipato. These proportions were then applied to the total demand for energy, estimated previously, and subdivided into demand arising from the manufacture of consumer goods and of capital goods. In the case of the latter, allowances were made in the proportion of coal and gas to include the operation of two blast furnaces and the subsequent manufacture of iron and steel. The results are contained in Table 6.

/Table 6

Table 6 Energy Consumption in 1950 and Estimates for 1962, Assuming the Maximum Probable Substitution of Electricity for Fuels

	Consumer goods		Capital goods a/		Total		Percentage
	1950	1962	1950	1962	1950	1962	annual increase
	(millions of kilowatt-hours)						
Electricity	305	640	177	710	482	1,350	9.0
Coal	330	600	338	1,500 b/	668	2,100	10.1
Petroleum	78	178	26	112	104	290	9.2
Gas	6	58	4	92	10	150	21.6
Others	151	174	55	56	206	230	1.0
Total	870	1,650	600	2,470	1,470	4,120	9.0

Source: United Nations Economic Commission for Latin America.

a/ Includes actual consumption at Huachipato in 1950.

b/ On the assumption of two blast furnaces in operation at Huachipato in 1962.

4. Transport

On the hypothesis of moderate development, the demand for energy by the different systems of transport should increase 124 per cent over the period 1950-62, growing at an annual rate of 6.9 per cent. On the other hand, as it is estimated that the total activities of these systems would expand at least by 70 per cent, average fuel-productivity (measured in terms of units transported per unit of energy consumed) would be lower than at present. This is partly due to the replacement of draught animals, but above all to the disproportionate increase in motor transport, the efficiency of which, in terms of energy insumption, is relatively low.

As will be shown subsequently, it was nevertheless estimated that railway transport is more efficient, in terms of energy, owing to the reconditioning of steam equipment and the introduction of diesel units. It was impossible to ascertain the changes which may have occurred in such productivity, both in the case of motor vehicles and coastwise shipping, so that these two systems are one of the possible sources of error in the calculations.

Railway consumption. The railway system of Chile, consisting mainly of the Empresa de Ferrocarriles del Estado (State-owned Railways), employs coal-fed steam locomotives chiefly. In 1950, of the 835 engines in

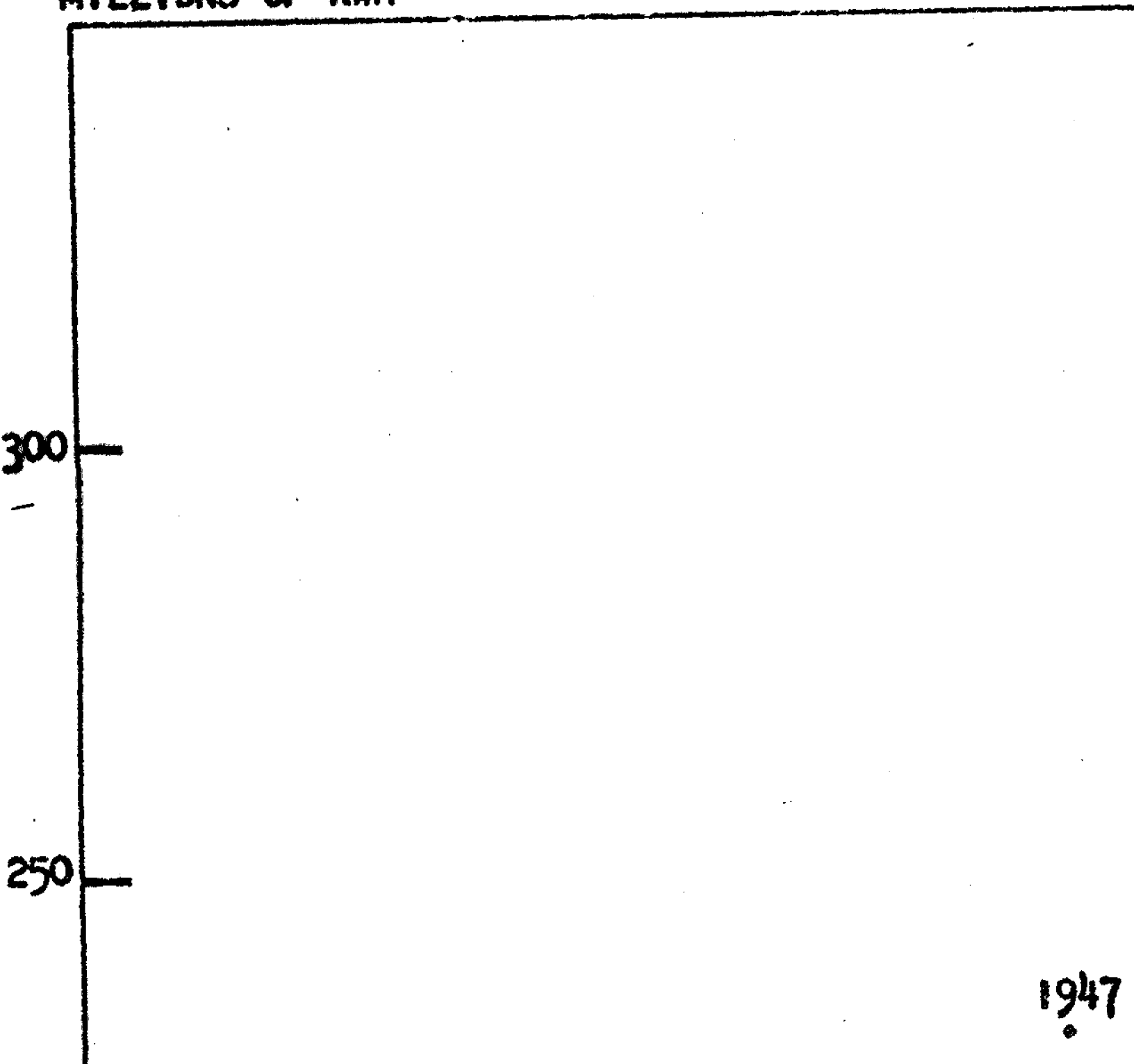
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PART II

CHAPTER VI

CHART 5

RELATIONBETWEEN PURCHASED ELECTRICITY AND INDUSTR
A SAMPLE OF THE STATISTICAL OFFICE O

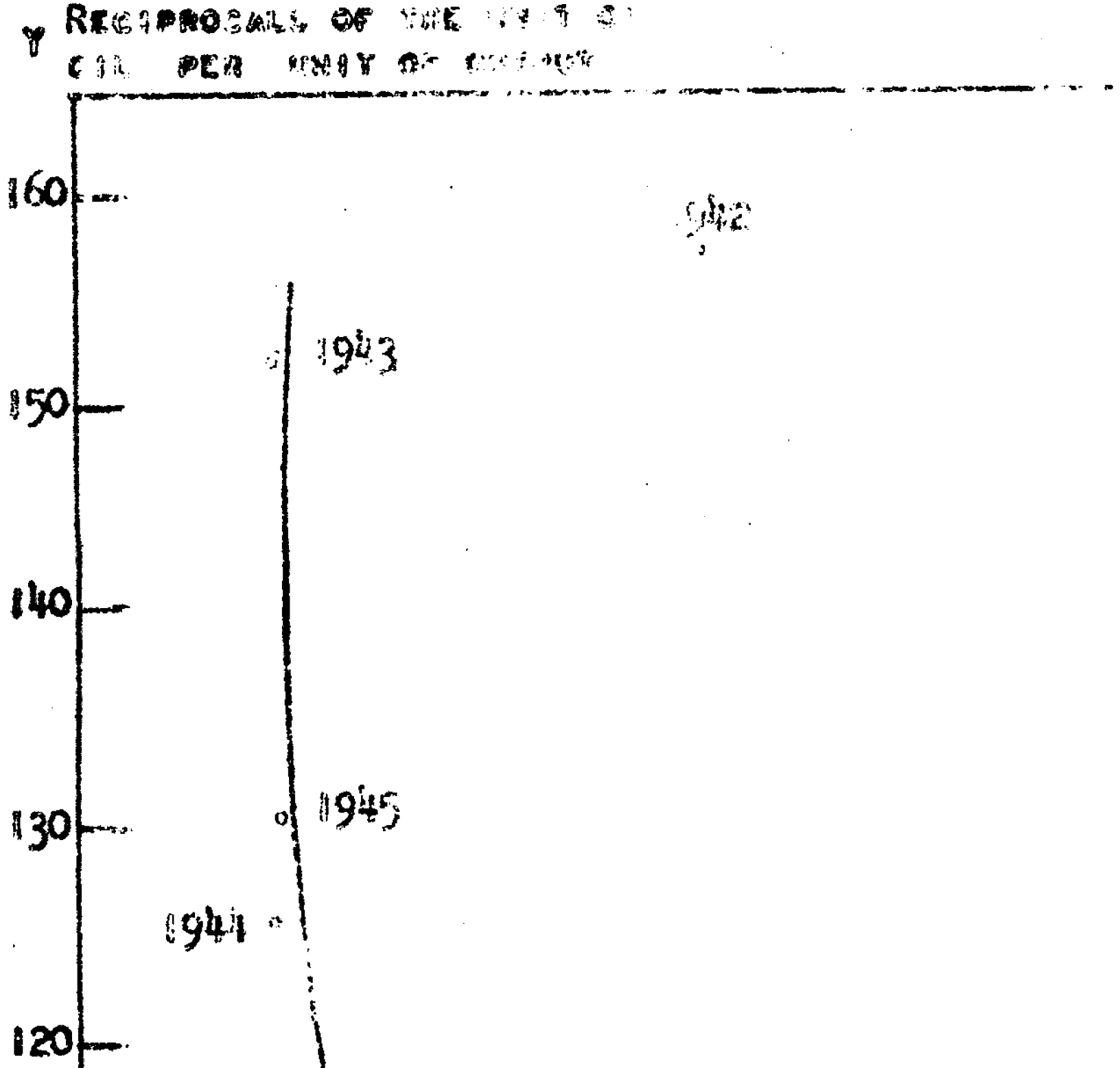


PART II

CHAPTER V

CHART 6

RELATIONSHIP OF [illegible] OF THE INPUT [illegible]
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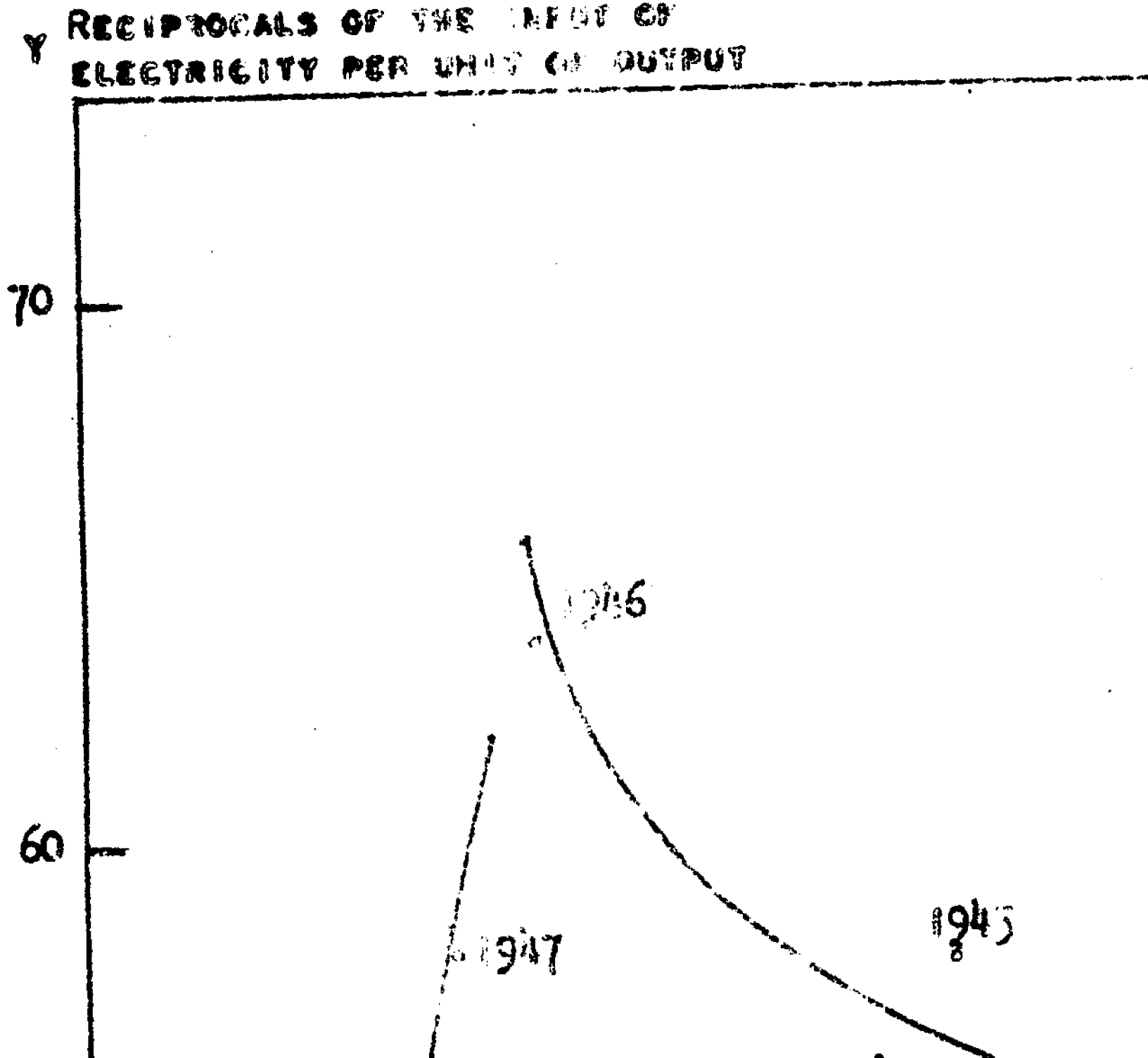


PART II

CHAPTER VI

CHART 7

RELATIONSHIP OF THE RECIPROCALS OF THE INPUT OF
UNIT OF OUTPUT BASED ON A SAMPLE OF THE STATIST

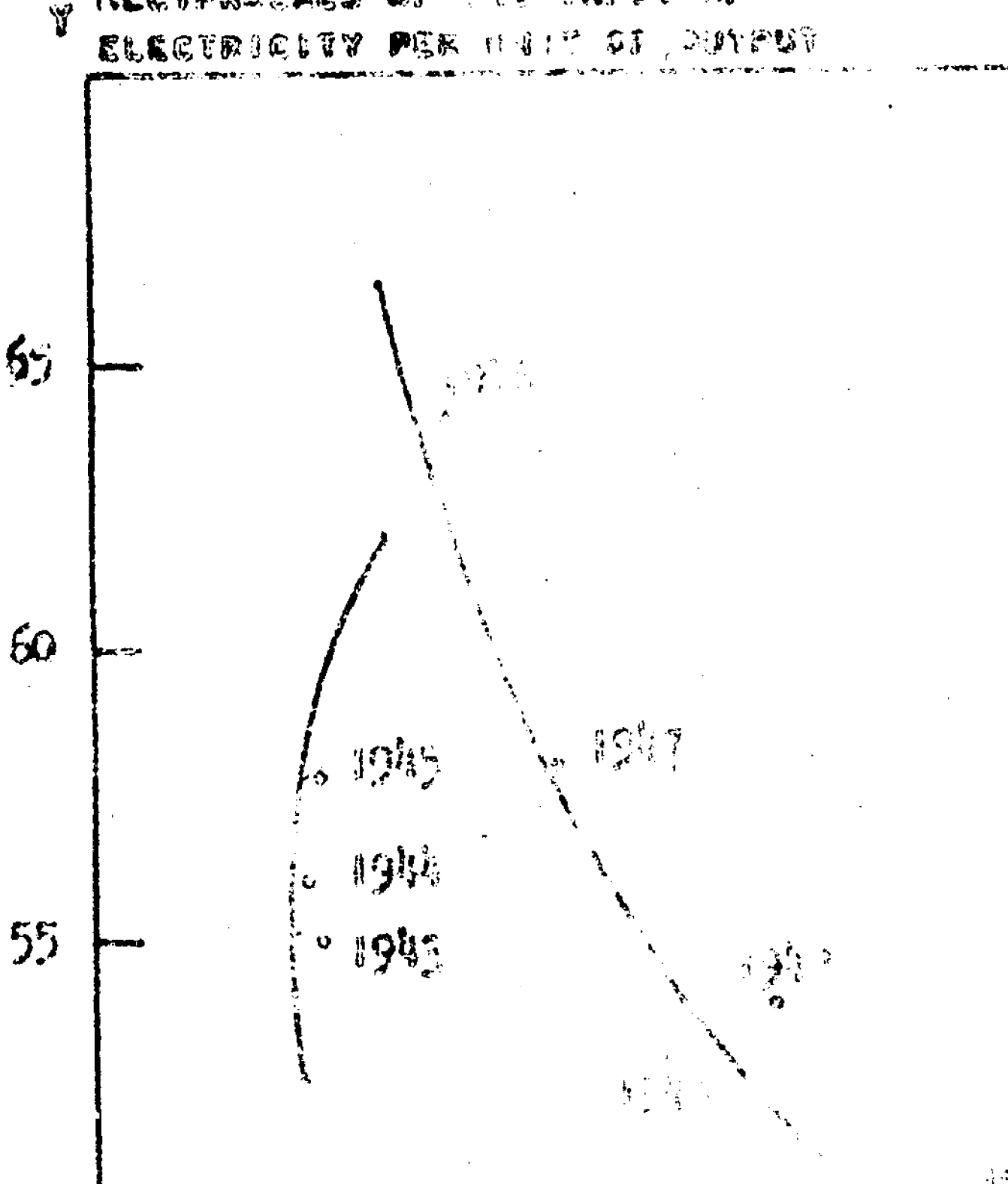


PART

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RELATIONSHIP BETWEEN THE RECIPROCALS OF THE UNIT OF OUTPUT AND OF THE SCALE OF THE



operations only 65, engaged on the Valparaiso-Santiago run, had been electrified and there were only two diesel-electric engines hauling trains to the northern sector of the country. However, in 1951-52, several diesel-electric engines were added. A special commission appointed to study the situation of the State-owned Railways, recommended an increase in the number of diesel-electric units, although indicating its preference for steam engines.

On the basis of these recommendations, it was estimated (in the corresponding chapter) that between one-third and one fourth of the equipment would consist of diesel units. ENDESA has implicitly ceased to consider the possibility of electrifying the line from Chillan to Santiago by eliminating this scheme from its estimates of probable demand of electricity. Consequently, it would only be necessary to make corrections directed to compensating the greater productivity of the diesel equipment and that which might be obtained from improvements in steam equipment.

According to the annual report of the railway lines, deficiencies of equipment and tracks during the past few years constantly raised fuel consumption per unit of traffic on the State-owned Railways. Thus, between 1945 and 1950, coal consumption per kilometre-engine increased 12 per cent on the so-called "Southern network", and 15 per cent on the northern lines, while even larger imports were observed on some of the branch services. One of the objectives of the Chilean Government's railway plan (prepared in 1952), the basic elements of which were included in these estimates of moderate development, was to eliminate the causes of this decline in the productivity of the railway system. It was therefore expected that energy consumption in this sector would rise in a measure with traffic, once the basic work of the railway programme was completed.

As was pointed out, however, it may be anticipated that proportionately less coal will be consumed as more diesel equipment is used. In the case of the United Kingdom,[1] one ton of petroleum used in this way replaces between 4 to 5 tons of coal. In the case of Chile, this proportion would have to be reduced to 3 to 4 tons, in view of the recommendations made by the Special Commission, whereby a substantial proportion of the diesel equipment would consist of engines for yard manoeuvres and for passenger trains. Hence, the replacement of the old equipment by 25 per cent diesel

1/ Petroleum Press Service, December 1951.

units would involve a saving of only 12 per cent in energy consumption, but at the same time it would reduce coal consumption by 28 per cent, as may be seen from example B in the following table:

Table 7 Projection of the Demand for Energy by Railways, on the Assumption of Moderate Development

(in millions of kilowatt-hours)

	1950	1962	
		Example A: Without diesel equipment a/	Example B: With 25% diesel equipment a/
Electricity	100	220	220
Coal	530	1,080	780
Petroleum	5	11	155
Total	635	1,311	1,155
Total (indices)	100	207	182
Estimated traffic (indices)	100	220	220
Efficiency (indices)	100	106	121

Source: United Nations Economic Commission for Latin America.

a/ It was assumed that the efficiency of steam equipment would be 10 per cent higher.

The consumption of energy by private railways had to be forecast on the basis of a 100 per cent increment to traffic, allowing for no improvement in productivity. The results are included in the general table contained in the first section of this chapter.

Consumption by the merchant navy. The Compañía de Acero del Pacífico (CAP), with a view to ascertaining the advisability of working the Arauco fields, carried out research on coal consumption. The data obtained showed that in 1950 the merchant navy used about 136,000 tons of coal which, according to the projects and statements of shipowners, would be reduced to 130,000 tons in 1961-62.

No estimates were made regarding the use of diesel or fuel oil. However, the probable consumption of petroleum was estimated, taking into account the statements on transformation and substitution of ships and the fact that nearly all the enterprises surveyed are engaged in coastwise trade. On the assumption that coastwise trade has been stabilized and that it

/will not

will not continue to decline as in recent decades, it was estimated that the conversion of burners and the introduction of new ships would raise the 5,000 tons of petroleum apparently consumed in 1950 to a total of 15,000 tons in 1962. It was likewise assumed that international shipping would pursue the present method of bunkers outside Chile.

Both the estimates for 1950 and the projection for 1962 are subject to revision insofar as petroleum is concerned, and they should therefore only be considered as probable tendencies, providing the shipowners' forecasts materialize.

Consumption by motor vehicles. It was calculated that the number of lorries and buses would increase 235 per cent between 1950 and 1962, while that of private motor vehicles would be 150 per cent higher. Using an average consumption of 2,200 gallons annually for lorries and buses, and 1,100 gallons annually for private motor vehicles, as was done by the Automobile Club of Chile, it was believed that by 1962 it would be necessary to add 205 per cent to the 300,000 tons of 1950 petrol consumption.

It is quite likely that consumption per vehicle will fluctuate, particularly in the case of non-passenger vehicles. However, it is not possible to estimate the degree of such fluctuations. The factors concerned are practically unmeasurable so that unitary consumption must perforce be deemed constant. It should also be pointed out that according to experience obtained in the United States,[1/] the amount of petrol consumed per vehicle did not vary substantially between 1937 and 1949, the possible margin of error arising from constant unitary consumption therefore being very small.

Consumption by other means of transport. No direct forecast is made regarding consumption by national and international airlines, owing to the lack of any detailed study of future possibilities. Solely with a view to including it in the total, this consumption in 1950 and its projection for 1962 were added to that by motor vehicles.

5. Direct Consumption by the Population

As was pointed out at the beginning of the analysis of the demand for energy, direct consumption by the population is subject to variable

1/ U.S. Petroleum Facts and Figures, 1950 page 92.

coefficients of income-elasticity, in the same way as the demand for other consumer goods. However, owing to the lack of adequate statistical data and frequent differences in estimates of fuel-wood consumption, there are often insuperable difficulties in attempting to calculate these coefficiencies. In the case of Chile, these difficulties are sharpened by the abundance of forest resources and particularly by the high degree of substitution of fuel-wood as a consequence of urban expansion in the past few years. It was therefore found preferable not to calculate these coefficiencies.

However, it was assumed that domestic fuel-wood consumption, either as such or in the form of charcoal, would not expand in the future and that any increment to the demand for energy, caused by a higher level of personal income, would affect the remaining sources of energy exclusively. In limiting the forecasts to these latter, it was taken into account that fuel-wood is used predominantly in the rural areas, implying a decline in the total volume for consumption, since moderate development of these areas presupposes a decrease, in absolute terms, in their population.

The consumption of commercial sources of energy has increased from almost 500 million kilowatt-hours in 1940 to more than 1,000 million kilowatt-hours in 1950, that is at an annual rate of 7.4 per cent. Moreover, per capita consumption increased 6 per cent annually, a rate which, when compared with increases in per capita personal expenditure, shows an elasticity-coefficient similar to that obtained by relating income to commercial energy, as was done at the beginning of this section. It is therefore likely that, after 1950, these coefficients will tend to contract and so prevent a repetition of the sharp consumption curves of former years.

/Table 8

Table 8 Projection of Direct Consumption of Energy by Population, on the Assumption of Moderate Development

	1940	1950	1962	Annual rates 1940-50	Annual rates 1950-62
	(millions of kilowatt-hours)			(per cent)	
Electricity	187	591[a/]	1,623	12.1	8.7
Coal	205	196	276	- 0.5	2.8
Gas	94	143	470	4.3	10.4
Kerosene	21	108	119	18.3	1.0
Petroleum	2	6	6	11.6	0.0
Total	509	1,044	2,494	7.4	7.6
Per capita	(kilowatt-hours)			(per cent)	
For the population as a whole	101	181	366	6.0	6.1
For the urban population	188	312	528	5.1	4.4

Source: United Nations Economic Commission for Latin America.

a/ Includes 5 per cent of unsatisfied demand in Santiago and Valparaiso. Were this not included, the annual rate for the period 1950-62 would be 9 per cent.

The last column but one of the above table stresses the irregularity in the rates of expansion of the different types of commercial energy during the period 1940-50. Electricity consumption rose 216 per cent, kerosene 414 per cent, manufactured gas 52 per cent, while that of coal fell 4 per cent. These figures reflect the dissimilar price trends of the period. While those of coal doubled, in relation to electricity, those of petroleum and kerosene fell between 10 and 15 per cent, owing to the stabilization of the exchange rate in force.

However, as was pointed out in considering the consumption of energy by manufacturing activities, supply difficulties modified price repercussions, distorting demand. It was remarked above that coal consumption had been stabilized; at the same time, an unsatisfactory balance of payments position discouraged imports of kerosene, its distribution being controlled throughout the country. Installed capacity for the production of electricity in the Santiago-Valparaiso sector expanded at a lower rate than demand, making constant rationing measures necessary - a policy which reached its peak between 1946 and 1948. In

/1949-50, the

1949-50, the new plants added to the public utility services, permitted supplied to cover all but 5 per cent of demand, owing largely to the temporary lack of a thermic unit. In the rest of the country, the capacity installed by ENDESA exceeded demand and enabled promotion tariffs to be introduced, stimulating rural electrification.

One of the most important points in forecasting energy requirements in this sector is the ascertaining of future demand for electricity. As will be seen in Table 8, demand rose 12.1 per cent between 1940 and 1950. This expansion can be ascribed not only to relative price conditions and distortions of supply, but also to a 24 per cent growth of the urban population and the increase of electric services throughout a series of neighbouring towns and their extension to the more distant communities. Although they only suggest the influence of these latter factors, the figures shown in Table 9 indicate consumption by regions. It will be seen that in the Santiago-Concepcion zone, where electric services have been more developed and the level of income is higher, these services expanded at a lower rate than in the northern and southern sectors.

Table 9 Direct Consumption of Electricity by the Population in Different Parts of Chile

(thousands of kilowatt-hours)

	North	Santiago-Concepcion	South	Total
1943	6,976	265,000	7,122	279,098
1950	17,366	459,000	21,135	497,491
Percentual rate of increase	13.9	8.1	22.3	8.6

Source: Dirección General de Servicios Eléctricos y Gas.

Note: Sales by enterprises were confirmed by the above-mentioned Dirección.

The possibilities of further expansion in electrical services to new areas are somewhat limited, both as regards the number of communities and the number of inhabitants. Consumption rates therefore will depend on the growth of the urban population and the degree of rural electrification. In this connexion, accurate forecasts of this consumption could only be made by analysing the growth of consumption in electrified areas since 1940, and

/estimating their

estimating their probable levels in areas which have yet to be electrified. However, since the basic data for this purpose are lacking, an ample rate was used, representing the average increases of a) the growth of the urban population, and b) the projection of the average tendency for the period 1940-50.

Fuel consumption between 1940 and 1950 rose only 72 per cent, owing largely to the decline in coal consumption. On the basis of individual analyses shown below for the different items in this group, it was estimated that between 1950 and 1960 fuel consumption would increase 92 per cent.

a) Coal. The unfavourable relative prices of coal and supply difficulties led to a decrease in its consumption. Nevertheless, it is worth noting that the majority of residential and office buildings, built and being built, use this fuel for their heating systems. In the remainder of non-popular housing schemes, however, the so-called "hydro-electric heating equipment" is found and is considered to involve lower investments. In buildings where neither system is in operation, gas and kerosene heaters are used. However, since the scheme of development assumes stability in the general price level and a lowering of coal prices, resulting from greater mechanization in the mines, it is possible that per capita urban coal consumption may tend to rise. It may be estimated conservatively that this consumption will probably expand in a measure with the growth of the urban population, that is, more or less 41 per cent between 1950 and 1962.

b) Gas. In the six cities where gas services have been installed, consumption increased by 52 per cent between 1940 and 1950, representing a per capita improvement of only 10 per cent. It should be pointed out that in five of these six cities, output was stabilized in 1948, owing to the fact that plant capacity had been exhausted. Hence, previous expansion should be raised to 58 per cent and 15 per cent, respectively, if the 1940-47 tendency is projected to 1950.

The Compañía de Acero del Pacífico (CAP) began selling the surplus gas from its blast furnace and coking plants to the towns in the vicinity of Huachipato. In fact, it is hoped to extend this service to other nearby markets. Owing to the quality of Chilean coal, the volume of gas surplus is appreciable and even sufficient to supply a number of industries and a

wide sector of home consumption in the south. The petroleum refinery of ENAP at Concón should begin operations early in 1954. It will then have a surplus of about 460 million cubic metres of gas annually, which could be profitably used to replace the present factories in Santiago and Valparaiso, and allow a wide margin for additional new markets in this sector. Moreover, apart from the small refinery at Magallanes, ENAP will also produce almost 120,000 litres of propane gas daily, which it proposes to bottle and sell as gas for cooking and heating purposes, replacing kerosene.

Since these are sub-products, it was considered advisable to intensify their use and it may therefore be expected that their consumption will expand at a much greater rate than during the period 1940-50. The respective plans have not yet been completed, nor can their ultimate effects be determined accurately. Broadly speaking, assuming that by 1955 these new markets will add 40 per cent to the present number of consumers and that per capita increase will be equivalent to 15 per cent annually, it is estimated that gas consumption in 1962, including bottled propane, should rise by 230 per cent.

c) Kerosene. The expansion envisaged in electricity, gas and propane services will cause a sharp reversal in the upward trend of kerosene consumption. In fact, stabilization of present total consumption might a also occur because the output of the Concon refinery will scarcely meet industrial demand, in addition to that of mechanized agriculture and domestic consumption. It may therefore be expected that domestic use of kerosene will increase until 1954-55, and then be stabilized, dropping ultimately to the levels now prevailing. In the opinion of ENAP officials, its total substitution is not likely, because there is still a margin for the displacement of firewood and charcoal, and also because the home installations required for the use of propane are probably beyond the reach of a large proportion of the working classes. A conservative estimate would place a probable increase at 10 per cent above current consumption, with a view to adjusting demand to cover that portion which at present remains unsatisfied.

6. Investments

With the exception of a part of petroleum and a small proportion of metallurgical coal, it was considered feasible to raise the output of

commercial types of energy sufficiently to meet volume of demand likely to be created by moderate development. Net investments required would amount to 18,560 million pesos at 1950 prices, in addition to a further 3,000 million pesos for replacements. Gross investments therefore would amount to 21,560 million pesos. As may be seen from Table 10, more than half of this capital would be used in building electricity plants and the essential transmission elements to meet a maximum winter demand of 900,000 kilowatts. The balance is divided into almost equal parts in order to expand coal and petroleum output.

It was estimated that only 41 per cent of gross investments would be made in Chilean currency. The remainder, amounting to 182 million dollars, at the rate of 70 pesos per dollar applied throughout this report, would have to be met in foreign exchange.

Investments in petroleum comprise the installation of a refinery with a productive capacity of 21,000 barrels of crude petroleum daily, which would cover slightly less than two thirds of liquid fuel consumption in sectors other than mining. In projecting domestic output of crude petroleum, a conservative criterion was adopted, the information regarding reserves being inadequate insofar as known deposits and workings are concerned. It was estimated that these would only yield the 21,000 barrels required for the refinery. The investments needed to secure this output total 4.6 thousand million pesos, comprising 47 million dollars in foreign exchange. These figures include both crude petroleum output and its transport to petroleum ports, as well as the refinery installations which it is expected will be concluded in Concon by the end of 1954.

Coal investments involve a total of 4.5 thousand million pesos, to cover the necessary expansion of output, but the main share is for mechanization of the deposits currently worked. As has been pointed out on other occasions,[1/] Chilean coal mining productivity is low, the average output per man-day being 400 kilos, against a total of 900 kilos in Mexico and 2,500 kilos in the United States. This yield could be raised

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1/ Economic Survey for Latin America, 1949.

/to 3,000 kilos,

to 3,000 kilos, with a corresponding decrease in costs and selling prices. In the present case, however, the measure of mechanization foreseen would not achieve that objective. It was proposed to consider only the loan which the main mining companies sought from an international credit organization, with a view to increasing output for the Huachipato iron and steel mills.

Among the other investments which must also be taken into account, are the distribution costs of bottled propane and butane and the gas produced by the Concon refinery and the Huachipato iron and steel mills. The lack of accurate data made it necessary to prepare rough estimates, showing a total capital requirement of 300 million pesos for the installation of the pipelines and bottling plants. This amount is included in Table 9 under the heading "Others".

Table 10 Assessment of Investment Needs for the Energy Sector, on the Assumption of Moderate Development

(millions)

	Investments		Expenditure	
	Gross (pesos)	Net (pesos)	In the country (pesos)	Abroad a/ (dollars)
Coal	4,500	3,100	1,490	43
Electricity	12,200	10,600	5,760	92
Petroleum	4,560	4,560 b/	1,280	47
Others	300	300	300	-
Total	21,560	18,560	8,830	182

Source: United Nations Economic Commission for Latin America.

a/ The rate of exchange used was 70 pesos per dollar.

b/ Petroleum investments and other items as a whole are considered as net.

Electricity. To meet the 175 per cent rise in demand for electricity, and assuming that the load factor is not substantially modified, it would be necessary to raise installed capacity from the existing 327,000 kilowatts of 1950, to a total of 900,000 kilowatts by 1962. In order to obtain the additional power required and assuming that the 50,000 kilowatts surplus in 1950 constituted an emergency reserve, about 12.2 thousand million pesos would have to be invested in addition to 92 million

/dollars in

dollars in foreign exchange.

These figures are based on the report submitted by ENDESA, Power Requirements for the Period 1950-60, following the analysis of the investments still required for the plants already built by this official organization, or those which are now under construction.[1/] Applying the rate of 70 pesos per dollar, instead of the lower rate used by ENDESA, an investment of 29,000 pesos per hydro-electric kilowatt was computed, including in this amount transmission lines and the main sub-stations. On the same basis, the investment per thermic kilowatt was estimated at 21,000 pesos. To obtain this amount, the cost of the small diesel plants (programmed by ENDESA for the north) was related to that of the 40,000 to 60,000 kilowatt plant projected by private capital for the Santiago zone. The expenditure in foreign exchange, based on data in Power Requirements for the Period 1950-60, should total 92.5 million dollars.

Petroleum. When the Empresa Nacional de Petróleo (ENAP) was established, it received from the Corporación de Fomento a total of 1,200 million pesos at 1950 prices, comprising the different investments made since 1943 (calculated at a rate of 31 pesos per dollar) for the purpose of prospecting for petroleum in the Magallanes zone. By 1950, reserves of more or less 35 million barrels had been found in these fields. Subsequent drillings suggest that this amount will be increased, though ENAP has not divulged the figures for the anticipated increment.

It is obvious that despite the success obtained, and the continuous increase of crude petroleum and gas production, ENAP's main task for some time to come will consist principally in prospecting. It would therefore be a mistake to compare past investments and those projected for the future with the probable volume of future output. As an example of these

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1/ In a recent publication Planning of the Second Period of the First Stage of the National Electrification Plan, 1953-1964, the figures presented by ENDESA differed in respect of the cost of plants which it was proposed to build. However, these data do not refer to the entire real investment, and therefore are not strictly comparable with those contained in this section.

difficulties, reference should be made to the drillings in Punta Delgada. This deposit is on the continent and separated from the Cerro Sombrero field by a deep, torrential canal. It was therefore necessary to seal the wells until a decision was taken as to whether or not future output justified a port or a costly submarine pipeline.

Hence, it is not surprising that it was found preferable to use the international figures applied to other South American countries which have encountered this problem. On the basis of United States data for 1950, adjusted to the differences in the depth and yield of the Magallanes wells, it was estimated that the average investment per barrel per day, would amount to more or less 2,300 dollars, or, at a fixed exchange rate of 70 pesos, a total of 16,100 pesos. In comparison, to adapt the Brazilian deposits,[1/] an estimate of 2,500 dollars per barrel per day was calculated, and in the case of one Peruvian firm this figure went as high as 3,150 dollars per barrel per day.[2/] As may be seen, the Magallanes estimate is well within what may be considered as essential, although it should perhaps be somewhat higher.

Considering that it is still in the prospecting stage, the primary objective should be to obtain an output equivalent to the capacity of the refinery which ENAP is building at Concón. That is to say, it will be necessary to raise the daily production of 1,600 barrels to 21,000 barrels by an additional investment of 44.6 million dollars. ENAP had estimated an investment of 8 million dollars in equipment and imported services for the Concon refinery, and a further 300 million pesos for expenditure in Chile. By 1955, Concon should be producing about 370 tons of petrol, 50,000 tons of kerosene, and 100,000 tons of diesel oil, and roughly 120,000 tons of fuel oil. These amounts, however, will not cover estimated petrol consumption for that year (420,000 tons), nor that of kerosene (66,000 tons). From this data it will be observed that by 1962 it will be necessary to import 48 per cent of estimated petrol consumption, 50 per cent of the diesel and fuel oil required, excluding heavy mining requirements, and about 40 per cent of the kerosene used in the country.

1/ Os Fundamentos de Petrobras, Rio de Janeiro, 1952.

2/ Empresa Petrolera Fiscal: Memoria 1950.

/The present

The present report does not take into account the possibility of expanding the capacity of the refinery. It is evident that this possibility would have to be considered, since, given the increment to the domestic market, whether or not local crude production exists, a refinery in the country will ensure a saving of foreign exchange. Technical analyses would still be required to determine the advisability of expanding the Concon refinery, or building another refinery elsewhere. It was felt therefore that it would be preferable not to include this item in the hypothesis of moderate development.

Lastly, investment requirements for the transport of petroleum to the refinery must be estimated. In international publications, expenditure on installations of this type is shown to be 1,000 dollars per barrel per day, including substantial pipeline facilities to cover long distances. The fact that the Chilean reserves are on islands would reduce such expenditure considerably; hence, 500 dollars per barrel per day was estimated, that is, a total of approximately 10 million dollars.

In order to determine foreign exchange expenditure, it was assumed that high pressure pipelines would have to be imported as well as drilling and other equipment. For transport purposes, it was assumed that future pipelines would be produced by domestic industry and only pumping equipment would be imported.

Table 11 Investments in Output, Transport and Refining of Petroleum

	Total	Expenditure	
		In the country (millions of pesos at 1950 prices)	Abroad (millions of US$)
Production	3,000	560	35
Transport	700	420	4
Refining	820	300	8
Total	4,560	1,280	47

Source: United Nations Economic Commission for Latin America.

Coal. The increment in the net demand for coal was estimated at 95 per cent over the period 1950-62. However, since its consumption in the gas factories would be reduced by the utilization of the sub-product of the petroleum refineries and blast furnaces at the iron and steel mills of Huachipato, and as metallurgical coal must continue to be imported, coal output would only have to be increased by 73 per cent, corresponding

/approximately to

approximately to a total of 1.4 million tons.

The problem of investments becomes more complex in the case of Chile, owing to the productivity problems encountered in the principal mines. As was pointed out, labour productivity is low, thus checking any expansion of output, proportionate to the country's requirements during the past few years. Under the circumstances, Chile requested an international loan of 2.2 hundred million pesos, with a view to modernizing its mines and at the same time increasing output by a total of 350,000 tons. It was recognized that this is the most important and the first investment which should be made.

There are two alternatives for obtaining additional output: either from the Arauco seams, which are being worked by the Compañía de Acero del Pacífico, or, alternatively, from the mines mentioned above. In the first case, the main advantage would be the development of a new source of supply which, according to the research carried out, contains vast reserves and appears to be an extension of the seams being worked at present. There are, however, certain disadvantages which might outweigh benefits. In the first place, it would involve a much higher total investment per ton than that required to expand the output of the existing mines. Secondly, the reserves of these mines have been confirmed, and it has been found that even at a higher rate of output than that foreseen for 1962, they will still be productive for another thirty years. Lastly, the Arauco mines are still being prospected, no date having yet been fixed for production to begin. These reasons are sufficient to reject the possibility of developing the Arauco mines, expanding output from existing mines instead.

Local sources could not provide data concerning the investments which would be required to obtain this increment. As in the case of petroleum, it was necessary to obtain international data which, although giving an approximate idea of the amounts required, might be inaccurate insofar as their applicability to Chile is concerned. Using North American figures, which have also been applied to Brazil, it was found that the investment required for the production of one ton of coal in these mines would amount to a little more than 20 dollars, or 1,400 pesos per ton. Multiplying this figure by the additional output required, the total investment would

/be almost

be almost 1,700 million pesos, which would have to be added to the figure indicated for mechanization.

In order to determine the amount of foreign exchange required for this investment, it was assumed that, in the absence of better data, the relation indicated in the above-mentioned loan would be respected, in which case foreign exchange expenditure would amount to 33 million dollars.

Other investments in surface instalments for washing, storage and transport in lorries or to the port, were roughly estimated at 500 million pesos.

CHAPTER VII. TRANSPORT

1. Projection of Demand

Introduction

In comparison with conditions existing throughout the rest of Latin America, the Chilean transport system is highly efficient, and has attained a fairly satisfactory degree of integration. Only two train changes are required for railway passengers or cargo travelling from Pisagua (in the north) to Puerto Montt (in the south), and between these terminals almost all the population and economic activities of the country are concentrated. A series of arterial branches, highways and rural roads supplement this main North-to-South line, linking it to most lateral points of any importance. The rest of the territory, and the 4,000 kilometres of coast, are served by relatively intensive shipping. In contrast, many other Latin-American railways were built exclusively with certain specific purposes, in view -- generally export activities, or alternatively they developed into isolated systems, lacking essential feeder lines. Where this is the case, long-distance haulage is often effected by lorry, at a higher operating cost resulting in a comparatively more expensive transport system.

Chile is likewise favoured by the relative stability of its economic frontier. Differing from other countries in this region, whose large territorial extensions render the expansion and renovation of transport networks indispensable, it is unlikely that Chile will have to make important changes in its present facilities when colonization begins in the extreme south. The hypothesis of development should therefore be based on the assumption that demand for transport in Chile will be borne mainly by the existing network. Increased capacity will be attained, either by adding equipment, or by improving the railways themselves.

Railway Transport

The basic transport system, namely, the railway, is at present handicapped by deficiencies in equipment and track, which prevent satisfactory performance of the services required. From 1934, when the principal lines were taken over

/by the

by the Empresa de Ferrocarriles del Estado (State-owned railway enterprise), until 1945-47, freight traffic increased at the same rate as the gross national product in real terms. A 70 per cent increase in traffic volume during this time, when few improvements were being made to the network, resulted in a better use of existing equipment. However, various financial factors stood in the way of its expansion, and during the past few years particularly, have prevented repairs and replacements from fully compensating for wear and tear of the equipment. The Report prepared by the Special Government Commission,[1/] appointed in October 1951, emphasized these deficiencies and pointed out that a number of trains have had to reduce their speeds, either because of mechanical defects or because of the state of the tracks themselves. Chart 1 shows the railway transport deficit arising from these deficiencies, the volume of freight carried (curve 3) having declined from 1947 onward, so that it no longer retains its previous relationship with the gross national product (curve 2).

It is doubtful whether this deficit was compensated by other means of transport, particularly lorries. Competition, measured in terms of tons-kilometres, from the 30,000 vehicles in operation at the end of 1950, was negligible since the majority of the units were used directly by industry and the urban services; indeed, they did not even displace the volume hauled by draught animals in the latter sectors. At all events, the fact that the 1943-50 trend of the total number of lorries (curve 1 of that same chart) shows no unusual alteration in the past few years may indicate that this deficit was not covered.

Assuming a moderate rate of development, railway transport should expand sufficiently to offset the above-mentioned deficit, and rise proportionately to the gross national product in the future. Hence in Table 1, an annual increment of 6.8 per cent was assigned to railway freight demand and 7.2 per cent to that for passenger services, where shortages are more acute. As will be seen in the section on investments, it was decided to adopt the previous criterion, namely, that the increase of demand will occur basically on the

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1/ Empresa de Ferrocarriles del Estado: Current Conditions in the Management and Operation of Railways and Proposed Changes (Santiago, 1952).

existing network. It was therefore proposed only to add equipment, and improve tracks and services, as outlined in detail by the Special Commission in their report.

Motor Vehicles and Highways

The demand to be met by the railway system consists mainly in long-distance services. For the short urban and rural hauls and some of the medium distance runs, it was assumed that demand for motor vehicles would attain a fairly high level.

For short runs, essential to all types of merchandise, including that carried by rail, the demand for motor vehicles in Chile stems not only from the volume of goods but also from continued substitution of draught animals engaged in transport. Thus, the replacement of oxen by agricultural machinery in rural areas is tending to eliminate carts, the traditional means of transport in those areas. Although the Corporación de Fomento has promoted the use of tractor-drawn vehicles, transport of agricultural produce will most likely depend on lorries. Since the hypothesis of moderate development provides for intensified mechanization of agriculture, it is assumed that demand for lorries tends to rise equally.

A second factor affecting the demand for motor vehicles results from their competition with railways on intermediary hauls. It is difficult to forecast the influence which this factor may have until detailed technical studies, on a regional basis, are available. It may be assumed, nevertheless, that demand for such vehicles would tend to increase as a result of the further employment of motorized elements in rural transport, since their greater radius of operation should enable them to haul some loads which formerly could not be carried farther than the nearest railway terminals.

Attention should be drawn to the influence that such competition exerts on railway revenues, although its prime importance rests on the propensity of the number of these vehicles to exceed the limits prescribed by general economic convenience. One of the main tasks to be fulfilled by the proposed Ministry of Transport is the co-ordination of different transport systems, especially of railways and highways. A step would thus be taken toward the elimination of wasteful competition, which ultimately leads to excessively high replacements costs.

/The increase

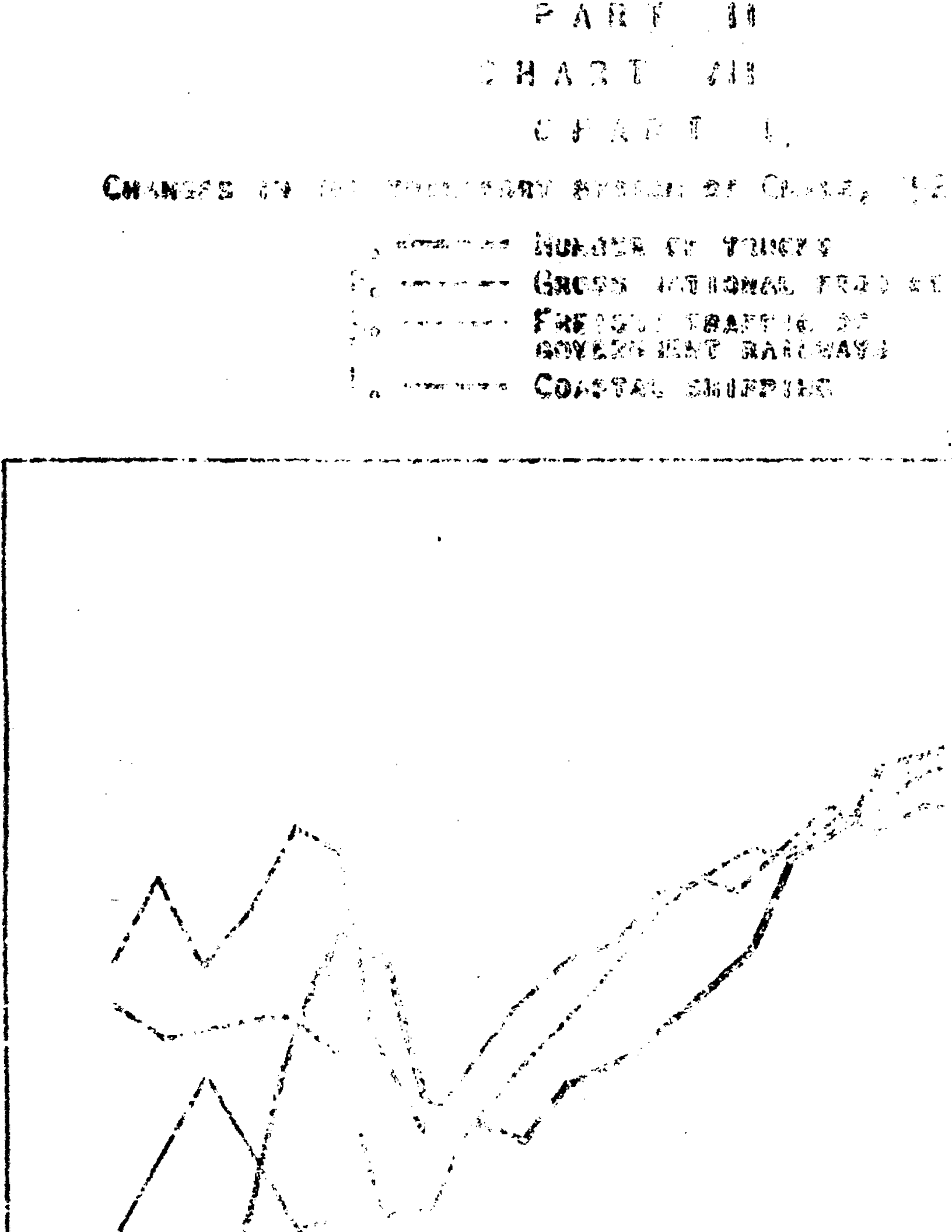
PART III

CHART XIII

CHART I.

CHANGES IN THE [illegible] SYSTEM OF CHILE, [illegible]

- [illegible] NUMBER OF TRUCKS
- [illegible] GROSS NATIONAL PRODUCT
- [illegible] FREIGHT TRAFFIC OF GOVERNMENT RAILWAYS
- [illegible] COASTAL SHIPPING



The increase in the demand for motor transport is associated with the need to improve the highway network. This problem naturally requires detailed study since local conditions, and co-ordination of the highway and railway systems, must be constantly considered. It was therefore necessary to adopt one of the plans submitted to the Departamento de Caminos of the Dirección General de Obras Públicas. Briefly, this plan proposes to extend the highways from a total of 1,700 paved kilometres in 1950 to 6,700 kilometres in 1962, and to raise the 16,600 kilometres of improved earth to 21,000 within this same period. This includes paving the longitudinal highway and the main transversal arteries; improving the summer-roads in the south; and opening new roads in the areas to be colonized in the extreme south of Chile.

Since the railway system is fairly complete, the proposed facilities appear to surpass probable requirements, if the rate of development of the economy is to be moderate. However, since the plan cannot be adapted to this hypothesis before additional research is undertaken, it was proposed to divide the scheme into stages, reducing the original twelve-year period to only ten years, that is, 1953-62. Subsequent investigation, in loco, may throw further light on the improvements which could best be postponed.

All the factors mentioned are considered likely to raise the demand for motor transport, although their ultimate influence on the total number of vehicles could not be determined precisely. It was thus thought necessary to base projected demand for lorries on the expectation that they would maintain the elasticity ratio of 1.8 to the gross national product prevailing throughout the twelve years ending in 1950. Similarly, it was considered that their annual freight capacity would not be substantially altered. As may be seen from Table 1, 92,000 units would thus be in operation in 1962, a figure that hardly seems excessive in comparison with other Latin-American countries.

It was observed that the ratio of passenger buses to lorries remained almost constant; moreover, it was generally assumed that their number would increase at the same rate. The stability of this relation is very likely a coincidence, but the complex nature of the many factors involved would lead to the rejection of any other criterion of calculation.

/Coastwise Trade

Coastwise Trade

Maritime coastwise trade, as may be seen from Chart 1 (curve 4) decreased appreciably since 1925-29, and even from the level of the thirties. The drop was nevertheless gradual and it was noted that the rate of decline showed signs of slackening, leading to the conclusion that the more stable tendency prevailing throughout 1942-50 would not be interrupted in the near future. With a moderate rate of development, it was anticipated, as a working hypothesis, that such stability would continue through 1950-62.

This hypothesis was based on the fact that declining demand for coastwise shipping is largely due to the reduction in nitrate output. The major part of the demand for foodstuffs and coal in Northern Chile was associated with the nitrate industry and it was believed that with moderate development, there would be slight increases in this sector. Other fundamental factors in this hypothesis are the increments assigned to the output of coal, wool, timber and tubers, most of which reach their domestic markets by sea. Moreover, it was borne in mind that after 1954, it would also be necessary to use coastwise shipping facilities for transferring about 8 million barrels of crude petroleum from Magallanes to the refinery being built at Concón. It was therefore assumed that the cumulative effect of these factors could counterbalance others which had caused the declining trend of coastwise shipping in past years.

Table 1, below, shows demand projections for different means of transport through 1962, on the assumption of moderate development.

/Table 1

Table 1: Projection of Demand for Transport on the Assumption of Moderate Development

	1940	1950	1962	Annual rates of increase 1940-1950	Annual rates of increase 1950-1962
Railways [a]					
Tons-kilometres (millions)	1,480	1,550	3,450	0.4	6.8
Passenger-kilometres (millions)	1,280	1,300	3,000	0.1	7.2
Motor Vehicles					
Number of lorries (thousands)	14.3	27.5	92	6.7	10.6
Number of buses (thousands)	2.1	4.2	14	6.8	10.6
Highways					
Paved (kilometres)	1,100 [b]	1,700	6,700	-	-
Improved-earth (kilometres)	13,582	15,451	21,000	-	-
Coastwise Trade [c]					
Shipping tons delivered (millions)	11.2	7.4	7.4	-4.2	0.0

Source: United Nations Economic Commission for Latin America.

a/ Northern and southern networks of the Empresa de Ferrocarriles del Estado.

b/ 1945.

c/ Chilean ships sailing from Chilean ports.

2. Investments

Estimates of investment in transport obviously require detailed technical considerations, such as studies covering the present state of equipment and lines as well as the probable future volume of traffic. In the present instance, the calculations were rendered easier by the publication of a railway investment programme, prepared by the above-mentioned Special Government Commission appointed in 1951. The highway plan, formulated by experts from the Departamento de Caminos of the Dirección General de Obras Públicas, was also of fundamental importance and contains an analysis of the investments to be placed over a period of twelve years. However, difficulties were encountered regarding estimates for investment in port works and a merchant fleet, mainly

/owing to

owing to the lack of similar studies in this field. The existing partial plans therefore had to be supplemented with information relative to projects of private shipowners.

As will be seen below, a different procedure was employed for assessing the investment requirements for the acquisition of lorries and buses, based, in this case, on certain rates of depreciation.

According to these estimates, it would be necessary to invest a total of 42.8 thousand million pesos at 1950 prices, between 1953 and 1962, in order to enable the transport systems to meet the demand which would then prevail, assuming a moderate rate of development. Replacements would account for almost half of this amount, since it was felt that demand would probably be heaviest on the existing networks. New investments would therefore be reserved to supply the increment to lorry and bus needs, and for the general improvement of highways. Foreign exchange expenditure was estimated at 337.5 million dollars (at a rate of 70 pesos per dollar). Fifty-five per cent of this amount, that is, 185 million dollars, would be allocated to increase and replace the number of motor vehicles; 37 per cent, or 125 million dollars, would be directed to the acquisition of rolling-stock and other materials for the railways; and the remaining 8 per cent would be invested in equipment for road building, for the mechanization of port works, and for reconditioning coastwise vessels.

/Table 2:

Table 2: Investments in Transport, on the Assumption of Moderate Development (1953-1962) a/

	Total investments		Expenditure in foreign exchange
	Net	Gross	
	(millions of pesos at 1950 prices)		(millions of US$)
Railways	4,000	11,227	125.0
Automotive vehicles			
Rolling stock and replacements	8,530	19,700	185.0
Highways	8,640	10,028	9.0
Coastwise trade			
Vessels	-	525	7.5
Port works b/	910	1,370	11.0
Total	22,080	42,850	337.5

Source: United Nations Economic Commission for Latin America.

Note: The rate of exchange applied was 70 pesos per dollar.

a/ Excluding air transport.

b/ Including improvements in port works for foreign trade services.

Railways

According to the report of the Special Commission, a total of approximately 10,200 million pesos, including 120 million dollars, would be invested over a period of seven or eight years in order to recondition and extend the mileage of State-owned railways which, at present, comprise practically all the public service lines operating in the country. Of this total, which precludes any items for subsidiary maritime services, 5,880 million pesos would be used in acquiring rolling-stock and replacements of foreign origin, and 2,920 millions — including 23 million dollars in foreign exchange — for rails, reinforcement of the tracks and for the partial mechanization of the loading facilities. These investments would have to be supplemented by additional expenditure for machinery, machine-shop tools, buildings and stations, representing a total of over 730 million pesos, of which 3 million dollars would have to be provided in foreign exchange.

/In the

In the opinion of the Special Commission, this programme should remove the deficiencies which caused the 25 per cent reduction in total traffic units carried; furthermore, it would cover any expansion of demand for freight and passenger services which may arise. Although no mention is made of the magnitude of such an increment, it is understood that the improved equipment could be used in varying measures, so that the demand created by moderate development could be met. Thus it would only be a matter of computing and including the value of replacement needs for the three years between the end of the Special Commission's plan (1960 and 1962). These latter, according to the data contained in the 1950 Annual Report of the Empresa de Ferrocarriles del Estado, were estimated at 1,500 million pesos, which sum also covers 5 million dollars for imports.

Motor Vehicles and Highways

An outlay of 12,000 million pesos at 1950 prices would be required for the highway network if the twelve-year plan referred to above were to be implemented. However, having assumed that this could be reduced to ten years and basing the projection of demand on this hypothesis, the volume of investments would also fall to 10,000 million pesos. As was previously pointed out, detailed investigation would have to be made concerning the most suitable order for the improvements selected and, consequently, for the investments to which corresponding priority would be granted.

The figure of 9 million dollars, estimated in the original plan as the price of essential road-building equipment, must nevertheless be retained. In this connexion, it should be pointed out that asphalt paving was rejected in favour of cement, due to the existence of unused capacity in this industry.

Investment in lorries and buses were estimated at 19.7 thousand million pesos. An annual rate of depreciation of 10 per cent was calculated for the former and 12.5 for the latter, thus raising the proportion of vehicles with less than ten years of service from 60 per cent in 1950 to 69 per cent in 1962. This improvement in age distribution is to a certain extent justified by the abnormal volume of accumulated demand for replacements observed since the end of the war, and by balance of payments difficulties in recent years. In these estimates, the vehicles were assessed at their 1950 average import values, the cost of building the bodies in Chile being added to that figure. A further

/15 million

15 million dollars and 550 million pesos were listed for imports of replacements and for repairs. The requirements for each type of vehicle were considered in these estimates; in the case of buses, the data correspond to those published by the Santiago urban transport companies at the end of 1951 and may perhaps be somewhat excessive.

Shipping

Estimated investments for shipping provide for the overhauling and refitting of the existing coastwise fleet, and the improvement of habour works at the principal ports; it is hoped that these measures will ensure the stability of the volume of coastwise trade. In the absence of specialized research on existing equipment and the degree of activity of the lines in operation, recourse was had to independent statements made by various shipowners, in order to provide basic data. Partial plans formulated by the Ports' Department of the Dirección General de Obras Públicas were used in connexion with estimates concerning habour facilities.

The Chilean merchant fleet,[1/] including ocean-going vessels, comprises an aggregate of 226,000 tons. Of this total, 106,000 are less than twenty years old and for the most part these ships are engaged in foreign trade; moreover, not all of them are necessarily limited to plying to or from Chilean ports. The remaining tonnage, some 54 per cent of the total, is composed of vessels between twenty and sixty-three years old; the reason for their high maintenance costs and low speeds can be directly attributed to their age. Freight rates are proportionately high, or, alternatively, owing to the marine legislation currently in force, they incur increasing losses. It was estimated that to replace all vessels in poor condition, by others designed to provide the same facilities, would call for an outlay of about 25 million dollars. However, reconditioning would cost only 7.5 million dollars and at the same time would improve their efficiency, so this alternative was preferred. Although Chile is actually in a position to build a number of small ships, relying mainly on imported materials, it was thought that the 25 million and the 7.5 million dollars mentioned above would be entirely disbursed in foreign exchange.

1/ Including shipping services linked with the State-owned railways.

/It was

It was also estimated that the aggregate figure for Chilean ocean-going tonnage could be increased by 60,000, with an investment of 18.5 million dollars, the most important result of which would be to effect substantial savings in the payment of freight to foreign shipowners. This, in turn, should prove beneficial from the standpoint of the country's balance of payments. At present, the advisability of stimulating domestic shipbuilding activities is under consideration, with a view to adapting the shipyards for the construction of substantially larger vessels. Should these projects materialize, the addition of an ocean-going merchant fleet would be of undoubted advantage, at the same time supplying part of the coastwise shipping facilities needed. However, these plans are still in a very preliminary phase, so that the investments involved do not appear in the hypothesis of moderate development and for the time being, at least, ships plying in coastwise trade will have to be purchased from shipyards abroad.

Experts agree that during the past ten to twenty years, no adequate replacements were made in Chilean port installations. It is therefore believed that operating costs in the majority of these ports are excessively high and could be reduced by mechanization of the principal harbour works, and dredging of the sand-clogged bays. Estimates vary, regarding the cost of these improvements, depending on the number of ports envisaged and the extent to which the measures are to be carried out. Despite these discrepancies, there is a general demand for dredging equipment and cranes, for the mechanization of loading and unloading operations and for the performance of other tasks connected with shipping. It is evident that only by detailed study can the required investment data be ascertained in this sector. In the present analysis, one of the more conservative opinions was adhered to, namely, that the improvement of existing ports and their respective installations would involve an investment of somewhat more than 11 million dollars, in addition to a total of 600 million pesos, the necessary dredging equipment having been taken into account in these calculations.

Other Types of Transport

It is practically impossible to compute the future development of domestic freight-carrying air lines owing to the fact that these services are still in the earliest stages of development. However, given Chile's characteristic

/geographic formation,

geographic formation, a substantial increment of demand for this type of transport may be expected. Nevertheless, since it is impossible to determine the measure in which this sector might expand, it would be extremely hazardous to estimate the investment that might be required to substitute aeroplanes for other forms of transport.