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STRUCTURE OF THE STEEL TRANSFORMING INDUSTRY IN LATIN AMERICA

CONTENTS

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I. INTRODUCTION

1. Purpose and Scope of Paper

The original purpose of this paper was to provide the Meeting with some preliminary economic data on the role played by iron and steel transforming industries in the economies of certain Latin-American countries.

Considerable study was devoted in the earlier stages of the Meeting to the economics of steelmaking. It is felt that a necessary complement to this study is the consideration of the economic significance, structure and evolution of iron and steel transforming. This allows steelmaking to be placed in its true perspective in relation to the present stage of development of the manufacturing industry in general in Latin America. It also permits an advance beyond the stage of the consideration of steelmaking as a purpose in itself, and the establishment of a link between steelmaking and the important industries depending on it for their raw materials.

Another paper presented to this Meeting, document L.86, considers the general trends in the total demand for iron and steel products in a series of Latin American countries. This survey, on the other hand, deals with one of the main sectors of demand: that connected with iron and steel transforming industries. 1/

For the purpose of this paper, iron and steel transforming industries are defined as those which utilize iron and steel products as their main raw materials - whether these products are turned out by iron works and steel mills or by other iron and steel transforming industries - and turn them into finished goods ranging from such simple items as wire, pipe or screws, to the more complicated types of machinery and transport equipment. They are generally described in industrial circles as "metallurgical", "mechanical", and "transport equipment" industries. As far as the classification of the available material permits, electrical machinery and appliances, instruments and, of course, aircraft production, are excluded from the scope of this study in view of the considerable importance of non-ferrous material in the composition of raw materials used in them.

1/ For the relative importance of these sectors, see section VII.

/For purposes

For purposes of comparison and also since, in many cases, it is impossible to separate the early stages of iron and steel transformation from their production, iron and steel making have been included in almost all the statistical comparisons made. Thus, this paper may be considered as a rough study of the importance and structure of the iron and steel sector in the economics of Latin-American countries.

The availability of data has limited this paper to the consideration of Argentina, Brazil, Chile, Colombia and Mexico which cover about 76 per cent of the total steel consumption of the region. The United States has been shown for purposes of comparison.

2. Structure of the Study

The scarcity of the statistical data available, has limited the scope of this study to a preliminary analysis of certain aspects of the iron and steel production and transformation in Latin America. It is based on the last industrial censuses or on some unpublished data from official sources, which are detailed in Annex III.

As the source material corresponds to different years, this study does not show a cross section of the iron and steel sector of the Latin American industry at a given time, but rather gives figures which can be taken as a series of examples illustrating the structure of the industry in underdeveloped countries at different stages of the development of their steel producing industries. In addition, the data show the relative structure for every country in a given year.

The paper presents mainly:

1) Data on the economic importance of iron and steel producing and transforming industries in relation to the manufacturing industry as a whole. These data include value added by the respective industrial branches, employment in them and imports corresponding to them.
2) An analysis of the production cost structure is made, special attention being paid to labour costs and raw material costs.
3) In addition, the labour factor and the consumption of raw materials has been analysed, and some data given on the structure of labour and the size of enterprises.

/4) The relationship

4) The relationship between the value added in the respective industries or industrial groups and the amount and structure of the capital invested in them, is then investigated.

5) Finally, the iron and steel products used as raw materials in the transforming industries are studied for the two countries for which detailed information is available, namely: Argentina and Mexico.

Throughout the study, efforts were concentrated on the comparisons of structure within the respective countries as they appear from the statistical data available. It is only in a few cases that direct comparisons of absolute levels could be made. Also, normative conclusions from the data presented were generally avoided.

3. Character of Data Utilized and Limitations of the Paper

For Argentina, Brazil, Colombia and the United States, the latest available industrial sources were used. For Chile and Mexico, unpublished data.

Annex III describes in detail the limitations inherent in the data available and the methods used in order to obtain at least a degree of homogeneity. In the data shown the principal limitations are the following:

a) The disparity of the industrial classifications. This has led to the adoption of a few broad groupings, as follows:

I. Iron and steel producing industries: blast furnaces, steelworks and rolling mills.

II A. Primary iron and steel transforming industries, including: foundries, wire-drawing, manufacture of pipes, as well as all other iron and steel transforming industries involving a relatively simple technology and producing finished goods of small bulk or simple mechanical elements.

II.B. Secondary iron and steel transforming industries, subdivided into:

1) Industries manufacturing, assembling and repairing transport equipment.

2) Mechanical industries (including workshops).

b) The unreliability of value data which results from inflationary conditions and the scarcity of data expressed in physical quantities.

c) The quasi-impossibility of converting values into a simple monetary unit for purposes of international comparison.

d) Double-counting between the products of certain industries and the raw materials of others.

Such limitations, which cannot be overcome satisfactorily, confer on the data provided in this study a preliminary and approximate nature.

An adequate study of iron and steel transforming industries would require a considerable amount of time and many additional data, and especially detailed breakdowns. It should, beyond the consideration of aggregates shown here, examine the individual industries, which are essentially heterogeneous in character.

4. Description of the Iron and Steel Industry Sector During the Years Covered by the Study

a) Argentina

The latest industrial census available corresponds to 1946. Argentina is the country with the highest per capita steel consumption in the region; the figure for 1946 stood at 38.2 kilos of iron and steel [1/] which had risen to 63.0 kilos in 1950. In 1946, five steel rolling mills were operating in the country. Their total production, mainly of bars, wire and light structures, was 170,000 tons, against imports of 437,000 tons in the same year.

The tariff act which was in force in Argentina in 1946 dated from 1916, and afforded substantial protection to the metal working industries. In addition, since 1932, a system of import permits was established and it seems probable that this system has been used in a manner which granted the metal working industries a further, although not always certain, protection. In 1946, therefore, Argentina held the highest proportion among the countries of Latin America for the consumption of metallic iron transformed domestically into different mechanical and engineering products.

1/ The statistics for per capita steel consumption in this study refer exclusively to rolled iron and steel products, pig iron, and some simple items such as: wire, pipes, bolts, nuts, nails, etc. Iron and steel contained in durable consumer goods and in machinery and equipment, which need more complicated transformation processes, have been excluded.

/b) Brazil

b) Brazil

The latest industrial census of Brazil, fully available, corresponds to 1939. In addition some summary data from the 1949 census have also been used in this survey, but they do not include statistics for individual industries. Although Brazil is at present the largest steel consumer in Latin America, the per capita consumption is still very low; 10.7 kilos in 1939, rising to 14.8 kilos in 1949.

Small size charcoal blast furnaces have been operated in Brazil for many years. The present production of steel began to develop in 1926, when a tonnage of 16,000 was produced, against imports of 380,000. In 1939 the same figures had reached 101,000 and 329,000 respectively, while in 1949 they stood at 505,000 tons of domestic production against 247,000 tons of imported steel. The real development of the steel transforming industries began after the establishment of flat products production at Volta Redonda in 1946.

In 1939, the year in which the available information is more complete, few steel transforming industries existed in Brazil as the former tariff act which was in force until 1937, had not afforded satisfactory protection. With the enactment of a new tariff and the ready availability in the market of a complete assortment of domestic rolled steel products, the secondary metal industries have developed rapidly, since 1943, but without reaching, so far, the high level attained in Argentina.

c) Chile

No industrial census is available in this country, but a certain amount of information pertainingg to 1948 has been supplied by the Dirección General de Estadística. The per capita consumption in 1948 stood at 25.9 kilos, while in 1951, the first year in which the new steel plant at Huachipato was in operation, it reached 34.8 kilos.

In 1948, three small scrap rerolling mills were being operated in Chile and the charcoal blast furnace of Corral, in the south, produced and also rolled some steel. The production consisted exclusively of bars and light structures, representing 40,000 tons in 1948, against 105,000 tons of imports. In 1951, including the production of bars, plate and sheet

/at Huachipato,

at Huachipato, domestic output had risen to a tonnage of 113,000 while imports had dropped to 93,000 tons. Incidentally, consumption has risen further during 1952.

The Chilean tariff act dates from 1928, and in order to foster economic development generally, it excepted, or imposed very low, duties on equipment and many durable consumer goods. At a later stage, amendments were introduced to protect both the new industry for primary steel products, which was created in the thirties, and certain simple mechanical industries. No attempt, however, has been made to revise this section of the tariff completely in order to adjust the protective measures to any definite policy. The prevailing duties are probably excessive in some sectors, while in many instances the raw materials pay a higher duty than the finished product. This pattern is further complicated by the fluctuating policy of the agency for exchange control, created in the early thirties, and by the fact that a substantial part of the capital investment for industry, transportation and hydro-electric power have been financed by international credit institutions which do not grant loans for expenditures made within the country. Thus local engineering industries have been excluded from a substantial part of the market.

In spite of the aforementioned difficulties, there exists a small steel transforming industry in Chile, but its relative importance within the country is considerably smaller than that of similar enterprises in Argentina or Brazil.

d) Colombia

The data which have been used correspond to the industrial census of 1945. The per capita steel consumption of Colombia is relatively low; in 1945 it amounted to 9.3 kilos, rising to 13.5 in 1950. The fact that the census for 1945 was taken in a war year may have limited steel consumption to a certain extent and thereby affected the relative position of the steel industry sector in the country; since the average steel consumption per capita in 1937-39 was only 11.1 kilos, it justifies the assumption that any change which occurred in the past was probably unimportant.

In addition, Colombia had no domestic steel production in 1945, a

/position which

position which is unaltered today, although an integrated plant for the production of bars, wire and rails is under construction at Belencito and whose output will probably commence in 1954-55.

The tariff legislation of Colombia was enacted in 1931, and affords almost no protection for domestic steel transforming industries; thus such industry existing at present is justified, almost exclusively, by the transport difficulties of the country. A typical example of this position, probably a unique one, is that pig iron for local foundry use is successfully produced in Colombia by carburizing steel scrap.

e) Mexico

The data regarding the metal industries in Mexico have been taken from a special study of the industrial research section of the Banco de Mexico, entitled Las Industrias Mecánicas Secundarias de México, and covering the year 1949. In that year the per capita steel consumption of Mexico stood at 20.2 kilos and has since risen to 28.0 kilos in 1951.

Two integrated blast furnaces, at Monterrey and at Monclova, were in operation in 1949. Of these the former produces bars, rails and medium weight structures almost exclusively, while the latter rolls flat products. In addition eight small rerolling mills have been operating, of which "La Consolidada" is the most important. They use either domestic or imported scrap and also some imported billets. "La Consolidada" sells a large part of its output in the form of wire, wire products, bolts, nuts, rivets, and nails. In 1949, domestic production in Mexico amounted to 334,000 tons, whereas imports totalled 167,000 tons.

Steel transforming industries have begun to develop, mainly since the last world war and in much the same way as in Brazil; the domestic production of flat rolled products for example appears to have added considerable momentum to such industries. A definite policy exists in Mexico to enlarge the domestic steel transforming industries; several factories produce mechanical equipment, while, with the cooperation of a European firm, the local manufacture of road and railway vehicles has been envisaged.

In 1949, the year to which the information in this study refers, such projects had not developed to any great extent since the production of plate

/and sheet at

and sheet at Monclova had only been placed on the Mexican market in 1946. The relative importance of the metal working industries was, therefore, less than that of Argentina.

f) United States

For a basis of comparison, some statistics from the 1939 and 1947 Manufacturers' Census of the United States have been included in this study.

II. THE IMPORTANCE OF THE IRON AND STEEL SECTOR IN THE INDUSTRIAL STRUCTURE OF CERTAIN LATIN-AMERICAN COUNTRIES

1. Value added by Iron and Steel Production and Transformation

In order to ascertain the weight pulled by the iron and steel producing and transforming industries of Argentina, Brazil, Colombia, Chile, Mexico and the United States, computations have been made of the values added 1/ in the industrial groups into which the sector has been broken down. These values added have been related, as far as possible, to those corresponding to the total of manufacturing industries in the same countries at the same time.

Table 1 is the result of some of these computations. It should be borne in mind that in the case of Brazil reference is made to a year, 1939, when large-scale production of iron and steel had not yet been initiated. Similar figures for 1949 cannot be shown with a fully comparable classification, but Table 2 allows an idea to be gained of the evolution of the industrial structure of Brazil from 1939 to 1949.

1/ A tabulation of the original data has been presented as Table A, Annex II. In the study value added has been calculated, in principle, as the difference between the total value of products as shipped from the producing enterprises considered, and the cost of materials, supplies, containers, fuel, purchased electric energy and contract work. This has not been strictly possible in the case of Colombia (because production is valued at cost) and in the case of Mexico (because the value of metallic raw materials only was known). In view of the fact that it approximates the value created in the process of manufacture, value added provides the most satisfactory measurement of the relative economic importance of given industries or industrial groups. It is particularly valuable since such a method is additive without involving double counting. It should be borne in mind, however, that if the contribution of given industries or industrial sectors to the national income of the countries is the notion in which one is interested, transfer payments - such as payments for rent, insurance, advertising, etc. - should be subtracted from value added because they are in fact contributions of other non-industrial sectors to the national income. The contribution of the industries themselves is thus reduced essentially to payments made for wages and salaries.

/Table 1.

Table 1 Value Added in the Steelmaking and Transforming Industries

(percentages of total value added in the sector)

Industry group	Argentina 1946	Brazil 1939	Brazil 1949	Chile 1948	Colombia h/ 1945	Mexico 1949	United States 1939	United States 1947
I Production of iron and steel a/	14 b/	20 c/		12	..	26	20	13
II Primary transformation	26 f/	37 d/		73	20	74 g/	27	29
III Secondary transformation	60	43		15	80		57 e/	58e/
Per capita consumption of iron and steel (kilos)	38.2	10.7	14.8	25.9	9.3	20.2	467.	543

a/ Blast furnaces, steel making and rolling mills, excluding foundries.
b/ Includes about 10% for the elaboration of non-ferrous metals, and about 20% for casting of iron, steel and non-ferrous metals.
c/ Includes the manufacture of rolled and drawn products.
d/ Excludes the manufacture of rolled and drawn products.
e/ Excludes repairs.
f/ Excludes foundries.
g/ Difference between the value of the products and that of the metallic raw materials only.
h/ The value added was obtained by subtracting the value of the raw and other materials from the cost of production at the mill.

The resemblance between the structure of Argentina and the United States, evidence of which may be found in these figures, is striking, especially if the difference in the per capita consumption of iron and steel in both countries is considered. The fact that the difference in the system of tabulation would make some minor adjustments necessary, does not alter this conclusion, which corroborates the previous statement on the development of steel transforming industries in Argentina. The other extreme case in Table 1 is that of Colombia which shows a structure often found in those Latin-American countries which have a very small iron and steel consumption and hardly any developed metal transforming industry. In such cases, almost all the ferrous material, used by the mechanical industries, is dedicated to repairs, and the plants are

/classified as

classified as "secondary transformation industries".

The figures referring to Brazil, Mexico and Chile are placed between these two extremes. In the case of the latter, the relative weakness of its engineering industries is clearly brought out in the table.

It is well known that the manufacturing industry is relatively less important within the framework of the economy of the Latin-American countries than in the United States. The importance of the iron and steel sector of the industry is still smaller, as is shown in Table 2. In Argentina, where the percentage is largest among these Latin-American countries, it is still only about one half of that of the United States. The table also shows that the relative importance of the iron and steel sector within the total manufacturing industry is greater in those countries which have a higher per capita steel consumption. It may be concluded that the development of iron and steel production, and the growth of consumption which usually follows it, should be considered, for a balanced growth with the development of transforming industries, at least those which are adapted to the economic conditions prevailing in the countries.

Table 2 Proportion of Value Added by Steelmaking and Transforming Industries Within the Total for all Manufacturing.

(percentages)

Country	Year	Percentage of value added in steel sector	Per capita steel consumption Kilos
Argentina	1946	13.4	38.2
Brazil	1939	10.8	10.7
Brazil	1949		14.8
Chile	1948	12.2	25.9
Colombia	1945	6.8	9.3
United States	1939	27.5	467
United States	1949	29.7	543

2. Employment

2. Employment in Steelmaking and Transforming Industries

Table 3 shows, on a comparable basis with Table 1, total employment (workers and employees) in iron and steel producing and transforming industries in Argentina, Brazil, Colombia, Chile and the United States. The evolution in Brazil from 1939 to 1949 is shown with a somewhat different classification, as 1949 refers to workers only. The basic data with which Table 3 was prepared appear as Annex II, Table B.

Table 3 Structure of Total Employment in the Steelmaking and Transforming Industries. a/

(percentages and thousands of persons)

Industry group	Argentina 1946	Brazil 1939c/	Brazil 1949b/	Chile 1948b/	Colombia 1945	United States 1947d/
I Production of iron and steel	13	20	71	12	..	14
II Primary transformation of iron and steel	24	50		72	23	30
III Secondary transformation of iron and steel						
A Transport equipment	46	11	12	10	7e/	21e/
B Mechanical industries	17	19	17	6	70	35
Percentage of total employed in manufacturing industry	18.5	8.5	—	14.6	6.8	30.3
Number of persons (thousands)	173	71	123	22.3	8.3	4,400

a/ Workers and employees.
b/ Workers only.
c/ Includes owners, partners, directors or managers.
d/ Includes all paid personnel.
e/ Excludes repairs.

Lacking (because of the difficulty of determining necessary currency conversion rates) an adequate basis for inter-country comparisons of the production of these industries, or of the value added in them, the figures included in this table at least allow an impression to be gained of the relative importance of the industries under consideration in the respective countries. 1/ The validity of these comparisons is, of course, limited in

1/ In the case of Mexico, no figures are available on a comparable basis with those of Table 3, but total employment in iron and steel transformation can be estimated at roughly 30,000 persons.

/view of the

view of the varying levels of productivity as between the countries.

The unusually high percentage of the labour force dedicated in Argentina to the Secondary Transformation of Iron and Steel - Transport Equipment (III A), is due to the inclusion of the repair shops of the railways and tramways. Incidentally, very strong labour unions have been organized in these shops and, as they have been able to obtain relatively high wages, the value added by manufacture in this sector is also higher than normal.

A comparison may also be made between the statistics in Table 3 and the total of the economically active population of these countries. Iron and steel transforming industries employed: one-sixth of all industrial workers and employees in Argentina, one-eighth in Chile, about one-tenth in Brazil in 1939, one fourteenth in Colombia and about one-third in the United States.

In Table 4 a similar distribution has been prepared, but presenting the number of persons employed in the various sectors of the iron and steel producing and transforming industries, per one thousand inhabitants of these countries.

Table 4 Number of Persons per 1,000 Inhabitants Employed in the Various Sections of the Iron and Steel Producing and Transforming Industries
(persons employed)

Industry group	Argentina 1946	Brazil 1939	Chile 1948	Colombia 1945	United States 1947	Mexico
I Production of iron and steel	1.4	0.35	0.5	..	4.2	
II Primary transformation of iron and steel	2.7	0.88	2.86	0.19	9.2	
III Secondary transformation of iron and steel						1.2
A-Transport equipment	5.0	0.21	0.4	0.06	6.4	
B-Mechanical industries	1.9	0.33	0.24	0.55	10.8	
Total iron and steel producing and transforming industries	11.0	1.77	4.0	0.8	30.6	

/It is outside

It is outside the scope of this study to judge whether these different levels of development of the iron and steel sector correspond to the physical and human resources of the countries and to the levels of income they have reached. Nevertheless, the differences observed are striking.

3. Imports of Iron and Steel Products and Goods

Whereas Table 1 allows a consideration of the importance of the iron and steel producing and transforming sectors in the total industrial production of certain Latin-American countries, Table 5 presents data which allow an assessment of the importance of the products in these sectors in the total value of industrial imports 1/ of these countries. An attempt has been made to carry out the grouping of imported goods on the same basis as that of producing industries. 2/

1/ It must be borne in mind that comparisons of import values within the same country are affected by multiple-exchange effects, particularly in Argentina.

2/ Only percentages are shown in Table 5. This is in order to discourage any attempt either at comparing money values of imports with those of internal production or at combining these figures into aggregates. The reason for this is that both series lack complete homogeneity, not only because of conversion and multiple-exchange-rate problems, but also because, in order to achieve comparability, import values should be adjusted upwards to allow for certain duties, taxes and importer's profits. Such a correction cannot be made, inasmuch as the last item, which is quite considerable (and variable according to the specific values of items) is unknown. It is believed that, in the case of Argentina, the adjustment should be of at least 50 per cent.

Table 5 Distribution of Steel Imports and Products in some Latin-American Countries
(percentages)

	Argentina 1946	Brazil 1949	Chile 1948	Mexico 1949
I. Semi-finished iron and steel	6.6	2.4	6.1	2.6
II A Products of primary steel transformation	5.4	7.3	5.9	6.8
B Mechanical products and transport equipment	14.0	35.0	21.9	31.7
1. Transport equipment	7.2	13.2	5.6	12.2
2. Mechanical products	6.8	21.8	16.3	19.5
Total of finished products	19.4	42.3	27.8	38.5
Total of finished and semi-finished products	26.0	44.7	33.9	41.1
Total imports, excluding food, drink and tobacco	100.0	100.0 a/	100.0 a/	100.0

Source: Import statistics of the respective countries.

a/ The imports of gold and precious metals are also excluded from the total.

These countries devote from one quarter to two-fifths of their import capacity (excluding food, drink and tobacco) to imports of iron and steel and their products. Such imports represent a considerably larger percentage of total imports 1/ than does the internal production of the corresponding sectors of total industrial production. The former percentage is twice as

1/ The total of imports was taken excluding food, drink and tobacco, and, in the case of Brazil and Chile, gold and precious metals. Thus a certain amount of industrial raw materials are included in this total, whereas the production of industrial raw materials is not included in the total of Table 1. If industrial raw materials had been excluded from the total of Table 5, the percentages shown in this table would have been higher still.

/large as the

large as the latter in the case of Argentina, almost three times as large in the case of Chile and four times as great in that of Brazil. The percentages relating to the imports of semi-finished iron and steel products reflect the degree of development of iron and steel production in the respective countries at the time the censuses were taken: where this development was relatively high, as in the cases of Brazil and Mexico in 1949 these percentages are of the order of 2.5. In the cases of Argentina and Chile, which had not yet seen the creation of integrated iron and steel works, the imports of iron and steel products are considerably higher - more than 6 per cent of the total of imports.

If one examines the structure of imports, striking differences can be observed in the relationships between imports of finished and semi-finished iron and steel products, groups II and I in Table 5. In the case of Argentina, with a fairly well developed steel transforming industry, the relation is approximately 3. In Mexico and Brazil, both in possession of integrated steel industries and only beginning to develop their steel transforming industries, the relation is 16 in the former, and as much as 19 in the latter. Chile, with a relation of 4 1/2 represents an intermediate case, owing to the existence of a primary steel transforming industry of certain importance.

Also, Argentina devotes 2 1/2 times more money to the imports of mechanical and transport equipment; Chile 4 times, Brazil and Mexico almost 5 times, than primary steel products.

III THE STRUCTURE OF PRODUCTION COSTS

1. Production Cost Structure for Major Industrial Groups

Table C, Annex II shows, for the countries and the industrial groups considered in this study, the total value of products shipped. [1] Tables 6 and 7 give the relationship to this total value of production, of:

1) Salary and wage payments (excluding social payments), in Table 6, and
2) Raw material costs (including parts, containers and supplies, but excluding fuel and purchased electricity), [2] in Table 7.

The figures of Table C, Annex II are, therefore, representative of the relative importance of labour and material costs in total production costs plus profits. [3]

a) Relative importance of wage and salary costs. It can be seen immediately, from Table 6, that the percentage of production costs represented by wages and salaries of iron and steel producing and transforming industries, is high in the case of Colombia - 34 per cent- very low in the case of Brazil - 18 per cent - whereas Argentina and Chile lie in between, with an incidence of labour costs of approximately 27 per cent. It is doubtful whether these differences can be explained by the levels of productivity of labour alone. They also bear some relationship to the different wage levels prevailing in the countries and industrial sectors under consideration.

1/ In all countries except Colombia, value of products shipped is calculated at factory sales prices. In the case of Colombia, production is assessed at cost value and not at market value.

2/ In the case of Argentina, Brazil and Colombia, the cost of lubricants is excluded also. The raw material figures for Chile include an item called "materiales", presumably fuel, lubricants, and perhaps purchased electricity. Allowance can be made for this item by noting that, in the case of Argentina, fuel, lubricants and purchased electricity represent on the average 2.6 per cent of the total market cost of production for the industries under consideration.

3/ In order to avoid double counting between the products of certain industries and the raw materials used in others, the Census of Manufacturers of the U.S. avoids giving figures for the total value of products shipped and total consumption of raw materials by industry groups. In order to give, for the U.S., comparable data to those shown for Latin American countries, it has therefore been necessary to recalculate the totals corresponding to groups on the basis of figures for individual industries. The resulting data, as well as those used for Latin American countries, are obviously not free from double counting. For the U.S. they could not be calculated for iron and steel producing industries.

/Table 6

Table 6. Cost Structures in Certain Countries Compared by Industry Groups

I. Percentage Value of Wages and Salaries (excluding Social Security) in the Total Value of Production a/

Industry group	Argentina 1946	Brazil 1949	Colombia 1945 b/	Chile 1948	United States 1947
I. Production of iron and steel	25.3	18	..	24.0	..
II A Primary transformation of iron and steel	19.9		26.6	25.9	32.3
B. Secondary transformation of iron and steel	31.8	19	38.6	33.9	34.8 c/
1. Transport equipment (Manufacture, assembling and repair)	33.6	15	..	35.6	32.6 e/
2. Mechanical industries	27.4	24.5	..	29.8	35.2 d/
Total, transformation of iron and steel	27.7	..	34.3	27.0	33.7 c/
Total, production and transformation of iron and steel	27.4	18	34.3	26.6	..
All manufacturing industries	16.6	13	15.8	15.6	..

Source: See Annex III. For Mexico, Group I and part of Group II, Revista de Estadística

Notes: a/ Calculated at selling prices.
b/ The total value of production is calculated at factory cost prices.
c/ Excluding refrigerators, motor vehicles and motor vehicle parts.
d/ Excluding refrigerators.
e/ Excluding motor vehicles and parts.

In every country, wages and salaries represent a considerably greater portion of the total value of production in the industries studied here than in manufacturing as a whole. Iron and steel producing and transforming industries are thus to be considered as labour intensive ones, somewhat less perhaps in the case of the former.

If one compares primary transformation of iron and steel with

secondary transformation, the incidence of labour costs is much higher in the case of the latter.[1/] This is probably due to the fact that primary steel transformation consists generally of mechanized processes in which the operator has to develop only a certain degree of mechanical skill similar to that prevailing in most other manufacturing industries. In the secondary transformation industries, it mainly happens that the worker has to acquire a special skill directly related to the raw material he is handling: to its cutting, forging, milling, shaping and so on. The availability of this type of worker is smaller, especially in underdeveloped countries, and his training more complicated than that of the worker who needs only a skill which he can apply to almost any mechanism.

It is interesting to note that the United States shows percentages of wage and salary costs which are on the average substantially equal to those of Colombia, and are only about one fifth higher than in the case of Argentina and Chile. This, notwithstanding the very considerable difference in wage rates, which are several times higher in the United States than in Chile and in Argentina. The higher rates to be paid per hour to workers in the United States in relation to Latin America appear to be, therefore, almost compensated by their higher productivity. This is particularly true for secondary industries. Annex I, Table A, shows some figures regarding productivity; value added per worker has been compared on a dollar basis, in spite of the shortcoming of any conversion in view of multiple exchange rates and other complicating factors.

b) Relative importance of the cost of raw materials. Table 7 allows comparisons to be made not only between Argentina, Brazil, Colombia and Chile, as in the case of the study of incidence of labour costs, but also for Mexico, although it must be borne in mind that in the case of this country only metallic raw materials are taken into account in the cost figures of transforming industries presented.

1/ Except in Brazil, but the groups are not readily comparable.

Table 7. Cost Structures in Certain Countries Compared by Industry Groups

II Percentage of Costs, g/ in the Total Value of Production a/

Industry group	Argentina 1946	Brazil 1949	Colombia 1945 b/	Chile 1949 h/	Mexico 1949	U. S. 1947
I Production of iron and steel	37.0	38	..	43.2	28.1	..
II A Primary transformation of iron and steel	43.3		57.6	42.6	48.7 d/	44.2
B Secondary transformation of iron and steel	33.4	51	45.3	32.6	29.0 d/	41.8 c/
1. Transport equipment (Manufacture, assembling and repair)	33.7	60	..	34.4	..	49.3 f/
2. Mechanical industries	32.8	38	..	28.6	..	40.1 e/
Total, transformation of iron and steel	36.8	..	49.7	41.1	46.7 d/	42.8 c/
Total, production and transformation of iron and steel	36.8	42	49.7	41.4	42	..
Total, manufacturing industries	49.8	53	75.6	53.1	..	..

Source: See Annex III. For Mexico, Group I and part of Group II, Revista de Estadística

a/ Calculated at selling prices.
b/ The total value of production is calculated at factory cost prices.
c/ Excluding refrigerators, motor vehicles and motor vehicle parts.
d/ Metallic raw materials only.
e/ Excluding refrigerators.
f/ Excluding motor vehicles and parts.
g/ Excluding fuel, lubricant and purchased electrical power.
h/ Including other materials.

The combination of iron and steel production and transformation here again shows some fairly similar percentages, particularly in the cases of Brazil, Chile and Mexico, where the figures are uniformly about 42 per cent. Argentina shows a lower relative cost of raw materials (37 per cent), perhaps because a considerable part of them is imported at preferential rates of exchange.

/In relation

In relation to total manufacturing, the iron and steel sector shows a distinctly low raw material intensity.

This comparative picture holds true also if iron and steel transforming industries (Group II) are considered alone, except that Mexico falls out of line with a higher percentage of raw material costs than the other countries, the more so as only metallic raw materials are considered. On the other hand, whereas Argentina and Chile show substantially the same incidence of raw material costs, in the case of production, as of transformation, Mexico shows very low raw material costs in iron and steel production: 28 per cent only. This is probably partly connected with the fact that Mexico possesses an old-established iron and steel producing industry, based on relatively cheap raw materials. On the other hand, some of the Mexican steel producing plants also perform primary transformation.[1/] At the time to which the data analysed here refer, Chile and Argentina had only rerolling plants, and industrial raw materials have been imported at preferential rates.

Within the iron and steel transforming sector, the secondary industries show, as was to be expected, a considerably smaller importance of raw materials than the primary industries. The relatively minor importance of secondary industries in the data available for Mexico and the mixed character of some plants, may explain the high percentage of raw material costs shown by Mexican iron and steel transforming industries as a whole.

It is important to note that in the case of iron and steel transforming industries, the United States again shows an incidence of raw material costs (43 per cent) of the same size as the majority of the Latin-American countries considered. Thus, the cheaper price of raw materials (as measured, for instance, by the cost of labour or by reasonable conversion rates) in the United States in relation to Latin America, is compensated by the fact that prices of finished products

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1/ The line between such steel production and transformation is difficult to draw in these Mexican plants.

/are cheaper,

are cheaper, approximately to the same extent. The greater importance of raw material costs in the United States in the case of secondary industries is probably due to the considerable amount of repair work covered by the census figures in Latin America.

In view of the scarcity of iron and steel, and also of energy, in all Latin-American countries (whether iron and steel producers or non-producers), a relationship which assumes a particular importance in iron and steel transforming industries is that between the value added to raw materials, and the value of these same materials. It will be noted that for iron and steel transforming industries as a whole, this relationship in magnitude is of the order of 1.8 in Argentina, 1.4 in Chile, Mexico and Brazil and a little under 1.0 in Colombia.

c) Other costs. The foregoing analysis has been limited to labour costs (wages and salaries, excluding social charges) and to raw material costs, excluding fuel, purchased electricity, lubricants, etc. As far as the latter are concerned, they do not represent in any country a substantial part of total costs of production. The average level of these items for iron and steel transforming industries is 2.6 per cent of the value of production in Argentina and 1.8 per cent in Colombia and Brazil.[1/]

Unfortunately, little information is available on residual costs, which include social security payments, taxes, rent, insurance, publicity and other transfer payments, as well as the important items of depreciation and interest, and also on profits. The information available on these subjects in the various industrial censuses utilized is extremely scrappy, but the following points may be noted:

1) As far as the overall level of "other costs" is concerned, the percentages of total value of production for iron and steel transforming industries as a whole (Group II) are as follows:[2/]

1/ Secondary transforming industries only, in the case of Brazil.

2/ The figurefor Colombia is considerably lower: 12%, but it excludes profits. In comparison with those for other countries, it may give some indication of their level.

Argentina	32.9	per cent
Brazil	35.0	" " 1/
Chile	31.9	" "
United States	23.5	" " 2/

No considerable difference exists between the iron and steel producing and transforming industries and manufacturing industries as a whole. However, a very significant difference does exist between the level of these costs in Latin America and the United States.

2) Chile is the only country for which statistical data are available as to the part played by profits in "other costs". In the case of the iron and steel transforming industries, these profits represent somewhat less than one quarter of "other costs". A comparison between profits and the total value of production shows the following results:

Group	Profits as percentage of value of production
Iron and steel production	7.9
Primary transformation of iron and steel	8.7
Secondary transformation of iron and steel	12.1
Total manufacturing industries	7.6

The profit factor in the iron and steel sector appears, therefore, as relatively high and increases with the degree of manufacture to which raw materials are subjected.

There is no way of judging directly, however, what the profit factor of iron and steel industries in other countries may be, except that, as appears from Table D, Annex II, which shows data drawn from the 1939 Brazilian Census, those parts of "other costs" which represent taxes, rents, transport, insurance and social security only represent 13.5 per cent of the total of costs not accounted for by labour and raw materials.

1/ Groups I and II together.
2/ Includes fuel and electricity.

/3) The same

3) The same table gives, in the case of Brazil for 1939, a breakdown of these "other costs" which do not represent depreciation, amortization and profits. The relatively small importance of expenditures for taxes (2-4 per cent), rent (0.4-1.6 per cent), transport (1-2 per cent), insurance (less than 1 per cent) and social security payments (3-5.4 per cent), appears clearly.

4) Table 8 gives data for Brazil, Colombia and Chile on the relationships of social security payments to the total value of payments for wages and salaries (excluding social security). For the total of manufacturing industries, the figures vary between 8 and 13 per cent - they are lower in the case of the iron and steel sector: 8-10 per cent.

Table 8 Relation Between Social Security Payments and Total Cash Wages and Salaries

(Percentages)

Industry group	Brazil 1939	Colombia 1945	Chile 1948
I Production of iron and steel	..	..	8.2
II A Primary transformation of iron and steel	8.7	8.2	9.5
B Secondary transformation of iron and steel	8.0[a]	7.9	13.0
Total, production and transformation of iron and steel	8.5	8.0	9.9
Total, manufacturing industries	11.3[b]	8.4	12.6

Source: See Annex III.

a/ Includes the manufacture of electrical and communications equipment.
b/ All industries, whether manufacturing or not.

It should be emphasized that the relationships outlined above are drawn from very miscellaneous sources; much of the data is only available in special cases and for certain countries. The conclusions to be drawn from them as to the structure of costs in Latin-American countries should, therefore, be extremely cautious.

2. Production Cost Structure for Individual Industries

In order to penetrate more intimately the structure of production costs in iron and steel transforming industries in Latin-American countries, it is necessary to go beyond industrial groups and to consider the breakdown of these costs for individual industries. Such a complete cost breakdown is shown for one country, Argentina, in Table 9 (a and b).

/Table 9a

Table 9a Argentina 1946 - Distribution of Production Costs in Percentages of the Value of Production

Industries	Value of production	Raw materials	Fuel, lubricants & electricity	Wages and salaries	Other costs	Value added
	Thousands of Argentine pesos	Percentages of the value of products at selling prices				
I Production of iron and steel	239,361	37.0	7.4	25.3	30.2	55.5
II A Primary transformation of iron and steel						
1. Wire drawing, galvanizing, etc.	22,802	48.8	3.1	14.9	33.1	48.0
2. Iron goods, not otherwise specified	117,807	37.0	2.7	23.0	37.3	60.3
3. Articles of tinplate, zinc, etc.	99,559	58.0	1.3	16.1	24.5	40.6
4. Rural articles (mills, etc.)	6,822	37.7	1.8	21.6	39.9	61.5
5. Bolts, screws, rivets, etc.	31,160	37.0	2.3	18.1	42.5	60.6
6. Safes, metal furniture, etc.	18,447	41.3	1.2	26.3	31.2	57.5
7. Iron and brass beds	18,398	53.4	0.7	12.8	33.1	45.9
8. Iron and steel tubes	18,594	48.0	5.6	19.1	27.2	46.3
9. Cooking apparatus similar articles excluding electrical	45,280	33.8	2.1	20.6	43.5	64.1
10. Galvanizing	6,766	43.4	3.7	15.9	37.0	52.9
11. Iron worked in various forms in forges	8,175	24.2	4.8	16.7	54.3	71.0
12. Doors, windows, shutters, etc.	43,088	42.5	1.3	22.5	33.7	56.2
Total primary transformation of iron and steel	451,854	43.3	2.2	19.9	34.6	54.5

/Table 9b:

Table 9b: Argentina 1946 - Distribution of Production Costs in Percentages of the Value of Production

Industries	Value of production (Thousands of Argentine pesos)	Raw materials (Percentages of the value of products at selling prices)	Fuel, lubricants & electricity	Wages and salaries	Other costs	Value added
Total primary transformation of iron and steel	451,854	43.3	2.2	19.9	34.6	54.5
II.B. Secondary transformation of iron and steel						
13. Work done in workshops (excluding workshops)	58,201	21.0	3.1	38.1	37.7	75.8
14. Dockyards and naval workshops	77,434	18.0	1.9	46.2	33.8	80.0
15. Elevators	8,045	34.4	1.2	34.5	29.9	64.4
16. Motorcars, trucks, assembling and manufacture of coachwork	72,453	55.3	1.1	12.6	31.0	43.6
17. Bicycles, tricycles, manufacture, assemblage and repair	9,128	37.5	1.4	20.0	41.0	61.0
18. Trams and rail coaches, manufacture and repair	34,337	30.9	4.6	19.0	45.4	64.4
19. Machinery and motors, excluding electrical	186,289	36.5	1.8	23.7	38.0	61.7
20. Railroad workshops	143,936	32.8	6.0	56.5	4.7	61.2
21. Tramway workshops	26,343	45.0	2.6	43.1	9.3	52.4
22. Workshops for motor-vehicles, buses, etc.	257,313	31.9	2.3	24.3	41.5	65.8
Total secondary transformation of iron and steel	873,479	33.4	2.8	31.8	31.9	63.7
Total transformation of iron and steel	1,325,333	36.8	2.6	27.7	32.9	60.6
Total production and transformation of iron and steel	1,564,694	36.8	3.3	27.4	32.5	59.8
Total manufacturing industries	14,793,358	49.8	2.9	16.6	30.6	47.3

/In addition

In addition to percentages of material, labour and "other costs", Table 9 gives a breakdown of raw material costs into imported and domestic raw materials, and also shows fuel, lubricant and electricity expenditures. It will be noted that for iron and steel transforming industries as a whole, the consumption of domestic raw materials is only slightly higher than that of imported ones, whereas for the total of manufacturing industries in Argentina, consumption of domestic raw materials is more than five times greater in value than that of imported ones. The vital part played by imported raw materials is greater still in the case of primary transforming industries, whereas in the case of secondary transforming industries their value represents only two thirds approximately of those produced domestically. It should be borne in mind here, however, that the figures shown only relate to the direct consumption of raw materials. They cannot take into account the "integrated" cost of raw materials represented by those consumed as such and those entering into the finished products - mechanical elements, spare parts, etc. - which play the part of raw materials for secondary transforming industries and which are very important in Argentina since many of these industries only involve assembling and not production.

As may be expected, some of the primary transforming industries, those which subject their raw materials to very little elaboration, show a high proportion of cost of raw materials within the total value of production. Such is the case with: tinplate transforming, industries manufacturing tubular products, beds, wire and wire products. Within the secondary transforming industries, shipbuilding has very low costs for raw materials and extremely high labour costs.

A special situation is that of railway and tramway construction, assembly and repair shops. The importance of salary payments is very considerable in these sectors: 56.5 and 43.1 per cent respectively. As material costs are high also, both appear with abnormally low

"other costs": 4.7 and 9.3 respectively, as opposed to 31.6 per cent for the whole group. This is probably due to the following reasons: a) management has largely been charged to the transportation systems which they serve, b) the unions in these shops are powerful and wage rates high; b) they have been running at a considerable loss during the period concerned.

a) Inter-country comparisons. The difficulties connected with inter-country comparisons for individual industries as a result of difference of coverage, have already been stressed. They handicap any attempt at a detailed comparison of the structure of production costs. An attempt has been made, however, in Table 10 to bring together data on the importance of wage and salary payments and of raw material costs for those few industries for which data are available in three countries at least (including the United States) on a fairly comparable basis.

/Table 10

Table 10 Cost Structures in Various Countries Compared for Selected Industries

I. Percentage of Wage and Salary Costs[c] in the Total Value of Production[a]

	Argentina 1946	Colombia 1945[b]	Chile 1948	Mexico 1949	U.S. 1947
Tinplate goods	16.1	20.5	17.2	..	18.7
Production and transformation of wire	14.9	..	11.6[d]	..	19.3
Kitchen ranges and stoves	20.6	32.0	24.4	..	28.5
Galvanizing	15.3	36.9[e]	29.0[g]	..	31.4[h]
Mechanical and other workshops	38.1[i]	37.7	32.2[j]	..	..
Dockyards	46.2	47.6	38.4[k]	..	51.0

II. Percentage of Raw Materials Costs[l] in the Total Value of Production[a]

	Argentina 1946	Colombia 1945[b]	Chile 1948[m]	Mexico 1949[n]	U.S. 1947
Tinplate goods	58.0	71.4	53.5	70.0	65.0
Production and transformation of wire	48.8	..	53.8[d]	77.0	63.5
Kitchen ranges and stoves	33.8	49.5	43.6	..	45.4
Galvanizing	43.4	33.2[e]	37.6[g]	54.[e]	37.1[h]
Mechanical and other workshops	21.0[i]	46.9	21.9[j]	28	..
Dockyards	18.0	34.2	31.3[k]	..	33.4

Sources: Industrial Censuses of the respective countries.

a/ Calculated at selling prices.
b/ The total value of production is expressed at factory costs prices.
c/ Excludes payments for social benefits.
d/ Includes production of bolts, staples, tacks, pens, etc.
e/ Includes nickelplating, enamelling, etc.
g/ Includes amalgamation and enamelled goods.
h/ Includes almost exclusively metal coating for account of third parties.
i/ Excludes motor vehicle workshops.
j/ Includes electrical workshops.
k/ Includes machine shops.
l/ Excludes fuel, lubricants and purchased electric power.
m/ Including "materials".
n/ Metallic raw materials only.

/The major

The major conclusion to be drawn from Table 10 is that the relative importance of labour and material costs for those industries for which comparisons are possible, does not very substantially from country to country. Thus the tinplate products and the wire products industries show high material costs and low labour costs, probably because of the high level of mechanization involved and the relative simplicity of the operation. On the other hand, high labour costs and low material costs are to be noted for mechanical and other shops, and shipbuilding yards.

Such relative positions among the industries appear to hold true even for countries in which iron and steel transformation is at such different stages of development, as in Colombia on the one hand, and the United States on the other. As the wage rates are notoriously lower in Latin America than in the United States, this unexpected relationship must probably be explained by lower productivity.

IV. PRODUCTIVITY OF LABOUR

Tables A and B of Annex II provide basic information on the structure of employment in the iron and steel sector.

Table 6 shows the importance of labour in total production costs. In this section some other aspects of the labour factor in iron and steel production and transformation in Latin America will be studied.

1. Inter-Country Comparisons of the Level of Productivity

It would be extremely interesting to try and gain an impression of the relative levels of productivity in the various countries under consideration, as measured by per capita value added in the various industry groups studied. This cannot be done unless a means of converting values expressed in national currencies into one single unit may be found and this raises problems of conversions rates, the difficulty of which is great (see Annex III). These problems are the more difficult as the internal value of the currency of the Latin-American countries has not, in the course of the process of inflation, moved on a par with its external value; that is, internal prices have generally increased more rapidly than the foreign exchange rate - which was in most cases controlled - was allowed to do. A satisfactory solution to the resulting conversion problems can hardly be found. Annex I contains, however, an attempt at an inter-country comparison of the levels of productivity, based on one particular approach to the solution of the conversion problem.

2. Proportion of Workers in Total Employment

It is interesting to note that - as appears from Table 11 - the proportion of workers in total employment (workers plus employees and administrative personnel) is somewhat higher in the Latin-American countries than in the United States. This is true particularly for the group of iron and steel producing and transforming industries. For this group, the figures are 87 per cent in the case of Brazil and 89 per cent for Argentina, Colombia and Chile, whereas in the United States the percentage is only 84 per cent.

/Table 11

Table 11: Percentages of Workers in the Total Employed[a/]

Industry group	Argentina 31-XII 1946	Brazil I-IX 1949	Colombia 30-VI 1945	Chile 1948	United States 15-X 1947
I. Production of iron and steel	87.5	87.8	..	..	87.3
II.A.Primary transformation of iron and steel	89.8		88.0	..	85.6
B.Secondary transformation of iron and steel	89.5	83.9	88.8	..	82.5
1.Transport equipment (Manufacture, assembly and repairs)	89.5	..	88.1	..	85.7
2.Mechanical industries	89.5	..	88.9	..	80.5
Total transformation of iron and steel	89.6	..	88.6	..	82.5
Total production and transformation of iron and steel	89.3	86.8	88.6	89.1[b/]	84.1
Total manufacturing industries	87.8	81.2	85.3	87.3	83.4

Sources: See Annex III. For Chile: Anuario de Industrias 1948, page 8.

a/ Workers, employees and administrative personnel. For further details by countries, see Table 3.

b/ Includes electro-mechanical industries.

It may be noted also that the importance of productive workers in total employment is fairly constant for Argentina and Colombia from one industrial group to the other, whereas it is more differentiated in the case of the United States where, for instance, it is considerably lower in the case of mechanical industries than the others. The same criterion is true for Brazil.

It is probable that as Latin-American industries gain age and experience, an evolution may take place involving in many cases an increase in the proportion of employees.

3. Average Size of Iron and Steel Producing and Transforming Industries in Latin America

Table 12 shows data on the average size of enterprises for the groups considered in this study and for the countries and years of the censuses.

/The size is

The size is measured by the average number of workers employed at the time of the census. It should be taken into account that in all the countries under consideration the censuses are supposed to cover every single manufacturing enterprise in the country, even if it is a one-man enterprise; therefore the figures are not fully representative of the average size of industrial enterprises, but rather of industrial and handicraft enterprises engaged in the activities surveyed by us.

Table 12 Average Number of Workers per Enterprise

Industry group	Argentina 1946	Brazil 1940	Brazil 1950	Chile 1948	Colombia 1945	United States 1947
I. Production of iron and steel	69	649		535	..	559
II.A. Primary transformation of iron and steel	8	32	40	58	16	59
B. Secondary transformation of iron and steel	7	38	29	29	13	97
1. Transport equipment (Manufacture, assembly and repair)	6	34	28	38	130	257
2. Mechanical industries	9	41	29	18	12	69
Total transformation of iron and steel	7	34	..	48	14	79
Total production and transformation of iron and steel	8	38	36	54	14	91
Total manufacturing industries	11	23	13	35	15	49

Sources: See Annex III.

One is struck by the small size of Argentine enterprises on the whole which may perhaps be due to a more complete coverage in Argentina than by the censuses of other Latin American countries.[1]

1/ Twenty-seven per cent of all manufacturing enterprises covered by the Argentine census have no workers or employees, and another 57 per cent employ less than ten persons.

/Colombia with

Colombia with its very young metal industries has many small enterprises also. Here again, the census may be more comprehensive than in Brazil, whereas in Chile the data refer to a selection of industries prepared by the Dirección General de Estadística, in which handicrafts have probably been excluded.

With the exception of Argentina, where cast iron foundries are included with steelmaking, iron and steel production in Brazil and Chile takes place in enterprises of the same average size as in the United States:[1] 500 to 600 workers. Transformation of iron and steel is performed in units approximately one half of the size of the United States counterparts, the difference being larger in the mechanical industries mostly devoted to repairs, and in which mechanization is not indispensable, than in the primary iron and steel transforming industries. In the countries (United States, Brazil) where significant comparisons can be made, the percentage of workers within total employment (Table 11) tends to increase with a parallel growth in the average size of the enterprises.

1/ This is due to the inclusion in the U.S. steel production group of numerous small forging and cold rolling establishments. For blast furnaces and steel mills the figures for the U.S. is much higher: 1500.

V. INVESTMENTS AND CAPITALIZATION

1. Total Capital Assets

It is obviously very important to know what the investments involved in iron and steel transformation in Latin American countries are. The corresponding question was examined in the course of the Meeting in connection with iron and steel production. In the case of iron and steel transforming industries, no body of systematic knowledge similar to that accumulated for iron and steel production exists. On the other hand, such steel transforming industries are a highly diversified and non-homogeneous group. An analysis of the data, available in the industrial censuses and elsewhere, on the capital assets of the producing corporations which existed at the time of the censuses, seems theretofore, of advantage.

Because of the inflation which has prevailed in practically all Latin-American countries in recent years, the depreciated value of assets, as it appears from the books, is not in any way simply linked to replacement costs, peso for peso or cruzeiro for cruzeiro, owing to the various time periods at which the investments have been made. In order to be comparable within the same country, and also from country to country, the data given in the censuses should be "blown up" by an "inflation coefficient" which might be calculated if investments could be distributed according to the years in which they were performed. This information, of course, is lacking. A considerable inflation bias, therefore, affects the data relating to Colombia, Mexico and Brazil, which are essentially based on the book value of assets. Moreover, coverage and methods of calculation vary considerably from country to country.

An interesting solution to the difficulties connected with the inflationary bias, can be found in the Argentine census and also in the Chilean data; instead of basing the figures for fixed capital and inventories on book values, a completely fresh evaluation has been made at the time when the census of the values of capital assets was taken. This method, if performed perfectly, would eliminate the sequel of a

/number of years

number of years of inflation and allow for an adequate comparison of the investment values with those of other economic quantities valued in pesos of the census year. But such a method involves an element of subjective judgment in the assessment of the value of assets which may be influenced by such considerations as the fiscal system prevailing at the time.1/

(a) Relative importance of investments performed in the industrial sectors

Table 13 relates fixed assets for the various industrial groups to value added in them. The diversity of the "investment coefficients" obtained is striking: whereas in the case of the United States, gross assets represent 80 per cent of value added for all manufacturing industries, the figures are respectively: 136 per cent in the case of Argentina and 178 per cent in the case of Brazil in 1939.2/ These differences are probably mainly due to discrepancies in definitions, coverage and significance of the figures used.3/

1/ A further attempt has been made to present data similar to those given for Latin-American countries in the case of the United States. The Census of Manufacturers, however, does not provide any figures of the total value of assets of the industries covered. It limits its information on investments to those performed during the census year. Recourse had to be made to some summary data on the gross capital assets at the end of 1945 published in the Survey of Current Business, U.S. Department of Commerce, December 1951, p. 19, Table 3. In order to relate them adequately to data for value added for the same groups, the 1947 value added figures were adjusted to 1945 values, taking into account the evolution of the contribution of the respective groups to the national income, as shown in the National Income Supplement to the Survey of Current Business, U.S. Department of Commerce. The slight difference between the evolution in time of value added in an industrial sector and of the contribution of the same sector to national income, can be neglected here, in view of the shortness of the period and of the fact that relative values (in relation to total manufacturing) are mainly considered.

2/ Figures for Brazil in 1949 have not been considered here in view of the fact that they would have been affected much more than those of 1939 by inflationary trends.

3/ In the case of Colombia, value added excludes profits - a considerable upward bias in the investment coefficients is the result. In the case of Mexico, value added does not strictly follow the customary definition for other countries: it represents the difference between value of products and that of metallic raw materials only. This causes a downward bias in the coefficients, enhanced by the fact that fixed assets are included for Mexico only.

/Table 13:

Table 13: Investment Coefficients

(Relationships between capital invested[a] and the value added)

Industry group	Argentina 1946	Brazil 1939	Colombia 1945[b]	Chile 1948	Mexico 1949[c]	United States 1945[d]
I. Production of iron and steel	1.25[e]	2.74	..	1.31	..	1.12[e]
II.A. Primary transformation of iron and steel		1.43	4.72	1.20	1.27	
B. Secondary transformation of iron and steel	0.91	1.01	2.30	0.87	0.93	0.43
1. Transport equipment (Manufacture, assembling and repair)	..	2.27	2.19	0.98	..	0.36
2. Mechanical industries	..	0.81	2.32	0.69	..	0.51
Total transformation of iron and steel	..	1.21	2.99	1.14	1.26	..
Total production and transformation of iron and steel	1.09	1.51	2.99	1.16	..	0.70
Total manufacturing industries	1.36	1.78	3.10	1.22	..	0.80

Sources: See Annex III. For the United States: Survey of Current Business, December 1951, page 19, Table 3.

a/ Including fixed assets and stocks of raw material and products, but excluding financial assets such as participations, etc.

b/ The value added excludes profits in the case of Colombia.

c/ In the case of Mexico, the value added which has been used is the difference between the value of production and that of the metallic raw materials. Also, fixed assets only are included.

d/ In the case of the United States, the figures used to represent the capital invested were those of "gross capital assets" of the companies in the respective industrial sectors at the end of 1945. For comparison with the value added in 1947 an adjustment was made, taking into account the evolution of the value added between 1945 and 1947. (Source: National Income Supplement 1951, U.S. Department of Commerce)

e/ Includes production and primary transformation of non-ferrous metals.

The scattered figures in Table 13 disclose certain regularities in the structure of capitalization. Iron and steel production and transformation as a whole show investment coefficients which are lower by 5 to 20 per cent in all Latin-American countries, as well as in the

/United States,

United States, than those corresponding to the total of manufacturing. The difference is particularly large in the cases of Argentina and Brazil.

For the only country for which data referring to an integrated industry are available, Brazil, capitalization in production of iron and steel, as might be expected, is higher than for the average of all manufacturing industry, about 54 per cent higher. In the United States, iron and steel production cannot be separated from primary transformation, but both together show also a very high capitalization ratio. In the United States, in addition, the early stages of production appear to involve much greater quantities of equipment, relating to the subsequent stages and to manufacturing as a whole.

In the case of Latin-American industry, only the figures relating to primary and secondary transformation in Chile appear to be of use. The value of the data for Brazil, Colombia and Mexico are impaired by the inflation which prevailed in these countries and the doubt regarding the time when the investments have been made; the figures for Argentina, represent investments in all the industry, including a large proportion of handicrafts, and although they may be of interest for certain economic analysis, they are of no value to ascertain the capital intensity in iron and steel transforming plants on an industrial scale. Finally, the Chilean data on iron and steel production are not representative of integrated industries as they refer to an old charcoal blast furnace, built in 1906, and several scrap rerolling plants. The remaining figures for Chile show that the primary steel transforming industries which existed in the country, had the same capital intensity as the total of the manufacturing industry, and that secondary transforming industries had substantially less capital intensity than the aforementioned two groups.

2. Structure of Assets: Investments in Machinery and Equipment

Table 14 compares the partial investment coefficients for Argentina, Brazil and Chile as regards the investments in machinery, the procurement of which involves expenditures in foreign currencies. Comparisons with Table 13 show that, generally, these investments represent about one

/third of

third of total assets, the discrepancies being explained by variations in coverage. The very low level of investments in machinery in the secondary industries of Argentina is due, as previously noted, to the great number of small enterprises of a handicraft character, for which investments in land, buildings, furniture, and so on, are relatively high.

Table 14 Relationships Between Investments in Machinery and Values Added

	Argentina 1946 a/	Brazil 1939b/	Chile 1948c/
I. Production of iron and steel	0.41	0.70	0.51
II.A.Primary transformation of iron and steel			0.38
B.Secondary transformation of iron and steel			0.30
1.Transport equipment (Manufacture, assembling and repair)	0.19	0.39	0.31
2.Mechanical industries			0.29
Total transformation of iron and steel	..	..	0.37
Total production and transformation of iron and steel	0.31	0.56	0.38
Total manufacturing industries	0.41	0.68	0.41

a/ Investments in machines, installations and tools.
b/ Investments in machinery and tools, power installations, accessories and tools.
c/ Investments in machinery.

3. Capitalization in Individual Industries

Table 15 and 16 show investment coefficients for individual industries in Brazil and in Mexico. Comparisons between the countries are impossible, in view of the difference in definition of industries and in the method of estimating investments, but the considerable spread of the values of the coefficients is remarkable.

/Table 15

Table 15 Brazil 1939 - Investment Coefficients by Industrial Branches

(Relationship between the capital used and the value added by production)

Industrial branch	Investment coefficient
1. Steel and metallurgical industries	3.49
2. Rolling, wire-drawing and manufacture of articles from rolled and drawn products	1.92
3. Steel casting	1.38
4. Metal coating and similar applications	2.13
5. Pressing and sheet metal products	1.97
6. Locksmiths, boiler makers and forges	1.09
7. Construction of kitchen ranges and stoves	1.20
8. Associated metallurgical industries and other activities	2.08
9. Construction of machinery	0.68
10. Construction of hydraulic apparatus and machinery	0.79
11. Construction of machines and tools for industry	1.10
12. Construction of machines and tools for rural industry	1.38
13. Construction of instruments for technical activities	1.22
14. Construction of transport equipment	2.31
15. Assembling and mechanical repairs	0.66
16. Associated mechanical industries and other industrial activities	1.19
Average	1.51

/Table 16

Table 16 Mexico 1949 - Investment Coefficients by Industrial Branches

(Relationshi between fixed capital assets and the value added by production to the value of the metallic raw materials)

Industrial branch	Investment coefficient
1. Structural steel products	2.32
2. Products of light steel sections	0.88
3. Products of round and square bars, etc.	3.75
4. Wire products	2.58
5. Plate products	0.96
6. Sheet products	0.98
7. Strip products	1.44
8. Tinplate products	4.23
9. Tube products	1.22
10. Dies and fittings	1.17
11. Machinery	0.64
12. Workshops and others	1.98
14. Electro-plating	0.52
15. Foundries	0.93
Average	1.26

Source: Industrias Mecánicas Secundarias de México, Banco de México.

As no correction for the inflation bias on investment has been made in the corresponding censuses for any country, the investment coefficient which appear on the tables, will probably in most cases need a considerable upward correction. They should, therefore, be taken as minimum possible values.

In Annex I Table B, will also be found approximate figures of the capital invested per capita of production worker, converted to U.S. dollars of 1950. Notwithstanding possible errors for conversion rates, the low Latin-American ratios of investment to manpower are apparent.

VI. THE CONSUMPTION OF IRON AND STEEL IN TRANSFORMING INDUSTRIES

The importance of raw materials in the cost structure of iron and steel transforming industries[1] has been shown in Section III (Tables 7,9 and 1). The figures shown in these tables cover all raw materials - not only iron and steel. In this section, special attention is devoted to iron and steel as the raw materials of transforming industries.

For essential reasons, which are explained in detail in Annex III, the raw materials problem can only be studied very incompletely.

These reasons are essentially:

1. The unavailability or inadequacy of the information on the composition of raw materials used;
2. The scarcity of data expressed in tonnages;
3. Double counting between the products of certain iron and steel transforming industries and the raw materials of others.

Data relating to one country only, Mexico, will be studied here. Judging from the indications available, it is probable, however, that other Latin-American countries would show approximately similar results.

No adequate comparison can be made in this section with the United States.

1. The Share of Iron and Steel Transforming Industries in the Total Consumption of Iron and Steel

Table 17 shows that iron and steel transforming industries (excluding foundries) accounted for thirty per cent of the total consumption of iron and steel products[2] in Mexico in 1949. If foundries are included, the relationship increases to 43 per cent, but this figure may involve some double counting.[3]

1/ The problem of raw materials in iron and steel producing industries is not studied here. See document L.87.

2/ That is, products of blast furnaces, steel works and rolling mills.

3/ Foundry iron and steel for casting are excluded in both cases.

/Table 17

Table 17: Relationship Between the Total Iron and Steel Consumption and that of the Transforming Industries

(thousands of tons and percentages)

	Mexico 1949
Total consumption of iron and steel	502
Consumption of iron and steel in the transforming industries excluding foundries	153
Percentage of total consumption used by the transforming industries	30

Sources: See Annex III, and document L.86.

If this relationship can be generalized, contrary to what occurs in highly industrialized countries, other uses of iron and steel than those studied here (mainly building and transport) still absorb the major part of the total consumption of the Latin-American countries.

2. The Structure of Consumption of Iron and Steel in Transforming Industries

Table 18 shows percentage distributions of the consumption of iron and steel in Mexico in 1949:

a) by the iron and steel transforming industries;

b) by all sectors of demand[1/]

1/ Foundry iron and steel for casting are excluded in both cases.

/Table 18

Table 18: Mexico 1949 - Consumption of Iron and Steel by Categories of Products a/

(percentages)

	Rails and accessories	Bars, sections and structural steel	Sheets and plate	Tinplate	Derivates of wire rod	Tubes and other products	Total
Consumption of iron and steel by the transforming industries	..	15.	51.3	11.1	19.5	3.0	100.0
Total consumption of the country	12.3	39.2	22.0	4.3	12.8	9.4	100.0

a/ Excluding ingots of iron and steel for foundries.

Iron and steel transforming industries show a very high consumption of flat products (two thirds of the total, if tinplate and strip is included with plate and sheet) and of wire and its derivatives. On the other hand, whereas total consumption of bars, sections and rails represents more than 50 per cent for all sectors of demand, it only amounts to 15 per cent in iron and steel transforming. The fact that flat products constitute more than 60 per cent of the raw materials used by the iron and steel transforming industries in Mexico, if it can be generalized to other Latin-American countries, as seems probable, supplies an explanation for the very impressive rate of growth of consumption in general, and the steel transforming industry sector in particular, in the three countries which have recently established a plate and sheet rolling mill (Mexico 1943, Brazil 1946 and Chile 1950). Alternatively it explains why the steel consumption of these countries was not influenced by the bar, rails, wire and profile production for many years; Mexico since 1902, Brazil since 1926 and Chile since 1937.

VII. SUMMARY OF FINDINGS

Iron and steel producing and transforming industries account, in the more industrially developed Latin-American countries, for 12 to 14 per cent of the total value added in manufacturing and for a slightly smaller share of industrial capital assets. They employ in Argentina, almost one fifth of all industrial workers or one per cent of the total population, the proportions being smaller in the other countries studied.

The structure of the iron and steel sector varies considerably from country to country. Primary transforming industries are more developed in Chile and Mexico, transport equipment industries (including repairs) in Argentina. Mechanical industries are weakly developed throughout the region.

2. In relation to manufacturing as a whole, iron and steel producing and transforming industries of Latin America are labour-intensive, wage and salary payments representing about 27 per cent of the value of the products (except in Brazil, where the figure is much lower) and raw materials roughly 40 per cent.

It is notable that there is no considerable difference in cost structures between Latin America and the United States. The importance of wages in total cost is only about 20 per cent higher in the United States than in Latin-American countries, higher United States wage levels being almost compensated by higher productivity.

The similarity in the share represented by raw material costs is greater still. Components (including profits), other than labour and materials of the price of the products of the sector, are higher in Latin America than in the United States.

This similarity in cost structure as between countries does not hold true for comparisons between industries within the same country. The relative importance of labour and raw materials in specific industries is often very different from the average for the sector, but the technological conditions causing this situation seem to have roughly the same impact upon the various countries examined.

/Iron and steel

Iron and steel transformation adds between 140 and 180 per cent to the value of the raw materials.

3. The productivity of the iron and steel sector (if measured by value added per productive worker) is from three to ten times smaller in Latin-American countries than in the United States. Whereas in the latter country, it is, by and large, constant for the various manufacturing sectors, and for the various groups of the iron and steel sector, the spread is much larger in Latin-America. Except in Brazil, the productivity per worker is smaller in the iron and steel sector than in manufacturing as a whole.

4. Iron and steel transforming enterprises are several times smaller in Latin America than in the United States. They show a somewhat higher percentage of workers in total employment.

5. The relationship between investment and value added per year is of the order of 1 : 1.5 in the iron and steel sector; it is higher in production than in transformation and here, again, lower in secondary than in primary transformation.

Although investment per capita of worker is two to three times higher in the United States than in Latin America, the relative structure of capitalization shows great similarities between Latin-American countries and the United States.

6. Iron and steel transforming industries (excluding foundries) account for thirty per cent of the total consumption of ferrous metals in Mexico. In this country, about two-thirds of the products consumed by them are flats. This fact explains the influence of an integrated flat products producing industry, on the development of the steel transforming industry and on consumption.

ANNEX I

A ROUGH INTERNATIONAL COMPARISON OF ABSOLUTE LEVELS OF VALUE ADDED AND INVESTMENTS PER CAPITA IN IRON AND STEEL PRODUCTION AND TRANSFORMATION

The possibility of making a comparison between absolute levels of productivity (measured by value added per capita of worker) and of investments per capita, depends upon the establishment of a series of conversion rates relating the internal value of the currencies of the countries under consideration to one common unit (for instance, the United States dollar of 1950).

The following solution of this complex problem has been attempted here. Conversion rates between Latin-American countries and the dollar were based on their levels in 1937 when currencies were, to a certain extent, freely convertible. The evolution of the internal value of the Latin-American currencies from this time to the respective census years, was supposed to be measured by that of the official indices of the cost of living, whereas the evolution of the value of the United States dollar was measured by that of the "implicit deflator" used to calculate the real value of the national income of that country. As a result, the following internal values of Latin-American currencies for the census years have been reached (in terms of the U.S. cent of 1950).

Argentine peso (1946)	33.4
Brazilian cruzeiro (1939)	9.30
Brazilian cruzeiro (1949)	2.52
Colombian peso (1945)	52.20
Chilean peso (1948)	1.47
Mexican peso (1949)	12.65

Applying these conversion rates to the figures corresponding to value added per capita in national currencies, Table A has been obtained which gives an approximation of per capita value added in United States dollars of 1950.

Similarly, the data of Table B have been calculated by applying the conversion rates to figures of investments per capita of worker.

/It need

It need hardly be stressed that both tables should be considered as approximate indications only.

Table A Value Added per Worker

(U.S. Dollars, approximate figures)

Industry group	Argentina 1948	Brazil 1949	Chile 1948	Colombia 1945 a/	United States 1947
I. Production of iron and steel	2,280	..	1,080	..	6,196
II A. Primary transformation of iron and steel	2,120	1,280	1,130	630	6,305
B. Secondary transformation of iron and steel	1,840	1,280	880	730	6,739
1. Transport equipment (Manufacture, assembling and repair)	1,740	1,480	870	940	6,480
2. Mechanical industries	2,060	1,160	940	680	6,848
Total transformation of iron and steel	1,900	..	1,090	680	6,570
Total production and transformation of iron and steel	1,960	1,280	1,090	680	6,475

Sources: For methods of conversion see Annex I.

a/ Excludes profit.

/Table B

Table B: Investments per Worker

(Thousands of U.S. dollars, approximate figures)

Industry groups	Argentina 1946	Brasil 1949	Colombia 1945	Chile 1948	United States 1945
I. Production of iron and steel		2.45		1.43	
II.A.Primary transformation of iron and steel	2.67	0.97	2.98	1.36	8.0
B.Secondary transformation of iron and steel		1.34	1.67	0.78	2.3
1.Transport equipment (Manufacture, assembling and repair)	1.77	1.15	2.04	0.85	1.9
2.Mechanical industries		1.51	1.62	0.60	3.1
Total, transformation of iron and steel	..	1.11	2.09	1.24	..
Total, production and transformation of iron and steel	2.24	1.38	2.09	1.26	4.1
Total, manufacturing industries	3.54	2.06	2.04	1.78	4.8

ANNEX II

Table A Relation of Value Added in Steelmaking and Transforming Industries and the Value Added in all Manufacturing Industries

(millions of units of local currencies)

Industry group	Argentina 1946	Brazil 1939	Colombia 1945 k/	Chile 1948	Mexico 1949	United States 1939	United States 1947
I. Production of iron and steel a/	133 b/	139 c/	..	198	120	1,332	2,995
II. A. Primary transformation of iron and steel	246 d/	260 d/	2.78	1,214	..	1,806	6,496
B. Secondary transformation of iron and steel	557	297	7.01	240	..	3,602	12,634
1. Transport equipment h/ (Manufacture, assembling and repair)	393	41	0.93	165	..	1,567 g/	4,821 g/
2. Mechanical industries	164	256	6.08	75	..	2,037	7,812 g/
Total transformation of iron and steel	803	556	9.79	1,454	340 i/	5,410	19,130
Total production and transformation of iron and steel	936	695	9.79	1,653	460	6,742	22,125
Total manufacturing industries f/	6,992	6,420	144.80	13,644	..	24,487	74,426

Sources: See Annex III.

a/ Blast furnaces, steel mills and steel rolling mills. Excludes foundries.
b/ Includes a small part (less than 10%) for the elaboration of non-ferrous metals and casting of iron and steel and non-ferrous metals (approximately 20% of the total).
c/ Includes the manufacture of rolled and drawn products.
d/ Excludes the manufacture of rolled and drawn products.
e/ Excludes the industries manufacturing electrical machinery and apparatus.
f/ Excludes mining, construction and the production of electricity and gas.
g/ Excludes repairs.
h/ Excludes the aircraft industries.
i/ Excludes foundries.
j/ Difference between the value of the products and that of the metallic raw materials only. Includes non-metallic raw material (fuel, purchased electricity, etc.)
k/ The value added was obtained by subtracting the value of the raw and other materials from the cost of production in the factory.

/Table B

ANNEX II

Table B Structure of Total Employment[a] in Steelmaking and Transforming Industries

(thousands of persons)

Industry group	Argentina[b] 1946	Brazil[c] 1940	Colombia 1945	Chile[d] 1948	United States[e] 1947
I. Production of iron and steel	22	14	..	2.7	606
II A. Primary transformation of iron and steel	42	36	1.9	15.7	1,307
B. Secondary transformation of iron and steel	109	21	5.7	4.0	2,487
1. Transport equipment (Manufacture assembly and repair)	81	8	0.6	2.8	942
2. Mechanical industries	29	13	5.1	1.2	1,545
Total, transformation of iron and steel	151	57	8.3	19.7	3,794
Total, production and transformation of iron and steel	173	71	8.3	22.3	4,400
Total, manufacturing industries	932	835	123.0	153.1	14,294
Economically active population	6,267[f]	14,020	4,500[g]	1,741[h]	58,027

Source: See Annex III. Also Yearbook of Labour Statistics I.L.O.

a/ Workers and employees.
b/ Excludes owners or managing directors and members of the family of the owners.
c/ Includes owners, partners or managers.
d/ Workers only.
e/ Includes all paid personnel.
f/ 1947.
g/ 1938.
h/ 1940.

/Table C

ANNEX II

Table C Value of production of Steelmaking and Transforming Industries

(millions of units of local currencies)

Industry group	Argentina 1946	Brazil 1949	Colombia 1945	Chile 1948	Mexico 1949	United States 1947a/
I. Production of iron and steel	239		..	349	..	..
II. A. Primary transformation of iron and steel	452	8,076	8	2,115	492[a/]	11,888
B. Secondary transformation of iron and steel	873	3,976	14	357	52	15,291
1. Transport equipment (manufacture, assembly and repair)	621	2,315				2,736
2. Mechanical industries	253	1,661				12,555
Total, transformation of iron and steel	1,325	..	21	2,472	544	27,179
Total, production and transformation of iron and steel	1,564	12,052	21	2,821	..	..
Total, manufacturing industries	14,793	104,815	641	29,038	..	..

Source: See Annex III

a/ Excludes the production of wire and tubes.

/Table D

ANNEX II

Table D Brazil 1939: Partial Analysis of Production Costs Excluding Wages, Salaries, Raw Materials and Fuel

	Total of specified "other costs" b/	Taxes	Rents	External Transport	Insurance a/	Social and provident benefits	Social and provident benefits
	Percentage of the difference between the value added and that of wage and salary costs.						Percentage of the wage and salary costs
Metallurgical industries (I + II A)	14.9	4.6	1.0	2.1	0.7	5.4	8.7
Mechanical industries and transport equipment (II B) c/	7.2	2.1	0.4	1.0	0.1	3.0	8.0
Total, industries of the country d/	13.5	3.7	1.6	2.1	0.7	4.6	11.3

Source: Recenseamento Geral do Brasil, 1940, Volume III, p. 180.

a/ Accidents at work, fire and transport.
b/ Also includes advertising expenses.
c/ Includes the manufacture of electrical and communications equipment.
d/ Includes also mining, construction and production of gas and electricity.

/ANNEX III

ANNEX III

SOURCES AND CLASSIFICATIONS USED AND THEIR LIMITATIONS

It has fortunately been possible to obtain, for the study, relatively recent and elaborate industrial censuses for Argentina (IV Censo General de la Nación, Censo Industrial de 1946, Buenos Aires, 1950) and for Colombia, (Primer Censo Industrial de Colombia -1945, Bogota, 1947). In the case of Brazil, the latest fully available industrial census is that which was taken on 1 September 1940 and covers mainly the year 1939 (Censos Económicos. Agrícola. Industrial, Comercial e dos Serviços, Rio de Janeiro, 1950). Some summary data on the 1950 Census, covering the year 1949 (Sinopse Preliminar do Censo Industrial, Rio de Janeiro 1952) have, however, been used, but they do not include figures for individual industries.

In the cases of Chile and Mexico, no industrial censuses were available. For the former country, a certain amount of data relating to the year 1948 was supplied by the Dirección General de Estadística; for the latter, advantage was taken of an unpublished study of the Industrial Research Section of the Banco de Mexico called Las Industrias Mecánicas Secundarias de México, covering the year 1949.

For purposes of comparison with a fully industrialized country, data for the United States have been shown, wherever possible. They were drawn from the Census of Manufacturers, 1947, Washington, 1949.1/

For certain purposes, other sources were used; they are shown in the tables.

Owing to the character of the data used and to the economic conditions prevailing in the countries studied in recent years, considerable difficulties arise in the comparison and analysis of these data. The principal difficulties and the methods used to try and obviate them are discussed hereunder.

1/ It is regretted that similar information was not available for countries which are not so far removed from Latin America - in terms of degree of industrialization and economic conditions in general - as the United States.

/I. Classification

1. Classification Problems

Every one of the sources used is based on a different classification of industries, raw materials and products, and some of these classifications are so far apart that they hardly allow for comparisons. For instance, the Mexican industry classification is based, almost exclusively, on the nature of the prevailing raw material used in the given industrial group; in the other countries classifications are mainly based either on the nature of the products manufactured or on the type of operations performed in the industry, and generally on both. Moreover in the case of Brazil, the classification used does not allow for an adequate separation between steel production and steel transformation, etc.[1/]

These difficulties have led to the utilization of a broad classification of industries into four groups only (including production of iron and steel). No doubt, even in this approximate form, the categories do not correspond strictly in scope, and this must be taken into account when reading the tables.[2/]

1/ Classification problems are further complicated by the fact that it is only for Argentina, Mexico and Colombia that complete enumerations could be obtained of the products manufactured by the various industries listed.

2/ It is impossible, except in the very early stages of transformation, to separate completely iron and steel transforming industries from industries transforming non-ferrous metals. An arbitrary line must be drawn somewhere, and it has been drawn in the case of this study by the elimination of industries manufacturing electrical equipment and apparatus, precision mechanic industries, optical instrument-making, jewelry and watchmaking industries, and finally of aircraft production, as well as by the elimination of all those industrial sectors specified in the censuses of the respective countries, which show a greater consumption in value of non-ferrous metals than of ferrous ones, or which are specified to be prevailingly transformers of non-ferrous metals. Nevertheless, consumption of non-ferrous metals in the remaining industries is by no means negligible.

It should also be borne in mind that not only will the industries grouped into some sectors for the respective countries differ considerably, but there will often be some difference in coverage between the figures for different economic data referring to the same country.

Also, it has not been possible to separate adequately, steel production from certain forms of primary transformation, especially foundry transformation. In Brazil the separation made is highly arbitrary.

/Notwithstanding efforts

Notwithstanding efforts made to achieve approximate comparability, serious discrepancies remain between these four groups. The principal ones are referred to in the notes to Table A, Annex II. These notes - as far as they refer to the limitation of industries - are applicable also to other tables showing the same groupings, even though they may not be repeated each time.

In the case of Brazil, the 1949 Census uses a different classification from 1939. The industrial groups of tables referring only to Brazil and those of the tables covering several countries but in which data for Brazil in 1949 are shown, have therefore a different coverage from that shown in Annex III. The same applies to the investment data for Argentina.

In the case of Mexico, the distinction between primary and secondary transforming industries can only be drawn very roughly and it has been felt preferable in general to combine the two groups together.

2. Inflation and Conversion Problems

Another difficulty, which is inherent to the inflationary conditions prevailing in the countries under consideration during recent years, is that of the consequent distortions in the price structure and the general unreliability of value data, particularly for comparisons in time. This is specially true for data on the value of capital assets, which are generally the cumulative sum of values which, although nominally honogeneous, are not at all so in real terms.

A consequence of inflationary conditions and of the multiple exchange rates prevailing in the majority of the countries under consideration, was the quasi-impossibility of converting value data to one common monetary unit (e.g. the U.S. dollar).

Difficulties connected with, firstly, the impossibility of using money values as a unit of measure and, secondly, with conversion problems, were one of the reasons for which the analysis of time trends has been eliminated. Taken in combination with classification problems, they are the explanation of the fact that intercountry comparisons, in

terms of levels of productivity, etc, have been limited to the minimum (Annex I) and that effort has been concentrated on comparisons of structures (production pattern, cost pattern, etc.) as they appear in the different countries. Finally, combined with differences between classifications of production and foreign trade statistics and other complications, they have unfortunately prevented any useful comparison between the output of iron and steel transforming industries and imports of corresponding products.[1/]

3. Unavailability of Data Expressed in Physical Quantities

The situation as to data expressed in quantities, is unfortunately not any happier than that described above in relation to money values. The reason for this is that, rarely in the case of raw materials consumed and almost never in the case of products elaborated, is a total quantity given in one common standard of measurement, for instance in tons. This difficulty is inherent in the strongly heterogeneous character of the products of the industries under consideration, which hardly allows them to be measured in any one physical quantity. Combined with the above mentioned problems of monetary valuation, it limits considerably the scope of the analysis.

4. Double Counting

This limitation is inherent in the industries studied; it resides in the fact that double counting cannot be avoided between the products of some of the industries analysed and the raw materials of others.

The term "raw materials", as used in the censuses, covers all items or products which are purchased by the industry under consideration, be it for the purposes of transformation through such operations as milling and grinding; be it only for a superficial change in aspect such as takes place in the various metal-plating industries; be it for integration without any transformation into a larger aggregate, such as a motor car chassis which is purchased to be provided with a body

1/ For iron and steel producing industries, such comparisons may be found in paper L.86.

and sold as a motor car; be it even, in certain cases, for re-sale. Correlatively, the "raw material" can be a semi-finished product of a steel mill, such as a bar or a sheet; it can be an intermediate product of a transforming industry such as a bolt or a washer; or finally, it can be an almost finished and highly complex mechanical aggregate, such as a motor car body, in relation to which the term "raw material" can be used only by an extension of the language. Moreover, all the raw materials considered in this study are themselves the products - in the first case of the iron and steel producing industries and the latter ones of the iron and steel transforming industries (not to speak of non-iron and steel raw materials, metallic or not).

Double counting, therefore, necessarily arises between the products of certain industries and the raw materials of others which are identical items. This double counting cannot be adequately eliminated without a very searching investigation of every individual industry.[1/] An attempt has been made, in Section VI, which deals with ferrous raw materials, to limit its scope by the following devices:

a) The iron and steel producing industry has been left out of the consideration of raw material problems for the purposes of this study. Thus duplication between the products of the iron and steel producing industry and the raw materials of the iron and steel transforming industries are avoided. Borderline problems remain, however, in the case of certain industries which can be considered either as iron and steel producing or transforming ones, such as the foundry industry, the wire-drawing industry, the pipe and tube producing industries. These have systematically been classified into

1/ This is the reason why the U.S. Census of Manufacturers does not give figures for consumption of raw materials or value of products shipped for any industrial groups, limiting these figures to individual industries. In certain cases, such as the refrigerator and motor car industries, no data for consumption of raw materials and value of products shipped are given even for one single industry.

Group II A.(Primary transformation of iron and steel) for the purposes of this study, but it has been necessary to reclassify some census data in order to separate them from iron and steel production, for instance in the case of the United States. This has not always been possible in the case of foundries. Also, in other sections than VI, double counting remains.

b) As far as the elimination of duplication within the iron and steel transforming industries is concerned, this could be done in the case of primary transforming industries in Argentina.

Two clearcut cases of duplication are those between production and consumption of wire and wire products (Industry I) and production and consumption of pipes and tubes (Industry 8). Argentine production of wire and wire products is almost exactly equal to the consumption fo these products in the group of primary transforming industries (II A.). On the other hand, consumption of pipes and tubes in this group is approximately equal to one sixth of the country's production. Double counting remains between the products of such industries as the nut and bolt industry and the consumption of these items as raw materials in other primary transforming industries. It cannot be eliminated with the data available in the census.

In the case of Mexico, the situation is simplified by the fact that the only raw materials taken into consideration are products of iron and steel mills, plus a few simple intermediate products such as wire and tubing, plus a relatively small amount (5 per cent) of non-ferrous metals which are mainly used in one industrial group, that of the transformation of non-ferrous metals which has been left out for the purposes of this study. In addition, the problem of the consumption of raw materials in, and the production of, foundries, which cannot be solved in the case of Argentina, appears simple: the consumption of iron and steel in the form of ingots in Mexico in 1949 was 65.000 tons and

/the consumption

the consumption of raw materials in the foundry industry, 59,000 tons. It can be assumed, therefore, for purposes of simplification, that no ingots other than those in the foundry industry were used.