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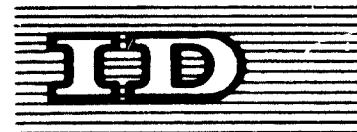
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Moscow, USSR, 19 September - 9 October 1968

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ECONOMIC CONDITIONS REGULATING THE GROWTH OF
LATIN AMERICAN STEEL PRODUCTION ^{1/}

by

A. Gómez,
Chile

^{1/} The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. The document is presented as submitted by the author, without re-editing.

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OF LATIN AMERICAN STEEL PRODUCTION^{1/}

by

A. Gomez.
Chile

SUMMARY

The paper analyses the economic conditions which make possible the development of the iron and steel industry in Latin America, considering first those which relate to the economic environment and then those relating to the factors of production. Among the former, the paper discusses national economies, the size of domestic markets, the balance of payments, the structure of demand and production, international trade, prices, and legislative provisions and tax arrangements. Among the factors of production, the analysis is limited to financial resources and raw materials, since it is felt that this group comprises the factors which are likely to influence the development of iron and steel in the region most decisively.

* This is a summary of a paper issued under the same title as ID/WG.14/3.

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The characteristic features of the Latin American economy would take long to enumerate, but the most relevant are its total population, exceeding 240 million, and its per capita gross product of US\$ 350. The average annual rate of growth of its economy during the last fifteen years was somewhat below 5 per cent, whereas the rate of growth of industrial production was nearly 6 per cent.

A characteristic of the external trade of the Latin American countries is the dominant position occupied by one or two products, with the result that fluctuations in the prices of these products cause great instability in the foreign currency earnings of the countries concerned and hence in their capacity to import. This fact has stimulated the industrialization of the region, with the aim of substituting imports which can no longer be paid for.

Almost all these nations have detailed development plans; but the above-mentioned balance of payments difficulties, inflation, inadequate domestic capital formation and political instability have hindered the achievement of the targets set in the plans.

Another characteristic of the Latin American region is the notorious insufficiency of external economies, the development of the iron and steel industry being particularly affected by transport difficulties, the lack of electric power, the inadequacy of the systems of commercial distribution and the absence of vocational training facilities.

Leaving aside these general figures and common features, the twenty or so Latin American countries display great differences among themselves, because the general tendencies which are mentioned throughout the document do not affect them all in the same way.

The size of domestic markets determines, in the first place, the magnitude of domestic demand for steel. The populations of the Latin American countries are relatively small, and in some cases so small that this factor alone limits the establishment of steel plants. The low level of individual incomes results in limited expenditures, directed mainly towards the satisfaction of essential needs, while their high concentration also adversely affects steel consumption.

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche.

The price of Latin American steel is affected by the economic conditions described in the document; however, the prices of bars for reinforcing concrete and of crude wire exceed United States prices by only 26 per cent and 22 per cent respectively. It is clear that this difference will not be an obstacle to the expansion of demand and, on the other hand, may affect the development of the domestic supply of steel.

Although legislative provisions and tax arrangements are not sufficient on their own to ensure industrial growth, they have assisted the development of steel production by making it possible to obtain capital, promoting imports of equipment and raw materials, reserving domestic markets for national products and exempting the industry from certain taxes.

The financial resources which have been required for the development of this sector have been substantial; 43.7 per cent of the necessary finance has been provided by the State itself, 30 per cent has come from domestic and foreign loans, 9.2 per cent from private investment and only 4.6 per cent from the reinvestment of profits. When this distribution is compared with that to be found in enterprises of the European Coal and Steel Community, it is found that the last-mentioned source of funds plays a major role in the Western European region and is destined to constitute one of its principal sources of funds replacing State contributions. Although loans have the same importance in Latin America as in Europe, the importance of loans from abroad will doubtless increase even more. Credits offered by suppliers of equipment will also play a fundamental role in the financing of expanded steel production.

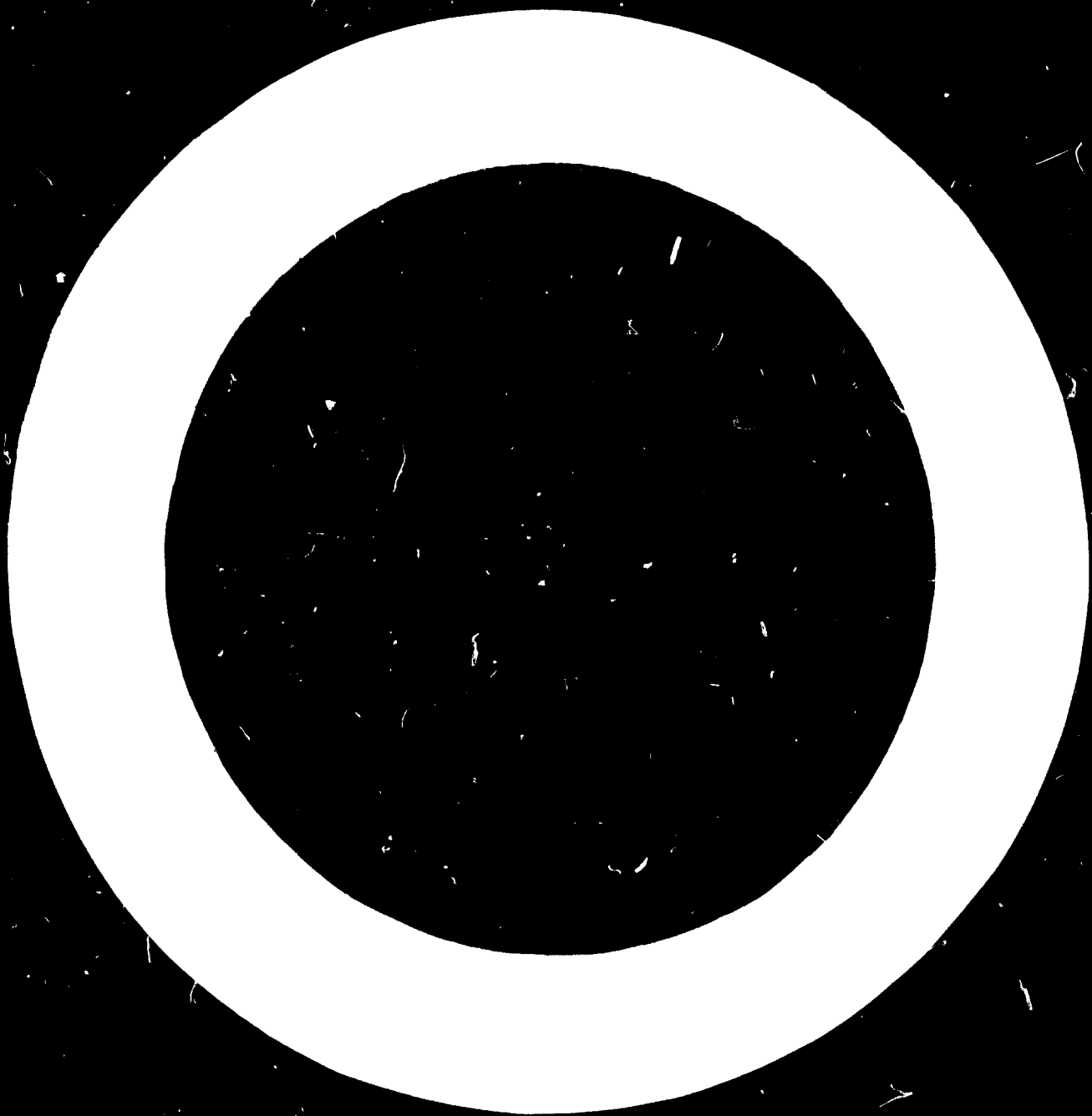
With regard to raw materials, Latin American possesses considerable reserves of iron ores, although they are distributed unevenly among the countries of the area. Increased productivity in extractive activities, the increase in the scales of operation of these activities and the production of agglomerates are expected to reduce the costs of iron ore considerably, thus stimulating the steel production of the region. However, the poor quality of the coal available is a significant obstacle; this problem will have to be resolved in technological research programmes which the region will need to undertake on a joint basis.

CONCLUSIONS

All the conclusions of this document are open to dispute, since they are based on generalizations which are not applicable to some of the Latin American countries. The conclusions are summarized in the following ten points:

1. Although the economies of the Latin American countries vary greatly among themselves in the degree of development achieved, they have common features which adversely affect the growth of steel production. Among the most marked of these features are the lack of external economies, political instability and the existence of small populations with low income and a very unequal distribution of incomes.
2. The local iron and steel industry, which has grown up through the substitution of steel imports, has stimulated the expansion of demand, and this in its turn has led to increased investment in this sector. Nevertheless, the process of import substitution is losing its impetus and it could be replaced by an acceleration in exports, the most promising opportunities for which are to be found within the Latin American region itself, thanks to its decision to seek economic integration, and also in the export of semi-finished products which could be favoured by the new European trends away from integration and towards the localization of factories.
3. The divergencies in monetary policies, systems of exchange, import regulations and systems of reimbursing domestic taxes have affected the negotiations for the removal of tariffs on steel within the framework of the Latin American Free Trade Association; there are, however, prospects for increased intra-area trade in these products as a result of temporary trade openings, for which special regulations should be considered.

4. The structure of production has evolved, with an increase in the degree of vertical integration, leading to a marked concentration of steel production in integrated enterprises, a concentration which gradually decreases as one goes from flat bars to elaborate products and which does not affect the process of production.
5. The price of Latin American steel is higher than that in countries which are more developed industrially; however, this difference, which results from the general economic conditions of the region, is acceptable and does not constitute a factor limiting the growth of demand.
6. The price control systems for iron and steel products may result in abnormally low prices, leading to a lack of interest in investment in this industry and endangering the future supply of the products concerned.
7. Although, in most of the countries of the region, there are no special legislative provisions and tax arrangements for the iron and steel industry, which benefits only from general industrial promotion measures, these have proved effective in stimulating production.
8. The structure of the financing of Latin American investments can be expected to change radically, a fact which may in some circumstances delay the carrying out of projects for the development of the industry. The State will cease to be the principal source of funds and its role will be replaced by the reinvestment of profits, loans from abroad and suppliers' credits.
9. The main obstacles in the way of an increase in external loans derive from the economic and political instability of the countries concerned and the lack of sufficient pre-investment surveys.
10. The poor quality of Latin American coal is offset by the abundance of iron ores. The increase in mining activities in the region guarantees the growth of regional steel production.



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A study of the requirements for steel industry development in Latin America would necessarily include an examination of the entire economy of these countries, which would be beyond the possibilities of the present document. This circumstance, together with the desire to utilize the limited space available for considering in greater detail some aspects of the problem that escape the responsibility of industrialists, led us to focus solely on economic factors. To separate these from technical, social and institutional factors is no doubt arbitrary, both because the line dividing them is extremely thin and because all these factors mutually influence each other and may not be framed in any form of rigid classification. The above limitation becomes even greater inasmuch as in no two Latin American countries do the economic factors discussed below have the same effect.

Nevertheless, the fact that these nations have reached similar stages of development as well as their decision to supplement one another's economies makes it possible to attempt an overall analysis.

Bearing in mind the above circumstances - which, though not the only ones, are the most significant - we deemed it advisable to classify economic conditions into two groups: those referring to the economic environment and those related to production factors. The former will include national economies, size of internal markets, balance of payments, international trade, demand and production structure, prices, legal provisions and taxation. Of the latter only financial resources and raw materials will be discussed, since it is felt that theirs will be the most decisive influence on the region's steel development.

CONDITIONS OF THE ECONOMIC ENVIRONMENT

National economies

Latin America, with a total population of over 230 million, has a Gross National Product (GNP) amounting to about 350 dollars per capita. The average yearly growth of the economy in the last fifteen years has been estimated at 4.8%, while the annual increase of the region's industrial product is estimated at nearly 6%. The manufacturing industry's contribution (including factories and handicrafts) to the region's GNP is at present 22.7%, against 18.7% in 1950. Industrial growth in Latin America in recent five-year periods has shown a

gradual modification of the composition of manufacturing production, with increasing participation of the industry producing intermediate goods, durables and capital goods.

Within the foregoing overall figures for Latin America, the twenty nations composing the region present wide differences. Those with the largest population are Brazil, Mexico and Argentina (with approximately 88, 44.5, 23.5 million inhabitants respectively), the smallest are Nicaragua, Costa Rica and Panama (with approximately 1.8, 1.6, 1.4 million respectively). Population growth rate is high in all of them, however, the region's annual average being close on 3%. As regards total gross domestic product, the three first places go to Brazil, Mexico and Argentina (with approximately 18,600, 18,400 and 14,800 million dollars respectively), while at the other end of the list we find Honduras, Paraguay and Haiti (with 508,429 and 314 million dollars, respectively). Gross domestic product per capita compares Venezuela, Argentina and Uruguay (835, 645 and 560 dollars, respectively) against Paraguay, Bolivia and Haiti (205,145 and less than 80 dollars respectively). Likewise, in the degree of industrialization, measured by the manufacturing industry's contribution to the GNP, there is a great difference between the case of Argentina, Brazil and Mexico (with 33%, 26% and 25% respectively) and that of Haiti with only 6%.

Trade in Latin American countries is characterized by exports, with one or two products predominating. Thus, fluctuations in the prices of the latter originate great instability in foreign currency receipts and, consequently, in import capacity. The scarcity of means for foreign payments was precisely one of the main factors behind these nations' move toward industrialization, within the framework of an import substitution process that began by end products and went on to intermediate products and capital goods. The foregoing applies particularly to the most highly industrialized countries of the area, which are the same ones where integrated steel plants operate - Argentina, Brazil, Colombia, Chile, Mexico, Peru and Venezuela.

Although most of the Latin American nations endeavour to co-ordinate and organize their investments according to general and sectorial development plans, the imbalances arising from balance of payment difficulties, together with persistent monetary inflation processes - that are usually most acute in the countries which have advanced most along the road to industrial progress - and notable insufficiency of internal capitalization have all conspired against

timely fulfilment of the goals established in the programmes.

Another element that has hindered more rapid progress appears to be political instability which more than once has brought about delays and even changes in planned investments as well, of course, as in the overall economic policy of many governments in the area.

Nevertheless, the figures mentioned at the beginning of this introduction show that the whole of Latin America features a certain level of dynamism permitting an optimistic view of the expansion of their economies to be taken, both in the countries where the degree of relative industrialization is highest as well as those that are at the initial stages of industrial development. One of the most promising prospects in this regard is economic integration. Eleven nations (Argentina, Bolivia, Brazil, Colombia, Chile, Ecuador, Mexico, Paraguay, Peru, Uruguay and Venezuela) formed the Latin American Free Trade Association with a view to progressive liberation of their mutual trade exchanges and promotion of industrial co-operation. On the other hand, the five Republics of Central America, joined by Panama, have established the Central American Common Market with even more ambitious goals. Both groups are at an initial stage of development and currently face serious obstacles. However, both represent a perfectly viable solution to another of the problems that hinder economic development in most of the countries - the reduced size of domestic markets due both to the low number of the population as well as to low per capita income levels.

Insufficient external savings is another major obstacle in the way of steel production development, inasmuch as the need to face construction of ancillary works to supplement purely industrial facilities has considerably raised the amount of investment required for this sector, to the extent of discouraging them absolutely in some cases.

The most important deficiencies affecting the steel making process are derived from transport difficulties, lack of electric power, insufficient commercial distribution systems and lack of machinery for professional training, to quote only the most outstanding.

For this industry deficiencies in maritime and land transport systems are particularly serious, as operations involve handling large amounts of ore, coal, finished products, byproducts, residuals, etc., and the cost of moving these materials impinges to a considerable degree on that of the steel produced.

The high power consumption involved, whatever the steel making process employed, has very often led to postponing investments until hydro-power plants are ready to supply power at favourable prices. Fortunately the hydraulic resources available in the region are sufficient to guarantee future expansion of this industrial activity.

Size of domestic markets

The size of domestic steel demand depends essentially upon the size of the population, national per capita income and its distribution among the inhabitants.

As we have seen, population levels in several Latin American countries are so low that this factor alone is enough to restrict the development of industries such as steelmaking, which require large scale projection. However, the fact that in these same countries steel consumption is mainly of reinforcing bars and wire for farm use may allow for a certain degree of local steel production. The foregoing possibility is illustrated by the Ecuador project involving a rolling mill to produce 25,000 tons per year of reinforcing bars, starting from billets obtained from a 4 ton electric furnace using scrap.

Low individual income is one of the reasons that have led to classify Latin America among the insufficiently developed regions, although - as we stated above - income levels vary considerably from one country to another. Low incomes originate limited expenses mainly directed to meeting basic needs, thus adversely affecting consumption of steel products.

High income concentration contributes to make the demand potential generated by the above mentioned factors more apparent than real. In fact, the great majority of the people in these countries fail to obtain the average income and are unable to consume industrial products.

The erection of steel plants is closely linked to the size of domestic markets and the elements determining it are examined in detail in every feasibility study. In spite of this, the trend is often to bypass the effects that local steel production has on the demand for such products.

The development of apparent consumption of rolled products in the region between 1951 and 1966 (see Table 1) shows that consumption increases were fully covered by increased internal supply, imports having remained practically static throughout the entire period.

The regional phenomenon was of course echoed at national scale. Thus if we examine the case of the two countries where steel development has been most considerable - Brazil and Mexico - we find that the entire consumption increase in the period was covered by local production (see Annexes 1, 2). The same thing happened in smaller markets, as in the case of Chile. Statistics on apparent consumption, production and imports for Chile may be found in Annex 3.

Local steel production has stimulated per capita steel consumption. Thus, despite the impressive population growth rate of Brazil and Mexico - both over 3% per year - per capita consumption has developed from 27 kg of rolled products in 1951 to 45 kg in 1966, in Brazil, and from 36 to 70 kg in Mexico. In Chile, where the population growth rate is slightly lower - 2.3% - per capita consumption increased from 47 to 90 kg in the same period. But in Argentina, where production has not kept abreast of internal demand, consumption only rose from 87 to 96 kg per inhabitant, in spite of the country's low population growth rate of only 1.6%.

Although it is a fact that steel production promoted increased consumption, the latter in turn gave rise to new investments in the steel sector. The process of creating external inter-enterprise savings that Ragnar Nurkse speaks about is arising in the steel-producing countries of the region, as various industrial branches grow in simultaneous and balanced fashion, originating an increase in actual incomes and consequently promoting the growth of these and other new sectors.

Import capacity and import substitution

The effects that the crisis of the thirties and the last world war had on Latin American foreign trade were reflected by the countries' industrial development. The impossibility of continuing to spend foreign currency at the rate they were accustomed to and the pressure brought to bear by the metalworking industry - which had developed greatly in the course of the war years - forced nations to consider producing steel locally. Hence steel import substitution became one of the basic objectives of this industry. A brief description of the process is justified.

Table 1

Evolution of apparent consumption of rolled
products in Latin America
(thousand tons)

	<u>1951</u>	<u>1955</u>	<u>1960</u>	<u>1965</u>
Production	1,493	2,495	4,193	6,791
Imports	2,508	2,345	2,355	2,280
Apparent consumption	3,988	4,822	6,414	8,724
Imports/apparent consumption (%)	62.5	48.6	36.7	27.2

Source: ILAFA

Table 1 shows that the amount of rolled products imported by Latin America has remained practically unchanged, having decreased by only 9% over the 15-year period starting in 1951. The measure of substitution attained may be obtained by observing the variation in the relationship between imports and apparent consumption, which amounts to 35.3% in the three five-year periods, meaning that the substitution process is of surprising magnitude.

It is often argued that the growth of the steel industry in less developed countries will entail a reduction of their purchases abroad and it is possible that such a development may influence the attitude adopted by industrialized countries toward these areas. Latin American experience, however, is quite clear - the volume of rolled product imports has been maintained, and what is more important, import composition has been modified, unit values rising. That is to say, steel needs have transferred to more sophisticated, consequently more expensive, products. This modification may be judged by examining the variation in import composition as seen in Table 2. The percentage of flat product imports over non-flat products has risen from 37.2 to 56.3%; volume has increased, furthermore, from 933,000 to 1,285,000 tons.

Table 2

Composition of apparent consumption of rolled products
(thousand tons)

	<u>1951</u>		<u>1955</u>		<u>1960</u>		<u>1965</u>	
	<u>Flat</u>	<u>Non-flat</u>	<u>Flat</u>	<u>Non-flat</u>	<u>Flat</u>	<u>Non-flat</u>	<u>Flat</u>	<u>Non-flat</u>
Production	464	1,029	863	1,632	1,558	2,634	2,883	3,908
Imports	933	1,475	1,007	1,378	1,166	1,189	1,285	995
Apparent consumption	1,391	2,497	1,842	2,979	2,655	3,759	3,893	4,830

Source: ILAFA

Tables 1 and 2 clearly show the slowing down of the substitution process rate, a fact which applies, moreover, to most of the region's industrial products, leading to the conclusion that such possibilities are exhausted in Latin America. Examination of the prospects presented by substitution of steel imports naturally necessitates the study of individual products and countries. However, purely for information purposes, sheet and tinplate imports in the countries of the region in 1965 are shown in Annex 4.

Imports of the two products selected are seen to concentrate geographically in Argentina and Venezuela which, taken together, cover 40% of the sheet and 52% of the tinplate. Both countries are implementing programmes for expanding production of flat products which should bring about a considerable degree of import substitution. With the exceptions noted, it will be seen that no significant expectations are apparent in the remaining Latin American countries. In fact, the low level of such foreign purchases, together with the minimum economic size of facilities for producing sheets and tinplate, preclude the possibility that the steel industry of these countries will develop solely to meet this requirement.

For the foregoing reason a new industrialization strategy has been taking shape in latter years, with exports parallel to industrial expansion, which deserves more detailed examination.

International steel trade

Existing world steel production capacity was estimated at about 560 million tons in 1966; that same year world production totalled only a little over 470 million tons, thus idle capacity amounted to about 90 million tons of steel, or the equivalent of ten times Latin American steel production. This production potential has made itself felt in the area in one way or another as an element limiting local production expansion. The greatest influence is exerted perhaps by the unfavourable price comparison that local producers must face in their own markets, let alone competition in regional export markets.

Given such international conditions, what are the specific prospects of exporting steel as a possible means for this industry's expansion?

As one way of expanding local markets for industrial products, Latin American governments established the Central American Common Market and the Latin American Free Trade Association. For steelmaking purposes only the latter

is of any interest. Nevertheless, the negotiations on tariff liberation for steel have been hindered due to unsolved problems such as disharmony among monetary policies, exchange systems, regulations governing imports from extra-regional countries, internal tax refund methods, etc. It is unlikely that in the future Latin American governments may wish to advance any further along the road to economic co-operation while these problems that distort the potential value of permanent tariff concessions remain unsolved. Conversely, a certain degree of intra-regional steel trade may feasibly arise due to temporary disadjustment between internal consumption and supply of given products, which continuously appears in these countries because while the former grows in regular form, the latter grows by leaps and bounds, as the various expansion projects reach the starting stage. Steelmakers of the area have repeatedly stated that they are interested in setting up a system whereby such possibilities of temporary co-operation might be utilized and the resulting experience used as a basis for broader economic integration patterns. The fulfilment of such aspirations would greatly contribute to carrying out projects that require implementation on a larger scale than that determined by domestic consumption, by opening LAFTA markets to the products originated by such projects.

Regarding steel exports to other international markets, Latin American possibilities appear very much reduced as a consequence of increased competition in the international market. The immediate effect has been a considerable reduction in export prices, thus making the prospect currently unattractive to Latin American producers, though their attitude may vary very greatly in the near future.

Nonetheless, Latin American iron ore exports may attain higher values provided that a certain degree of processing is carried out locally, and that intercontinental transport costs are lowered. These prospects are favoured by recent trends in Europe toward locating reduction and steelmaking facilities on the seashore as one way of making raw materials more easily accessible, which leads to the thought that location on the Latin American seashore might present greater advantages. There is no doubt that, in the light of international competition in the field of semifinished products, these plants should sell their production to European, Japanese or American companies, which might even be led to co-operate financially with such projects.

Demand and production structure

The importance of flat products within total consumption of rolled products in these countries has increased, as may be seen in Table 2. From only 36% in 1951 their participation has gone up to 44% in 1965, a change that clearly points to the influence of industrialization processes in the area.

Sectorial distribution of demand for rolled products has also diversified remarkably for the same reason. The traditional interdependence between steel consumption and construction activities has weakened, as a result of greater participation by the food-packing, automobile, oil, machine construction, etc., industries. Diversification of end uses for steel favoured the economic stability of producing plants, since a reduction in the activities of one consumer sector may be set off by stability in others. No doubt this trend toward diversification will continue in the future - following the pattern of more industrialized countries - increasingly benefiting the development of Latin American steelmaking.

In view of the changes that have occurred in steel demand, it is interesting to know how the production system is composed.

In order to estimate in graphic form the degrees of production concentration Lorenz curves are used, whereby it is possible to see the extent of deviations from the diagonal representing optimum distribution. Thus we find (see Annex 5) that concentration of raw steel is high; it is considerably lower in non-flat rolled products, even lower in the case of flats. The various degrees of concentration are explained by the technical structures for each of the production stages; thus the great diversity of furnace sizes and the immense amount of steel produced by major plants is clear; on the other hand, the rigid limitations of existing rolling facilities makes for more equitable capacity distribution, leading to lower concentration.

In this respect the structure of Latin American steelmaking is similar to that of countries with equivalent development, showing no special features that might hinder the normal growth of production activities.

The trend toward vertical integration of production facilities is a natural process in this industry as a result of power savings entailed by the need to save foreign currency used to import semis, difficult internal supply of semis or scrap, etc. This trend has been clearly followed in Latin America and by 1964, once a number of new integrated plants began operating, four fifths of the entire

steel production came from totally integrated establishments.

The same elements influencing the integration process will be present in the area in the next few years; thus current development must continue, although to a lesser degree than in preceding years. It is possible that increased requirements for special steels which are bound to occur in the most highly industrialized countries - Argentina, Brazil and Mexico - will favour the transformation or erection of semi-integrated plants for manufacturing these specialities.

Steel prices in Latin America

The same factors that affect steel prices in Latin America influence any other industrial product, though perhaps to different degrees. Simply stated, it is possible to group these elements as regards cost, supply and demand conditions and market organization.

The most significant element connected with cost is perhaps the high investment required to produce steel, since, as will be seen elsewhere, this industry's capital density is one of the highest. Another essential element is input value, particularly that of local coal which in most of these countries is of an inferior grade compared to that purchased abroad, thus contributing to increasing coke consumption at plants using local coal. The fact that the region is located far from centres where equipment is produced forces the industry to keep large stocks of spares, thus artificially raising operating costs. Labour is still cheaper than in industrial countries, although the difference has lessened considerably in the past few years. The need to train unskilled labour which is characteristic of Latin America, plus social security costs further contribute to increased labour costs. The high interest rates that must be paid on operating capital in money-scarce markets such as ours are another adverse element.

Among the conditions that might affect supply and demand the fact stands out that steel-producing enterprises in the area become natural monopolies or oligopolies; in no instance, however, has this fact meant that the enterprises have been free to set their own prices. On the contrary, this feature has led governments to take action in this respect, State agencies being finally responsible for fixing prices. Reiterated economic stabilization campaigns in countries where there is a high inflation rate have affected the price level of intermediate products, among which steel is a major item.

Of the factors connected with market organization one of the most weighty is demand diversification leading plants to produce a wide variety of articles in small quantities, consequently increasing costs and prices. Another point which was mentioned elsewhere is that of high distribution costs resulting from the state of the ways of communication and transport systems.

In order to find out how the foregoing elements affect prices a comparison between them and those in force in industrialized countries may be attempted. A number of obstacles hinder such a comparison, the most significant being the lack of standard pricing systems in these countries, wide variations in the price structure of steel goods, and the distorted exchange rates of these countries' currencies. In order partly to bypass these difficulties - particularly the last-named - we prepared a "Latin American price" for reinforcing bars and wire rod, representing the price at which all these products have been sold in the area, weighting the prices in the various countries, as of 31 August 1967, by the amounts produced in 1966. This weighted average price corrects to a considerable extent the effect of over or undervalued exchange rates, since it cannot be assumed that on that date all Latin American currencies were simultaneously in one or the other position.

Based on the price series prepared by the Instituto Latinoamericano del Fierro y el Acero (ILAFIA), under clearly defined conditions, for regional products, and on prices quoted by THE IRON AGE for the U.S.A., we find weighted averages amounting to \$167.68 and \$172.35 respectively, for reinforcing bars and wire rod, with a difference of 26 and 22% in each case in respect of U.S. prices.

It will be seen that these differences are considerably lower than those applying to other manufactured products, such as those of the region's metal-working industry. This is quite logical because the latter involves a higher degree of processing than steel, thus its costs are more greatly affected by the above mentioned elements.

The differences between Latin American prices and those of countries with greater industrial development will not entail an obstacle to demand development, since, as we have seen, prices are inflexible. Conversely, though, abnormally low prices may affect the growth of steel supply as they would bring about low profitability of the sector's investments and reluctance to participate in it on the part of credit agencies and investors in general.

Legal and tax provisions

One of the elements promoting installation and expansion of the steel industry in Latin America are the divers systems established in the region in order to favour the sector. Although not all the countries have issued specific legislation on the subject, steel is in fact included in other laws concerning industrial development in general.

Though tax and legal provisions of themselves cannot be said to promote steel operations, they have undoubtedly become valuable tools for aiding steel development. The most significant include tariff regulations which have enabled governments to keep their markets open to local producers; duty exemption on imports of machinery and materials; tax exemptions to steel companies or stockholders.

Provisions regarding financing for this branch of industry make it possible to obtain both local and foreign capital required for erecting and operation. In the former case, financing institutions or special funds grant loans to basic industries, including steel; in the latter case, the same institutions provide the necessary guarantees for operating on foreign credit. A resolution in force in Colombia deserves special mention, whereby taxpayers are exempt from certain taxes if they prove that they have invested an equivalent amount in the main steel company stock; this has become the company's major source of financing.

In all Latin American countries steelmaking equipment, machinery and ancillaries are free from import duties, while the land on which steel facilities are built is exempt from land tax, and companies are allowed to operate their own ports in order to cover their requirements for shipping products or receiving materials.

Regarding raw materials there are regulations for reducing costs, either by freeing them from import duties when they are imported or ensuring supply when they are locally produced. The Chilean legislation is illustrative of this point; it enables the State to purchase up to 10% of national iron ore production at cost.

Tax resolutions in force in Latin America entail a powerful incentive to domestic steel production. Among them the most noteworthy concern income tax exemption on profits under a given percentage (usually 8%), and product marketing.

Tariff protection imposed by Latin American governments as a means to protect their foreign currency reserves and favour local producers has enabled the latter to grow together with their respective domestic markets, and to the extent that they have been able to substitute imports. The level of such protection varies very much from one country to another, but it has proved to be one of the main fiscal instruments for promoting industry in general.

PRODUCTION ELEMENTS

Financial resources

The capital investment involved in steel plant erection is extremely variable, being closely linked to location, project size, technical production layout, product mix, existence of utilizable external savings. Thus, it is estimated that a plant for producing 1 million tons of flat products with a layout including blast furnace, open-hearth, roughing and rolling requires investing over 300 dollars per yearly ton produced, or a cost of over 300 million dollars.

Investment in expansion projects for existing plants also hinges on a number of elements, including size of expansion, section to be expanded, present and projected size of this section, equipment included, etc. Unit investments in expansions are of course considerably lower than those required for initial erection because, besides having the necessary infrastructure completed beforehand, some sections were previously oversized. To quote an instance, the expansion planned by USIMINAS, in Brazil, from 624,000 to 1.4 million tons per year, contemplates investing \$115.00 per additional ton of steel.

The magnitude of the investments noted points out, to some extent, the size of the financing problems that must be solved in order to develop this industrial sector, regarding both fixed assets and operating expenditures required to mobilize such investments. To simplify the discussion we will refer solely to the former. What sources of financing have been available to Latin American steelmaking for initial installation and development? In late 1964 the Instituto Latinoamericano del Fierro y el Acero (ILAPA) conducted a survey on financing sources, which was answered by 22 companies representing a total investment of just under 1,500 million dollars. Bearing in mind that the total investments for the entire sector are estimated in a little over 3,000 million dollars, the sample taken represented nearly 50% of the sector, for the present purposes.

Table 3 shows the percentage distribution of such funds and a comparison with the investments carried out in a recent year by steel companies in the European Coal and Steel Community.

Table 3
Origin of funds invested in steelmaking (%)

	<u>Latin America</u>	<u>ECSC</u>
National public contribution	43.7	0
National private contribution	5.7	4
Foreign contribution	3.5	
Profit capitalization	4.6	48
National credit	19.5	
Foreign credit	19.5	39
Other sources	3.5	9
Total	100.0	100.0

Source: ILAFA, ECSC

It will be seen that a major percentage of the funds comes from the public sector. The figure given is doubtless unrealistically high due to the fact that the 22 companies that answered our questionnaire included a large number of State-owned enterprises. However, such a high percentage need cause no surprise since steel is one of the basic industries that governments of developing nations are interested in promoting. This type of financing has been extensively used to establish steelmaking plants. It is unlikely, however, that governments will participate in the same degree in plant expansions. It will probably not be possible, therefore, to mobilize large State resources in order to finance the growth of this activity, as may be seen from experience in Europe.

Private contributions have originated 9.2% of the funds used by Latin American steelmaking, arising for the most part in the respective countries. Although participation of this source of financing may increase in the future, the low profitability of steel investments discourages capitalists, so it will certainly not improve to any significant degree. External contributions have financed only 3.5% of the total invested in these operations. The main obstacles against establishing such "joint ventures" stem perhaps from the conditions that foreign capitalists require from steel companies interested in receiving their capitals. In any case, it is natural that such capitals be tied to purchases of materials, equipment, engineering, etc. In order to attract investments most

governments in the area have issued provisions favouring them, such as special measures for capital protection and remittance of profits abroad; but it is highly improbable that significant levels will be reached, as ECSC steelmaking shows.

Capitalization of the companies' own profits has originated barely 4.6% of steelmaking capital, whereas in Europe this is a major source of funds. In general profits are reinvested in the same business for two reasons. One, there are provisions exempting such capital from certain taxes; two, the international financing institutions require such reinvestment as a means to increase local participation. In general self-financing of company expansion may be expected to increase over the figure shown, taking into account that the enterprises will have been operating now for a number of years. Of course, the magnitude of such resources is related to the amount of profits that in turn depend upon the prices that governments set for local steel, which will be dealt with elsewhere in this paper.

As in the ECSC, credits originated 39% of the capitals used by the industry, national and foreign banks sharing the responsibility in the same proportion. It seems highly improbable that internal credit sources will contribute to future expansions as they have done heretofore, for the same reasons given to justify reduced government efforts, since both sources are to a great extent subordinate to national development policies.

Foreign credit is particularly important because it provides the foreign currency required by these projects and should be the supporting column on which steel development is based. The sources of such credit are twofold - international and government banks, and equipment suppliers. Of the former the World Bank, which has been most active in steel operations in other areas, will very possibly increase its activities in Latin America. In the same way, the increase in Inter American Development Bank operations allows us to expect that its participation in steel financing will increase substantially, though it has shown reluctance to participate in the sector up to now, in view of the vastness of the investments involved. The Export-Import Bank, in its role of government bank, has contributed greatly to the sector's growth. Thus, as of September 1967, it was responsible for financial assistance amounting to nearly 800 million dollars, distributed among Latin American steelmaking and metalworking. Experience acquired by this Bank in operations of this nature will doubtless determine

continuation of the interest shown to date.

The main obstacles encountered in the search for foreign credit are found in the lack of adequate feasibility studies, which unnecessarily prolongs the periods allotted for examining projects. The institutions, furthermore, are particularly sensitive to economic and political conditions prevailing in the interested countries, both of which, as we have seen, are not particularly stable in the region. The loans are granted for reasonable periods and may be repaid from the returns on the investment financed. It has been suggested, however, that interest rates are high and the banks have been requested to grant to steelmaking the same terms that are granted to infrastructure loans. Another flaw that has frequently been pointed out is the fact that such credits may not be applied to expenditures in local currency, which restricts their usefulness.

Supplier credit should also increase in the future, particularly considering the excellent organization of foreign groups interested in placing their equipment. In general, the terms of these credits are very similar - 2 or 3 years' grace period, total repayment over 10 to 13 years, 4.5 to 6.5% interest, which makes for sound competition over bids and brings positive advantages to Latin American steelmakers.

Raw materials

Latin America may be said to possess substantial iron ore reserves; however, not all the countries are equally endowed, neither do all the ores have a high metal content. It should be recalled that Latin America is not yet sufficiently surveyed geologically, therefore many surprises may yet be revealed, mainly due to increasing use of modern survey methods.

According to geological studies conducted to date, the Latin American continental countries have about 92 billion tons of iron ore, including proved reserves (4,800 million tons), probable and possible reserves (87,000 million tons), most of which are located in Brazil and Bolivia. The greatest percentage of these ores are hematites and magnetites, but large deposits of limonites, itabirites and others also exist.

In 1966 iron ore mining in the countries of the region totalled 73.7 million tons, only 2% of this total being produced by underground mining. Average metal content of the ore mined was about 61%, which clearly shows its high grade. Of the total for the year, 8.4 million tons were consumed by steel plants operating

in the same countries, 17.8 million tons went to concentration plants, 41.5 million tons were exported.

Production of iron ore pellets in 1966 amounted to 1.7 million tons and may reach a total of 5.5 million t.p.a. beginning next year when operations start at expansion projects currently under way. Sinter production was of the order of 4.5 million tons.

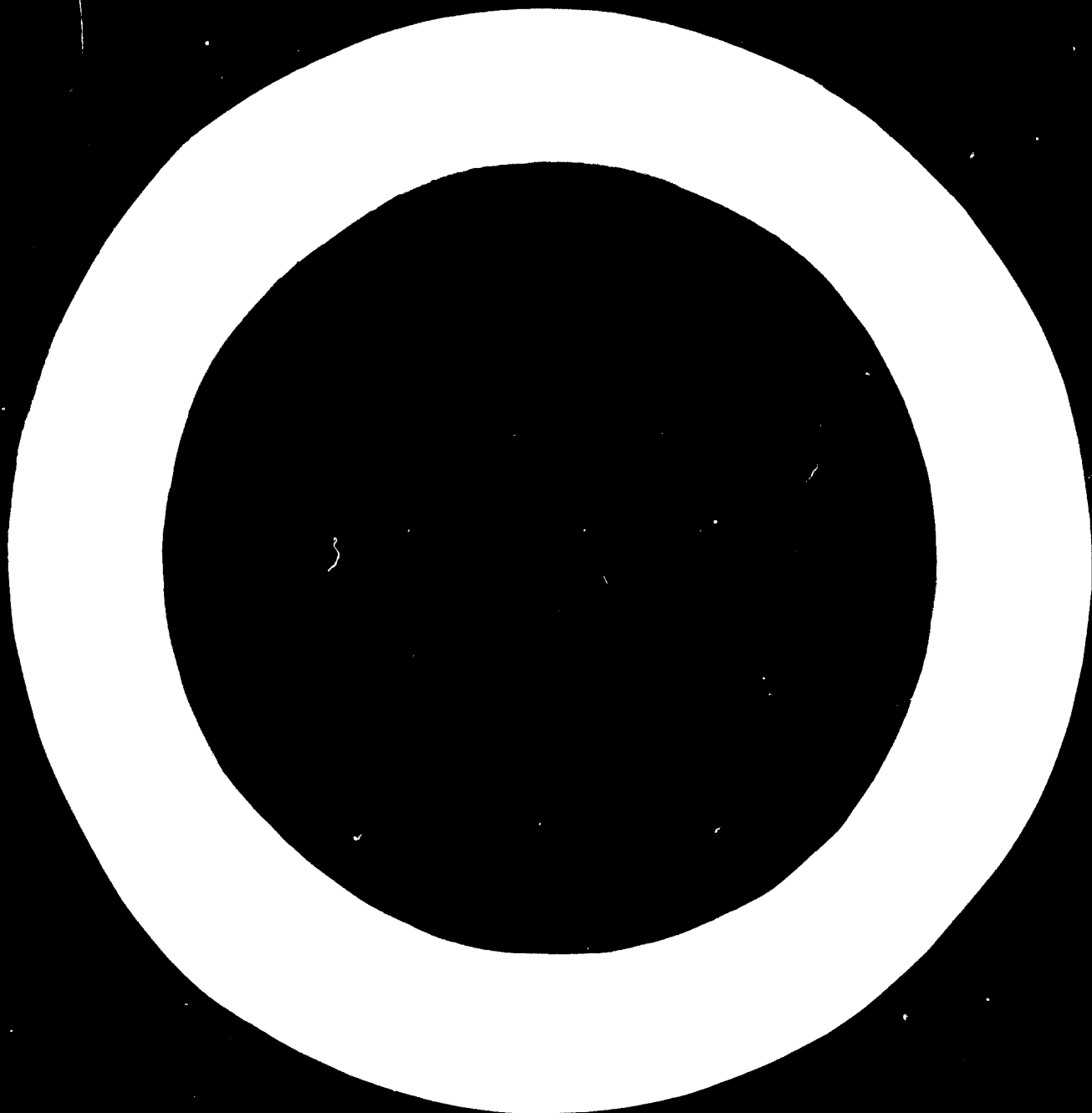
Mining costs are undoubtedly competitive with those of other parts of the world, since considerable amounts are being exported. Nevertheless, the growth of mining operations in other countries together with technical developments for enriching low-grade ores are forcing Latin American iron ore mining to improve production economics further. This progress is being sought through productivity increases, higher mining yields and production of agglomerates.

From the picture presented we may conclude that ore reserves, ore grade and the efficiency of mining operations will continue to foster steel production development, as they have done in the past.

Whatever the steelmaking process selected, it cannot work without the use of power which, for this reason, must be viewed as another essential raw material for producing primary iron. Although 96-98% of world primary iron production is obtained through the use of coal as a power source, the percentage for Latin America is far lower. Here, due to the lack of coal of suitable grade, great importance attaches to secondary power sources. The figures for 1966 point to only 6% use of coal in Latin American steelmaking, whereas the remaining 31% comes from other sources.

Of the 7 countries in Latin America where integrated steel plants are operating, only Argentina, Brazil, Chile, Colombia and Mexico mine coal of a grade more or less suitable for steelmaking purposes. However, only the latter two are able to cover the full requirements of their steel plants. Argentina, Brazil and Chile still need to import certain amounts of coal to improve the domestic product by mixing, while Peru and Venezuela still lean entirely upon imports for their solid fuel supply.

The foregoing description shows that the quality of Latin American coals raises serious obstacles in the way of steel industry expansion. Improving the properties of this material is a major challenge to Latin American researchers and must become a focal point in any effort to seek new ways to technological progress.



ANNEX 1

Apparent consumption of steel in Brazil
(tons)

Year	Apparent consumption	Production	Imports
1951	1,068,016	681,255	386,761
1952	1,087,934	700,379	387,555
1953	1,006,821	794,460	212,361
1954	1,486,411	834,037	652,374
1955	1,265,659	920,432	345,227
1956	1,324,508	1,070,937	253,571
1957	1,521,321	1,127,079	394,242
1958	1,518,146	1,303,633	214,513
1959	1,998,826	1,492,009	506,817
1960	2,061,184	1,626,593	434,591
1961	2,147,027	1,813,091	333,936
1962	2,328,329	2,046,018	282,311
1963	2,692,698	2,216,133	476,565
1964	2,657,057	2,365,311	291,746
1965	2,232,974	1,977,289	255,685
1966	2,791,083	2,482,508	308,575

Source: ILAPA

ANNEX 2

Apparent consumption of steel in Mexico
(tons)

Year	Apparent consumption	Production	Imports
1951	736,556	356,231	380,325
1952	717,363	408,580	308,783
1953	647,990	396,903	251,087
1954	654,967	464,037	190,930
1955	807,978	571,615	236,363
1956	1,095,077	763,909	331,168
1957	1,239,130	934,981	304,149
1958	1,144,196	917,947	226,249
1959	1,104,799	1,033,465	71,334
1960	1,433,678	1,219,021	214,657
1961	1,422,397	1,288,145	134,252
1962	1,447,368	1,300,398	146,970
1963	1,511,630	1,361,183	150,447
1964	1,885,900	1,685,961	199,939
1965	2,130,785	1,900,195	230,590
1966	2,301,398	2,074,609	226,789

Source: ILAFA

ANNEX 3Apparent consumption of steel in Chile
(tons)

Year	Apparent consumption	Production	Imports
1951	220,313	138,138	2,175
1952	224,578	159,580	64,999
1953	218,342	146,495	71,847
1954	223,524	194,214	29,310
1955	249,972	200,300	49,672
1956	287,597	232,375	55,222
1957	268,390	181,438	86,952
1958	251,491	200,810	50,680
1959	300,713	248,230	52,484
1960	233,573	185,806	47,767
1961	307,368	227,100	80,268
1962	544,534	402,260	142,274
1963	458,379	422,893	35,486
1964	485,619	440,883	44,736
1965	457,482	384,526	72,956
1966	579,958	472,917	107,041

Source: ILAPA

ANNEX 4

Latin American imports of sheet and tinfoil in 1965
(thousand tons)

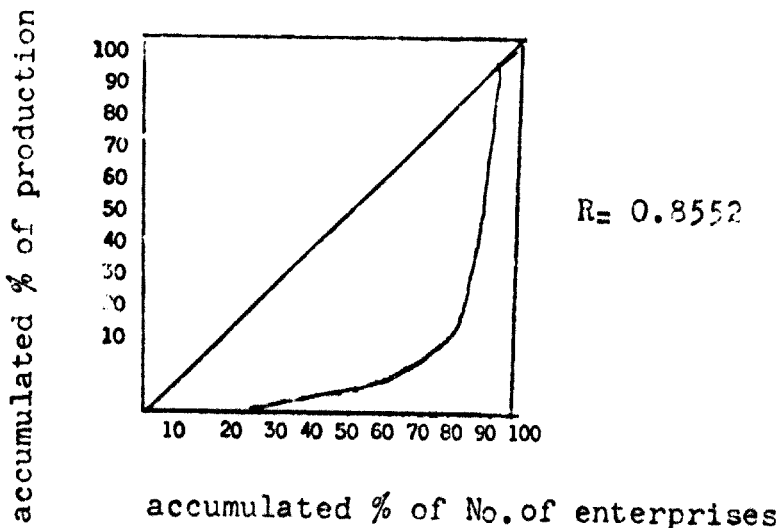
<u>Country</u>	<u>Sheet</u>	<u>Tinfoil</u>
<u>Total</u>	<u>671.6</u>	<u>281.5</u>
Argentina	199.0	91.5
Bolivia	7.3	1.9
Brazil	79.7	11.1
West Indies	29.6	12.1
Chile	6.3	6.0
Colombia	57.2	13.8
Cuba	0.5	24.1
Dominican Republic	3.7	2.3
Ecuador	7.9	2.2
Guatemala	13.5	3.4
Haiti	1.8	-
Honduras	3.5	0.1
Mexico	18.4	10.2
Panama	8.2	2.2
Paraguay	2.0	3.1
Peru	42.2	18.9
Uruguay	12.9	6.7
Venezuela	124.6	54.4
Others	53.1	17.5

Source: ILAPA

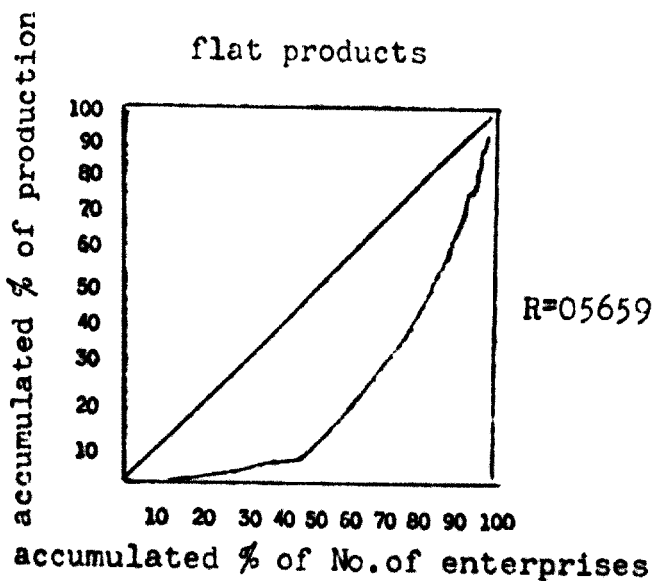
ANNEX 5

Lorenz concentration curves for steel, flat and non-flat products

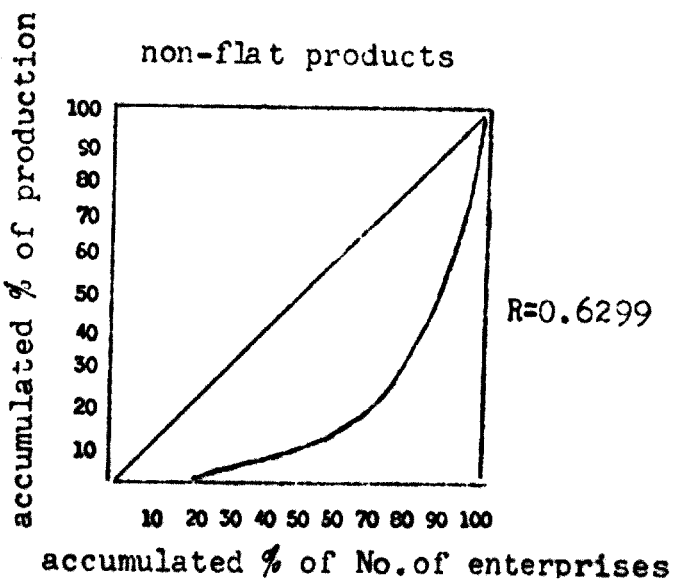
steel



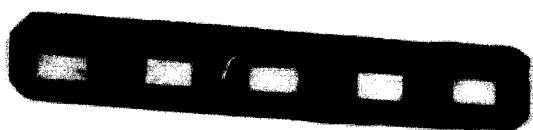
flat products

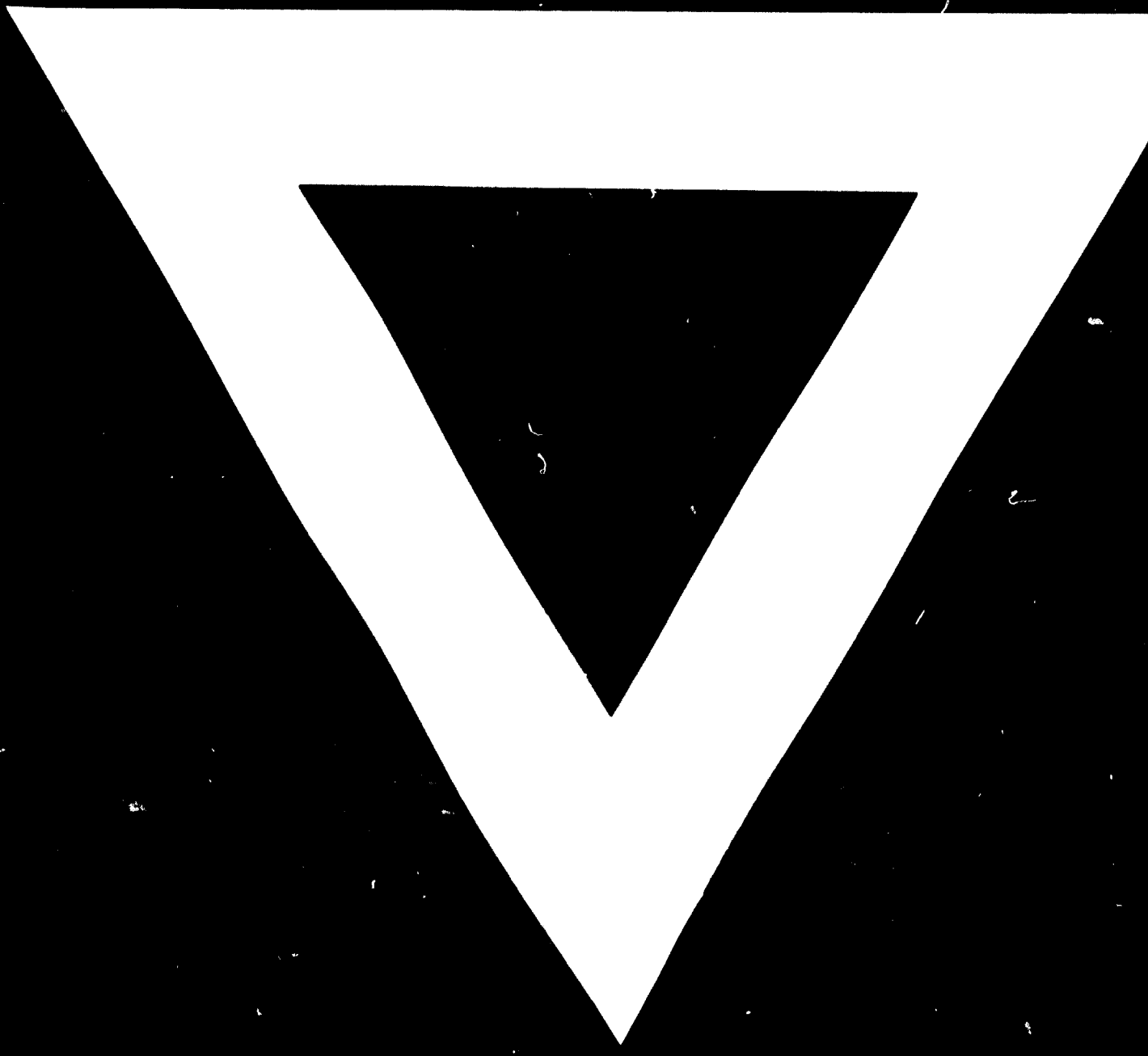


non-flat products



R= GINI concentration index





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