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UNITED NATIONS

D03595

INTERREGIONAL SYMPOSIUM ON
THE APPLICATION OF MODERN TECHNICAL
PRACTICES IN THE IRON AND STEEL
INDUSTRY TO DEVELOPING COUNTRIES

STEEL SYMP. 1963/
Technical Paper/B.23
10 October 1963

11-28 NOVEMBER 1963

Original: ENGLISH

REGIONAL INTEGRATION OF THE STEEL INDUSTRY IN
LATIN AMERICA

by

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The present paper examines the problems to be faced when dealing with the possibility of integration or co-ordination of iron and steel production for the markets of a group of countries under development, such as those of Latin America, taking advantage of scale economy. In addition, a report is made on the work being carried out by the Instituto Latinoamericano del Fierro y el Acero toward facilitating such integration.

I. General Data

1. Before the II World War, in 1938, the countries of Latin America, that is, those situated South of the Rio Grande on the borderline between the United States and Mexico, in Central America, part of the Caribbean, and all of South America, totalling 20 independent countries^{1/}, jointly produced a total of 220,000 tons of steel, and in 1962 they were producing 5,820,000 tons.

The evolution of production and consumption is shown in the following chart.

^{1/} Countries of Latin America: Mexico, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, Cuba, Haiti, Santo Domingo, Venezuela, Colombia, Ecuador, Brazil, Peru, Bolivia, Paraguay, Uruguay, Argentina and Chile.

Chart 1

Year	Population in millions of inhabitants	Crude steel production in thousands of tons	Apparent consumption in thousands of tons	Per capita production in kilos	Per capita consumption in kilos
1938	110	220	1.680	2	15
1952	152	1.870	4.600	12	30
1962	215	5.820	8.330	27	41

2. Maximum production capacity

It may be estimated as follows for 1962:

Chart 2

Pig iron and sponge iron	5,800,000 tons per year
Steel	7,500,000 " " "
Bars and sections	3,800,000 " " "
Rolled products: Flats products	2,800,000 " " "
Tubes	600,000 " " "

3. Investments

Based on production capacity, direct investments in the iron and steel industry may be estimated at approximately 5 billion dollars.

4. Raw Materials

Latin America is amply self-sufficient in high-grade, low-cost iron ore, lacks coking coal for steelmaking in the greater part of the area, therefore exports the former and partly imports coal. Other raw materials required by the industry are no great problem. In 1962, Latin America produced approximately 39,000,000 tons of iron ore, of which about 33,000,000 were exported to the rest of the world.

Proved reserves in Latin America are estimated at about 30 billion tons, most of which are to be found in Brazil and Venezuela. Some estimates of probable and possible reserves exceed 50 billion tons.

II. Organizations Instrumental to Integration

5. Latin America is composed of a group of nations under development, with this feature, among others, peculiar to it, that its current rate of population growth is the highest of all world areas. These countries are united by a common historical, racial, religious and language background, and separated by the independence and autonomy of twenty states which, from an economic and political point of view, are so many tight compartments. Few regions in the world are endowed with a uniformity theoretically so favourable, and yet so wasted for lack of practical action in unison,

directed toward a form of integration indispensable to speed their overall development.

6. Nonetheless, the ambitious objective of such integration has always been present in the minds of Latin American leaders. Organizations have been established promoting common action and wider understanding. The first and primary concerns were to maintain peace among the countries, to regulate their international relations, etc., under a number of treaties signed in the course of the years. The pioneer body in this undertaking was the Organization of American States and their Secretariat, Pan American Union, also associating the United States of America. At present, the OAS, particularly through their specialized Council, is more and more concerned with economic and social affairs, and with technical assistance.

7. The desire for union and the search for common objectives was intensified after World War II was over and the United Nations was born. The Economic Commission for Latin America (ECLA) was established in 1945, with its Secretariat in Santiago, Chile.

ECLA investigations began to reveal the harsh realities of poor economic development, the serious problems of all types that have to be faced, such as basic industrial equipment, housing, lack of capital, and so forth. Simultaneously, studies were undertaken to point out ways to implement a process conducive to raising the living levels of Latin American populations.

8. The seed bore fruit, and other complementary organizations were established to promote regional development. In April 1959, the Interamerican Development Bank (IDB) was founded, soon to play a significant part in promoting and financing economic and social projects. In February 1960, the Treaty originating the Latin American Free Trade Association (LAFTA) was signed in Montevideo, Uruguay; its current members are Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru and Uruguay. The foundations were thus laid for the next step, which is to be the establishment of a Latin American Common Market. In August 1961, at a meeting held in Punta del Este, Uruguay, the governments of America signed the declaration originating the "Alliance for Progress" entailing a commitment to adopt serious measures in order to ensure the speedy rise of their people's living levels, the structural reforms deemed necessary, and the implementation of national development plans. The step is still to be taken whereby such national development programmes may be co-ordinated into a common effort toward integration, undoubtedly entailing

fundamental political reforms in order that the various stages may appoint a common high authority to whom certain basic decisions for directing such regional development may be delegated.

III. Instituto Latinoamericano del Fierro y el Acero (Latin American Iron and Steel Institute).

9. In 1959, representatives of the Latin American steel enterprises met in Santiago, Chile, and agreed to establish the Instituto Latinoamericano del Fierro y Acero (ILAFA), a private entity enabling a permanent link to be set up between enterprises, facilitating co-ordination of their activities, exchange of information, uniformity of products standards, etc. The mutual acquaintance of steelmen by means of periodic meetings of which the first was then being held, was to make such an undertaking easier. It is now in full development. The statutes of ILAFA were approved there and then, stipulating as main objectives of the Institute, among others, "to carry out surveys and research on Latin American markets with a view to obtaining a co-ordination leading to improved development of the regional iron and steel industry" "to promote exchange of information, experience and techniques leading to improved productivity and production quality", "to promote the preparation and maintenance of statistics on production, end uses, prices, etc., of steel products in the Latin American area", "to promote steel product standardization".

The work undertaken by the Institute Secretariat is directed toward achieving such objectives and accomplishing the supplementary resolutions of the Board and of the General Assemblies who meet, respectively, once every six months and once yearly, each time in a different Latin American country.

10. From its inception, ILAFA has maintained close contact with the Inter-american organizations aforesaid, particularly the OAS, ECLA, IDB, the Pan American Standards Committee and IAPTA. Such contact has given rise to agreements to carry out programmes of common interest, basically coinciding in the search for ways to attain a more effective and speedy integration of the Latin American steel industry.

IV. Steel Integration Projects

11. ECLA-ILAFA-IDB Project

In September 1962, ECLA and ILAFA signed an agreement to conduct a joint study on Latin American steel economy, with financial assistance from the Inter-american Development Bank. Under this programme, working groups were set up in the various Latin American countries, who prepared monographies on the actual and prospective situation of the steel industry in each of the respective countries, in

accordance with a common plan. A working group composed of members of the ECLA and ILAFA secretariats, together with ad hoc advisers, is at present at work on a regional report collecting the data gathered in the individual national monographies, analysing future perspectives, and making suggestions for attaining a greater measure of co-operation, which are to be submitted to regional steelmen for consideration and, once they have been duly examined, discussed and approved by them, later presented to the Latin American governments.

12. OAS-PASC-ILAFA Project

In July 1962, a joint programme was also started by ILAFA, the Pan American Standards Committee (PASC), and the Organization of American States, for the purpose of preparing and approving common standards intended to be adapted as Pan American. A good number of standards have already been approved by national standards bodies represented on the PASC. In this way, the basic steps are being taken toward making Latin American steel products interchangeable, and adapting them to the needs of regional consuming industries. Full details of this programme, now entering its third year of operation, are given in a separate paper submitted to the present Symposium^{2/}.

V. Need for Uniform Bases

13. When starting a programme for integration of the Latin American steel industry, it was found indispensable to set up certain uniform bases in order to facilitate the requisite studies concerning terminology, statistics, specifications, tariffs, legislation and exchange rate systems in each of the countries of the area.

14. Language and Nomenclature

Despite the fact that, with the exception of Brazil, the Latin American countries have Spanish as their common tongue, different traditions have originated in each of them, different terms for steel products, the same name being used in some cases for different products, or, conversely, different names for the same product. One of the first tasks undertaken by ILAFA has been to define steel products with indication of their limit dimensions, and to propose a Latin American term with equivalents in Spanish, Portuguese and English. To date, three provisional editions have been issued of a Common Technical Lexicon, which have been circulated among ILAFA members and organizations from other countries, from whom comments have been requested which will be taken into account when preparing the definitive edition.

^{2/} Steel Standards and Regional Standardization - Latin America - UN Symposium, Prague - Paper by A. Gómez and F. Aguirre, 1963.

15. ILAFA conducts a quarterly survey of production statistics among all regional enterprises, issuing the results for their inclusion in world statistics of steel production. The product classification employed by the Steel Committee of the Economic Commission for Europe of the UN, has been followed.

16. Standardization and Simplification

In dealing with a programme for integration of production covering different countries, the importance of having an adequate system of common standards and of tending toward product simplification, cannot be ignored. As stated above, ILAFA, with the help and assistance of the PASC and the OAS, has successfully undertaken the task so specified under its own statutes.

17. Common Tariff

Economic integration in Latin America entails the setting up of a tariff common to all the countries that compose it. A first step has been taken toward a common structure, and once the anticipated Latin American common market agreement (see 8) is achieved, tariff values expressed in an equivalent monetary unit will likewise have to be equal to one another. The establishment of common standards and specifications for steel products makes such an undertaking much easier to accomplish.

18. Legislation and By-laws Comparison

ILAFA has engaged in a permanent study whereby a comparison is made of various laws and legal provisions affecting steel production in Latin American countries. Experience born of application in certain countries serves others when faced by similar situations. If steel enterprises operate under equal circumstances with regard to taxation, legislation, social action and incentives, unbalanced conditions are prevented which may seriously jeopardize an integration that must be based on comparable productive efficiency.

19. Exchange Rate Systems

Another condition essential to furthering interchange of products among Latin American countries, is that the exchange rate system prevalent in each of them should arise from the relationship between costs and prices in the various markets, in order to prevent distortions possibly originating irregular competitive conditions.

ILAFA studies are directed toward ascertaining the relationships required for operating on uniform bases, and examining such measures as may lead to balanced conditions necessary for harmonious development.

VI. Conditions and Problems of Regional Interchange

20. Natural Obstacles

The main consuming centres of Latin America are situated for the most part on the perimeter of the continent. This is particularly so in South America. Internal communications are scarce and expensive, so that maritime freight predominates, covering great distances. The low volume of current regional interchange, coupled with the uncertainty of return cargoes, raise the unit cost of transportation to figures very often higher than those for products transported from outside the area, whether from Europe, the United States, or Asia. Deficient port facilities and working methods contribute to raise cargo costs, while loading and unloading are responsible for a very high part of the total cost. Thus, the fact that these countries are actually situated in the same continent or region is of no advantage to regional interchange, not even in the case of neighbouring countries. Among the measures that will have to be taken to implement greater intraregional trade, the solution of the foregoing problem will perhaps be the most costly.

21. Competition from Extra-Regional Products

(a) C.I.F. prices at which products from outside the Latin American area are offered, are considerably lower than domestic market prices for local production, and likewise for those that regional producers are normally able to offer when exporting within the area. These same export prices for products from more highly developed countries are likewise considerably lower than those current in the domestic market of those same exporting countries. Competition of such a nature tends to inhibit development of local steel production, which thus requires steep customs barriers to be erected for its own protection. Such competition obviously holds back the expansion of Latin American steelmaking, in addition to placing local producers in a difficult and uncomfortable position with regard to the consumers in their own domestic markets.

(b) High customs barriers are not an effective defence against dumping, since exporting countries are driven to lower their C.I.F. prices even more, in order to reach the domestic markets of the importing countries on a competitive level.

(c) The disturbing effect of such competition on the development of the Latin American steel industry was stressed at the latest Congress of Latin American Steelmaking held in July 1963, in the "Declaration of Caracas", there approved as follows:

"The IV General Assembly of ILAFA assembled in Caracas, having examined the position of Latin American steelmaking with regard to the world situation, and bearing in mind:

"That the region as a whole shows a deficit in steel production amounting to approximately 4,000,000 tons a year;

"That surplus steel reaches our markets at prices much lower than those current in the countries of origin; and

"That it is our collective task to promote the speedier industrial development of the area as the only way to ensure a constant rise in the living level of its population,

"AGREES

"1. To declare the urgent need for adequate barriers to be set up, without prejudice to the interests of steel users, in order to ensure the sale of local production at all times, and for preference to be granted to similar Latin American production when local supplies prove insufficient.

"2. To resolve on the immediate preparation of a report making it possible to submit specific recommendations to the Governments of the countries in the area, with the least possible delay."

22. Preferential Market

To grant preferential treatment for regional products, by reducing duties with respect to those affecting products from outside the area, means that, when regional exporters make use of this advantage, the importing country must pay a higher price than would actually have been the case in the international market. Compensation would take place when the importing country by virtue of the same treatment, would in turn obtain equivalent advantages through sale of its products in the same regional market. Such balanced conditions are not easily obtained, however, at least in the present stage of Latin American industrial development. The sole establishment of a preferential market will not of itself increase regional interchange, until other conditions essential to balance are met.

23. The establishment of an overall common market, that is, of equal protection toward third countries, and entirely free interchange between countries within the area, is likewise difficult to apply at the present time. A number of supplementary

measures of an exceptional nature are required in order to safeguard the urgent needs for equipment and development felt by many of the more backward countries of the area. Such countries are upheld by exports of a primary type, usually supported by a single product making up over 80% of the total, and for which market outlets must be found outside the area, thus making interchange compensation within the area practically impossible.

24. Export Financing

Although in many cases Latin American producers may be in a position to enter into fair competition with producers or manufacturers from outside the area, with regard to prices, quality and delivery of their products, regional purchasers are driven to decide in favour of foreign suppliers, whose offers include payment terms much more favourable than those within the reach of Latin American bidders. The Interamerican Development Bank (IDB), having recently acknowledged this disadvantageous situation, is making medium term credit available to Latin American exporters for intraregional operations, in order to restore competitive balance with regard to extra-regional suppliers. A way remains to be found whereby Latin American producers may make important sales within their own countries under financing conditions equivalent to those available to outside suppliers.

25. Exchange Rate Problems

A serious obstacle to the continuity of any interchange which it might be possible to set up, under permanent multilateral agreements, between the countries in the area, is the prevalent instability of most of their currencies, and the resulting lack of a more or less permanent ratio between such currencies. This means that the competitive position of producers of one country in relation to those in another, from the point of view of internal costs, does not remain constant; neither does the competitive position depend on their respective productivity rates. Permanent agreements on complementing tariffs could very well be affected by unfair competition, often comparable to "dumping", from one of the contracting parties. Internal fluctuations of the currency, so often speeded by violent inflationary processes, coupled with an acute and almost incessant scarcity of foreign currency force many governments to set up special exchange rates, governed by foreign trade demands more than by a true relationship with domestic costs. In the case of a policy of growing interchange between the Latin American countries, the rules governing exchange rates will have to be clearly specified in order to avoid provoking disturbances that will discourage or endanger co-operative agreements or mutual exemption from customs duties.

26. Uneven Degree of Development in the Area

Whereas all the Latin American countries are under-developed, or, more generously, "undergoing development", it is also a fact that there are considerable differences in the degree of their development, in some cases reaching ratios of over 1 to 4.

Such uneven conditions, when found in the various countries of an area seeking economic integration, are a serious setback to the overall economic growth of that area, in the same way that a greatly uneven income distribution among the population of any country is a setback to that country's growth. In order to prevent neutralizing all efforts toward economic integration, care must be taken that neither the consequences of an expansion of Latin American domestic markets nor the location of new industrial facilities contribute to greater imbalance than at present. Instead, the trend must be to achieve a greater degree of balance, thus stimulating inter-change.

VII. Bases for and Problems of Co-operation

27. The most widespread "leit-motiv" in favour of Latin American integration is that, in view of the present structure of the area, composed of twenty countries impermeable to one another, industrial production should be planned for twenty separate markets, each of them, tending toward economic self-sufficiency and consequently disregarding the advantages of scale economy. Most of our steel plants, for instance, must now produce a wide range of products, in lower quantities than it would be economic to produce with more advanced techniques, and with excessive costs due to frequent changes in processes or production schedules. Markets are small and fitful, due to local changes in demand composition. It follows, then, logically enough, that if each of the steel plants, in addition to their own national market, could operate in the wider regional market, with a total of nearly 200 million potential consumers, more productive designs and more efficient production schedules could be put in practice. Surveys conducted by experts, and particularly ECLA reports,^{3/} prove the above conclusively.

28. Notwithstanding, we ask ourselves whether the foregoing theory is entirely applicable to a system of independent countries desirous of attaining closer economic

^{3/} See "ECLA: Memorandum on the state of the work being carried out by ECLA together with ILAFA, connected with regional steel industry studies". Presented at the III Congress of Latin American Steelmaking, Caracas, July 1963. ECLA Doc.

relationships through an alliance respectful of their individual sovereignty. Any economic union affects sovereignty to some extent, whether to curtail or to extend it, according to how it is judged.

The wide and simple rules governing a unified market, such as the United States or the USSR to consider two widely different types of economies, are inapplicable to Latin America, which must be looked upon as a group of markets seeking to eliminate customs barriers, but maintaining well-defined and independent internal structures. Planning, therefore, cannot be conducted by estimating the most suitable location and size of each new industry as though it were to operate in a new country resulting from the elimination of customs barriers between its former components, because all other dividing conditions remain in force; such as different currencies, taxation systems unrelated to each other, natural resources not easily transferable, very unbalanced incomes, and so on. The number of variables is inordinately large, making the formulation of optimizing equations exceedingly complex, not to say utopian.

29. The geographic extension wherein the various Latin American countries, as political and economic units, are situated, is so large, that physical distances between the countries are enormous, and aggravated by a deficient system of communications. Any industrial co-operation agreement, therefore, has a very high initial cost which is equal to the cost of transportation in both directions of the products affected, and which must be equal to or lower than either the benefit arising from the productivity increase inherent to an increase in the production scale, or the advantage obtained from the employment of idle capacity in existing plants. Consideration of marginal costs can also contribute to achieve this balance, provided that there is a market in each country capable of absorbing a significant proportion of local production. Otherwise, if all or a great part of overhead is charged to a small percentage of production, which is that delivered to the local market, resulting domestic prices would be inordinately high.

30. Geographical distances between the various Latin American markets are a limiting factor for co-operative agreements between distant areas, but their effects may be calculated and are not contrary to logical planning based on traditional premises, as, for instance, the method followed in order to decide on the most suitable location for a large new steel plant in the United States of America.

Obviously, a programme for Latin American steel development must take into consideration the recognized advantages of large-scale projects, for which, however, greater markets are required.

31. However, the application of a system of scale economy for Latin America gives rise to other considerations. A certain industrial process successfully operating in a fully developed country is not always directly applicable to a country under development. The ratio between capital cost and social cost of labour is different in both cases, and, in turn, creates a difference in the measure of productivity, as seen from the point of view of the general economy. In a country under development there may be alternative investments open to its scant savings, of greater economic and social urgency, motivating a different evaluation of invested capital cost. We will not enter into the problems derived from the lack of political stability, as they are incalculable.

32. Development Programmes

Of late years, the Latin American countries have acknowledged the need to plan their national development, culminating in the commitments entailed by the Alliance for Progress. In many of the countries, plans are under way for the development of certain areas, various national agencies having been established in order to promote and direct them. The step is now being taken toward wider national programmes, usually of ten-year duration, wherein the development of the steel industry plays an important role.

It may be safely said that wherever possible all Latin American countries are in some degree anxious to own a steel plant in order to supply national needs for the construction, metalworking and manufacturing industries. In almost all of them, moreover, the steel industry is looked upon as a training-school for management and planners, fundamental for a future industrial take-off. This makes it difficult to think of a Latin American steel programme specifying that certain countries be set aside only as consumers, whereas, in accordance with their own plans, they require to erect steel plants, or even small rolling units at first.

If we examine the programmes of all the countries and add together their projected steel production, we may well find that the total exceeds the general demand anticipated for the Latin American group in the next few years, or that projected production of certain items may be excessive, while others may be deficient.

Up to now, a systematic comparison of the various national development plans has not been possible, nor is there in Latin America an authority able to demand their co-ordination. ILAFA has undertaken to examine such programmes, as far as the steel industry is concerned, to report on them, and to promote frequent meetings of all interested parties, both in business enterprises and government, in order that their decisions may be based on the greatest amount of information available, thus making mutual agreements easier to attain.

33. None of these countries can be denied the right to erect a steel plant as they may deem most advisable at the present stage of their development. However, producers and governments alike can be made to realize that their plans should have a common objective. They should seek in each case the most suitable solution, after taking into account local markets and possibilities of export within the area, as well as what may be regularly imported from within the same area, so that, through adequate co-ordination, they may avoid making costly or superfluous investments. They must be in a position to foresee when expansions should be carried out and what items are to be covered, in accordance with programmes existing in the rest of the continent and with regard to products which may have access to their respective countries.

VIII. Way to Integration

34. A clear view of the possible growth of multiple national markets, once mutual access to them is established, will allow economic advantage to be taken of plants designed for larger production than present domestic market conditions justify, and permit to be temporarily disposed of in other countries in the area. We say temporarily advisedly, as within a few years the respective domestic market will have grown enough to absorb the entire production. This, however, will soon again become insufficient, until an important expansion takes place or a new plant is undertaken to satisfy the demand. And so on, indefinitely. As larger projects are planned, inception periods will be longer from approval of the preliminary outline to products for delivery to the market after all financial needs have been met and erection is complete. This period lasts several years, in some cases five or more. Meanwhile, local consumption continues to increase gradually, to a greater extent in these countries just starting an industrialization and import substitution process. Such an increase in consumption is more continuous than the local supply of steel

products, and therefore, this possible market expansion may act as a regulating tank providing an outlet for steel production at times of local surplus, and taking it in when supply is deficient.

Whereas consumption progresses continuously as a result of the multiple demand factors, supply, locally considered, jumps ahead in fits and starts of a size proportionate to the benefits achievable from large scale steel production facilities. Thus the process of temporary interchange of steel production between countries in Latin America is justified, and its sign may change at certain times, in accordance with the same principle.

35. It must not be felt, however, from many of the foregoing conclusions, that integration of the Latin American steel industry presents unsurmountable obstacles. On the contrary, our intent has been to emphasize certain points which have not always received sufficient consideration from builders of theoretical plans, based on sound principles, though applicable only within a single political and economic organization. These problems have been outlined with the purpose of avoiding measures that may mean a backward step on the road to a closer industrial collaboration among countries under development, and cause discouragement or restraints only serving to strengthen autarkic feelings in the countries affected.

The step from the present stage of Latin American steelmaking to regional planning, bringing about an increase in scale of plant operations, must be taken gradually, following the improvement of transportation, which will require large investments, and allowing for adaptation of individual political and economic structures to a closer interrelationship.

Step by step, progress has been made. In the first place, through the action of ILAFA, the mutual acquaintance of steelmen from each of the countries was fostered, and an atmosphere of trust and friendliness was created, suitable for discussing common problems, and for finding adequate solutions.

ILAFA has organized a system for supplying information and exchanging experience in order to give producers a clear idea of projects currently being planned or executed, their anticipated starting dates and the various stages of their future expansion. In addition, ILAFA has undertaken a permanent examination of present and future fluctuations in the market for steel products in each country, internal variations in steel prices, and conditions governing steel product interchange.

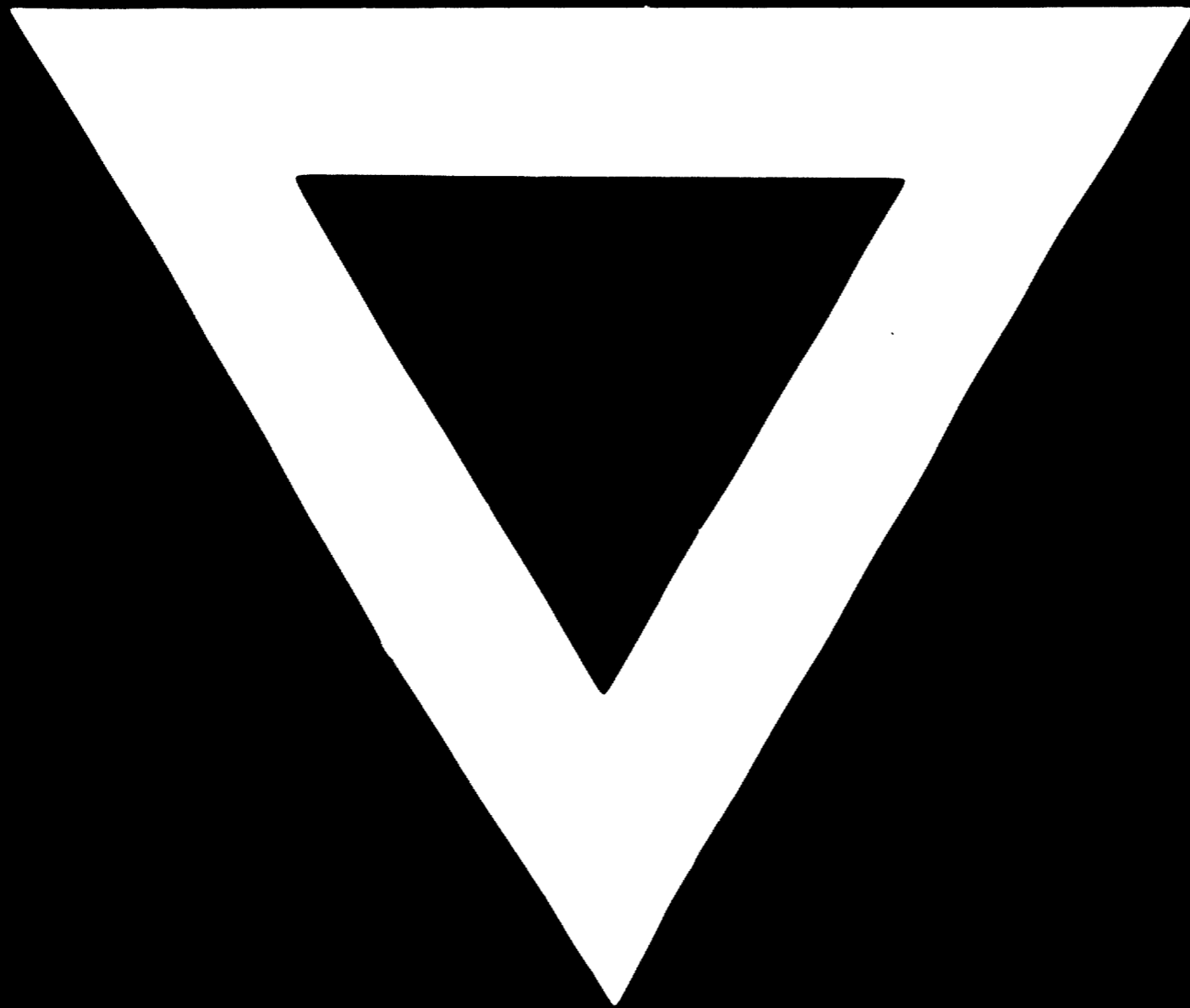
By means of the systematic use of such information, it will be possible at any time to assess the effect to be produced by new investments projected and ascertain whether they will truly tend to meet actual and timely demands, or whether they will only add products to an already saturated market. The lack of capital for Latin American economic development is so great, and internal savings up to now so small, that investments cannot be duplicated, nor made in order to build plants unsuited to the requirements of regional development.

For the same reason, the present iron and steel industry must be enabled to work at full capacity, even bearing in mind that in many cases only out-dated or inefficient equipment is in use, in order that new income so obtained may be re-invested in plant expansion and modernisation. To achieve the foregoing, many co-operative agreements will be required, even to integration of capital wherever possible and advisable. Agreements of this nature can be made for periods in accordance with the respective market situations and reasonable projections.

36. The above considerations lead us to realize that within a not too distant future it will be necessary to face the need for establishing a "common authority", freely appointed by the steel producers, which will co-ordinate, examine and report to them on the advantages and disadvantages of their plans for investment and production. For this purpose, obviously, up-to-date information will have to be made available to it, concerning steel market behaviour and all development plans under way in the area.

37. Latin American steelmakers view with the greatest interest the present opportunity of meeting the experts assembled by the UN in Prague, and of examining in their company new steel production processes as applicable to countries under development. It will thus be possible to know or to review medium-scale solutions which may later be applied in order to attain more rational utilization of raw materials and power sources.

More highly-industrialized countries may effectively contribute to the steelmaking integration sought by Latin America, through their experts, if in addition to continuing to develop projects in their own countries of increasingly amazing efficiency and size, they co-operate with researchers in less developed areas in order to seek ingenious though less ambitious solutions suitable to meeting the need for industrialization felt in poorer countries. Then, in a not very distant future, the product of their scientific research and of their technical ingenuity, will reach and benefit the peoples most greatly in need of it.



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