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# POSSIBILITIES FOR CO-OPERATION AND INDUSTRIAL COMPLEMENTATION BETWEEN LATIN AMERICA AND JAPAN IN PRODUCING AND MARKETING IRON AND STEEL */

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/INTRODUCTION

## INTRODUCTION

1. The development of the mining and steel-making industry could depend chiefly on the following determining factors: an extensive consumer market, adequate supply of most of the basic inputs, financing of the production and marketing processes, and economic absorption of technological changes. The most important of these factors is, perhaps, market size.1/ Markets, inputs, financing and technology are not factors that are evenly distributed geographically, and they are therefore subject to close interrelationships relating to international exchange and co-operation.

2. Following the Second World War the United States economy did not have a counterpart that would permit absorption of its production surpluses and its financial means, and it therefore started to support the industrial restructuring of Europe and Japan through a programme of economic assistance (Marshall Plan), investment by private enterprises and, chiefly, opening its markets to the new European and Japanese production. A new international division of labour based on specialization and trade among the countries of the Northern Hemisphere, which reactivated all their economies, was thus established. Latin America and the rest of the developing countries were excluded from this industrialization process, and their participation was limited to the export of raw materials and the import of industrialized goods.2/ In 1947 world output of steel was approximately 230 million MT, of which over 60% was accounted for by the United States. This output rose to approximately 900 million MT, with the United States contributing only 18%. Latin America's share of steel output was 5%. Following more than two decades of economic expansion the continuing deficit in the United States trade balance, which was accompanied by strong inflationary pressures for countries with surpluses, meant that economic growth and international trade became secondary, giving way to monetary control of inflation as the predominant economic policy goal.

3. The high rate of industrial growth and the growing share of wages and salaries and of the tax burden permitted considerable expansion of both public and private consumption, it being estimated, for example, that the number of cars in use in the world rose from 70 to 380 million units between 1950 and 1978. This high number of

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1/ See Takeuchi, Chung and Chhabra.
2/ See A. Ferrer.

/vehicles formed

vehicles formed not only one of the fundamental bases of the direct demand for steel, but also of the strong indirect demand for the substantial volume of petroleum required for their operation, whose production in turn called for a considerable quantity of steel for the construction of extraction towers, oil-pipelines, refineries and freight vessels.3/ The increase in costs owing to rapid increments in wages and salaries, taxes and environmental conservation prompted entrepreneurs to react a number of times by raising their prices, with the resulting inflationary pressures of a structural nature, and a number of other times by reducing the rate of investment, even on expenditure on adaptation to new production processes, thereby giving rise to the technological obsolescence of various sectors in a number of industrialized countries.4/

4. Despite inflationary pressures resulting from higher costs and excess demand, until 1973 the world economy developed within a system of economic growth, employment and expansion of world trade. For example, in the period 1965-1974 world output of steel grew at a cumulative annual rate of 5%. In 1974-1975 the sharp increase in oil prices pushed production costs even higher, while at the same time reducing consumption levels. This disequilibrium, which was aggravated by recessive policies and the dislocation of the monetary system, meant that international relations were conducted in a context of slow growth, high unemployment and considerable trade deficits, particularly in the non-oil-producing countries.

5. It has, for example, been estimated that between 1974 and 1980 world steel output grew at a rate of less than 0.5%, in other words, at annual rates below one-tenth of 1%. The situation became even worse in 1981, with a negative rate of 3.8% between December of that year and December of the preceding year. The only groups that recorded a positive rate in that period in the Western world were Latin America, with a positive rate of 3.8%, and the European Common Market, with a rate of 13.6%; however, it must be borne in mind that the latter group of countries recorded a negative rate of 2.2% between January and December 1981. Other countries with high negative rates were the United States, with -24.8%, Canada with -17.8% between December 1980 and December 1981, and Japan, with -8.7% between January and December 1981. From May 1976 onwards the drop in the rate of output was accompanied by a drop in steel prices of 11% to 16%.5/ Despite programmes establishing production

3/ See W.T. Hogan.
4/ See L. Tomassini in Trimestre Econômico No. 193.
5/ See ILAFA, Informativo estadístico No. 94 of 22 February 1982.

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quotas and minimum prices, effective prices in 1981 dropped once again to approximately 15% below the scale established in the agreements in question. There was fierce competition in foreign trade, and sales were concluded at prices below production costs. It is therefore possible that the companies that had the greatest opportunities in the international market were those that not only achieved the highest level of productivity and economic efficiency, but also reached the highest level of subsidies. The drop in the pattern of prices in the international steel market and the gradual adoption of greater protective measures would appear to be exerting pressure for a replacement of the Northern Hemisphere's macro-market system by new international forms of operating, whose chief features might be self-sufficiency and an increase in more complex systems of commercial barter.

6. Between 1976 and 1978, when it was believed that the crisis in the steel sector was coming to an end, there was a certain tendency to initiate a process of industrial redeployment of iron and steel activities, with the result that instead of exporting raw materials (ores and concentrates) the developing countries began to export semi-processed products (flat and non-flat rolled products). The chief reasons for this action were as follows: beginning of implementation of the principles of the New International Economic Order and of the goals set forth in the Lima Declaration and Plan of Action on Industrial Development and Co-operation, a reduction in the developed countries in industrial requirements for petroleum, including those relating to the greater volume of maritime transport of minerals, a reduction in the cost of environmental conservation, which was more costly in the populated areas of the developed countries than in the less populated areas of the developing countries, and an increase in demand in the developing countries for machinery and equipment for producing iron and steel. However, the exacerbation of the world crisis obliged the developed countries not only to close a considerable number of plants, making thousands of workers redundant, but also to cancel industrial redeployment projects; a movement in the other direction towards concentration within their own territories on different technological and energy bases thus began.

7. The situation described above is giving rise to the need for a reform of the world development style on the basis of methods that consume less petroleum (reserves of which have clearly been diminishing as a result of the accelerated Western rate of growth), which would mean achieving a new industrial structure in

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which the developing countries could have a more comprehensive and equitable share.6/ However, account must be taken of the fact that until sustained levels of steel consumption are regained, particularly in the case of the manufacture of vehicles, and installed capacity is fully exploited, including the introduction of technological changes, it will not be possible to minimize uncertainties regarding the anticipated profitability of projects in the iron and steel industry and, as a result, to establish a pattern of investment permitting initiation of this new international division of labour. On the contrary, it would appear that during the 1980s the trend will be to attain only a satisfactory level of self-sufficiency, without generating exportable surpluses, for the following reasons: the aim of not depending on the steel production of the developing countries and, in view of the low profitability levels, the aim of producing only for "domestic consumption". In that connexion, it is noted that investment in the developed countries is being channelled towards modernization of industry through adoption of the latest technological advances, but without an increase in total production capacity. The strategy that will possibly prevail during the 1980s will perhaps not be entirely in conflict with a long-term strategy promoting, for example, in the 1990s not only dynamic development of the iron and steel industry but also appropriate participation by the developing countries.7/

8. The iron and steel output of the developing countries was not affected in the same way as that of the developed countries with market economies; on the contrary, in the period 1975-1976 it gave a stimulus to the output of the latter countries through demand for special types of steel, capital goods, and advisory and administrative services.8/ At the same time, in the case of Latin America and Africa effective output exceeded the projection made for 1980. However, the long economic recession in the developed countries has already began to give rise to adverse factors of importance in Latin America and Africa, particularly with regard to export volume of ores and direct and indirect domestic demand for steel. It is possible that the opportunities for undertaking new activities permitting a continuation of the dynamism in mining and steel-making activities in the countries in question have not yet disappeared. The following lines of action or strategic guidelines have been referred to in that connexion:

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6/ See L. Tomassini.

7/ See UNIDO, The World Iron and Steel Industry, Second study, UNIDO/ICICS 89.

8/ See UNIDO, Report of the Second Consultation Meeting on the Iron and Steel Industry, ID/224.

/(a) In

(a) In view of the drop in prices and, consequently, in direct benefits, the developing countries may tend to maximize indirect benefits, including the regional development of areas influenced by mining and steel-making activities, opportunities for interlinkages down-stream; production of machinery, equipment and inputs required for the mining and steel-making sector and opportunities for interlinkages up-stream through the utilization of steel in engineering output. It has been estimated that approximately 40% of Latin America's imports are accounted for by this type of goods.9/

(b) The industrial processing of all minerals produced by the developing countries, a strategy that would be in keeping with United Nations General Assembly resolution 3202 (S-VI), section I (1) paragraph (g) (May 1974). Steel output would have to rise at annual rates of over 11% in order to achieve that goal. If account is taken of the fact that on the basis of historical rates steel consumption would rise at a rate of approximately 9% and that it is necessary to bridge an initial gap, the greater proportion of iron and steel output would be destined for the markets of the developing countries themselves.10/

(c) A share of 30% in world steel output by the year 2000, a goal that is set forth in paragraph 59 (d) of the Lima Declaration and Plan of Action of the Second General Conference of the United Nations Industrial Development Organization (March 1975). It is estimated that by the year 2000 world output of steel will have risen by approximately 700 million MT, of which 68% will have to be produced by the developing countries in order for that goal to be reached.11/

(d) Achievement of self-sufficiency in steel without generating exportable surpluses, unless such surpluses are destined for other developing countries. This line of action would be in keeping with the developed countries' policy of self-sufficiency in steel for the 1980s.

(e) A gradual increase in the industrial processing of mineral exports, chiefly using new technology for direct reduction through use of natural gas for producing pellets and use of electric power for producing primary iron (sponge iron). This strategy would be supported by UNCTAD resolution 124 (XIV), B, 6, (b), which

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9/ See CEPAL, E/CEPAL/R.265.

10/ See Takeuchi, Chung and Chhabra.

11/ See UNIDO, Report of the First Consultation Meeting on the Iron and Steel Industry ID/WG 243/6/Rev.1.

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expresses the need to establish measures to assist the developing countries in promoting the industrial processing of their raw materials in order to facilitate the expansion and diversification of their exports (September 1974).

9. In the light of the strategies and requirements referred to above, the central topic of this paper will be a preliminary analysis of the opportunities that Latin America would have for developing its mining and steel-making industry, including possibilities for co-operation and complementation with Japan, a country that is in the vanguard of technological progress in the field of iron and steel, that records the highest per capita levels of steel consumption, and that lacks most of the principal inputs within its own territory.

10. The present paper forms part of a set of four documents whose purpose is to promote further analysis of the possibilities of the Latin American mining and metallurgical sector and to provide one of the frameworks of reference for formulation of horizontal co-operation programmes and projects for developing the region's mineral resources.

SUMMARY

11. In the course of the period 1966-1979 Latin American mining and iron and steel output for final use rose from 46 million MT to 89 million MT in terms of fine metal content, with a cumulative annual rate of growth of 5.2%. The most dynamic factors in this process were trends in domestic consumption, which rose at a rate of 7.1% and whose share of global demand thus rose from 19.5% to approximately 25%. Exports expanded at a rate of 4.6% and imports at a rate of 3.1%. Output for intermediate use expanded more rapidly than that for final use, which was indicative of a more rapid process of industrial processing. As a result of that process the relative importance of output of ores and concentrates dropped from 84.0% to 62.4%, while output of pellets and steel rose from 0.3% to 13.0% and from 15.7% to 24.6%, respectively.

12. The breakdown by country of Latin American mining and steel-making activities in 1978 is as follows:

(a) Ore production: Brazil 68.2%, Venezuela 11.7%, Mexico 9.2%, Chile 6.0%, Peru 4.2%. Total output was 116 million MT.

(b) Steel output: Brazil 50.5%, Mexico 28.3%, Argentina 11.6%, Venezuela 3.6%, Chile 2.5%. Total output: 24 million MT.

/(c) Consumption

(c) Consumption of rolled products: Brazil 43.3%, Mexico 24.5%, Venezuela 10.7%, Argentina 9.4%, Colombia 2.7%. Latin American apparent consumption was estimated at 23 million MT.

(d) Ore exports: Brazil 68.2%, Venezuela 19.9%, Chile 7.7% and Peru 4.2%. Total exports: 64 million MT.

(e) Imports of iron and steel products: Venezuela 31.6%, Mexico 20.4%, Brazil 11.8%, Argentina 8.7% and Colombia 6.1%. Total Latin American imports: 6 million MT.

13. The breakdown of the destination of Latin American exports for the period 1978-1979 was as follows:

(a) Ores: Western Europe 45.1%, Japan 34.1%, North America 6.8%, Eastern Europe 6.8%.

(b) Pellets: North America 27.9%, Western Europe 26.3%, Japan 24.4%, Latin America 14.4%.

(c) Iron and steel products: North America 36.6%, Latin America 33.8%, Western Europe 10.6%.

14. In terms of iron content total Latin American resources for the period 1977-1978 were estimated at over 61 000 million MT, of which 45% was accounted for by proven reserves (R.1) and 55% by potential reserves (R.2), which means that Latin America could have an average output of 600 million MT of metal over the next 100 years, a level that would be equivalent to two-thirds of current world output. According to the following figures, both reserves and total resources would appear to be concentrated in a small number of countries:

(a) Reserves: Brazil 62.5%, Bolivia 23.5%, Venezuela 4.5%, Chile 3.2%, Peru 2.2%, other countries 4.1%.

(b) Total resources: Bolivia 45.4%, Brazil 36.6%, Venezuela 8.6%, Peru 2.9%, Chile 2.0%, other countries 4.5%.

15. Despite the high level of imports of products of the engineering industry, Latin America is using relatively low proportions of the installed output capacity of the mining and steel-making industry, as may be noted from the following figures for 1979:

(a) Imports of engineering products: US$ 28 000 million.

(b) Utilization of installed capacity:

(i) 40% of ore output, estimated at 310 million MT distributed as follows: Brazil 73.8%, Venezuela 8.9%, Mexico 7.3%, Chile 5.1%, Peru 4.2%, Colombia 0.4% and Argentina 0.3%;

/(ii) 50%

(ii) 50% of output of pellets, estimated at 70 million MT distributed as follows: Brazil 55.3%, Mexico 21.6%, Venezuela 9.5%, Peru 5.7%, Chile 5.0% and Argentina 2.9%;

(iii) 65% of steel output, estimated at 42 million MT distributed as follows: Brazil 56.9%, Mexico 17.7%, Argentina 12.2%, Venezuela 8.8%, other countries 4.4%.

16. As a result of the projects underway, installed capacity for producing iron ore will be approximately 350 million MT by 1990. Assuming that approximately 100% of this capacity will be taken up by the year 2000 and that this capacity is entirely industrialized, in that year there will be an output of 280 million MT of pellets, which will be processed into 250 million MT of primary iron and 230 million MT of steel, a figure that is close to the projections made for the region's steel consumption; this means that as a result of this industrialization process only regional market requirements would be met by the year 2000 (Alternative I). These output levels would call for an annual investment volume of approximately US$ 15 000 million, which by the year 2000 would generate a gross value added of US$ 50 000 million at 1980 prices. Account should also be taken of the fact that, if the growth rates of the period 1970-1979 are maintained, the value of import requirements for engineering products by the year 2000 will amount to approximately US$ 80 000 million at 1980 prices. The preceding alternative includes exportable surpluses of approximately 77 million MT of ore annually and 16 million MT of pellets between 1980 and 1995. A variant that reduces the exportable surplus of pellets, and thus raises that of ores (Alternative II) has been estimated with a view to reducing the annual investment requirement by US$ 1 000 million.

17. With the aim of determining the feasibility of meeting the goal set at the Lima meeting, in accordance with which the developing countries steel output would have to attain from 25% to 30% of world output by the year 2000, UNIDO prepared a model enabling it to estimate such output in 1976, with two alternatives and two variants of each of those alternatives. According to those alternatives, the developing countries' share would be between 22.7% and 25.0%, while consumption would be between 23.7% and 34.0%. In the year 2000 world steel output and consumption would range from 1 665 to 1 925 million MT, to be achieved as a result of average annual increments of 35 million to 50 million MT. Latin American consumption would be from 164 million to 282 million MT of steel by the year 2000, while Latin American output

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would be from 162 million to 197 million MT. For the purpose of comparison between actual performance and the projection for 1980 it was estimated that it would be more likely that in the year 2000 world consumption and output would be close to the projection of 1 665 million MT. Since the actual Latin American figures exceeded the projections for 1980, it was estimated that Latin American output could be approximately 210 million MT and consumption 235 million MT, or 13% and 14% of world output and consumption (Alternative III). In view of the fact that Latin America has over 27% of world reserves in terms of metal content, it is feasible that, in addition to meeting its own consumer requirements, it could supply the international market with ores that would be gradually exported in forms of pellets and primary iron. According to this projection, by the year 2000 output volumes could be: 820 million MT of ores, 650 million MT of pellets, 580 million MT of primary iron and 210 million MT of steel, which are output levels that would absorb annual investment of over US$ 28 000 million at 1980 prices. According to the comparative analysis of reserves, projected output and ore requirements, in the year 2000 the breakdown of the destination of Latin American exports could be as follows: Western Europe 71%, Japan 14%, other Asian countries 12% and North America 3% (Alternative IV).

18. In addition to iron ore, the mining and steel-making output process requires the following basic inputs: manganese ore, natural gas, hydroelectric power (or nuclear energy), coking coal, petroleum and forestry resources. It is considered that a country that has at least five of these seven resources has an advantage where such production is concerned. On the basis of the output levels referred to in the paragraph above, requirements for such inputs have been estimated and correlated with the corresponding reserves of each input. As a result it was established that the only input that would be somewhat critical in Latin America is coking coal, whose known reserves would meet output requirements for over 40 years. The following action could be taken in order to overcome this limitation:

(a) Exploration work with a view to expanding known reserves, which are concentrated particularly in Chile and Colombia. As a result of preliminary work it has been established that it is possible that there are deposits of this mineral in Bolivia, Brazil, Central America and Venezuela.

(b) Greater use of direct reduction methods by means of natural gas and electric-arc furnaces, which keep the use of coke to a minimum.

/(c) Use

(c) Use of other types of coal, particularly vegetable coal, whose production however requires extensive areas of forestry reserves.

19. The high levels of financing required by mining and steel-making activities mean that it is necessary to supplement traditional financing sources with:

(a) Credits from machinery and equipment suppliers;

(b) The establishment of joint ventures;

(c) Long-term supply contracts.

20. With an output level of approximately 200 million MT by the year 2000 total labour requirements would be approximately one million workers, of whom 3% would be engineers, 7.5% technicians, 11.5% administrative personnel, 32.0% skilled labour, and 46.0% semi-skilled and unskilled labour.

21. In general, co-operation between Japan and Latin America has taken place through private bodies with indirect support from the Government of Japan and with the chief aim of expanding sources of supply of ores or pellets. However, Latin America's need to increase indirect benefits from mining and steel-making activities, particularly through expansion of engineering output and rapid growth of a market that will possibly be similar in scale to that of North America by the year 2000, mean that it is desirable to seek new forms of co-operation and complementation permitting not only exploitation of the potential for trade but also co-operation in the restructuring of new industrial lines. For example, the following new forms of co-operation could be explored:

(a) Adaptation of technological innovations in the production and marketing processes, particularly in the following areas:

(i) installation of integrated plants and dissemination of direct reduction methods, electric-arc furnaces, continuous casting and direct rolling;

(ii) establishment of coefficients for the preparation of appropriate loads for direct reduction and blast furnaces;

(iii) use of monitoring methods for reducing environmental pollution;

(iv) improvement of transport systems: installation of conveyors, rationalization of maritime transport, methods for preventing reoxidization of sponge iron during transport;

(v) use of business organization and administration systems and training of technical staff;

(vi) research on, and testing of, various types of ores and coal;

/(vii) preparation

(vii) preparation of studies that contribute to the dynamic development of the sector by improving the distribution of production and identifying areas and activities for industrial integration and complementation between regions and with Japan.

(b) Granting of credits for risk capital, particularly for prospecting and exploration of mineral coal deposits.

(c) Extension of long-term contracts ensuring an adequate exchange of goods, services and financing for mining and iron and steel output.

(d) Establishment of joint ventures not only in the mining and steel-making sector but also in the engineering sector, particularly in the field of production of capital goods for the former sector.

## CONCLUSIONS

22. There is surplus investment in Latin America in production of iron ore, and it would therefore be possible to double the volume of such output by 1985, or to triple it by 1990. On the other hand, a greater volume of investment will be required in order to increase the industrial processing of this raw material. These factors are responsible for the following situation:

(a) Heavy dependence on the international market for expansion of exports and, consequently, expansion of ore production, demand for which began to falter at the beginning of the preceding decade and which possibly will not regain the rate of growth of the 1960s and early 1970s until the end of the current decade or the beginning of the next decade.

(b) In 1979 only 25% of ore production, in terms of steel, was subjected to complete industrial processing up to the level of semi-finished products. However, in the same year Latin America imported engineering products in a value of almost US$ 28 000 million, which on the basis of historical rates would have a value of over US$ 80 000 million in the year 2000 at 1980 prices. Studies aimed at identifying those production lines that would permit a rapid increase in industrial processing of iron ores up to the point of the manufacture of engineering products currently imported would therefore take on extreme importance in that connexion.

23. The initial gap between supply and indirect demand resulting from the difference between demand and engineering output and the low per capita levels of direct demand for steel, make it reasonable to assume that in the year 2000

/consumption levels

consumption levels could be six to nine times higher than those of 1979, calling for growth rates in the production of pellets, primary iron and steel possibly higher than those attained in the two preceding decades. A process of industrialization would thus be achieved through displacement of the relative importance of the market to Latin America, and not only through redeployment of production capacity.

24. Latin America has sufficient reserves of the chief inputs to attain such production levels, with the possible exception of coking coal, whose current reserves are sufficient for a production process lasting 40 years; however, it should be borne in mind that a considerable volume of investment will be required in order to make the inputs in question available.

25. On the other hand, it is possible that the major part of the requirements regarding financial resources, technology and skilled labour will continue to have to be drawn from the developed economies.

26. It is possible that production up to the level of crude steel will have to be concentrated in the areas where the basic inputs are most readily available in order to exploit the efficiency of integrated plants. Within the context of the systems in question consideration should be given to direct reduction methods by means of natural gas, supplemented by electric furnaces, and output of self-fluxing pellets that keep use of coking coal to a minimum, and the processes of continuous casting and direct rolling, which increase production efficiency by reducing energy requirements. On the other hand, owing to the need to produce a large number of semi-finished and finished products and the high value added of such products it would be feasible to decentralize such production to a greater number of producers specializing in one or more industrial lines.

27. Industrial co-operation and complementation between Latin America and Japan would depend on various types of action with a view to achieving the following goals:

(a) Meeting the requirements of the Latin American market and its future expansion in the field of steel and engineering products.

(b) Meeting raw materials requirements of the Japanese iron and steel industry, reaching a higher level of industrial processing: production of pellets, primary iron and a number of types of steel.

(c) Increasing exports of raw materials and semi-finished and finished products to third countries.

/28. The

28. The basic prerequisites for achieving the above goals would be as follows:

(a) Organization of the regional macro-market;

(b) Regional complementation and integration of the mining and steel-making industry, the engineering industry, production of their principal inputs, and interregional and overseas means of transport.

29. The above requirements would mean that it is desirable to study as soon as possible multilateral action relating to:

(a) Exchange of information for the purpose of establishing production, marketing and technological research policy.

(b) Programming and location of mining and steel-making activities, including the establishment of multinational enterprises.

(c) Co-ordination of negotiations with transnational enterprises supplying machinery, technology, markets and/or financing.

/BIBLIOGRAPHY

BIBLIOGRAPHY

- Aguirre T., Fernando, Estudio del mineral de hierro con especial énfasis en las políticas relacionadas con el comercio y la cooperación económica entre América Latina y el Japón, Santiago, Chile, 1979.
- Bilhorn, W.W., Sarget, R.E., Whelan, R.M., Blackwell, D.C., Growth of Direct Reduction Iron Production: the Effects on International Scrap Prospects and Iron Ore Pellet Availability, ILAFA-22, Buenos Aires, September 1981.
- CELADE, América Latina: Situación demográfica evaluada en 1980, Series A No. 168, Santiago, Chile, February 1982.
- CEPAL, Evolution of, and prospects for, the mining sector in Latin America (E/CEPAL/R.265), Santiago, Chile, May 1981.
- Cosulich, Rosario, Estrategia industrial, Universidad Católica Boliviana, La Paz, 1978.
- Ferrer, Aldo, "La crisis del sistema trilateral y América Latina", in América Latina y el Nuevo Orden Internacional, Edits., E. Hill and L. Tomassini, Corporación de Promoción Universitaria, Santiago, 1979.
- Hogan, William T., Perspectivas para la década del 80, Seminario sobre siderurgia mundial. Buenos Aires, Argentina, July 1981.
- IBRD Unit value index of exports of manufactures from industrialized countries to developing countries, Commodity Trade and Price Trends 1980.
- ILAFA, Informativos estadísticos.
- ILAFA, Anuario estadístico de la siderurgia y minería del hierro de América Latina, 1972, 1975, 1977 and 1979.
- ILAFA, La siderurgia latinoamericana en 1977-1978 y sus perspectivas al 2000.
- ILAFA, Siderurgia latinoamericana N° 227, March 1979.
- McGraw-Hill Mining Investment 1982, Engineering and Mining Journal, New York, January 1982.
- J.P. Nelson, Neumann, G.R., Grandall, R.M., "A Comparison of Alternative Econometric Models of Iron and Steel Investment Behaviour", The Review of Econometrics and Statistics, 1979.
- OLADE, "El potencial hidroeléctrico, Alternativa Energética y Desafío Industrial y Financiero para América Latina", Oil and Gas Journal, December 1981.

- Radetzki, Marian, "Will the Long-Run Global Supply of Industrial Minerals be adequate? A case study of iron, aluminium and copper", Economic Growth and Resources, Vol. 3, Natural Resources, Edit., C. Bliss, M. Bogerup. MacMillan, London, 1980.
- Radetzki, Marian, Mineral Markets, Institute for International Economic Studies, Stockholm University, Sweden.
- Takeuchi, K., Chung, Ch.-Chhabra, J., "Export Oriented Processing of Primary Commodities in Developing Countries", World Development Report 1979, World Bank.
- The Mining Journal Limited, "Mining Activity in the Western World", Mining Magazine, New York, January 1982.
- Tomassini, Luciano, "Las negociaciones norte-sur y el cambio de las relaciones internacionales de los países en desarrollo", Trimestre Económico No. 193, January/March 1982, FCE, Mexico City.
- UN, Survey of World Iron Ore Resources, United Nations 1970, ST/ECA/113.
- UN, Economic Commission for Europe, Bulletin of Statistics on World Trade in Engineering Products 1970 and 1979, New York, ST/ECE/ENG/12.
- UN, ECE Report, Forty-ninth session, Steel Committee ECE/S/EEL/34, November 1981.
- UNCTAD, Trade and Development Board, Proposed Establishment of an Annual Statistical Programme Relating to Iron Ore, TD/B/IPC/IRON ORE/13, December 1981.
- UNIDO, Mineral processing in developing countries ID253, UN, New York, October 1980.
- UNIDO, International Centre for Industrial Studies, Draft World-Wide Study of the Iron and Steel Industry 1975-2000, UNIDO/ICIS, 25 December 1976.
- UNIDO, International Centre for Industrial Studies, The World Iron and Steel Industry. Second Study, UNIDO/ICIS.89, November 1978.
- UNIDO, Información de antecedentes y complementación sobre puntos que se podrían seleccionar para examinarlos en la Reunión de Consulta sobre la Industria Siderúrgica ID/WG.241/1/Rev.1, December 1976.
- UNIDO, Report of the Second Consultation Meeting on the Iron and Steel Industry, Vienna, February 1977, ID/WG.243/6/Rev.1, March 1977.
- UNIDO, Second Consultation Meeting on the Iron and Steel Industry, New Delhi, January 1979. ID/224.
- Yamazawa, Ippei; Kunimoto, Kazutaka, Minerals Trade and Economic Co-operation: The case of Iron Ore. Towards New Forms of Economic Co-operation between Latin America and Japan, CEPAL/IDCJ, November 1980.