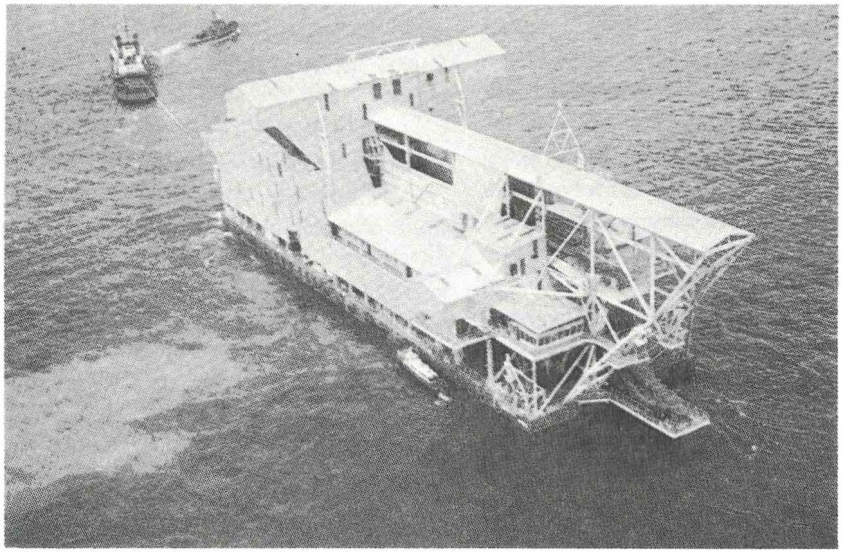

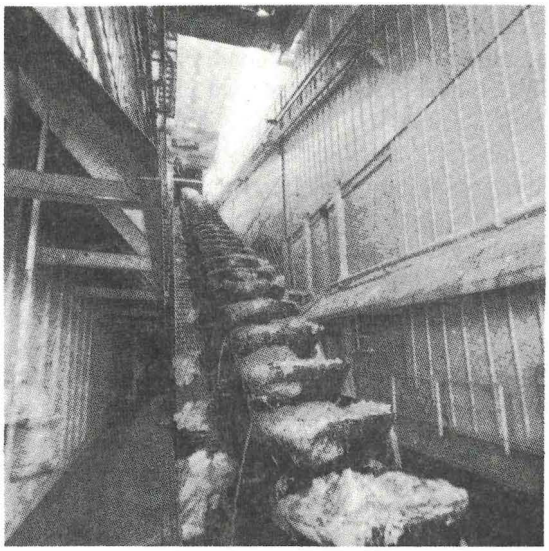

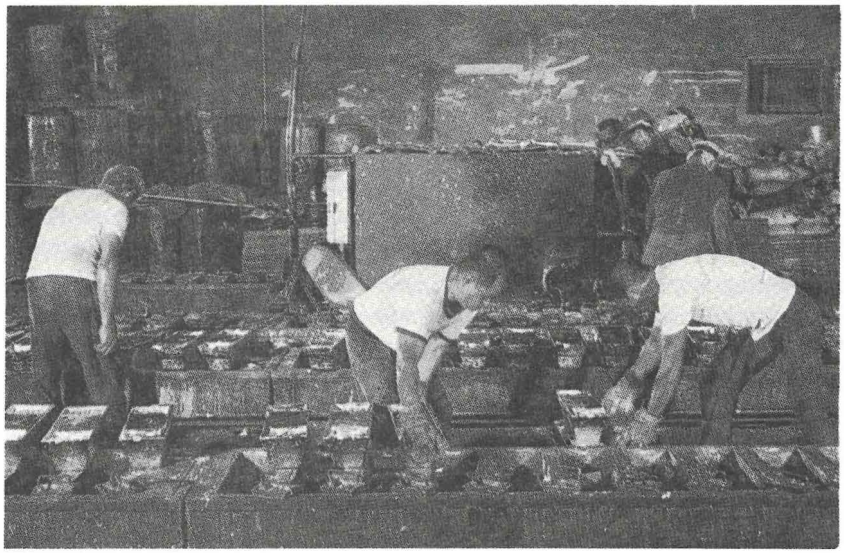

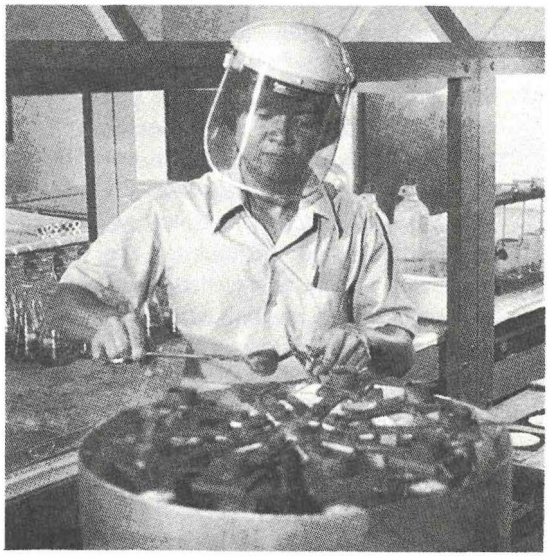

Empress Minera Comival tin mine in the department of Potisi, Bolivia. (Top).
Tin dreding in Indonesia and smelting in Thailand, both by companies controlled by Billiton, a subsidiary to Shell Petroleum NV. (Below).

International commodity agreements in the mineral sector

By Gonzalo Oroza

In this paper the author examines the possibilities of developing countries by establishing international commodity agreements and governmental producer associations. He specifically analyses the tin industry and the International Tin Agreement (ITA), and compares it to the bauxite and copper industries.
His main conclusion is that political co-operation between producing countries is a necessary precondition for establishing successful commodity agreements.

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Introduction

The first international commodity agreements (ICAs) were made by private producers in the attempt to control the decline in prices for their products at the turn of the nineteenth and twentieth centuries. From the beginning these agreements were intended to influence the pattern of commodity trade in the long term.

Many of the ICAs may be regarded as stabilization measures, and several have made use of the regulation of quantities: buffer stocks and export quotas in the International Tin Agreement, internationally controlled national stocks in the International Sugar Agreement, export quotas in the International Coffee Agreements and guarantees by importers to buy minimum quantities at or above the agreed minimum price and by exporters to sell minimum quantities at or below the maximum price in the International Wheat Agreement.

The measures have had varying degrees of success. In some cases they have been hampered by actions taken by governments remaining outside the agreements. For example, the existence of the General Service Administration (GSA) tin stock in the United States has resulted in a lower price range for tin in the ITA than would otherwise have been the case. In other instances governments participating in the agreements were unable to agree on modifications to existing control schemes.[1]

ICAs IN THE MINERAL COMMODITIES SECTOR

Mineral raw materials are of much greater relative importance for the developing countries. The ratio of the value of mineral production to GNP in the developing countries is 5.5 times that of the ratio in the market-economy countries and 1.75 times that of the socialist countries. With the exceptions of the Republic of South Africa and Australia, the ratio is low in the industrialized market-economy countries.[2]

In the mineral commodity sector several attempts to stabilize prices by means of producer–consumer negotiations have been made in the past. However, with the exception of *tin*, agreements have not been reached.

In the case of *copper* there is no formal agreement. Producer countries have endeavoured to establish a producer price from time to time, but without success. The last agreement was in force in 1964–1965 but it broke down under the pressure of high industrial demand and production disruptions which caused the London Metal Exchange price to increase sharply. There has been no producer pricing arrangement since then. Several meetings on copper were held within the framework of UNCTAD during 1976–1980, but it was not possible to establish an agreement mostly because the largest consuming countries were not convinced of the need of copper trade control schemes.

The first inter-governmental meeting on *iron ore* was held in 1965 within the framework of UNCTAD. In 1972 representatives of developing iron ore exporting countries stressed the adverse effects which their countries had experienced as a consequence of the recession then prevailing in the world steel industry. They pointed out that increases in prices for iron ore had been smaller than increases in prices of finished steel. They indicated the need for some sort of indexation to guarantee that increases in steel prices should be automatically accompanied by corresponding increases in the prices of iron ore. The representatives of the developed market economy countries consuming iron ore stated that the proposal to link iron prices with those of steel was impracticable and economically unsound. In summary, in past producer–consumer negotiations on iron ore, the developing countries have sought higher export prices, the maintenance or increase in their shares in the market, greater control over marketing policies, expansions of

processing and greater participation in the transport of ore.[3]

There have been inter-governmental discussion of *manganese ore* within UNCTAD since 1970. In these producer–consumer consultations particular attention has been paid to problems related to production, stocking, consumption and especially pricing and the feasibility of effective measures for bringing greater stability to the market. Developing countries have insisted on trade liberalization principally in the case of processed manganese. The inter-governmental meetings have also recognized the desire of developing countries to develop their manganese processing capacity and the related need for capital and technical assistance. There is no formal agreement, however.[4]

Producers and consumers are represented on an UNCTAD Committee on *Tungsten.* After some years of dissension the Committee agreed in 1974 on a statement of principle concerning the working out of appropriate measures for price stabilization. Member countries are examining their proposals from a legal, economic and administrative perspective, as a possible framework for an international arrangement on tungsten. International negotiations are at present in a dead lock.[5]

The International Tin Agreement in force for twenty-two years is widely viewed as the only commodity agreement that has been a long-term success.

THE INTERNATIONAL TIN AGREEMENT AND THE STRUCTURE OF THE TIN INDUSTRY

Compared with other non-ferrous metal industries, the tin industry displays a relatively low degree of vertical integration. In the producer countries where tin companies have not been nationalized, the mining industry is highly fragmented. In Malaysia, there are about 1 000 mines, and most of them produce about 40 tons of tin yearly. The majority of Thailand's 600 mines produce less than 30 tons of tin per year. The two largest tin mining companies of the world are state-owned companies – *P T Timah* of Indonesia and *Corporación Minera de Bolivia (COMIBOL).*

Table 1 shows that the developing countries with more than 3/4 of world production clearly hold a dominant position as suppliers of tin. Concentration of production is very high, the five main producing countries accounting for around 3/4 of total production.

The largest tin consumer market-economy countries – the United States, Japan, W Germany, and France – are dependent on foreign sources for all or most of their supply. The Soviet Union is also a net importer of tin.

Table 2 suggests that consumption of tin grew moderately in the socialist and developing countries in 1970–1980. However, from a worldwide perspective, tin is the only metal whose consumption shows stagnation. The use of alternative materials largely explains this stagnation. In general, however, satisfactory substitutes have not been found for tin in all of its end uses, although the tin content of the final product has been lowered by increasing the content of other metals in several applications. Current production of tin in the industrialized market-economy countries will remain negligible (with the exception of Australia), and no important increases in output through technological advances appear probable.

International price controls for tin

For more than sixty years attempts have been made to reduce the amplitude of fluctuations in the price of tin. In 1956 a five-year *International Tin Agreement* was made between all producers outside the socialist countries and involving all major consumers except the United States. International Tin Agreements have covered the periods 1956–61, 1961–66, 1966–71, 1971–76 and 1976–82. The Sixth ITA entered into force on July 1982. Membership is open to all exporter and importer countries.

To achieve its objectives, the International Tin Council (ITC) has three main tools:

- a price-supporting buffer stock
- export controls applied for only one

Table 1

Production of Tin in 1970 and 1980
(in Kt and per cent of world total)

Country groupings	1970 kt	1970 Share	1980 kt	1980 Share	1980/1970 growth %/year
Market-economy countries	14.4	6.6	17.5	7.4	2.0
Socialist countries	33.4	15.4	35.4	15.1	0.6
Developing countries	169.2	78.0	182.3	77.5	0.7
World total	**217.0**	**100.0**	**235.2**	**100.0**	**0.8**
Five main countries (1980)					
Malaysia	73.8	34.0	61.4	26.1	–1.8
Thailand	21.8	10.0	33.7	14.3	4.5
Indonesia	19.1	8.8	32.5	13.8	5.5
Bolivia	30.1	13.9	27.5	11.7	–0.9
USSR	10.0	4.6	17.0	7.2	5.4
	154.8	**71.3**	**172.1**	**73.1**	

quarter at a time but subject to quarterly extensions.

- the setting and changing of "optimal" price ranges.

The buffer stock

The buffer stock has depended on compulsory contributions from producing countries made in tin or in cash. Voluntary contributions were made by several consuming countries during the Fifth ITA, and the Sixth Agreement provides for government contributions from consuming and producing countries up to 30 000 tons, and an additional stock of 20 000 tons of tin metal to be financed by borrowing.

In the first three Agreements the Buffer Stock Manager had authority to buy, but not to sell, tin when the market price was in the lower sector; and to sell, but not to buy, tin in the upper sector. The last three ITA's enable him to buy and sell in both the lower and upper sectors, with the proviso that in the lower sector he must be a net buyer and in the upper sector a net seller. The Buffer Stock Manager may only operate in the middle sector with the special authorization of the Council.

The buffer stock deals in any recognized market, i e on the London Metal Exchange and in Penang; its operations are shrouded in secrecy and the results are published only in the aggregate without any details after a three-month blackout at the end of each quarter. This rule is an unavoidable necessity because of too frequent leakages from Council members. One consequence is that the Council must often make decisions without knowing the precise Buffer Stock position.

Export control

If the buffer stock proves ineffective in counteracting price weaknesses, the ITC can resort to export controls. During control periods the maximum stock each producing country may hold is the equivalent of three month's exports. When controls are severe and prolonged so that the upper stock limit is reached by the producers, export quotas become identical in effect to production controls.

The ITC control system has had a negative impact when exports and consequently production have been cut back severely. In 1959 the number of Malayan tin mining operations was cut from 738 to 386 in order to restrict output to the level permitted by the ITC, and in 1966–68, 270 operations were closed down. In the case of Bolivia a third of the small tin mines were closed and the State-owned mining company – COMIBOL – reduced its number of employees from 31 000 to 22 000 in 1966–68.

Export controls are considered to be a "necessary evil" by producing countries, and without doubt it is the only instrument that can be used to sustain prices in periods of depressed industrial activity. However, resorting to export controls could be reduced by long-range planning of imports and by related commitments from importers. This would help producers make appropriate and timely adjustments in their production capacity. At present export control level is as high as 36 per cent and it seems that the same rate will continue for the whole 1983.

ITA and the United States strategic stockpile

From the very beginning the ITA has operated in the shadow of the U S "strategic stockpile" of tin.[6] In 1962, the total amount of tin in the US strategic stockpile was reported to have been 349 000 tons, which was 164 000 tons in excess of the stockpile objective for tin. Total disposals of tin by the GSA amounted to about 160 000 tons between 1962 and January 1982. This figure corresponds to the annual consumption of tin in the non-socialist world. Obviously the producing countries are very concerned about GSA tin policy because they consider that GSA offerings have affected the stocking and buying policies of consuming countries. The GSA has sold tin when the price has been in the non-interventions zone and thus significantly depressed the market price. Bolivia in particular has strongly opposed GSA tin policy arguing that once stockpiled tin is authorised for

Table 2

Consumption of Tin
(in kt and per cent of world total)

Country groupings	1970 kt	1970 Share (in %)	1980 kt	1980 Share (in %)	1980/1970 growth %/year
Market-economy countries	162.6	72.0	145.7	65.0	–1.1
Socialist countries	45.0	19.9	55.3	24.6	2.1
Developing countries	18.2	8.1	23.3	10.4	2.5
World total	**225.8**	**100.0**	**224.3**	**100.0**	**–0.07**
Five main countries (1980)					
United States	53.8	23.8	46.0	20.5	–1.6
Japan	28.6	12.7	30.9	13.8	0.8
USSR	17.0	7.5	24.5	10.9	3.7
Germany, FR	15.1	6.7	15.9	7.1	0.5
China, PR	13.0	5.8	12.5	5.6	–0.4
	127.5	**56.5**	**129.8**	**57.9**	

sale it becomes commercial tin, released at the sole discretion of a single member of the ITA. As a result the USA is able to lower the market prices for its total consumption by selling in competition with producers. This action also injects imbalance into the structure of rights and obligations of ITA members. In the Bolivian view sales of tin from non-commercial stockpiles should not be provided for in an agreement designed to promote price stability.[7]

The sovereign right of governments to dispose of stockpiled tin owned by them is widely recognized. However, such disposals constitute a form of government intervention in the market for tin and hence involve a heavy responsibility for any government concerned. This is especially so in view of the importance of export earnings from tin for a number of developing countries, the great sensitivity of market prices to increased supplies of tin in most market situations, and the large volume of potential disposals from non-commercial stockpiles in relation to market requirements.

Tin price and tin production costs

During the last 20 years, the price of tin has risen 815 per cent – far more than other base metals. However, an analysis of the real price index shows that the development has been more modest.

One of the main criticism of the ITAs has been that the buffer stock price range is not realistic and in line with current market forces. A clear indication that the price range has been unrealistic during the Fifth ITA is the fact that the average market price exceeded the ceiling price for most of the period 1976–1980.

According to ITC calculations, around 40 per cent of world production was unprofitable during this period. (See Table 3).

Consumers have "acknowledged that costs of tin production as well as other metals, have risen steeply in recent years. But this has little to do with the price consumers are prepared to pay in a competitive market".[9]

THE RELEVANCE OF ITAs FOR OTHER MINERAL COMMODITY AGREEMENTS

The foregoing analysis of the tin agreements leads to some conclusions which may be of relevance for other minerals:

- The more unstable the supply of or demand for a commodity, the more likely producer and consumer countries are to negotiate an ICA (the first tin control schemes and ITAs were established when either supply or demand showed a high degree of unstability).
- The more concentrated the supply of or demand for a commodity, the greater the likelihood that an international agreement can be successfully negotiated (the number of tin producing countries has always been small).
- Price instability and prices which fall relative to production costs facilitate the negotiation of an ICA (defence of tin floor prices is a *sine qua non* for the regular supply of tin).
- The scarcer the proved reserves or, in general, the more limited the supply of a particular mineral, the greater the need to negotiate an ICA (tin reserves are small compared to most of the important minerals).
- The higher the substitutability of a particular mineral, the lower the likelihood than an ICA will be negotiated (when the first tin agreements were established it was technologically and economically extremely difficult to substitute other materials for tin. Although at present the use of alternative materials has caused tin consumption to stagnate, the advent of the two-piece tinplate can and new uses in the chemical sector ensure that demand for tin will be steady).
- The stronger the political and economic co-operation between the producing

Table 3

Tin production costs by main sectors[8] (in MYR/kg)

Country	Mining method	Approx. share of world prod (%)	Costs July–Dec 1980 MYR/kg (–R)	(+R)
United Kingdom	Underground	2	33.57	34.62
Indonesia	Gravel pump	6	29.63	34.72
Bolivia	Lode underground	13	29.53	36.44
Malaysia	Gravel pump	18	24.17	34.92
Australia	Lode underground	3	22.75	23.51
Thailand	Gravel pump	5	21.88	32.34
Malaysia	Dredge	9	14.10	24.80
Thailand	Dredge offshore	1	12.33	22.62
Indonesia	Dredge offshore	7	11.64	26.73

The column (–R) shows mining costs without royalties, export duties and tributies. Column (+R) includes these additional costs. During July–December 1980 the average Penang price was MYR 34.51/kg, and the floor price of the ITA MYR 27.28/kg.

Source:
ITC calculations cited in *Metal Bulletin Monthly*, March 1982.

countries, the greater the likelihood that an agreement will be negotiated (economic, political and – with the exception of Bolivia – cultural co-operation among tin producing countries has a long tradition).

BAUXITE

Concentration of supply

The production of bauxite by country groups and by the more important producing countries in 1980 is shown in Table 4.

All together 24 countries produce bauxite but supply concentration is very high. The five largest producing countries account for 69 per cent of world output.

Although Australia was still an insignificant producer in the mid-1960s, today it could, if all capacity were used, satisfy 90 per cent of the bauxite needs of the six largest multinational aluminium producers in the world. These large firms – Alcan, Alcoa, Kaiser, Raynolds, Alusuisse and Pechiney – control about 70 per cent of total bauxite and primary aluminium capacity in the developed market-economy countries and developing countries.

The oligopolistic structure of bauxite-aluminium industry is a major factor influencing the likelihood of the formation of an ICA for bauxite. The presence of the six major bauxite-aluminium companies in Australia means that this industrialized country could play a decisive role in international bauxite negotiations. Moreover, these multinationals have interests in bauxite-related industries in the largest producing countries through wholly-owned or partially-owned subsidiaries, joint venture with local firms or governments and long term contractual arrangements. As a consequence, the proposition that the more concentrated the sources of supply of or demand for a particular commodity the higher the probability that an international agreement will be negotiated, is not valid in the case of bauxite. While the main objectives of international commodity agreements are the regulation of supply, demand and prices, it is obvious that the vertically integrated bauxite-aluminium companies have no motivation to limit their own activities.

Concentration of demand

The consumption of primary aluminium by the largest consuming countries and by country groups is shown in Table 5.

Aluminium consumption is more concentrated than the consumption of other common metals. This is a structural characteristic of the bauxite-aluminium industry, which holds true irrespective of whether it is measured in terms of coun-

Table 4

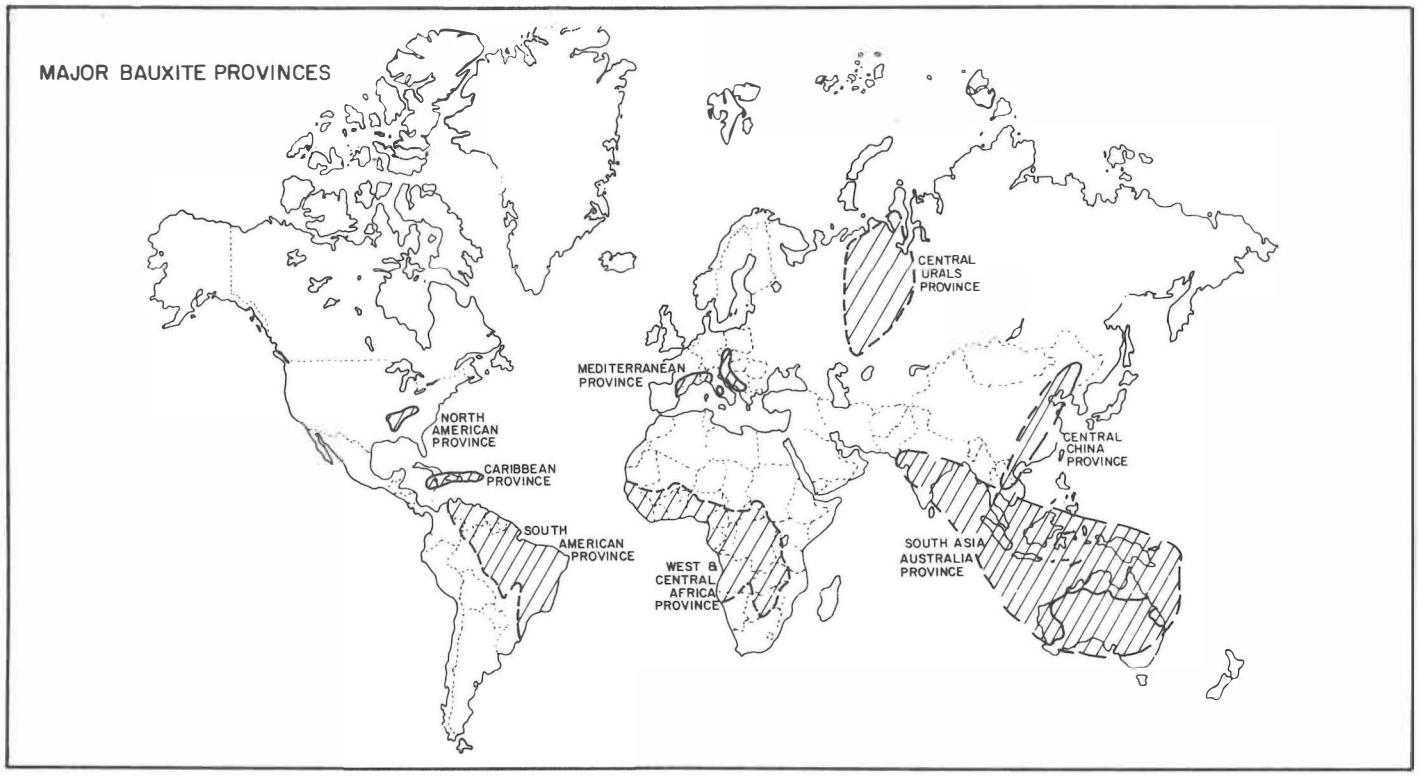
Production of Bauxite
(in Mt and per cent of world production)

Country groupings	1970 Mt	1970 share (in %)	1980 Mt	1980 share (in %)	1980/1970 growth % year
Market-economy countries	19.0	31.3	37.1	40.1	6.9
Socialist countries	19.0	16.3	11.7	12.6	1.7
Developing countries	31.8	52.4	43.8	47.3	3.3
World total	**60.7**	**100.0**	**92.6**	**100.0**	**4.3**
Five main countries (1980)					
Australia	9.3	15.3	27.2	29.4	11.3
Guinea	2.5	4.1	13.3	14.4	18.2
Jamaica	12.0	19.8	12.1	13.1	0.08
USSR	6.5	10.7	6.4	6.9	– 0.2
Surinam	6.0	9.9	4.9	5.3	– 2.0
	36.3	**59.8**	**63.9**	**69.1**	

Table 5

Consumption of primary aluminium
(in Mt and per cent of world total)

Country groupings	1970 Mt	1970 share (in %)	1980 Mt	1980 share (in %)	1980/1970 growth %/year
Market-economy countries	7.4	74.0	10.6	69.3	3.7
Socialist countries	2.1	21.0	3.3	21.6	4.6
Developing countries	0.5	5.0	1.4	9.1	10.8
World total	**10.0**	**100.0**	**15.3**	**100.0**	**4.3**
Five main countries (1980)					
United States	3.5	35.0	4.5	29.4	2.5
USSR	1.3	13.0	1.9	12.4	3.9
Japan	0.9	9.0	1.6	10.5	5.9
Germany, FR	0.7	7.0	1.0	6.5	3.6
France	0.4	4.0	0.6	3.9	4.1
	6.8	**68.0**	**9.6**	**62.6**	



tries industrial sectors or individual company users.

The principal aluminium firms are vertically integrated: they mine bauxite, refine alumina, smelt aluminium and fabricate finished products. This means that the six big aluminium multinationals are the main users of the bauxite produced by their subsidiaries. Thus concentration of demand, like concentration of supply, does not, in the case of bauxite, militate in favour of the formation of international agreements.

On the other hand, demand for primary aluminium is estimated to amount to 27 million tonnes in 1985 and 53 million tonnes in 2000. Even if the estimates are too high by 50 per cent, the demand for aluminium and thus for bauxite will be substantially higher than at present. The largest bauxite mine expansion projects are in Guinea, Australia, Brazil and Greece. These projects are being undertaken as joint-ventures between multinational companies and governments. The participation of governments in these contractual arrangements is changing the nature of the traditional concentration and vertical integration of the bauxite-aluminium industry. An expanded role of producing countries' governments may make it easier to form an international bauxite agreement.

Price instability

Official prices for bauxite are not published, nor is there one uniform price. Most of the trade is carried out within or between the vertically integrated international companies (85–90 per cent). Bauxite is traded under long-term contracts whose terms and conditions are generally known only by the companies themselves. The governments of the producer countries receive revenue in the form of royalties and taxes imposed on the bauxite which is exported or processed. The value of exports is used to estimate bauxite prices. However, the export figures are only crude estimates because they can be influenced by tax and royalties requirements and by the accounting conventions of the companies.

The significant increase in nominal prices during the past few years are the result of taxes and royalties imposed by some producer country governments, specially the former Jamaican government. Even though nominal prices of bauxite increased strongly during the last decade, real prices were below their 1963 level at the end of the decade.

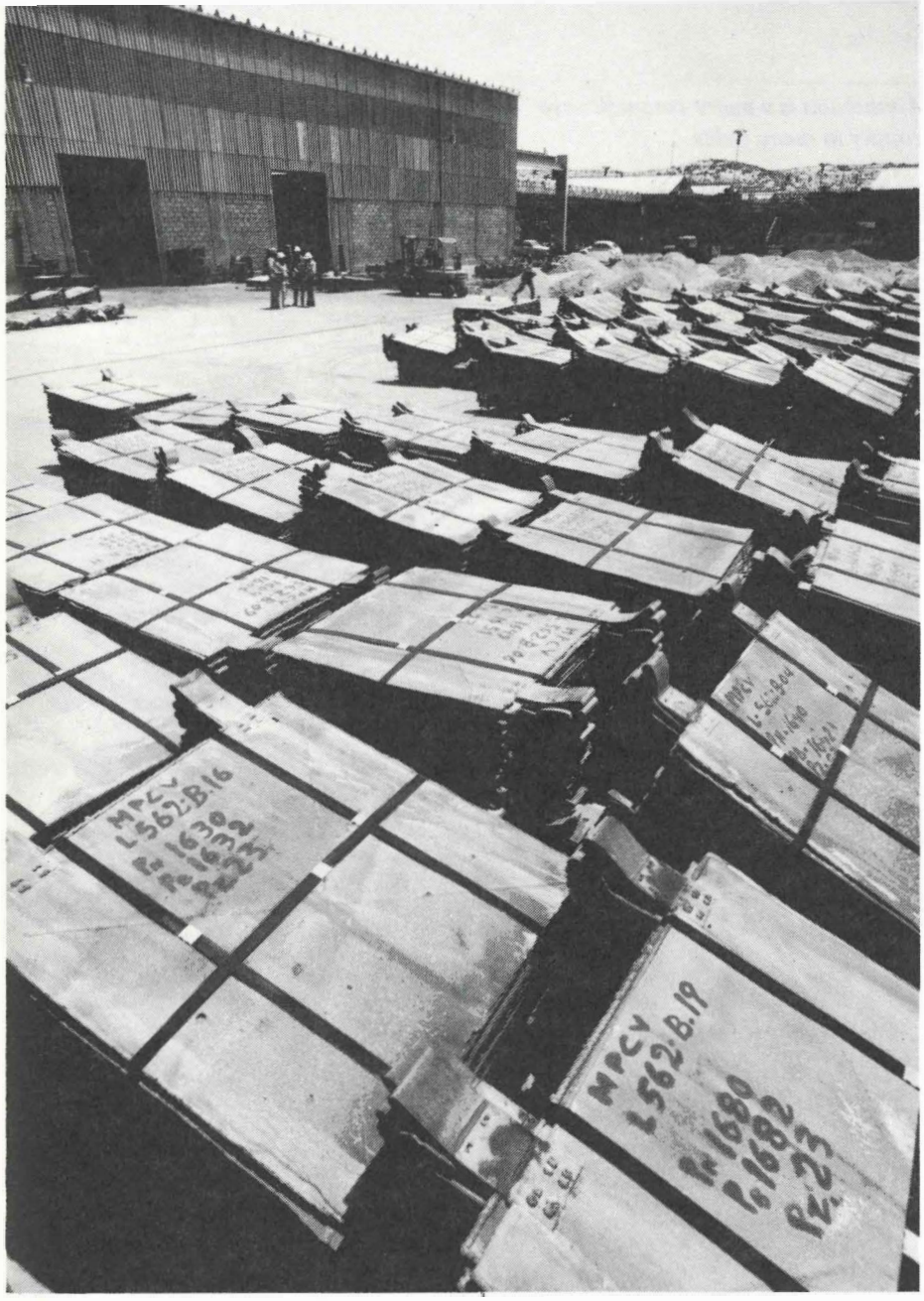
The member countries of the *International Bauxite Association (IBA)* do not have a common pricing policy, and this fact is considered "a major achievement of the organization, especially when considered in the light of the complex nature of the problem and the multiple technical ideological variants that had to be harmonized. In this connexion, it is pertinent to note that, consistent with the Association's respect for sovereignty, the precise manner in which each member country is to achieve the minimum price is not stipulated.[10] This means that negotiating a common price range is not considered feasible and that the high vertical integration prevailing in the bauxite-aluminium industry limits the role the developing countries can play in the determination of pricing policies.

As a consequence, in the case of bauxite price cannot be considered a parameter that can be subject to an international agreement.

Technological conditions

New bauxite deposits have been discovered in recent years, and huge potential reserves of lower grade bauxite could be used in the aluminium industry if necessary. Brazil could become a major bauxite producer in the 1980s, and prospecting for new deposits is expanding in Australia and Guinea. The large bauxite-aluminium corporations have been active in locating new reserves to diversify their sources of bauxite. As a consequence there will be an adequate supply of bauxite in the long term even if economic, technical or political factors cause disruptions in supply from traditional sources.

Obviously, the existence of large bauxite reserves is not a sufficient condition for ensuring an adequate supply of aluminium in the future. Bauxite mining is



Newly made copper sheets at a copper mine in Cerro Verde, Peru. Peru is one of the world's leading exporters of copper and a member of CIPEC.

the first step in a complex process of aluminium metal production. But in the short- and long-term there appear to be no insurmountable obstacles to obtain an adequate supply of bauxite. Thus, the fear of shortages in supply will not compel consumers to initiate negotiations concerning bauxite. On the contrary, as world bauxite resources continue to increase relative to demand, the probability that an international bauxite agreement will be established becomes lower.

Substitution

The strength of demand for aluminium is attributed to its many desirable physical properties. Since new uses for aluminium will continue to be found, demand for bauxite will also increase. It is possible to produce aluminium from ores other than bauxite. In the United States and the Soviet Union research has been conducted for many years on how to extract aluminium from non-bauxite ores. However, almost all aluminium is still produced from bauxite. The main reason for this is that it requires significantly less energy to produce one ton of aluminium metal from bauxite than from non-bauxite aluminium ores. Further increases in energy prices may make bauxite's position still more secure in the future. As a result it is very unlikely that bauxite will be replaced during this century. In the case of bauxite, this is the only factor that militates in favour of international negotiations.

COPPER

Concentration of supply and demand

The developing countries have become the most important group producing copper during the past decade. In 1982 their share in the world total has increased to 45 per cent while the share of development market economies has fallen to a third of the total.

The growth of consumption has been fastest in the developing countries, whose share in total consumption more than doubled during the past decade – from 4.0 per cent in 1970 to 11.1 per cent in 1980. The socialist countries are roughly self-sufficient in copper, while the developed market-economy countries are dependent on imports from the developing countries. This import dependence is not as great as might be inferred from the production and consumption figures, as recovery of scrap is more significant in the developed countries than elsewhere. In the developed market economies 18.5 per cent of consumption was satisfied by recovered scrap in 1980.

Price instability

The international copper market can be roughly divided into three parts, each of which has its own price. The socialist countries trade mainly among themselves, and the price-setting mechanism in this market is not well-known. In the United States most trade occurs at the so-called U S producers' price. In the rest of the world, the London Metal Exchange (LME) price plays a central role, even though most physical trade occurs outside the LME.

The price of copper has been characterized by alternating periods of high and low variability. Thus the annual coefficient of variation of the average monthly price ranged from 0.019 to 0.289 between 1970 and 1980.

The relatively high degree of instability in the price of copper is a factor that makes an international agreement on copper more likely. The reduction of instability may, however, prove difficult because of the sporadic periods of extreme instability. Price stabilization efforts that fail may in fact increase instability,[11] and the entire agreement, involving aspects

Aluminium is a major competitor to copper in many fields.

To encourage increased consumption of aluminium the leading companies are actively promoting recycling.

other than stabilization, might break down.

Technological conditions

Approximately 70 per cent of the copper consumed can be recuperated. Technical progress and more information could easily improve this percentage in case of supply disruptions. It would thus seem that the regular supply of copper metal and concentrates is fairly secure in both the short and the long term. As a result, fear of shortages in supply due to the inadequacy of available reserves is not a factor which will increase the probabilities that a copper agreement will be included.

Almost all the regions of the world possess copper resources and reserves, but as in the case of other minerals the geographic distribution is irregular. In 1960 economic reserves amounted to 154 Mt with an average grade of 1.30 per cent Cu content. In 1978 the average copper content fell to around 0.8–0.9 per cent but at the same time total available reserves increased to 450 Mt. This rapid growth is due to the improved technology for exploiting deposits which were previously considered uneconomic.

Substitution

Although the properties of copper make it very difficult to replace in some applications, other materials such as aluminium, stainless steel and plastics are increasingly competing with it.

The rate of substitution of aluminium for copper varies in the European countries from 30 per cent in France to around 20 per cent in the Federal Republic of Germany and the United Kingdom. Substitution is expected to increase in the future particularly in countries where there are no copper mines but where supplies of aluminium are ample.

The volatility of the price of copper is a factor encouraging substitution. It is obvious that manufacturers prefer to use a raw material whose future prices can be predicted with some certainty. Moreover aluminium and steel-based alloys are in general cheaper than copper.

Competition will become more intense in the future and substitution will continue to be a threat to copper. Copper is not irreplaceable, and therefore the largest copper-producing countries in the developing world will not be able to use this argument to press for the negotiation of an international agreement.

OTHER MINERALS

As was mentioned before, tin is the only mineral commodity for which there is an ICA, and the probabilities that new agreements will be established for copper and bauxite are very low. Using the same em-

pirical approach employed in analyzing tin, copper and bauxite, Table 6 summarizes the factors affecting the probability that ICAs will be established. The number of points indicates the favourability of conditions for commodity agreements; the higher the number of points the more probable the formation of an agreement.

As can be seen from Table 6 there are only a very few mineral commodities where the conditions for successful negotiation of international agreements are met. Regarding supply concentration, the share of the five main producing countries is very high in every case (see Figure 4). The production of cobalt, manganese, chromium, tin, bauxite and antimony shows the highest concentration – from 70 per cent in the case of bauxite to 95 per cent in the case of cobalt.

Price instability is common to almost all metals and minerals. Only in the case of bauxite, iron ore and manganese, where trade is based on long-term contracts, have prices been relatively steady.

Scarcity of reserves is not a condition which could play an important role in the ICA negotiations concerning any mineral except silver and tin. More important than physical scarcity is the regional distribution of reserves.

Substitution is mainly a question of price. Any metal can be substituted for by other materials if prices move far enough. However, there are some metals and minerals which are more difficult to replace. Owing to its physical and economic characteristics, chromium is one of these. Bauxite, iron ore and manganese were assigned three points because they are bulk mineral commodities for which it is very difficult to find substitutes, mainly because of economic considerations.

The political co-operation condition is fulfilled only in the case of tin and to a lesser degree in the case of cobalt. Even if all other conditions permitted the establishment of an ICA, the lack of political understanding among producing countries can prevent its creation. This lack of co-operation separates not only developed countries from developing countries but also developing mineral producing countries themselves.

Table 6

Economic, technical and political characteristics of mineral commodities

Mineral or metal	Supply concentration	Price instability	Reserves lifespan	Substitution	Political co-operation of producers
Tin	●●●●●	●●●●●	●●●●	●●●	●●●●●
Bauxite	●●●●●	●●	●	●●●	●●
Copper	●●●	●●●●●	●●	●●	●●
Iron ore	●●●	●●	●	●●●●	●
Manganese	●●●●●	●●	●	●●●●	●
Lead	●●●	●●●●●	●●●	●●	●
Zinc	●●●	●●●●●	●●●	●●	●
Nickel	●●●●	●●●	●	●●●	●●
Antimony	●●●●●	●●●●●	●●●	●●●	●
Silver	●●●	●●●	●●●●	●	●
Cadmium	●●●	●●●	●	●	●
Chronium	●●●●●	●●●	●	●●●●●	●
Cobalt	●●●●●	●●●	●●	●●●●	●●●●
Tungsten	●●●	●●●	●●	●●●	●

Notes:

[1] Waters, A R: The Economic Reason for ICAs, KYKLOS, Vol XXVII, 1974, and J Behrman: International Commodity Agreements: An evaluation of the UNCTAD Integrated Commodity Programme. Washington 1977.

[2] F Callot: World Production and Consumption of Minerals, Mining Journal Books, 1981.

[3] UNCTAD: *Consideration of International Measures on Iron Ore,* Report by the Secretariat, TD/IPC/Iron Ore/3, Geneva 1977(a).

[4] UNCTAD: *Consideration of International Measures on Manganese,* Report by the Secretariat, TD/B/IPC/Manganese/3, Geneva 1977(b).

[5] UNCTAD: *Report of the Ad Hoc Intergovernmental Group of Experts on Tungsten* on its First Session TD/B/CI/Tungsten/26, Geneva 1977(d).

[6] Smith, W and Schink, R: The ITA: A reassessment, The Economic Journal, Dec 1976, Cambridge.

[7] UNCTAD: Posición boliviana ante el Sexto Conventio Internacional del Estano, Ginebra, Marzo de 1981(d). Bolivia and United States did not ratify the Sixth ITA.

[8] Since July 1972 the ITA ceiling and floor prices have been quoted in the Malaysian currency ringgit (MYR) per kilo ex-works Penang and the indicative GBP equivalent per kilo. The average for March was Ringgit 30.187 (GBP 8.897 based on MYR 3.393/GBP). 1 picul = 60.48 kg.

[9] Financial Times, February 15, 1982.

[10] IBA, *Review,* Volume 3, No 4, June 1978 (Statement of the IBAs Director).

[11] J Behrman: op.cit. ■