COMMODITY REPORT

Manganese — a commodity profile

By Ciaran O'Faircheallaigh

Manganese is an important industrial metal because of its necessity in the commercial production of nearly all steels. In this article Ciaran O'Faircheallaigh presents an up-to-date profile of the manganese industry and looks at the long term trends which influence the future role of the metal.

Ciaran O'Faircheallaigh is a Research Fellow at the North Australia Research Unit,
Australian National University,
PO Box 41321
Casuarina, Nt 5792
Australia

This article was first published in *Mining Magazine* (London), May 1985; it has been amended slightly by the author and the Editors of RMR to take account of recent developments in international manganese markets.

Manganese plays a vital role in contemporary industrial society, since it is virtually indispensible in the production of steel. While it will retain this strategic role for the foreseeable future, the manganese industry is, despite some recovery during the last year, in a depressed state, suffering from overcapacity, stagnant or declining demand, and low prices and profits. These circumstances are bringing about, or accelerating, fundamental changes in the structure of the industry and of international trade in manganese. This article tries both to present an up-to-date profile of the world manganese industry, and to analyse the long-term trends which have influenced the industry's development during recent decades.

Manganese is one of the more abundant elements in the world's crust, and a large number of manganese concentrations have been found throughout the world. However, very few of these are large enough, accessible enough, of a sufficiently high grade, and of a suitable physical and chemical composition to be economically exploitable. Indeed world manganese reserves (i e materials which could be economically extracted at current prices) are heavily concentrated in a few countries. According to the most recent US Bureau of Mines (USBM) estimates, South Africa accounts for 41 per cent of reserves and the USSR for 37 per cent, while the seven main producing countries (listed in Table 1) account for over 99 per cent.[1]

The principal use of manganese is in steelmaking, and it is in fact used in the production of virtually all steels and cast irons. Manganese was originally used to control oxygen and sulphur impurities, thus making possible steel production by the Bessemer process. Manganese also increases the strength, toughness, machinability and hardenability of steel and reduces surface defects. Increasingly, it is to obtain these alloying effects that it is used, technical developments in steelmaking having rendered its traditional role as a deoxidant and desulphurant relatively less important; no satisfactory substitutes exists for manganese in its alloying role. In excess of 90 per cent of world manganese output is consumed in iron and steel production, with much of the remainder used in production of dry cell batteries, chemicals, ceramics and non-steel alloys. Consumption of manganese in non metallurgical applications is expected to increase quite rapidly during the late 1980s[2], but steel-making will continue to absorb a very high percentage of total output, and the fortunes of manganese miners will remain tied closely to those of the steel industry.

Commercially-exploitable manganese ores vary widely in terms of manganese content and the level of associated minerals (e g iron, alumina, silica, lime). Manganese content of ores and upgraded ore products used for metallurgical purposes is in the approximate range of 38—55 per cent; a manganese content of 48 per cent is considered standard as a pricing basis. According to its use, manganese ore is commercially subdivided into metallurgical ore, chemical grade ore, and battery active ore. Manganese is usually added to the steel-making process in the form of alloys, particularly high carbon ferro-manganese or silico-manganese, though higher purity medium/low carbon ferro-manganese or manganese metal are required for some specific steel products. In the 1970s, ferro-manganese accounted for about 90 per cent of all manganese entering steel; in recent years, silico-manganese has increased its share of the market.

Production and consumption

Production of manganese is highly concentrated in geographical terms, as Table 1 indicates. The USSR is by far the largest producer (41 per cent of the total in 1982, 46.7 per cent in 1983), followed by South Africa, which during recent years has accounted for between 20 and 25 per cent of the total; its share declined dramatically in 1983, reflecting

Fig 1
Major manganese mines 1985

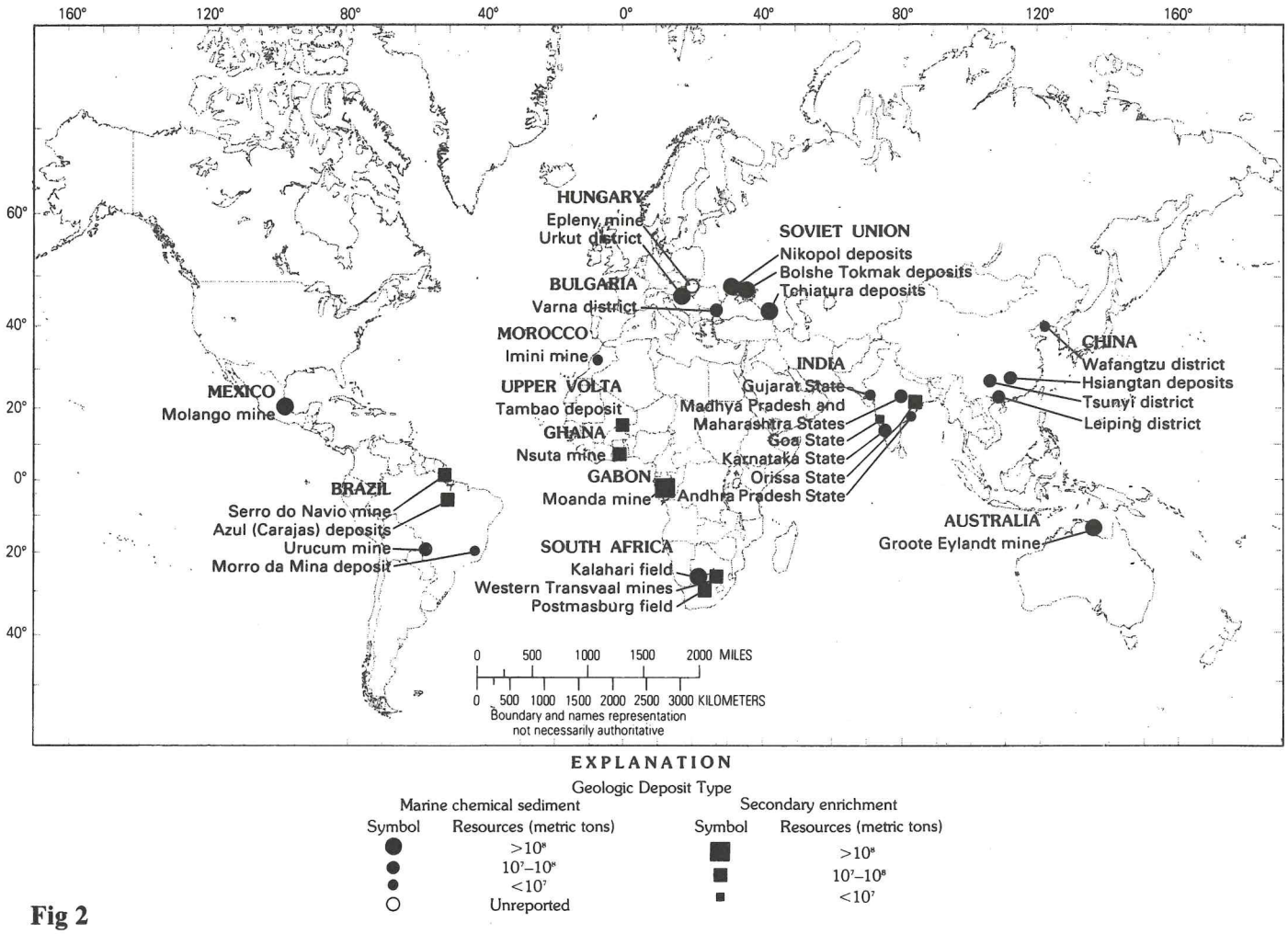
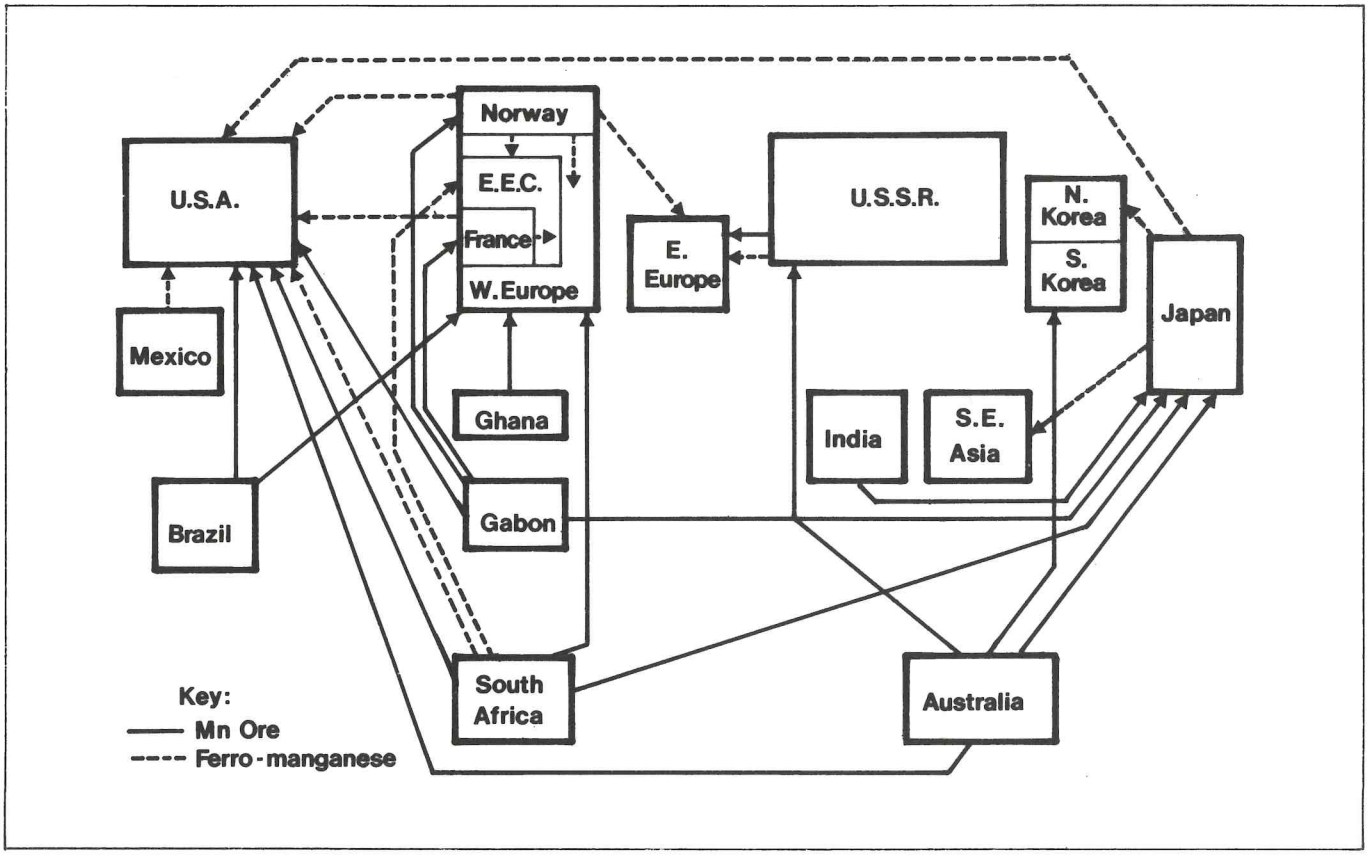


Fig 2
Major trade flows in manganese ore and ferro-manganese



severe production cut-backs in response to depressed market conditions. The seven countries listed accounted in both years for over 95 per cent of output. the degree of concentration of production in the non-socialist countries has increased significantly in recent decades; in 1960, the five largest producers accounted for 69.1 per cent of world production outside the socialist countries, while in 1978 they accounted for 87.5 per cent and in 1982 and 1983 for over 90 per cent.[3]

Table 2 provides data on production of ferro-manganese in 1960 and 1978; data published after 1978 is not comparable as production figures for the USSR have not been available. In 1978, the USSR was the most important producer, with 21 per cent of the total; South Africa, Japan, France, Norway and the US were also substantial producers. The figures indicate a major shift in the location of production between 1960 and 1978, away from the United Kingdom, West Germany and particularly the US towards ore producers (South Africa, Brazil, India, Mexico) and towards Japan and Norway. The very substantial decline in the US share (27.8 to 5.9 per cent) reflects a dramatic shift in the composition of its imports from manganese ore to ferro-alloys (see below). This shift in the location of production has continued since 1979, as indicated by the fact that the share of non-Soviet output accounted for by the US, the UK and West Germany declined from about 17 per cent in 1979 to about 12.5 per cent in 1983.[4]

In 1983, the socialist countries of Eastern Europe accounted for about 50 per cent of world manganese ore consumption, with the EEC and Japan accounting for about 10 per cent each and the US, South Africa, Norway, India, Brazil, Australia and Mexico for much of the remainder. The US, previously a very large consumer, now absorbs only about 3 per cent of the total. Detailed up-to-date information on consumption of ferro-manganese is not available,

Table 1

World production of manganese ore, 1982 and 1983
(kt)

	1982		1983	
Country	**Amount**	**%**	**Amount**	**%**
USSR	9 821	41.0	10 400e	46.7
South Africa	5 216	21.8	2 885	12.9
Gabon	1 490	6.2	2 030	9.1
Brazil	2 225	9.3	1 898	8.5
China	1 500e	6.3	1 500e	6.7
Australia	1 132	4.7	1 353	6.1
India	1 470	6.1	1 260	5.7
Others	1 101e	4.6	965e	4.3
Total	**23 955e**	**100.0**	**22 291e**	**100.0**

Notes:
e = Estimate.

Source:
Manganese Centre, Paris; Australian Bureau of Mineral Resources.

but in 1978 it was concentrated in Eastern Europe (27 per cent), the US (20.6 per cent), the EEC (about 20 per cent) and Japan (10.9 per cent).[5]

The US, Japan and the EEC countries are entirely dependent on imports for their consumption of manganese, either as ore or as ferro-alloys. Both now and in the foreseeable future, South Africa is by far their most important supplier: it accounted for nearly 40 per cent of non-Soviet ore production in 1982, and accounts for about 64 per cent of current reserves outside the USSR. Dependence on imported manganese, particularly from South Africa, led to substantial stock-piling by the US government in the 1950s and early 1960s. Stocks peaked in the mid 1960s at about 5.0 million tonnes (Mt) of contained manganese; the stockpile has since been progressively reduced, and stood at about 2 Mt contained manganese in November 1983. Stockpile releases have been particularly heavy in times of worldwide (and consequently domestic) shortages, with dampening effects on manganese prices.

Supply and demand

Demand for manganese grew rapidly after World War II due to the expansion of the world steel industry and (until 1965) the accumulation by the US of a large national defence stockpile. Rising steel output was largely responsible for the growth in consumption of manganese ore from about 11.5 Mt in 1960 to about 21 Mt in 1975. Demand has declined significantly during recent years due both to the depressed state of the steel industry and to a fall in the consumption of manganese per unit of steel produced. This second factor is clearly of vital importance in determining demand for manganese in the longer term. Consumption of manganese in steel production varies substantially from country to country, within a range of 3 and 9 kilograms (kg) per ton of raw steel. Some producers have significantly reduced manganese consumption per

unit during recent years; for example, the 1984 *Mining Annual Review* reports that in Japan consumption of high carbon ferro-manganese per tonne of raw steel declined by 20 per cent between 1981 and 1983.[6] There is apparently lttle scope for Japanese steel producers to further reduce consumption per unit. However, some other producers currently have significantly higher levels of consumption, and if they follow the Japanese lead, manganese requirements may decline significantly.

Demand for manganese may be furhter reduced as Brazil develops its major Carajas iron ore deposits, which are themselves high in manganese content and require little additional manganese for steel-making. On the other hand, it is reported that research in the US is leading to the discovery of manganese alloys which could open up substantial new markets, particularly in the motor vehicle industry, while demand for silico-manganese and for certain special steels with a high manganese content is buoyant. In any case, it seems certain that output from currently-existing and planned additional capacity will be more than adequate to meet future demand.

Production has followed the trend in consumption fairly closely, and output of both ore and ferro-manganese has declined significantly during recent years. Ore production fell from about 26.0 Mt in 1976 to an estimated 22 Mt in 1983, while US ferro-manganese production fell from 288 kt in 1979 to less than 100 kt in 1983 and Japanese production from 643 kt to 376 kt over the same period.[7] The tendency for production and consumption to keep fairly closely in line reflects the fact that production outside the centrally planned economies is largely controlled by private mining companies which respond fairly rapidly to market changes. Despite this fact, prices have remained depressed during recent years, due largely to the existence of substantial overcapacity in the industry. A number of key producers (e g GEMCO, SAMANCOR, ASSOMAN) expanded mine capacity substantially during the mid and late 1970s, but this additional capacity came on stream at a time when demand was beginning to decline significantly. The result has been keen competition between sellers for a shrinking market, a situation which steel producers, themselves under great pressure to reduce costs, have quickly turned to their advantage (see below).

Industry structure

About 50 per cent of world manganese production is accounted for by state-owned mines in the USSR, India, China and Ghana. Much of the remainder, and a very high proportion of manganese entering international trade, is accounted for by just five companies:

- Associated Manganese Mines of South Africa Ltd (ASSOMAN) in South Africa
- Compagnie Minière de l'Ogooué SA (COMILOG) in Gabon
- Groote Eylandt Mining Co Ltd (GEMCO) in Australia
- Indústria e Comércio Minérios SA (ICOMI) in Brazil
- SA Manganese Amcor Ltd (SAMANCOR) in South Africa.

Details of each company's ore and ferro-manganese production, and of their ownership, is provided in Table 3. The South African companies both operate three mines, the others only one.

None of these companies are part of fully-integrated corporate organizations, in the sense of having all of their output processed by other fully-owned subsidiaries of a single parent company or companies. However, a number of producers are partially integrated. GEMCO is fully owned by the Australian resources conglomerate Broken Hill Proprietary (BHP), part of its output is processed by another BHP subsidiary, TEMCO, and a portion of this is utilised by BHP in its steel mills; on the other hand, some 70 per cent of GEMCO's output is sold on an "arms length" basis to customers who have no corporate links with BHP. Other steel producers have also integrated backwards. US Steel has a 36 per cent shareholding in COMILOG and a major shareholding in ASSOMAN and is part-owner of a ferro-manganese plant in South Africa (Ferroalloy Ltd). Bethlehem Steel had until recently a 49 per cent stake in ICOMI while ISCOR, the South African state steel corporation, is a shareholder in SAMANCOR and owns its own ferro-alloy plants in South Africa. On the other hand, some mining companies have integrated forward. SAMANCOR owns ferro-alloy plants in the US and South Africa, COMILOG is a shareholder in plants in France, Portugal, Belgium and Italy, and is now proposing to build ferro-manganese and silico-manganese plants in Gabon.

Table 2

World production of ferro-manganese by country 1960 and 1978
(per cent of total)

	1960	1978
USSR	22.5	21.0
South Africa	4.0	11.5
Japan	5.4	10.9
France	9.6	9.3
Norway	1.7	6.6
United States	27.8	5.9
India	2.8	5.2
West Germany	9.7	5.0
Spain	0.9	3.3
Brazil	—	3.2
Mexico	0.5	3.0
Australia	0.2	1.7
United Kingdom	6.4	1.6

Source:
UNCTAD, "The processing and marketing of manganese", Annex, Table 2.

Table 3

Principal manganese-producing companies, non-socialist countries, 1975 and 1984 (1984 rank size order)

Company, country of operation	Manganese ore output 1975		1984		Ownership (Oct 1985)	
	kt	%	kt	%		%
Cie Minière de l'Ogooué SA (COMILOG), Gabon	2 300	16	2 087	19	US Steel, USA Gabonese state French state[1] Samaf, France Elkem, Norway Imétal, France	36.4 29.0 17.6 7.1 5.7 3.0
South African Manganese Amcor Ltd (SAMANCOR), South Africa	2 800	20	1 800	16	Gencor, SA[2] AAC, SA	50.0 28.7
Groote Eylandt Mining Co Pty Ltd (GEMCO), Australia	1555	11	1 717	15	Broken Hill Pty (BHP), Australia	100.0
Associated Manganese Mines of South Africa Ltd (ASSOMAN), South Africa	1 900	13	1 200	11	Anglovaal, SA[3] US Steel, USA[3]	47.9 20.6
Industria e Comercia de Minerios SA (ICOMI), Brazil	1 230	9	889	8	CAEMI, Brazil[4]	100.0
Manganese Ore (India) Ltd (MOIL), India	300	2	500e	5	Controlled by the federal state of India and the states of Maharashtra and Madhya Pradesh	
Cia Minera Autlan SA de CV, Mexico	400	3	400	4		
SA Mineracao da Trindade (SAMITRI), Brazil	—	—	300	3	Arbed, Luxemburg	56.0
Ghana National Manganese Corp (GNM), Ghana	410	3	268	2	Ghanaian state	100.0
Total, 9 principal companies	**10 895**	**77**	**9 161**	**82**		
Total, non-socialist countries	**14 115**	**100**	**11 200[5]**	**100**		

Sources:
RMG Data, corporate sources, Mining Annual Review and World Metal Statistics Yearbook 1985.

Notes:
e = Estimate

[1] Held through Cie Francaise de Mines (Coframines), which is 68 per cent owned by Bureau de Recherches Géologiques et Minières (BRGM), which is controlled by the French state.

[2] The entire share capital of African Metals Ltd, lwhich owns 39.6 per cent of Samancor, was transferred from state-controlled Iscor to General Mining Union Corp Ltd (Gencor) in two steps in 1983 and 1984.

[3] Anglovaal holds 34.6 per cent directly, 7.5 per cent through Mid Wits and other subsidiaries, and 4.9 per cent through its direct and indirect holdings in Associated Ore and Metal Corp (Assore). Assore, which holds 39.5 per cent of Assoman, is 52.3 per cent owned by Oresteel Investments (Pty) Ltd, which in turn is 49 per cent owned by US Steel and 35 per cent owned by the four directors of Assore.

[4] Bethlehem Steel Corp (a US company) sold its 49 per cent holding in Icomi to Cia Auxiliar de Empresas de Mineracao (Caemi) in 1985.

[5] Preliminary figure.

During recent years the degree of corporate concentration and of vertical integration in the manganese industry outside the socialist countries has increased significantly. Some ore producing firms have merged (for example Anglo American corporation's Middelplaats mine, which was taken over by SAMANCOR in April 1982); in other cases smaller companies producing lower-grade ores have become uncompetitive and gone out of business. In Australia, for instance, a number of small mines in Western Australia contributed to exports during the late 1960s and early 1970s, but by 1975 GEMCO was the only remaining exporter. Vertical integration, examples of which were noted in the previous paragraph, is steadily increasing, the most recent instance being the purchase by Elkem, the major Norwegian ferro-alloy producer, of a shareholding in COMILOG.

The depressed state of manganese markets during recent years (see below) has certainly contributed to these trends. Some small producers have been put out of business and even the largest and most successful have found their profits squeezed and their resources stretched. SAMANCOR's pre-tax profits, for example, fell from R90 million South African rands (M ZAR) in 1979 to 48 M ZAR in 1981 and 3 M ZAR in 1984, the last figure representing a return on capital employed of just 0.9 per cent.[8] In these circumstances, producers have had a strong incentive to merge and combine their resources, thus increasing their chances of survival, or/and to establish corporate ties with consumers, securing guaranteed market outlets for their ore in times of oversupply. Despite the current surplus capacity in the manganese industry, long-term security of supply has been a major consideration for ore consumers, ecouraging them to integrate backwards.

Thus manganese mining is increasingly dominated by a small number of large producers, most of whom are partially integrated into alloy production or who have as major shareholders companies which produce ferro-alloys or/and steel. This in turn has an influence on manganese trade and marketing, as explained in the following sections.

International trade

Table 4 provides details of manganese ore exports in 1960, 1978 and 1983. During recent years South Africa has been by far the most important exporter, contributing about a third of the total until 1982 and 28.2 per cent in 1983. It exports mainly to Western Europe and Japan (over 90 per cent of total exports in 1983), and also to the US. The second largest exporter, Gabon, ships mainly to Western Europe (particularly to France, which has a substantial shareholding in COMILOG) and to the US. It was previously a major supplier to Japan, but its exports have fallen during recent years and are likely to remain low, since it will now meet a substantial part of Elekm's requirements (estimated at about 720 kt per annum)[9] and since COMILOG has already committed part of its output to its principal shareholder, US Steel.

The direction of international trade is clearly influenced to some extent by ownership ties, a tendency which is likely to increase with the degree of vertical integration in the industry.

Figure 1 indicates the major trade flows for manganese ore and ferro-manganese. The key elements are:

- Exports of ore and ferroalloys from the USSR to the other socialist countries of Eastern Europe.
- Exports of ore from South Africa, Australia, Gabon and Brazil to Japan, the EEC, Norway, Spain, Portugal and the US.
- Exports of ferro-alloys from South Africa, Norway, Spain, Portugal, Brazil, Mexico and India to the US and the EEC and from France to other EEC countries and the US.

A number of general changes have occurred during recent decades in the direction and composition of international trade in manganese. First, the developing countries' share of exports has fallen significantly, from about 75 per cent in 1960 to about 40 per cent in 1983, because of the growth of exports from South Africa and Australia (15 per cent of total exports in 1960, 41 per cent in 1983), because of a major fall in Indian exports due to growth of the domestic steel industry, and because of the virtual cessation of exports from Morocco and Zaire (see Table 4).

Second, the socialist countries of Eastern Europe have changed from net exporters to net importers. The USSR has inadequately developed domestic supplies of high grade ores and it initiated imports of such ores in 1983 from Australia and, reportedly, from Gabon; GEMCO supplied 103 kt in 1983 and will supply between 105 kt and 145 kt in 1984.

Third, a major shift has occurred in the composition of international trade in manganese during the last twenty years; ferro-alloys have accounted for an increasing proportion of the total as ore producers, especially South Africa, have become more heavily involved in alloy production. This change is reflected in the fact that exports of ferro-manganese increased by 227 per cent between 1960 and 1978, whereas ore exports grew by only 44 per cent.[10] The result has been a major decline in ferro-alloy production in certain developed market economies, particularly the US, the United Kingdom and West Germany. This process is likely to continue, particularly in the light of rising energy costs and more stringent environmental controls (both of which have a major impact on the economics of manganese ore smelting) and as a result of rising transport costs, which represent a much lower proportion of the value of ferro-alloys than of ore. There are indications that Japan may also replace part of domestic alloy pro-

duction (particularly silico-manganese) with imports, a process which may be hastened by the apparent collapse of the so-called live-and-let-live principle, under which the Japanese were expected to make stable purchases of manganese ore in exchange for the producers not attempting to export ferro-alloys to Japan. In recent years the Japanese have both substantially reduced ore imports and have been at the fore in enforcing price reductions, and there is concern in Japan that, as a result, ore producers with ferro-alloy capacity will compete much more aggressively for Japanese markets.[11]

Marketing and pricing

Manganese ore is sold through free markets, captive or tied markets, and barter arrangements, the last mainly in Eastern Europe. Since the number of producers and major consumers is small, sales are usually negotiated directly between buyer and seller. A recent UNCTAD study estimated that free market transactions account for between 65 and 70 per cent of world trade, barter for some 15 per cent, and tied markets for 15 to 20 per cent, but tied sales are increasing in importance. Until 1983, such sales consisted largely of purchases by US Steel and Bethlehem Steel from two mining companies in which they are major shareholders, COMILOG and ICOMI respectively, both taking a share of manganese output roughly commensurate with their shareholdings (i e 40—50 per cent).[12] However, as mentioned above, COMILOG is now apparently committed to meeting a substantial part of Elkem's ore requirements, under long-term contracts. Pricing and other conditions of "tied" sales are apparently similar to those negotiated by the same mining companies on the open market.

Free market sales are made under annual contract, long-term contracts (i e longer than one year), and spot sales. Annual contracts are the most common, accounting for between 70 and 90 per cent of the total, depending on market conditions; however, mines often negotiate annual contracts with a single customer over extended periods of time. As might be expected, the precise mix of marketing arrangements varies from producer to producer, but most only make spot sales to take advantage of unexpected market opportunities created by sudden unanticipated increases in consumer demand or by production/shipping disruptions affecting other mines.

As a general rule, producers try to dispose of at least 80 per cent of their output under annual or long-term contracts, so as to permit effective production planning and transport scheduling. The latter is an important consideration for manganese producers, most of whom sell on a cif basis; they are responsible for chartering vessels, and the early conclusion of sales contracts covering the bulk of their output permits them to negotiate more favourable freight rates. GEMCO, it should be noted, sells a substantial part of its output on a fob basis and, since transport costs are substantial in relation to the total value of manganese ore, significant variations occur between the prices negotiated by GEMCO and by other producers.

Traditionally, contracts were negotiated towards the end of the calendar year for supplies in the following year. However, more recently the negotiating period has extended far into the new year because of failure to reach agreement on contract terms, particularly prices; consumers' stocks have been high, and so they can afford to delay the conclusion of contracts. Thus GEMCO's contracts for 1984 were not con-

Table 4

Exports of manganese ore, 1960, 1978, 1983
(kt)

	1960		1978		1983	
Country	**Amount**	**%**	**Amount**	**%**	**Amount**	**%**
South Africa	799	14.4	2 422	29.8	2 170	28.2
Gabon	—	—	1 533	18.9	1 930	25.1
USSR	883	15.9	1 076	13.3	1 200e	15.6
Australia	43	0.8	936	11.5	1 003	13.0
Brazil	785	14.1	812	10.0	704	9.1
India	1 217	21.9	499	6.2	300e	3.9
Ghana	503	9.1	263	3.2	110e	1.4
Others*	1 326	23.9	576	7.1	180e	3.6
Total	**5 556**	**100.1**	**8 117**	**100.0**	**7 697e**	**99.9**

Notes:
* Includes Morocco and Zaire, which together accounted for 11 per cent of exports in 1960 but whose share in 1978 and 1983 was insignificant.
e = Estimate.

Source:
1960 and 1978 — UNCTAD, 'Manganese'; 1983 — Manganese Centre data.

cluded until May 1984, by which time suppliers in Brazil and South Africa had still not reached agreement.

Sales contracts for manganese specify the quantity to be delivered, the description of the ore, and the price, which usually applies to all deliveries during the contract period. Manganese ores and alloys are not traded on any commodity exchange and there are no "world market" prices; trade journals do publish price quotations, but these reflect information received from trade contracts and do not perform any price-setting function. Prices are negotiated between producers and consumers, but the procedure involved is somewhat different from that followed in other bilateral mineral trade arrangements, for example for iron ore and coal. Usually only one buyer enters negotiations with one supplier at the beginning of the annual contract talks, while the rest of the industry defers negotiations. The price agreed upon is subsequently used as a guideline for negotiations between the other producers and consumers, with appropriate adjustments being made for quality differentials and other relevant factors. So, for instance, in 1983 the Japanese first negotiated with the South African producers, winning price cuts from them, and this started a series of negotiated price reductions with other consumers around the world.[13]

In 1982 the very depressed state of manganese ore markets apparently resulted in a departure from the traditional pricesetting arrangements. BHP had resisted price cuts strongly in 1980 and 1981, but as a result had seen its share of the Japanese market decline significantly. (GEMCO's sales contracts fell from 570 kt in 1980 to 480 kt in 1981). Determined to retain its traditional market share, BHP made pre-emptive price concessions to Japanese customers, a strategy which enabled it to maintain 1982 sales contracts close to the previous year's level, whereas contracts with Gabon, Brazil and South Africa declined by 62, 35 and 15 per cent respectively.[14] The other producers had little choice but to follow BHP's lead and accept lower prices, or face an even sharper decline in their own market shares.

According to a recent UNCTAD study, manganese prices are negotiated in the manner described above because steel producers wish to avoid wide discrepancies in the price of an essential input, discrepancies which could in their view adversely affect the competitive position of individual producers in world and regional markets. UNCTAD argues, however, that this form of price negotiation could result in market distortions since prices will be determined, or at least heavily influenced, by the relative bargaining power of the individual buyer and consumer chosen to initiate negotiations, rather than by the overall supply/demand situation. So, for example, a consumer with large stocks might be nominated (intentionally or accidentally) to negotiate and, being in a strong bargaining position, might push prices down below the level required to keep supply and demand in balance.[15] The validity of this argument depends to an important extent on the degree to which general price levels are in fact determined by the initial producer/customer agreement. It is certainly the case that subsequent negotiations do not always exactly mirror the initial outcome: for instance, in 1984 COMILOG failed to win any price increase from the Japanese, but GEMCO and other producers subsequently won modest increases; in 1983, US consumers, though following the Japanese lead in demanding price reductions, paid somewhat higher prices than did their Japanese counterparts. It may certainly be the case that the initial negotiations do broadly determine the general range within which prices will fall, as UNCTAD claims, but it seems certain that those negotiations will be heavily influenced by the overall supply-demand situation, and it appears that subsequent negotiations do permit adjustments to be made for the impact of bargaining factors specific to the initial negotiations.

Price trends for ore

Manganese ore prices are usually stated in USD per ton of ore or per unit of contained manganese; in the latter case, the price of a tonne of ore grading 48 per cent Mn, for example, is the unit price multiplied by 48. The first two columns of Table 5 provide data on US prices in current and constant dollars from 1962 to 1982; the final column indicates fob prices for GEMCO's exports to Japan over the period for which data is available (1972—1984).

In current dollar terms, prices fell significantly in the mid- and late 1960s, and in the early 1970s were about two thirds of the level which prevailed a decade earlier. They remained depressed until 1973, when a rapid expansion of steel production boosted demand for manganese; they rose rapidly in 1974 and 1975, and would have increased even more steeply but for stockpile releases by the US General Services Administration. Prices then remained steady until 1979, increased significantly in 1980, but declined in 1982 and fell further in 1983. In constant dollar terms, prices in the early 1970s were less than half the 1960 level; they reached their highest point since the early 1960s in 1975—76, but declined thereafter (with a brief interruption in 1980), so that by 1982 they were nearly 40 per cent lower than the 1960 level. Thus in real terms manganese ore prices have been depressed for much of the last twenty years, in comparison with their level in the early 1960s.

There is, however, a problem in interpreting the US price data, because it is expressed cif, that is inclusive of freight charges. As mentioned above, such charges account for a high proportion (up to a third) of the cif value of manganese ore. In other words, a

significant part of cif prices changes could be due to increases or decreases in freight rates, and thus cif prices are not necessarily an accurate guide to the prices actually realised by producers, a point which becomes apparent when one compares the US current dollar figures with GEMCO's fob prices, shown in the final column of Table 5. For example, between 1973 and 1975 GEMCO's prices rose by 0.58 USD per unit, as opposed to an increase in the US cif price of 0.73 USD indicating that part of the latter increase may have been due to higher freight charges associated with the 1973—74 oil price hikes. GEMKO's prices fell more sharply between 1977 and 1979 (by 0.17 USD) than did US prices (0.08 USD), possibly because freight costs were again rising, partly negating the impact of the fall in fob prices on the cif price. In 1979—80, GEMCO's price again rose less rapidly than US prices, due presumably to the impact of the second "oil shock" on freight rates.

It would seem, therefore, that during the 1970s price rises received by producers have been less substantial than the US cif figures would indicate, and also that price cutbacks suffered by producers have been more severe than those figures indicate. In other worlds, market conditions encountered by producers during the last twenty years have been even more adverse than the US price data would suggest.

Table 5

Average annual manganese ore prices
USD per long ton unit manganese

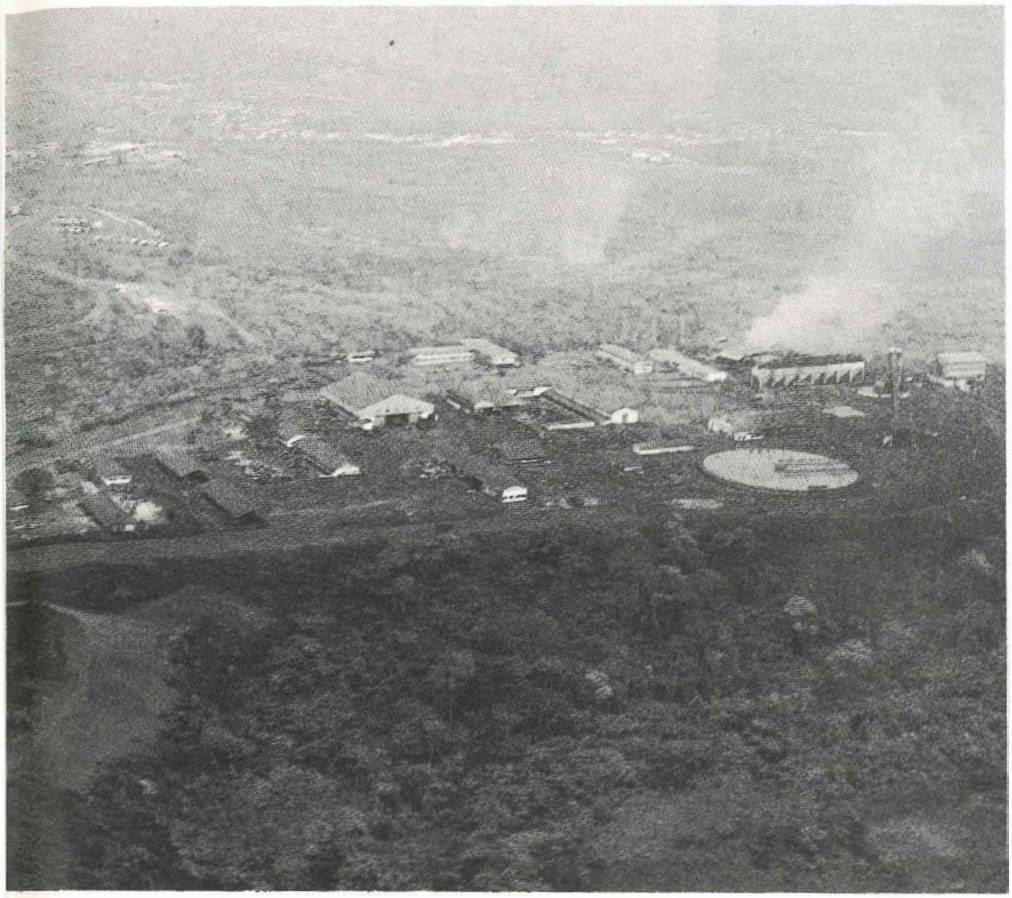
	cif US ports		fob Groote Eylandt
Year	Actual prices	Based on constant 1981 USD	Actual prices
1960	0.94	2.65	
1961	.94	2.63	
1962	.91	2.50	
1963	.81	2.19	
1964	.69	1.84	
1965	.73	1.90	
1966	.76	1.92	
1967	.67	1.64	
1968	.60	1.41	
1969	.50	1.12	
1970	.54	1.14	
1971	.60	1.21	
1972	.60	1.16	.52
1973	.65	1.19	.63
1974	.90	1.52	80-1
1975	1.38	2.13	1.21
1976	1.45	2.13	1.32
1977	1.48	2.05	1.36
1978	1.40	1.81	1.22
1979	1.40	1.67	1.19
1980	1.70	1.86	1.36
1981	1.72	1.72	1.40
1982	1.58	1.67	1.32
1983	1.44-1.47	na	1.13
1984	na	na	1.17

Source:
USBM, *Mineral Commodity Profiles 1983;* Australian Bureau of Mineral Resources, *Australian Mineral Industry Annual Review,* various years, and *Preliminary Summaries 1983.*

Overview

Some recovery has occurred in manganese markets during the last year, reflecting the healthier state of the steel industry in a number of major industrialized countries, particularly Japan. It should also be noted that individual producers have benefitted from development of new markets, particularly in the USSR and China. GEMCO, for example, is currently lifting mine production to a level not achieved since 1980 while its sister company, TEMCO, is to invest 47 M AUD over the next 3 years to upgrade and expand its ferro-alloy capacity.

Nevertheless, the majority of manganese producers have experienced serious economic difficulties during recent years and will continue to do so given that long-term demand for their product is stagnant or declining, and is currently well below mine capacity. It is difficult to obtain exact figures on either capacity or production, but in 1983 the five main producing companies (see Table 3) had a nominal capacity of about 13.5—14.5 Mt ore per annum, whereas their combined production was about 7 Mt. Excess capacity has resulted in keen price competition between producers, each anxious to maintain capacity utilization at as high a level as possible, with the result that real prices have continued to decline despite major cuts in output. Unit production costs have



The Moanda manganese mine in Gabon is controlled by COMILOG, the world's leading manganese producer.

been rising in the meantime due both to inflation and to partial loss of scale economies (resulting from declining capacity utilization), so that producers have been caught in a "cost-price squeeze".

Manganese producers have evolved a number of strategies to deal with these problems and with the more general difficulties of operating in an industry which, like almost all mineral industries, is cyclical by nature.

First, a number of major ore producers have become involved in ferro-alloy production and/or have established ownership ties with major customers, in order to ensure a guaranteed outlet for at least part of their output, and so reduce or remove one source of uncertainty and instability. The degree of vertical integration in the industry has consequently increased.

Second, a number of firms have left the industry, while some of those remaining have merged their interests, with the result that production is increasingly dominated by a small number of large units. third, producers have, as mentioned above, become more aggressive in competing for the markets which remain. Price competition may represent a rational strategy from each individual firm's point of view, but from the perspective of producers as a whole it almost certainly results in lower average prices and profits, putting them under further financial pressure.

If the trends evident during recent decades continue, the manganese industry outside the socialist countries will before long consist of a handful of very large integrated producers, supplying ferro-alloy to steel makers and other consumers in the developed market economies. It is difficult to gauge what the implications of such a development would be for consumers and producers. Consumers would certainly have benefited from the overcapacity and resultant price competition which would have helped to bring this situation about, but in the longer term their interests might suffer. A small number of large integrated producers might be in a position to exert upward pressure on prices, while a high proportion of western world manganese supplies would originate in a small number of countries, some of which might be regarded as vulnerable in a strategic or political sense. The developed market economies would no longer possess a substantial ferro-alloy capacity (the US is already in this position), making it impossible to simply switch to alternative sources of ore.

The remaining producers might be in a significantly stronger position than they are today, better able to plan mine and smelter capacity to match market developments, and able to maintain prices at levels which offered a satisfactory return on investment. For the moment, however, such a possibility must seem remote for manganese producers saddled with excess capacity and competing more keenly than ever for a shrinking market.

References:

[1] USBM, *Mineral Commodity Profiles 1983 — Manganese,* p 8.

[2] C I K Berglin and J F Cullen, "Changes in the Steel and Ferro Alloy Markets and Their Effect on Australia's Manganese Industry", The Australian IMM Conference, Melbourne, 1982, p 240, which also offers a detailed discussion of non-metallurgical uses (pp 238—240).

[3] UNCTAD, "The processing and marketing of manganese", TB/B/C1/PSC/20, Geneva, 1981, Annex, Table 1.

[4] Manganese Centre Data.

[5] UNCTAD, "Manganese", Annex, Table 2.

[6] *Mining Annual Review 1984,* p 65.

[7] Figures for US from USBM, *Mineral Commodity Summaries 1984;* for Japan from Tex Report Co Ltd, *The Tex Report 1983 Ferroalloy Manual,* Tokyo, 1984.

[8] SAMANCOR, *Annual Report 1984,* p 3.

[9] *Mining Annual Review 1984,* p 64.

[10] Figures derived from UNCTAD, "Manganese", Annex, Tables 4 and 7.

[11] *The Tex Report,* 1983-05-06.

[12] UNCTAD, "Manganese", p 20.

[13] *Mining Annual Review 1984,* p 375.

[14] The Tex Report Co Ltd, *1983 Ferroalloy Manual,* pp 51—61.

[15] UNCTAD, "Manganese", p 26. ■