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The Export Performance of the Brazilian Minerals Sector

By

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ABSTRACT

The objective of this paper is to discuss recent trends in Brazilian mineral exports as well as their future perspectives. As market structure, competitiveness and levels of reserve exhaustion vary greatly between different mineral types, it was felt appropriate to analyse four products in depth: iron ore, gold, tin and kaolin. The first two were chosen for their significance in overall Brazilian mineral output, while tin and kaolin were selected for being good representative cases of non-ferrous metal and non-metallic ores. The paper establishes that international prices have been depressed for these four products for some time. Despite this, iron ore and kaolin mining companies in Brazil have recently invested in enlarging capacity. However, gold and tin production has continued to decline. In the short run, the paper concludes that the Brazilian mineral sector can contribute little, if anything, to an expansion of the country's overall exports. In the long run, it is suggested that there will be an increasing dependency on iron ore exports. Consequently, enhanced vulnerability for Brazilian mineral export performance is expected to develop. This paper was prepared while the author was Banco Santos Visiting Research Fellow in Economics at the Centre for Brazilian Studies during the academic year 1998-99. The paper was originally presented at a conference entitled, "Brazil as an Export Economy", held at St. Antony's College on 7th December 1998.

RESUMO

O texto analisa tendências recentes nas exportações minerais brasileiras, bem como suas perspetivas futuras. A análise divide-se em quatro partes, cada uma correspondendo a um produto diferente. Embora hajam 39 produtos minerais exportados pelo Brasil, o autor escolhe analisar detalhadamente minério de ferro, ouro, estanho e caulino. Enquanto que os primeiros dois representam três quartos das exportações minerais brasileiras, o estanho foi selecionado como exemplo de um metal não-ferroso, e o caulino como exemplo de um produto mineral não-metálico.

O autor descreve as características principais do mercado internacional de minério de ferro e oferece uma visão detalhada da evolução da política mineira e de investimento de cada uma das principais companhias exploradoras do setor. Conclui que, a curto prazo, o mercado tem sido gravemente afetado pela crise asiática, bem como por uma mistura de fatores opostos que aumentam a capacidade produtiva ao mesmo tempo que diminuem a procura. Haverá provavelmente uma forte diminuição no preço. A longo prazo, no entanto, as perspetivas são mais positivas. As minas brasileiras mantiveram a sua quota de mercado e possivelmente até a melhoraram. As empresas investem atualmente em novas minas, um porto novo e no aumento da capacidade produtiva. De fato, espera-se que durante a próxima década o Brasil e a Austrália venham a controlar conjuntamente 70% do comércio marítimo em minério de ferro.

As perspetivas para o ouro não são tão positivas. O investimento e o output têm vindo a decrescer, e irão diminuir mais no futuro. As exportações também deverão diminuir, tal como tem acontecido nos últimos 5 anos. Um elemento negativo chave será a queda do preço do ouro a nível internacional. A curto prazo, a diminuição do preço, conjuntamente com a estabilização da produção resultará na queda das exportações de ouro do Brasil em termos financeiros. O trajeto mais provável será a estabilização da produção brasileira num contexto de expansão do mercado global.

No que diz respeito ao estanho, apesar de uma tendência inicial para o aumento significativo da produção e da quota de mercado brasileira nos anos 80, verifica-se mais recentemente uma tendência para a diminuição da quota de mercado. De fato, a produção tenderá a diminuir ainda mais como conseqüência da exaustão da principal mina de estanho no país. Por outro lado, o setor será também afetado negativamente pelo aumento de capacidade no Peru. Por último, também será negativa a tendência no preço internacional. O caso do estanho assemelha-se ao do ouro, já que nos anos 80 houve um forte aumento na produção brasileira, tornando o país no maior produtor em 1989. Desde então, tem diminuído a produção, tendência que persistirá no futuro próximo. É importante sublinhar que a maior mina de estanho no Brasil apenas tem mais quatro anos de vida.

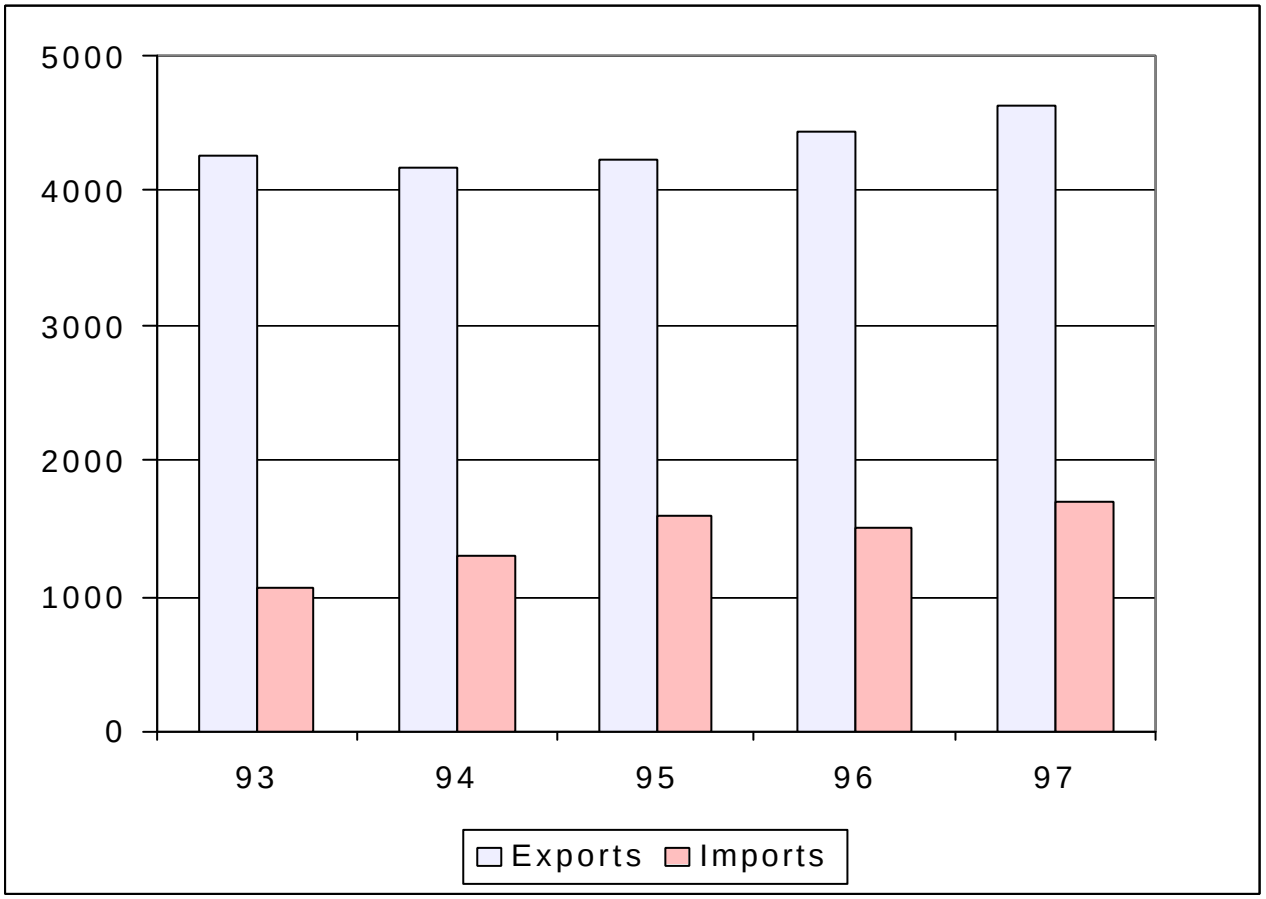
Em contraste com a situação do estanho, é altamente provável que o Brasil continue a aumentar a sua quota no mercado internacional de caulino. De um modo geral, o preço dos produtos minerais experimentou uma queda significativa, tal como se observa no caso do estanho e do ouro, o que provavelmente se verificará no caso do minério de ferro. Será possível uma recuperação nos preços durante 2000, mas será mais provável que os preços se mantenham baixos em comparação com os níveis registados durante a primeira metade da década passada. Por este motivo, bem como pela diminuição na produção de outro e de estanho em 2001, as exportações minerais brasileiras deverão diminuir. A curto prazo, as exportações contribuem apenas uma pequena parte, se alguma, ao aumento das exportações brasileiras. A longo prazo, a atividade mineira no setor do minério de ferro tenderá a consolidar-se como a principal exportação mineral brasileira, devido à realização de investimentos importantes no setor e aos problemas enfrentados pelo restantes minerais. Em 1993-1997, o minério de ferro representou 58% das exportações minerais brasileiras. Nos próximos 5 anos, a quota deverá aumentar para 65% ou mesmo 70%. Este fenômeno tem pelo menos uma grande desvantagem: aumentar a dependência sobre apenas um produto e, como conseqüência, aumentar a vulnerabilidade do setor exportador brasileiro.

O texto foi preparado durante a estadia do autor como Banco Santos Visiting Research Fellow em Economia no Centro de Estudos Brasileiros no ano letivo de 1998-99. O trabalho foi originalmente apresentado na conferência, *Brasil como economia exportadora*, que teve lugar em St. Antony's College, Oxford, no dia 7 de Dezembro de 1998.

Introduction

The Brazilian mining sector has usually played an important role in the country's balance of trade. During the Portuguese colonisation, gold was the most prominent mineral exported, but in this century its place has taken by iron ore. It is important to stress that the mineral share in the Brazilian exports has been reducing through time, as a result of industrialisation and diversification of exported products. In 1997, exports of mineral products (excluding fossil fuels) totalled US$ 4.6 billion, representing 8.7% of all Brazilian exports (Chart 1). The relevance of minerals is greater when it is taken into account the fact that mineral imports were only US$ 1.7 billion during the same year. Thus, Brazilian minerals generated US$ 2.9 billion in net exports.

Chart 1: Brazilian mineral trade balance, 1993-1997 (US$ million)



Source: DNPM, Sinferbase, Andrade *et al* (1997)

Note: Does not include energetic minerals like oil and coal

The figures shown in Chart 1 were calculated using official data, especially that published by Departamento Nacional de Produção Mineral (DNPM). In some cases, it also utilised data provided by the Banco Nacional de Desenvolvimento Econômico e Social (BNDES). When discrepancies were found in the figures, the latter were generally assumed as the most correct. There are other problems in the statistics used in this paper, especially in terms of coherence. Sometimes, as in the niobium oxide case, there is not a clear criterion concerning why a specific product was not included in mineral export accounts. The other data problem encountered was that for at least one mineral (titanium), the statistics give different treatments for the product's exports and imports estimates. The Brazilian government mining department also provides data on some products commodities, such as aluminium, alumina, cement, fertilisers, but we decided to exclude these products from the total mineral trade balance. In the case of iron ore, we decided to use the estimates of the iron ore exporter organisation (Sinferbase), when it differed from the governmental data.

Although, there are some localised troubles in determined products or years, the data can be considered reliable. In order to reduce effects of the distortions caused by high fluctuation of prices (mainly in the case of œmmodities), we prefer to use the average of period 1993-1997, both for exports and imports. Table 1 shows the Brazilian trade balance performance of 39 minerals in this period. There is a high diversity among these products, as would be expected. Considering imports, the most important minerals are copper and potash. Together, these two products represent almost 2/3 of the Brazilian mineral imports.

Table 1: Brazilian mineral trade balance, 1993-1997 average (US$ million)

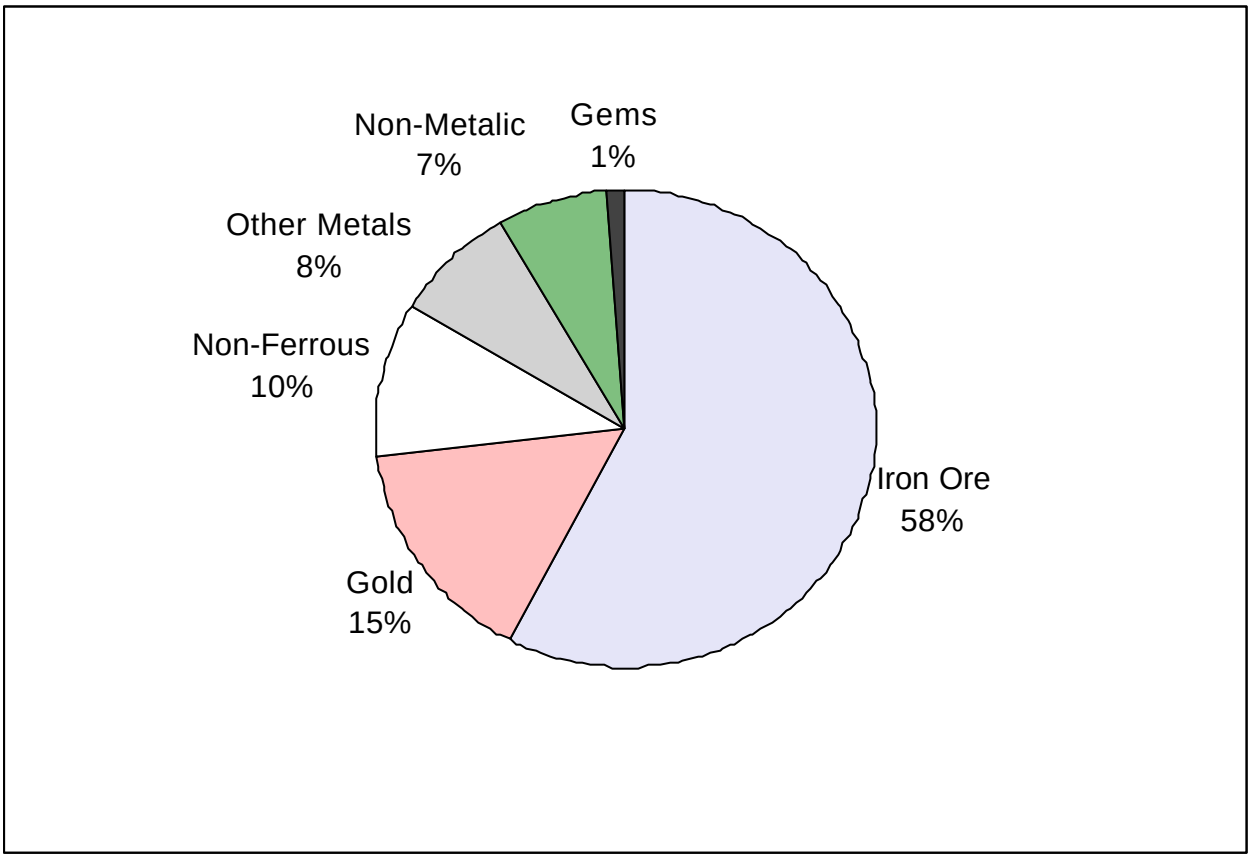
	Exports		Imports		Balance
	US$ million	% Share	US$ million	% Share	US$ million
Asbestos	74,58	1,71	36,62	2,57	37,96
Barytes	1,90	0,04	1,50	0,11	0,40
Bauxite	124,00	2,85	0,28	0,02	123,72
Bentonite	0,12	0,00	11,52	0,81	-11,40
Calcium	0,84	0,02	0,16	0,01	0,68
Chromium	15,38	0,35	9,92	0,69	5,46
Copper	139,58	3,21	542,20	37,98	-402,62
Diamond	45,94	1,06	14,24	1,00	31,70
Feldspar	0,12	0,00	0,40	0,03	-0,28
Fluorspar	0,16	0,00	0,94	0,07	-0,78
Gold	667,40	15,34	3,82	0,27	663,58

Graphite	11,86	0,27	0,64	0,04	11,22
Gypsum	0,52	0,01	1,70	0,12	-1,18
Iron Ore	2517,02	57,84	0,00	0,00	2517,02
Kaolin	73,20	1,68	4,26	0,30	68,94
Lead	1,50	0,03	33,02	2,31	-31,52
Lithium	0,14	0,00	0,12	0,01	0,02
Magnesium	18,76	0,43	5,08	0,36	13,68
Magnese	127,04	2,92	10,44	0,73	116,60
Mica	2,52	0,06	2,00	0,14	0,52
Molybdenum	0,00	0,00	34,40	2,41	-34,40
Nickel	59,56	1,37	59,18	4,15	0,38
Niobium	159,12	3,66	0,00	0,00	159,12
Ornamental Rock	141,20	3,24	15,38	1,08	125,82
Platinum Group	2,72	0,06	24,66	1,73	-21,94
Potash	0,46	0,01	375,42	26,30	-374,96
Quartz	7,48	0,17	18,38	1,29	-10,90
Rare Earths	0,58	0,01	2,56	0,18	-1,98
Salt	3,02	0,07	1,94	0,14	1,08
Silver	7,02	0,16	36,00	2,52	-28,98
Sulphur	0,12	0,00	69,88	4,89	-69,76
Talc	0,70	0,02	1,66	0,12	-0,96
Tin	76,62	1,76	1,90	0,13	74,72
Titanium	8,42	0,19	7,06	0,49	1,36
Tungsten	6,02	0,14	20,96	1,47	-14,94
Vanadium	0,04	0,00	1,76	0,12	-1,72
Vermiculite	0,68	0,02	0,00	0,00	0,68
Zinc	53,44	1,23	68,64	4,81	-15,20
Zirconium	2,08	0,05	9,02	0,63	-6,94
TOTAL	4351,86	100,00	1427,66	100,00	2924,20

Source: DNPM, Sinferbase, Andrade *et al* (1997)

Exports are also very concentrated in two products; iron ore and gold. These two products jointly account for almost 3/4 of Brazilian mining exports in period 1993-1997. In order to more easily visualise the relative importance of the different mining products, Chart 2 groups the exports by class. Excluding the two largest products exported, the others classes are: non-ferrous metals (10% of the exports), other metals (8%), non-metallic minerals (7%) and gems (1%).

Chart 2: Percentage of Brazilian mineral exports, by product class, 1993-1997 average



Source: Own estimates using data shown in table 1

Notes:

1) Non-ferrous includes bauxite, copper, lead, nickel, tin and zinc.
2) Other metals includes chromium, lithium, magnesium, magnese, molybdenum, niobium, platinum group, rare earths, silver, titanium, tungsten, vanadium, zirconium
3) Non-metallic includes asbestos, barytes, bentonite, calcium, feldspar, fluorspar, graphite, gypsum, kaolin, mica, ornamental rock, potash, quartz, salt, sulphur, talc, vermiculite
4) Gems include only diamonds

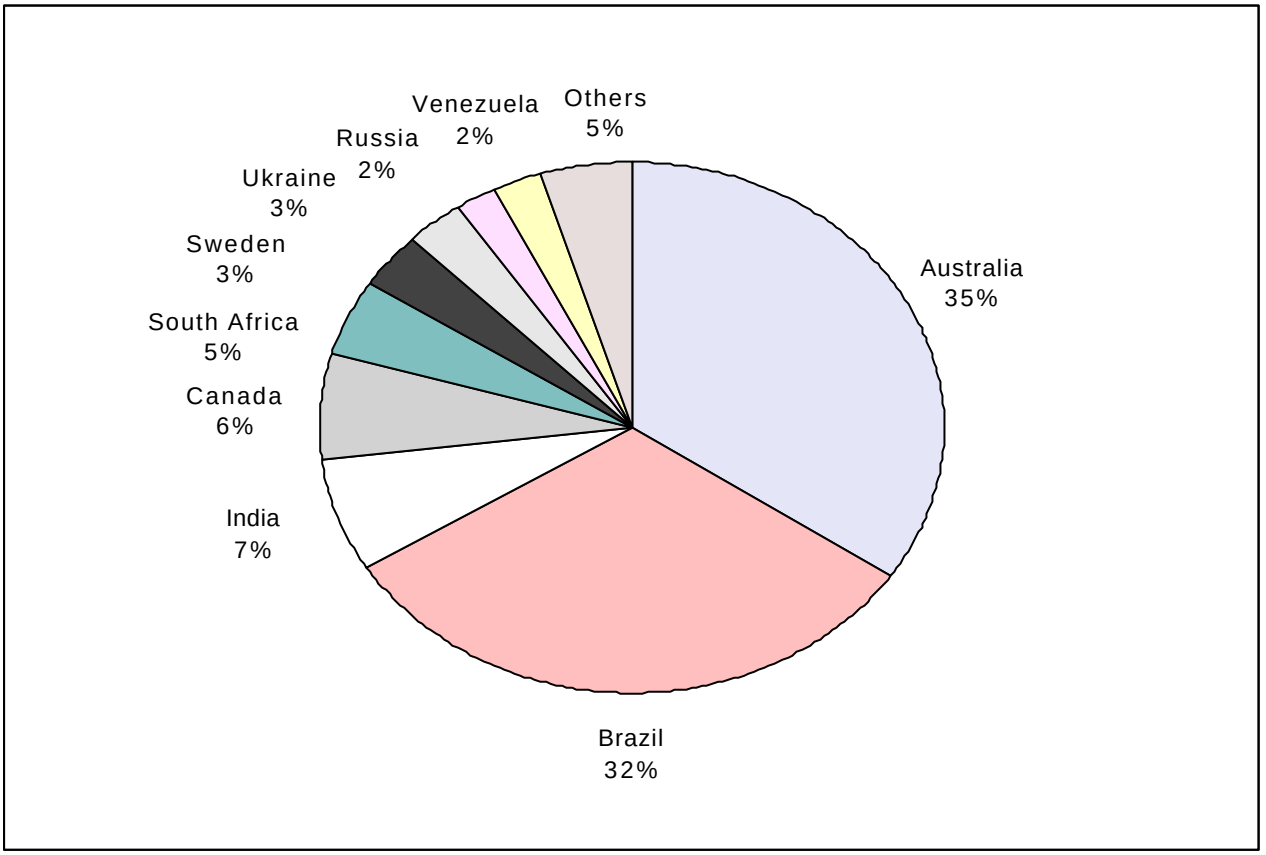
As has already been mentioned, there are a lot of differences between the minerals. Each mineral can be considered as forming a different sector, although in some cases they can be

extracted together, as in copper-gold and zinc-lead mines. For this reason, when the objective is to detect trends and discuss perspectives, it is better to use a product approach instead of a general analysis. Of course, a detailed examination of the 39 mineral products certainly is beyond this paper's scope. Instead, we have decided to make a more detailed analysis of four mineral products: iron ore (section 2), gold (section 3), tin (section 4) and kaolin (section 5). The first two cases were, naturally, chosen for their relative importance to the Brazilian mining sector. Tin was selected as an example of a non-ferrous metal and kaolin as a non-metallic one. Section six summarises the main conclusions of the article.

1. Iron Ore

In 1997, world iron ore production reached 1.07 billion tons and exports represented 41% of total production. Brazil has a very prominent role in the international iron ore market. In the period 1995-1997, Brazil and Australia jointly were responsible for 62.3% of world exports. The market is fairly concentrated, with 9 countries dominating 95% of the all exports in 1997 (Chart 3). It can be also considered a very stable one, since, from the beginning of the decade, the only important trend is the decrease of the share from Russia and the Ukraine. Together, their share reduced from 9.0% in 1990 to 5.4% in 1997. In same period, the Brazilian share increased from 28.8% to 31.7%.

Chart 3: Percentage shares of world iron ore exports, 1997

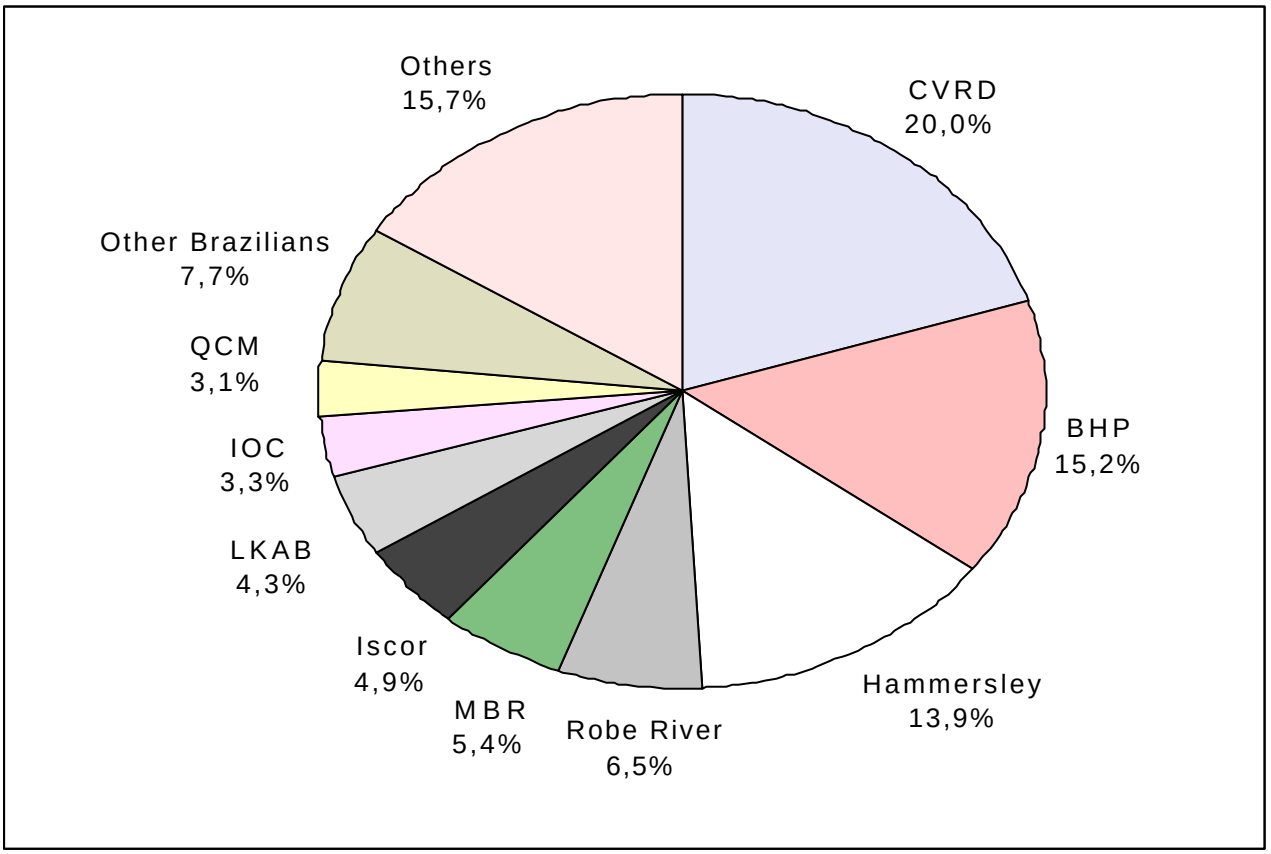


Source: UNCTAD, Sinferbase, Andrade *et al* (1998)

Iron ore exports are also very concentrated in the hands of large companies. Considering the seaborne trade, just nine companies control 76.6% of the market (Chart 4). Among these large exporters, two are Brazilian firms: Companhia Vale do Rio Doce (CVRD, a former State-Owned Enterprise, privatised in May 1997) and Minerações Brasileiras Reunidas (MBR). CVRD, the fourth-largest world mining company, is the leader in the iron ore trans-

oceanic market (with 20.0%) and MBR is the fifth-largest exporter (with 5.4%). In this leading team, three are Australian (BHP, Hamersley/Rio Tinto and Robe River), one is South-African (Iscor), one Sweden (LKAB) and two Canadian (Iron Ore of Canada, IOC and Quebéc Cartier Mining, QCM).

Chart 4: Percentage shares of the iron ore seaborne trade, by company, 1997



Source: CVRD, Sinferbase, Monteiro (1998), Andrade *et al* (1998)

The concentration in this market is even higher, for five reasons: a) the Australian mining company North Ltd. holds a 53% interest in Robe River and in April 1997 acquired a 59.3% share in IOC for US$ 230 million; b) the Brazilian mining company Caemi controls 84.7% of MBR's shares and 50% of those of QCM'; c) the Brazilian mining company Samitri (belonging to Belgo-Mineira/Arbed) controls 51% of Samarco (If the exports of the latter two enterprises are considered together, Samitri jumps to 7th place in the world market, with 4.7% of the iron ore seaborne trade); d) BHP, the third-largest world mining company, holds a 49% share in

Samarco; e) the giant Japanese trading company Mitsui holds stakes in Caemi, BHP Iron Ore Pty Ltd. and Robe River.

The Brazilian iron ore mining industry is controlled by 4 large groups: CVRD, MBR, Samitri-Samarco and Ferteco. CVRD extracts iron ore in two different regions. The so-called “System South” is composed of mines in the State of Minas Gerais, a 700-kilometre railway (Vitória-Minas) and one harbour (Tubarão, in Vitória, the capital of the State of Espírito Santo). The “System North” comprises the Carajás mines in the State of Pará, a 890-kilometre railway (Ferro Carajás) and one harbour (Ponta da Madeira, in São Luiz, the capital of the State of Maranhão). In 1997, CVRD exported 44 million tons through Tubarão and 41 million tons via Carajás.

Generally speaking, there are four different iron ore products: a) lumps: ore with granulation between 6 and 30 mm, which require less beneficiation; b) sinter feed: small particles of ore, usually less than 6 mm, that require agglomeration; c) pellet feed: extremely fine ore, with less than 0.1 mm, that is consumed in pelletising plants; d) pellet: ore enriched in a pelletising plant, with granulation between 8 and 18 mm. The pellet is the highest value added product in the industry, and CVRD is the most prominent player in the pellet market too. In 1997, it exported 21,2 million tons of pellets, which represents almost 1/3 of the seaborne trade. CVRD started to produce pellets at the end of the 1960s, with a plant of 2 million tons and the second plant was commissioned in 1973 (Table 2). Then, CVRD started to build pelletising plants through joint ventures, with Italian (Itabrasco, in 1977), Spanish (Hispanobrás, in 1978) and Japanese investors (Nibrasco, in 1978). In all these cases, the plants are located at Tubarão Port and CVRD has 51% of capital and operates the plants. Today, the joint capacity of these 6 pelletising plants is 21,1 million tons.

Table 2: Brazilian Pellet Exporters, 1997 (million tons)

Company	Plant	Start-up	Capacity	Exports, 1997
CVRD	CVRD 1	1969	2,0	
	CVRD 2	1973	3,0	
	Itabrasco	1977	3,5	21,2
	Hispanobrás	1978	4,0	

	Nibrasco 1, 2	1978	8,6	
	Kobrasco	1998	4,0	
Samarco	Ponta Ubu, 1	1977	5,5	5,7
	Ponta Ubu, 2	1997	6,0	
Ferteco	Fábrica	1977	3,7	3,3

Source: Paula (1993), Annual Reports, Web Sites

CVRD and its joint ventures produced 21,3 million tons of pellets in 1997, a little over their nominal capacity. This could be considered a strong reason to construct another pelletising plant. In 1996, CVRD and South Korean steel company POSCO established a new joint venture called Kobrasco. The seventh pelletization plant was also built in Tubarão; its annual pellet production capacity is four million tons, and involved investments of US$ 230 million. POSCO has 50% of the capital of Kobrasco and the rights to buy 62% of the production. However, in September 1998, when the plant was already completely built, POSCO decided to negotiate changes in the contract, taking part of its quota in fine ore instead of pellets (METAL BULLETIN, September 21, 1998, p. 19). Probably, this is the strongest evidence of the negative impacts of Asian crisis upon the international iron ore market. In this context, CVRD postponed the construction of its first pelletising plant at Ponta da Madeira, in the State of Maranhão (METAL BULLETIN, September 28, 1998, p. 43). In July 1998, CVRD had announced plans to build this mill, with a capacity of 6 million tons. The project should be finished in 30 months (at the end of the year 2000), and will require US$ 438 million of investment. Around 450 direct jobs would be generated in this new plant.

Samarco is the second-largest pellet producer in Brazil. As has already been mentioned, Samitri (51%) and BHP (49%) control the company. The iron ore extracted in the State of Minas Gerais is transported in a 396-kilometre slurry pipeline to Ponta Ubu (Espírito Santo State), where the pelletising plant is located as well as a private harbour. In November 1997, Samarco finished a large investment program of US$ 505 million. Before this project the capacity of the company was 9.2 million tons, with 6 million tons of pellets and 3,2 million of pellet-feeds. Now, the total capacity is 12.7 million tons, with 11.5 million tons of pellets and 1.5 million tons of pellet-feeds. With this project, the company that exports 100% of its production intends to increase its turnover from US$ 270 million to US$ 440 million. Other

goals are electricity self-generation (investment in two hydroelectric plants) and environmental improvements. The chairman announced that the main objectives, until the year 2002, are to improve the operational performance of the new equipment and to reduce the enterprise's liabilities (BRASIL MINERAL, 1997 (157): 16). As a result of the Asian crisis, at mid-1998, Samarco was operating with 20% idle capacity.

Ferteco is totally controlled by the German steel company Thyssen-Krupp Stahl. It operates two iron ore mines (Fábrica and Feijão), with a total capacity of 20 million tons. Twelve million tons of these are sinter feed, 3.7 million tons are pellets, and 4.3 million tons are lump ores. Fábrica, has a capacity of 13.0 million tons per year, including the pelletising plant commissioned in 1977. This mine is linked by the Vitória-Minas Railroad to the Port of Tubarão in the State of Espírito Santo, both owned and operated by CVRD. The Feijão mine, with a total capacity of 7.0 million tons per year, will use mainly the Minas-Rio-São Paulo Railroad (MRS) to transport its products to the Port of Sepetiba, currently under construction, to be operated by 1999. The port will be able to load 20-25 million tons per year and the total investment will be US$ 100 million. Presently, it also uses the Vitória-Minas Railroad to the Port of Tubarão. In 1997, Ferteco exported 11.8 million tons of iron ore by the Port of Tubarão.

In the short run, the pellet market has been extremely affected by the Asian crisis. In fact, there is a combination of opposing factors, increasing capacity and decreasing demand. In 1997, Western world pellet capacity stood at 197.4 million tons, 2.4% higher than the previous year and the capacity utilisation was 91%. In 1998, another 13.3 million tons of capacity is coming on stream, mainly in Brazil and India (METAL BULLETIN, October 8, 1998, p. 22). In Sweden, the State-Owned Enterprise LKAB has four pelletising plants, with an aggregate capacity of 16.6 million tons per year. In March 1998, LKAB has decided to invest US$ 24 million to increase production capacity at the new concentrating and pelletising plants in Kiruna (start-up in 1995) by 0.7 million tons to 5.0 million tons per year.

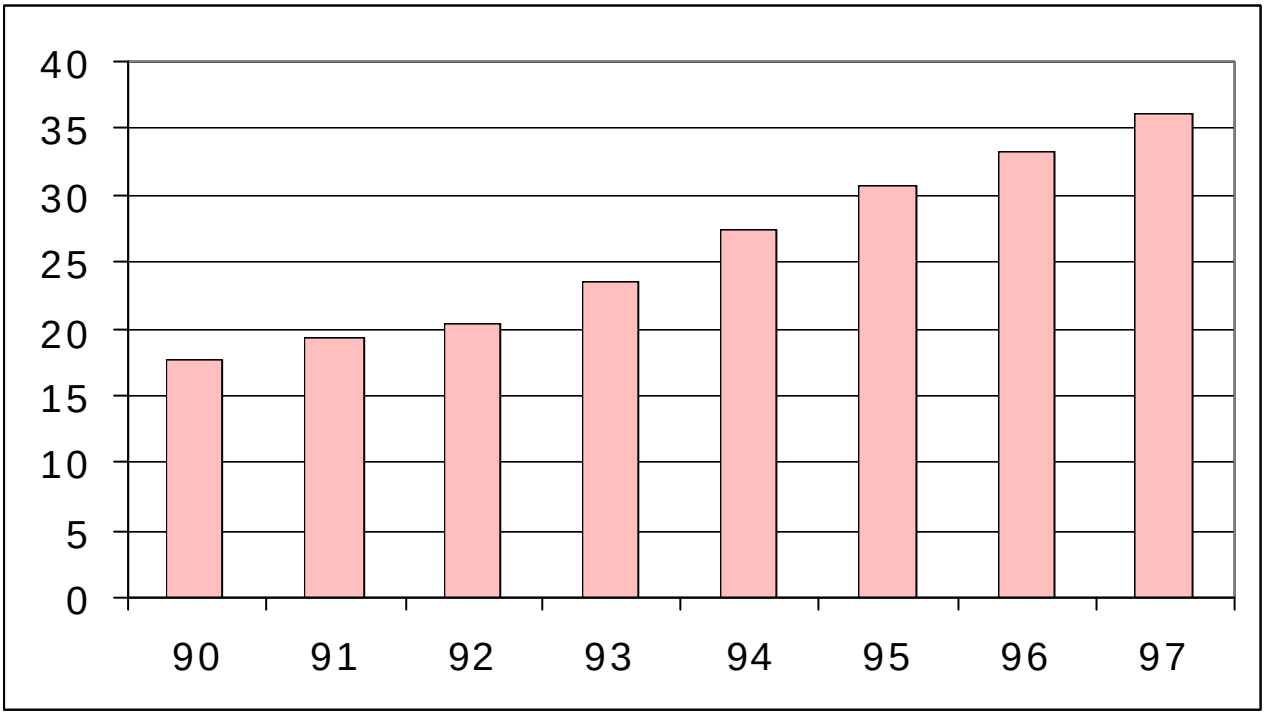
In October 1998, the Venezuelan State-Owned iron ore miner Ferromineria Orinoco (FMO) announced its intention to build a new pelletising plant to make 7 million tons per year. It will be located alongside FMO's existing 3.6 million tons pellet plant at Puerto Ordaz. In fact, the plant will be constructed under a joint venture called Pellas del Caroní, which initially be owned

51% by plantmaker Kvaerner and 49% by FMO. The total investment is estimated at US$ 330 million, and construction should start in mid-1999 with start-up in 2002 (METAL BULLETIN, October 29, 1998, p. 20). In the same month, IOC decided to reopen its pellet plan in Sept-Iles, Québec, which has been idle since 1982. The project will require US$ 225 million in investments, and the 4.5 million tons pellet plant is scheduled to start up in mid-2001. This will increase the total pellet capacity at IOC to 17 million tons (METAL BULLETIN, November 2, 1998, p. 29). But, the other large Canadian iron ore mining company, QCM, mothballed its plans to construct a new pelletising plant of 4 million tons capacity. The mill would cost at least US$ 400 million, allowing the IOC's pellet capacity to increase from 9 to 13 million tons (METAL BULLETIN, September 7, 1998, p. 36).

However, in the long run, the pellet market has good perspectives. In fact, the steel industry nowadays uses three technological routes with different requirements of iron ore. The conventional route is called coke integrated, which transforms iron ore (sinter feed or lump) into pig iron in a blast furnace. Then, this material is refined in the steel shop (oxygen converters) and rolled. A second route is called semi-integrated or mini-mills, that use ferrous scrap instead of iron ore. The scrap is directly smeltered in an electric furnace. Direct reduction integrated can be considered a mix of the first two routes: on one hand, it transforms iron ore (pellets or lump) into sponge iron in a direct reduction unit; from another, the steel shop has an electric furnace. Through time, the most important global tendency has been the increasing share of the electric furnace technology, from 16.3% (1970) to 22.0% (1980), 27.5% (1990) and 32.8% (1996). The large majority of mills that use electric furnaces are semi-integrated (almost 90% in volume terms, in 1996), resulting in a negative effect on the demand for iron ore.

The direct reduction integrated mills correspond to only 10-12% of the electric furnace production, but they show a very fast growth in the 90s. World sponge iron (usually termed DRI-HBI) production almost doubled in the six first years of this decade (Chart 5). This trend has an important impact on the iron ore market, because it changes the type of iron ore consumed. In the production of DRI-HBI, it is used only for lumps and pellets, inducing the iron ore mining companies to enhance their product mix.

Chart 5: World Direct Reduction Production, 1990-1997 (million tons)



Source: Midrex Corp.

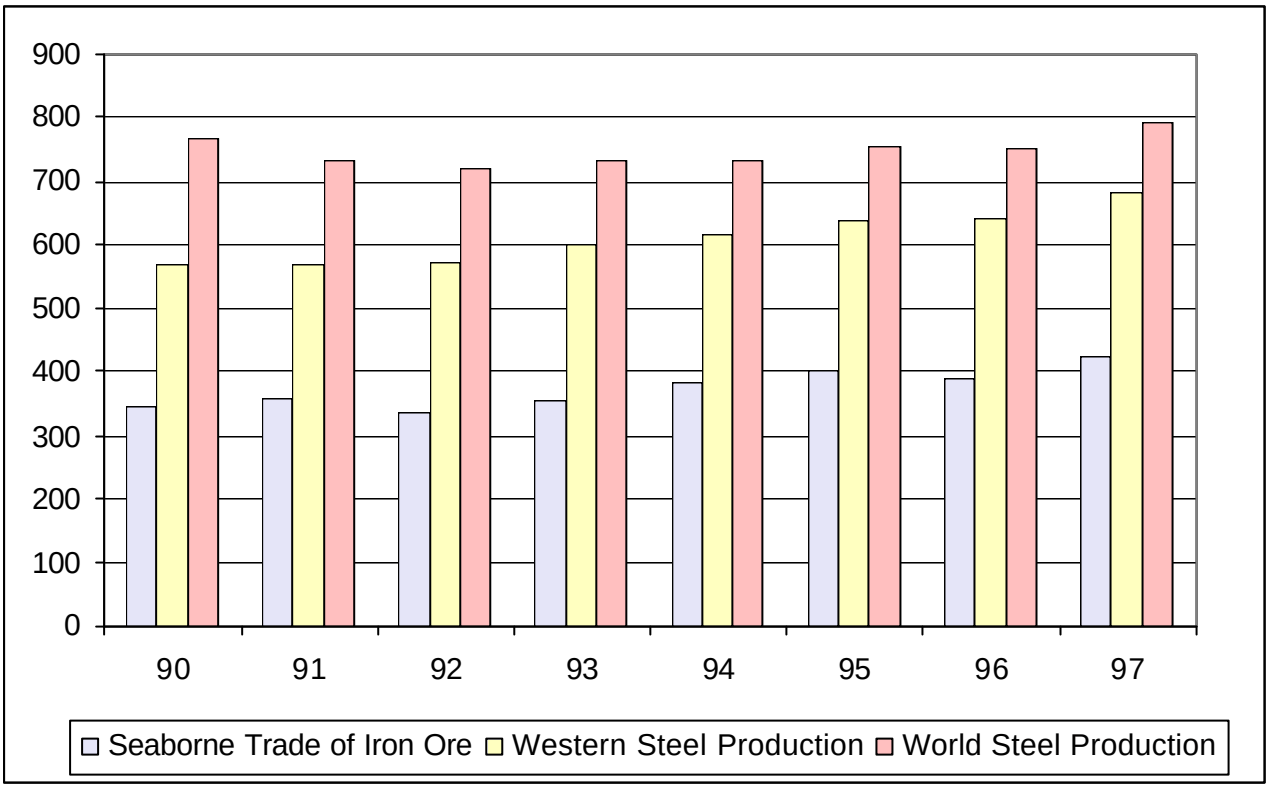
The two other large Brazilian iron ore miners, MBR and Samitri, do not produce pellets directly. Both are investing in increased capacity. The bulk of MBR's investments are in the replacement of old mines. The Tamanduá and Capitão do Mato deposits will be exploited at a low level, with their production being gradually increased, aiming at replacing the reduction of tonnage due to the depletion of Águas Claras and Mutuca Mines expected for the year 2003. In this period, the Capão Xavier Mine will be opened, with operations on a small scale, in order to preserve the mining rights and assure environmental licenses. MBR expects to increase production from 25.8 to 32.0 million tons per year by 2001, which will require US$ 359 million in investments. MBR extracts iron ore in Minas Gerais State and exports the

mineral from its own port on Guaiba Island, in the State of Rio de Janeiro. The distance from the mines to the terminal is 583 kilometres, covered by train. The railway is owned and operated by MRS Logísitca, a company where MBR has a 24% stake and participates in the management (MONTEIRO, 1998).

Samitri is 42% owned by Brazilian steel company Belgo-Mineira, which is controlled by Arbed. This group, as well as Thyssen-Krupp, is among the fifth-largest European steel companies. Samitri extracts iron ore in the State of Minas Gerais State, and uses Vitória-Minas railway and the Port of Tubarão to export it. In 1997, Samitri exported 10,4 million tons of iron ore. In 1997, the company completed a US$ 350 million investment project that expanded its capacity form 11.2 to 14.5 million tons. Now, Samitri is increasing its capacity again to 16.5 million tons with only a US$ 22-million investment by 1999 (ARIAS, 1998).

Obviously, iron ore production and exports are dependent on steel market evolution. Chart 6 shows the evolution of iron ore trans-oceanic trade and world steel production in the 90s. It is clear that world steel production has stayed flat in the 700-800 million tons range annually, although with an important reduction in the first years of the decade. The iron ore seaborne trade, in contrast, shows a tendency towards increasing, with the exceptions of 1992 and 1996. The difference can be explained when the steel production of Russia and other former centralised economies is considered. These countries, usually, consume iron ore from Russia and Ukraine (transported by train and not considered in the seaborne trade) and have experienced a strong steel production reduction. Thus, the western steel production (World – Eastern Europe) is increasing (at 3.1% p.a.) almost the same pace of the iron ore seaborne exports (3.4% p.a.). In the first 10 months of 1998, western steel production was almost the same (0.2% higher) as for the same period in 1997.

Chart 6: Seaborne Trade of Iron Ore and World Steel Production, 1990-1997 (million tons)



Source: CVRD, International Iron and Steel Institute (IISI)

Worldwide iron exports in first half 1998 were higher than in the first half of 1997, but lower than in the second half of 1998. In October 1998, UNCTAD predicted that overall exports for the full year are unlikely to be higher than in 1997, though any drop in volume should be small. Excluded from the Table 3 are exports from Australia, which fell by about 5 million tons in the first half of 1998 (METAL BULLETIN, October 8, 1998, p. 22). Turning to importers, South Korea has shown the most important decrease. In November 1998, POSCO, the second-largest world steel company, announced a further reduction of capacity of 1 million tons.

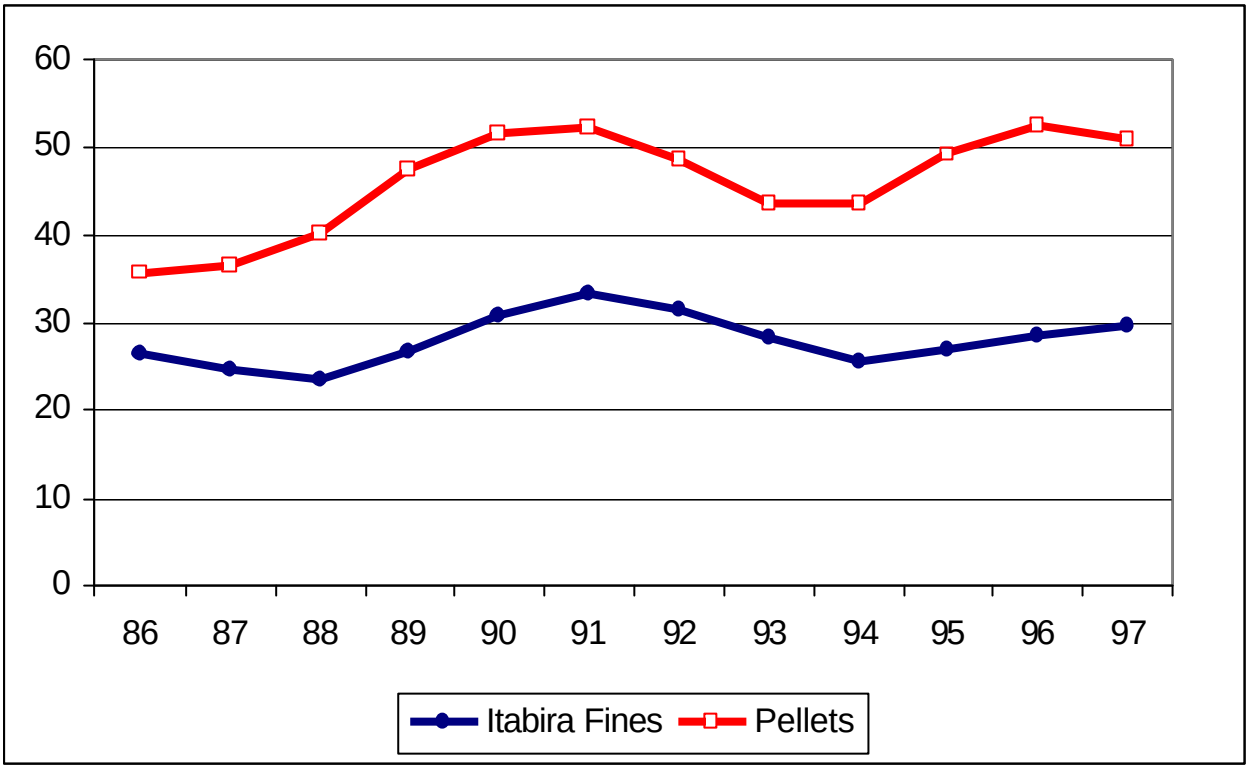
Table 3: Iron Ore Trade Performance, 1997-1998

	First-Half 1997	Second-Half 1997	First-Half 1998	% Change
Exports	108.6	124.1	120.7	11.1
Brazil	67.4	73.0	74.6	10.5
Canada	12.9	19.4	16.1	24.8
South Africa	9.7	11.0	11.3	16.5
Sweden	8.8	9.5	7.7	-12.5
Mauritania	5.6	6.1	5.9	5.4
Venezuela	4.2	5.1	5.1	21.4
Imports	109.0	125.3	107.5	-1.4
Japan	62.4	64.2	61.5	-1.4
China	22.4	32.7	24.5	9.4
South Korea	17.3	21.3	14.3	-17.3
Taiwan	6.9	7.1	7.2	4.3

Source: Unctad Trust Fund Project on Iron Ore Information, Metal Bulletin

Iron ore cannot be considered a commodity. Firstly, the price varies in accordance with the ore's chemical positive (iron content) or negative characteristics (phosphorus, alumina and silica contents). Indeed, prices are quoted in the unit c/u, US cents per iron unit, which is synonymous with dollars per ton pure iron (Fe). Secondly, prices are set on a yearly basis, even for contracts longer than one year, and are most often negotiated directly between buyer and seller. The benchmark level in price negotiations is usually set by the major market players; either between Australian iron ore producers and the Japanese steel industry, or between Brazilian producers and German steelmakers. Negotiations start in November, both in Europe and Asia, culminating in January with a price settlement. In January 1998, although CVRD was bidding for a 7% average increase and the iron market was robust, the setting price increased only 2.82% for fines and 2.94% for lump ore. However, pellet prices declined by 2.7% (Chart 7). For the next negotiations, it is expected that the iron ore prices will suffer a strong decrease of between 8-10%.

Chart 7: CVRD Iron Ore Prices in European Market, 1986-1997



Source: Metal Bulletin

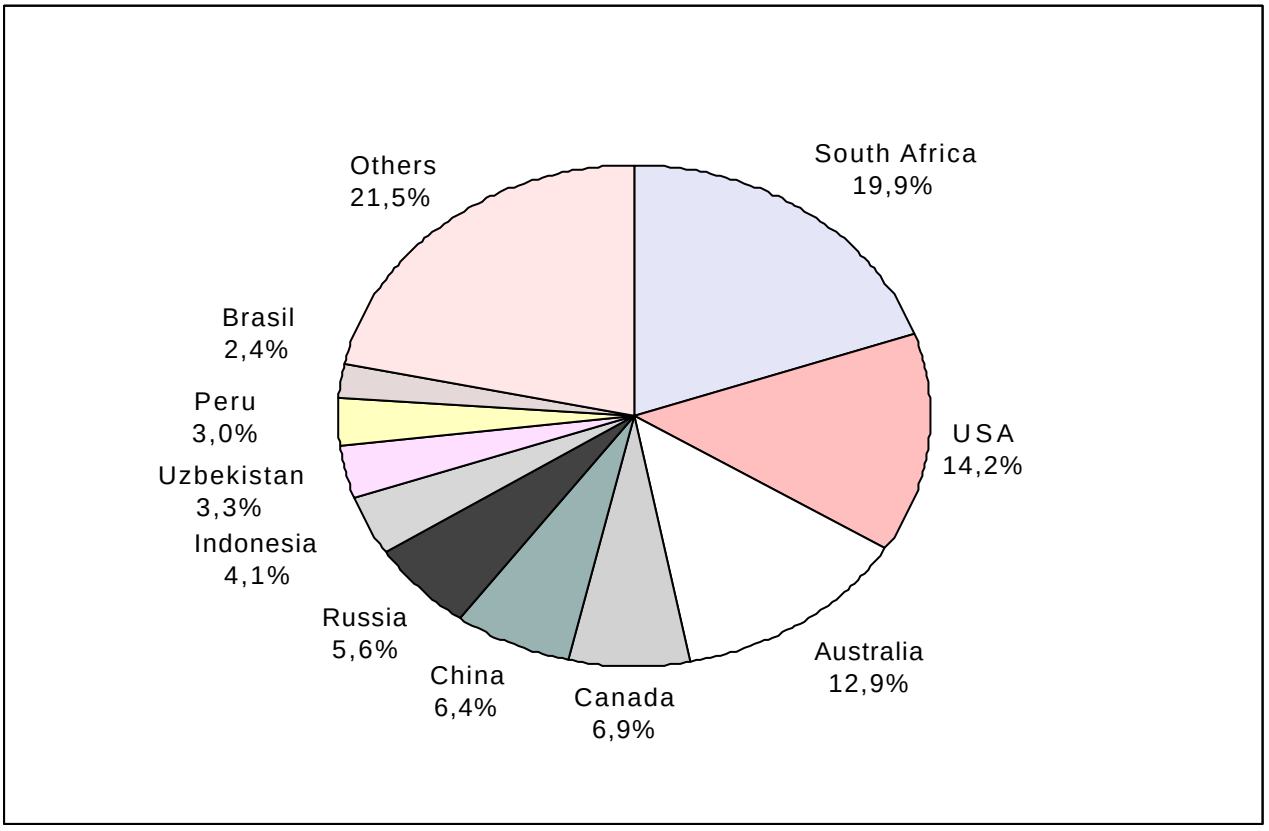
Note: cents for long ton Fe unit FOB

It is important to differentiate the perspectives for the Brazilian iron ore mining between two periods. In the short run, it can be expected that there will be a strong decrease in price, covering the entire 1999 year, because the price is set once per year. In the case of pellets, the situation may be worse, for two reasons: a) the price has already declined at the beginning of 1998; b) there have been important increases in world capacity, especially due to two new Brazilian pelletising plants. In the long run, Brazilian mines will continue to hold their share in this market and probably can improve it. The companies are investing in new mines, one new port and increasing capacity. Indeed, it is expected that in the next decade, Brasil and Australia will control jointly 70% of the iron ore seaborne market.

2. Gold

In 1997, world gold production totalled 2,464 tons, representing an increase of 8.8% in comparison with the previous year. South Africa produced 489 tons, corresponding to 19.9% of the world production (Chart 8). Other important countries are USA (14.2%), Australia (12.9%), Canada (6.9%), China (6.4%) and Russia (5.6%). In Latin America, Brazil is the second-largest producer, just behind Peru. De-centralisation is the most important trend in world gold mining. In the period 1900-1970, South Africa and the Soviet Union, to an extent, controlled the industry, because they jointly exceeded 80% of the world production. Since the beginning of the 1970s, the share of South African mines has been reducing, from 61.1% in 1970 to 49.5% in 1980 and 28.4 in 1990 (ANDRADE *et al,* 1996). Other countries, like USA, Australia and Canada, have increased their shares at the same time, jumping from 11.1% in 1970 to 33.0% in 1990.

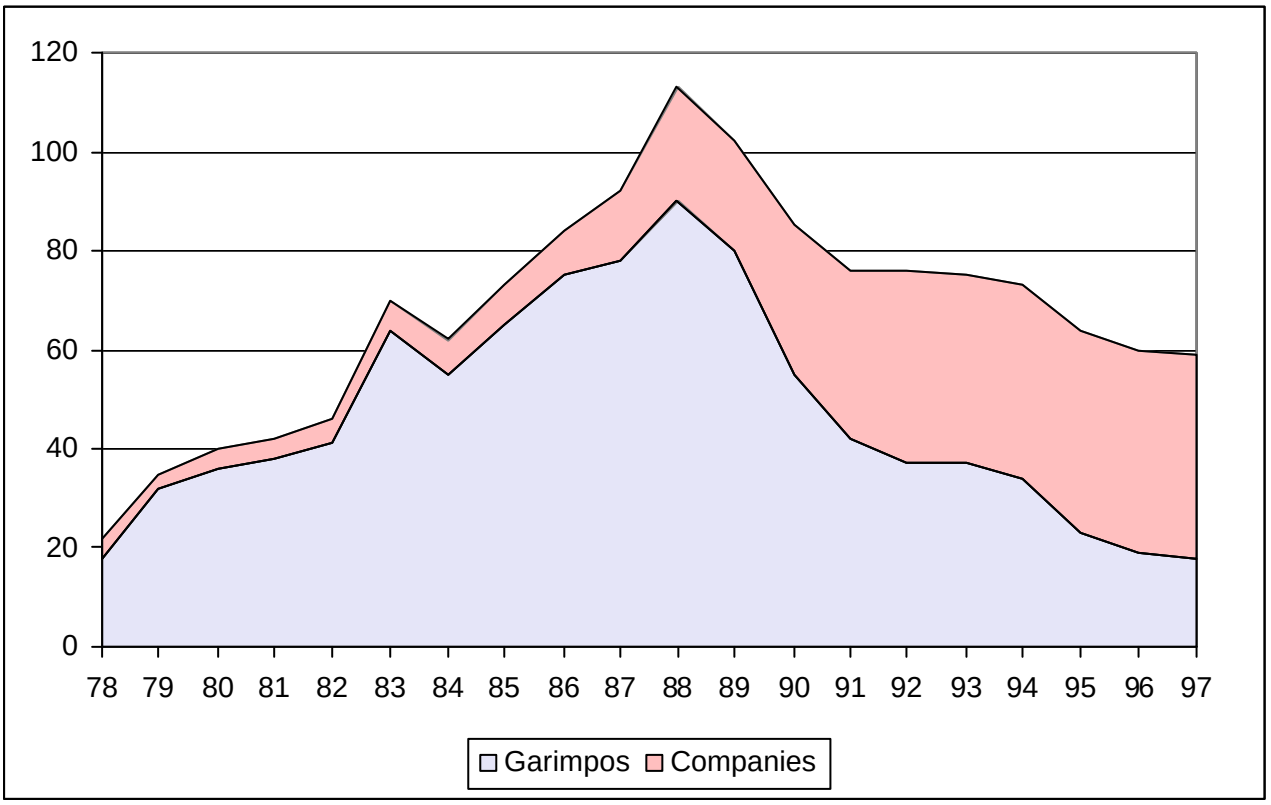
Chart 8: Percentage shares of the world gold production, 1997



Source: Maron (1998)

Brazilian gold production experienced a strong increase during the 1980s, when it rose from 40 tons in 1980 to 113 tons in 1988 (Chart 9). In that year, Brazil was the sixth-largest gold producer in the world. But, this development was radically different from other countries because it was based on “garimpeiros” (independent miners), who exploited surface deposits, mainly in the Northern States (Pará and Mato Grosso). Industrial production also had significant growth during the 1980s, but its shares were not so great. In 1988, the year of highest production, industrial production corresponded to only 20.4% of Brazilian production. Since 1989, official production coming from “garimpeiros” reduced enormously, falling from 90 tons in 1988 to 19 tons in 1996. The exhaustion of important deposits, environmental pressures and low prices are usually mentioned to explain the failure of “garimpeiros”.

Chart 9: Brazilian gold production, 1978-1997 (tons)



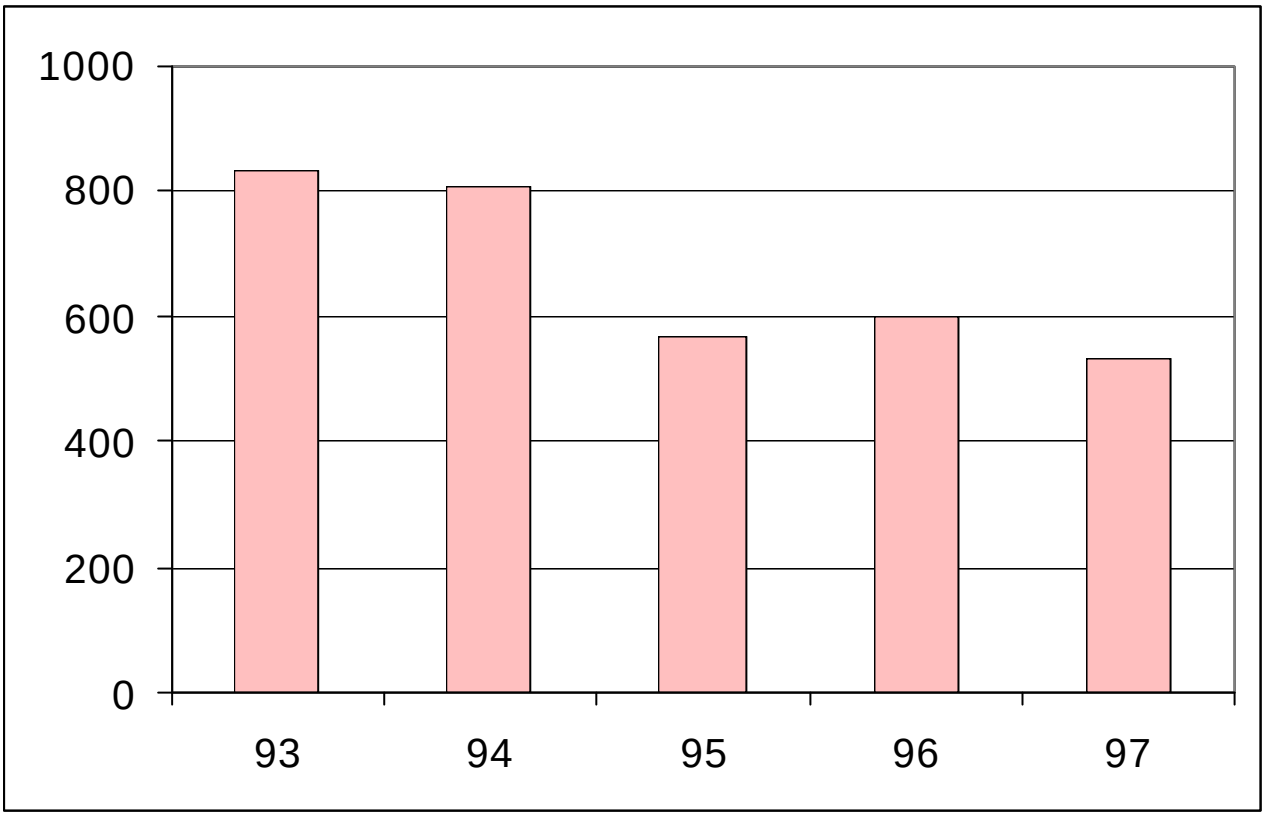
Source: Andrade *et al* (1996), Maron (1998)

Brazil produced 58.5 tons of gold in 1997, 70.1% by companies and 29.8% by “garimpeiros”. There is a small decrease in the total production (2.5%), caused solely by the negative performance of the “garimpeiros” as industrial production was maintained at almost the same level. CVRD, the largest gold producer in Brazil, produced 17.961 tons in 1997. The other important gold miners belong or are associated with multinational companies. Anglo-American controls Morro Velho and Jacobina that produced 9.934 tons in 1997. Rio Paracatu is a joint venture between Rio Tinto and TVZ and produced 4.969 tons. Serra Grande is another joint venture (Anglo-American and TVZ) with 4.223 tons produced in 1997. São Bento is controlled by Amira Trading and Gencor and had a production of 2.999 tons in the same year. Together, these companies correspond to 98% of Brazilian industrial gold production (MARON, 1998).

Investment in gold exploration was US$ 120 million in 1997 and is expected to fall to some US$ 90 million in 1998. An output reduction to 56.35 tons is expected this year, implying a drop to 12th from 10th place in the league of world gold producers. According to Anoro, the Brazilian national gold and exchange council, these figures may decline further in 1999. This tendency of declining production has a strong correlation with “garimpeiro” activities. In 1998, they will produce just 14 tons, down from 19 tons in 1997 and 23 tons in 1996. This year’s fall is attributable to extremely dry weather in the Amazon region where many “garimpos” are located. A further drop in “garimpeiro” output to 12 tons is expected for 1999, although this is seen rising to 15 tons from year 2.000 (METAL BULLETIN, October 8, 1998, p. 11).

As consequence of the gold production decline in Brazil, exports will also show a decreasing trend (Chart 10). In the last five years, Brazilian gold exports reduced from US$ 832 million in 1993 to US$ 536 million in 1997. It seems that there is little chance to reverse this tendency. Most likely, exports will stabilise at around US$ 500-600 million per year. CVRD, for example, has discarded its plan to produce 31 tons per year by early next decade. And according to Anoro, Brazil’s gold production is unlikely to exceed 60 tons per year from now until 2.005 (METAL BULLETIN, October 8, 1998, p. 11).

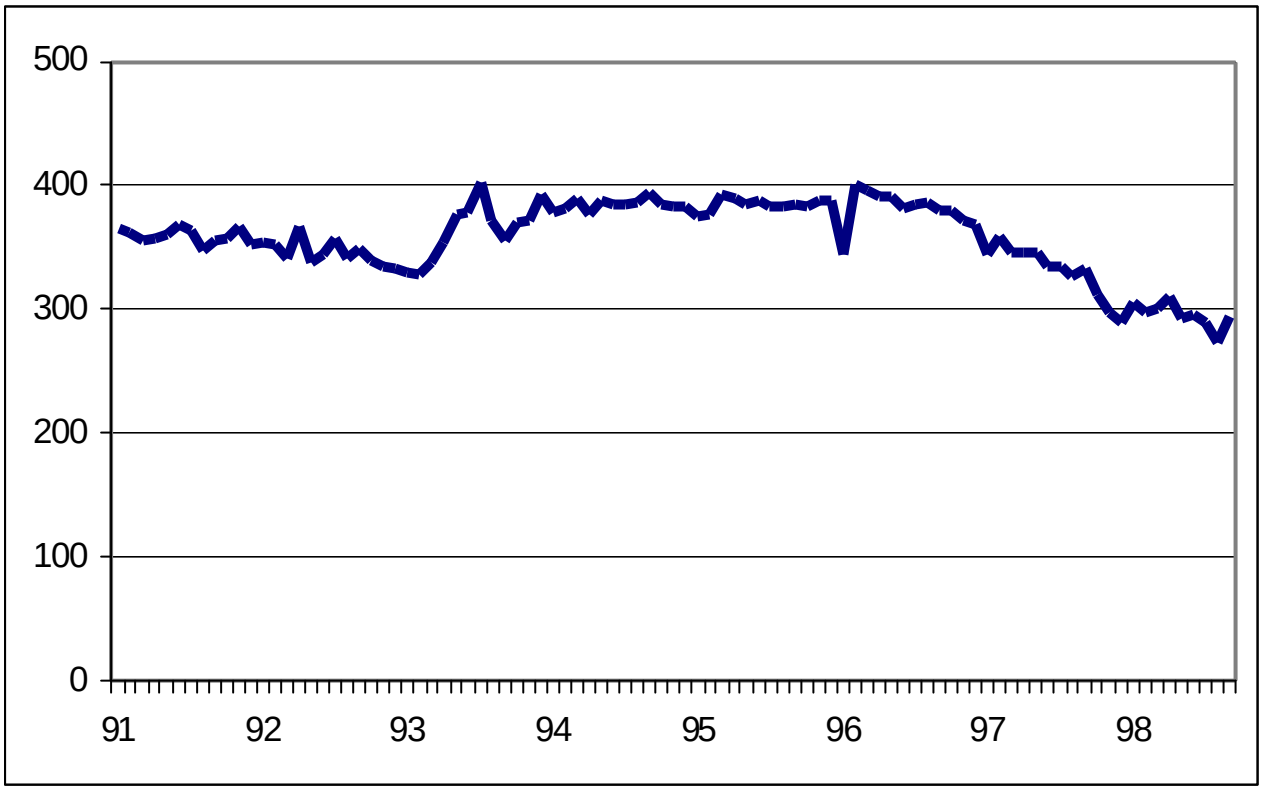
Chart 10: Brazilian gold exports, 1993-1997 (US$ million)



Source: Maron (1998), DNPM

Another negative impact on Brazilian gold exports is the metal's price in the international market. Indeed, since the record average price reached in 1980 (US$ 1,103 per oz), there has been a continuous devaluation process, with the price reaching in 1990 an average of US$ 435 per oz. In the period 1991-1996, the gold price fluctuated between US$ 328-402 per oz, with a US$ 370 per oz in average. On the last day of December 1997, the price was US$ 290 per oz and in August 1997, it reached US$ 273 per oz (Chart 11). Naturally, this trajectory tends to depress Brazilian and other countries' exports and serves also as a de-stimulating factor from the point of view of production increases. In the short run, a decrease in the international price combined with the stabilisation of production will result in a reduction of Brazilian gold exports (in financial terms).

Chart 11: Gold international market prices (US$/oz, last day of month), 1991-Sept. 1998



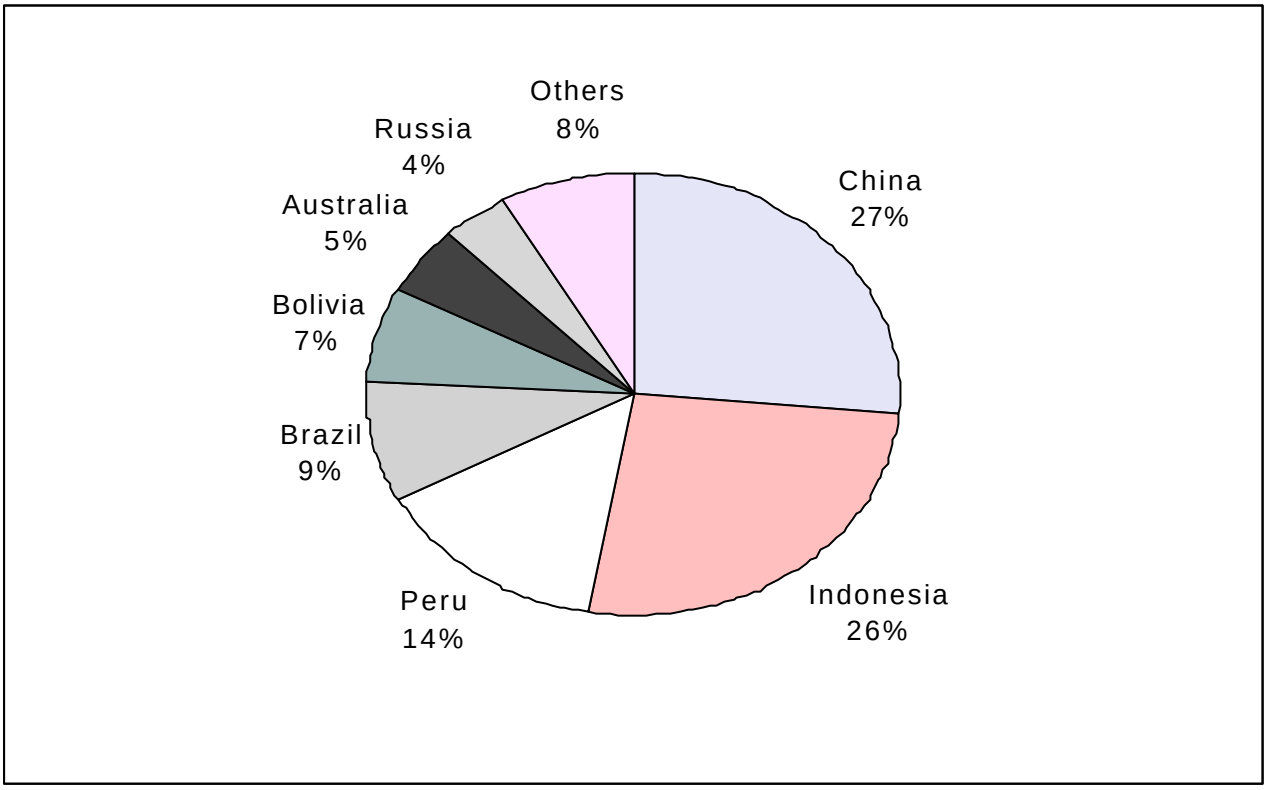
Source: Financial Times

3. Tin

In 1997, world tin production reached 209 thousand tons of tin contained. This number represents a decrease of 4.5% in comparison with the previous year. The top five producers are China, Indonesia, Peru, Brazil and Bolivia, which together are responsible for 83% of the world tin production (Chart 12). China's tin industry seems to have an instinct for increasing production. In the early 1980s, China produced around 17,000 tons per year of tin. When the figure doubled in the beginning of the 1990s, the government decided to put a halt to its expansion. But, in 1993, tin production jumped by 31.5% over the previous year and surpassed the 50,000 tons barrier. In 1996, Chinese production was almost 70,000 tons, decreasing to 55,000 tons last year. It is important to stress two disadvantages of Chinese tin

mining over that of other competitors. Firstly, its ore reserves lie mainly in underground veins rather than open deposits. Secondly, its ore has a low tin content (0,7%) and a much higher content of lead that is difficult to remove (XIAOMING, 1997).

Chart 12: Percentage shares of the world tin production, 1997



Source: Rodrigues (1998)

Indonesia produces tin mainly from alluvial deposits and the country's major reserves are located in the offshore areas of Bangka Island. Commercial exploitation of tin resources began on Bangka Island in the eighteenth century, but the introduction of large dredging operations in the early part of this century established Indonesia as a major efficient low cost producer. Malaysia used to be an extremely important tin producer. However, in view of the low world price, it became uneconomic to produce tin in its typical small mining units (ITRI Internet Printout). In 1997, Malaysia produced only 5,100 tons of tin contained, against 60,000 tons in 1964, when it was the largest world producer with a 42.0% market share. In fact, Malaysia has become a very important tin ore and concentrate importer, these products being

used to produce refined tin. In 1996, Malaysia imported 32,347 tons of tin ore and concentrate (54.2% of the total world) and exports 34,342 tons of refined tin. The imports totalled US$ 169,3 million and the exports US$ 211,8 million (UNCTAD, 1997).

Until 1991, Peruvian tin production was limited to 6,500 tons per year. In 1992, the figure increased to 10,000 tons, in 1994 to 20,275 tons and, finally, in 1997, to 30,200. Tin mining in Peru is concentrated on Minsur, which is the second-largest tin mining company in the western world. The company's operations consist of the San Rafael mine (considered the richest tin mine in the world, with 5% tin ore grade) and the Funsur smelter, which began refined tin production in September 1996. Now, Minsur is investing US$ 30 million to expand San Rafael's output rates 80% by 1999 and Funsur capacity from 15,000 to 20,000 tons by 1998 (ARIAS, 1998). Another important Latin American producer is Bolivia, which has been a significant producer for some years and many of its mines have been producing for over 50 years. Over 95% of tin production is derived form hard rock deposits, almost all of which is exploited by underground exploration (ITRI Internet Printout).

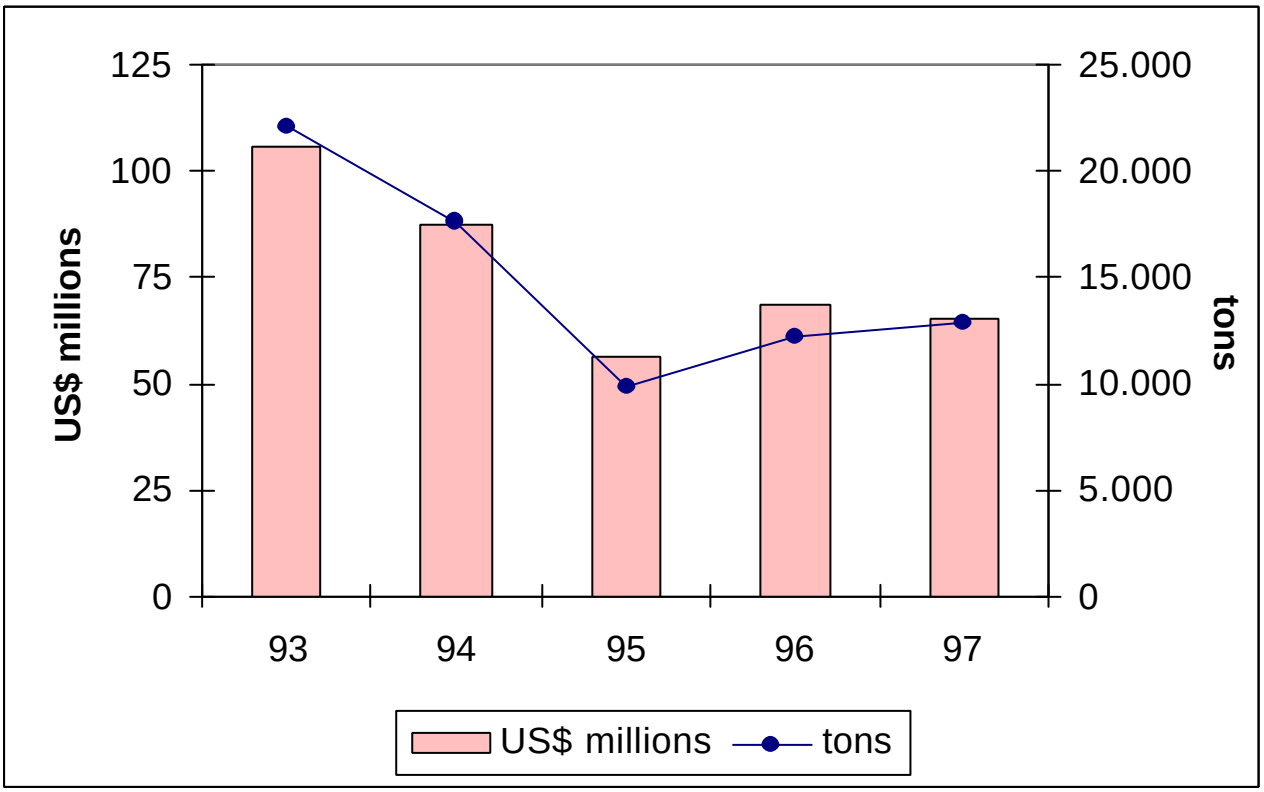
The tin market has been regulated by a series of international agreements for several decades. The main objective was to reduce the price fluctuations induced by the business cycles. In October 1982, another International Tin Agreement was signed. The high prices maintained by the Agreement encouraged non-members to expand supply. The output of Brazil, a non-member, rose from 6,900 tons in 1980 to 26,500 tons in 1985 (RADETZKI, 1990). At that time, Brazil became the second largest producer, just behind Malaysia. In 1989, Brazilian production reached 50,232 tons, enlarging its share to 21.5%, and became the largest world producer. In 1997, Brazil produced 18,291 tons of tin contained, which represented only 8.95% of the total world. In the near future, it is expected that the share will continue to reduce, as a consequence of the increasing production of other countries (especially Peru) and a small decrease in Brazilian production. According to RODRIGUES (1998), Brazilian production will tend to stay at the 17,000-ton level, until the end of the century. Yet, in the first half of 1998, tin contained output reached 7,236 tonnes, down 16.3% on the same period in 1997 (METAL BULLETIN, September 17, 1998, p.3)

Brazilian tin mining is concentrated only in two northern states: Amazonas (64% of the total production) and Rondonia (36%). In Amazonas, Paranapanema operates the Pitinga mine, for which current alluvial cassiterite deposits have an expected productive life of just 4 more

years. For this reason, Paranapanema is working on the final stages of a feasibility study into a hard rock tin mining in Pitinga (METAL BULLETIN, September 14, 1998, p. 9). This project will demand an investment of US$ 100-150 million, to maintain the mine's tin contained production at 13,000 tons per year, but it is necessary if the firm decides to continue producing tin (it also works with copper and zinc). The Bom Futuro mine is operated by Ebesa, which is controlled by Paranapanema, and two other tin producers (Cesbra and Best).

As direct consequence of the negative evolution of production, Brazilian tin exports show a strong decrease for the last five years (Chart 13). In the last two years, Brazil exported 12,600 tons of tin on average, corresponding to US$ 66,500 annually. The export / production ratio is around 70%, but it is expected to decrease more intensely than total production. It is probable that the Brazilian exports will repeat the 1993 performance, when the country exported 9,900 tons (US$ 56.6 million). Brazilian tin imports are trivial, being usually less than US$ 2 million per year.

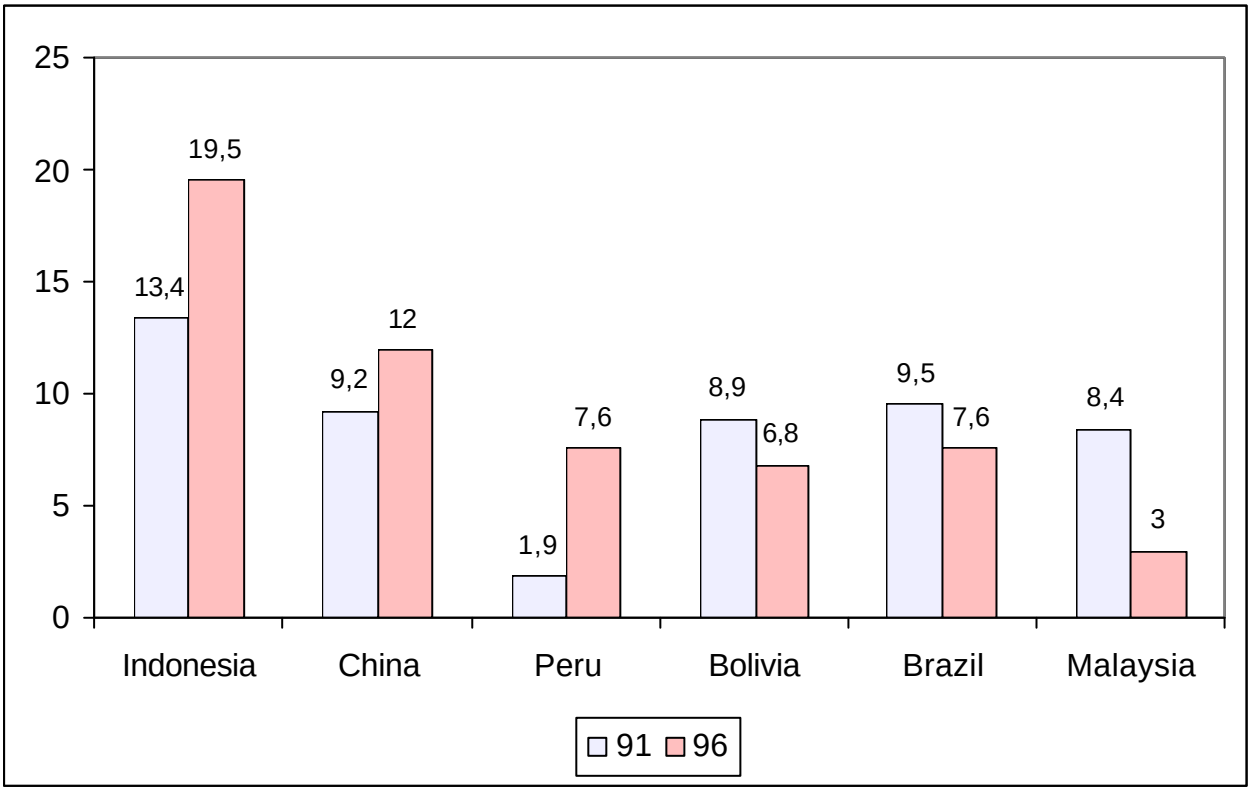
Chart 13: Brazilian tin exports, 1993-1997



Source: Rodrigues (1998), DNPM

There are two main types of export tin products: tin ore and concentrates and refined tin. Some countries, like United States, are important exporters of refined tin, although they do not produce tin ore. For this reason, the share in the international tin market has been calculated using net exports (in financial terms) and is shown in Chart 14. In the period 1991-1996, Indonesia, China and Peru increased significantly their share in the international market. Bolivia, Brazil and Malaysia, in contrast, lost part of their share. In the specific case of Brazil, the market share fell from 9.5% in 1991 to 7.6% in 1996.

Chart 14: Share in tin international market (net exports in financial terms), 1991-1996



Source: UNCTAD (1997)

As is easily observed in Chart 13, there is a strong correlation between Brazilian tin exports in volume (tonnage) and in financial terms. Tin is one traditional metal traded in important exchange houses, mainly at the London Metal Exchange (LME), in New York and in Kuala

Lumpur. The tin market has a long history of manipulation and panics, with at least two important crises, in the 1910s and in 1985. In the first half of 1980s, there was a strong increase in LME tin prices, with prices reaching up to US$ 9,475 per ton. In October 1985, the Tin International Agreement buffer stock manager's resources bankrupted, leaving behind a total debt far in excess of US$ 1 billion. Tin trade on the LME was suspended, and when free market transactions reopened in the spring of 1986, the prices quoted were about 60% below those that prevailed before the crisis (RADETZKI, 1990). In period 1991-1996, the prices fluctuated between US$ 4,400 per ton (in August 1993) and US$ 7,110 per ton (in June 1992), with a US$ 5,767 per ton in average. In 1997, the maximum price was US$ 5,810 and the minimum was US$ 5,347. On the last day of September 1998, the price was US$ 5,352 (Chart 15). Although tin's international price has shown a decreasing tendency, probably the Asian crisis has affected this market less strongly than is the case for other metals. In the mid-October 1998, analysts forecast that prices are likely to consolidate at around US$ 5.400 per ton (METAL BULLETIN, October 19, 1998, p. 11).

Chart 15: Tin international market prices (US$/ton, last day of the month), 1991-Sept.1998

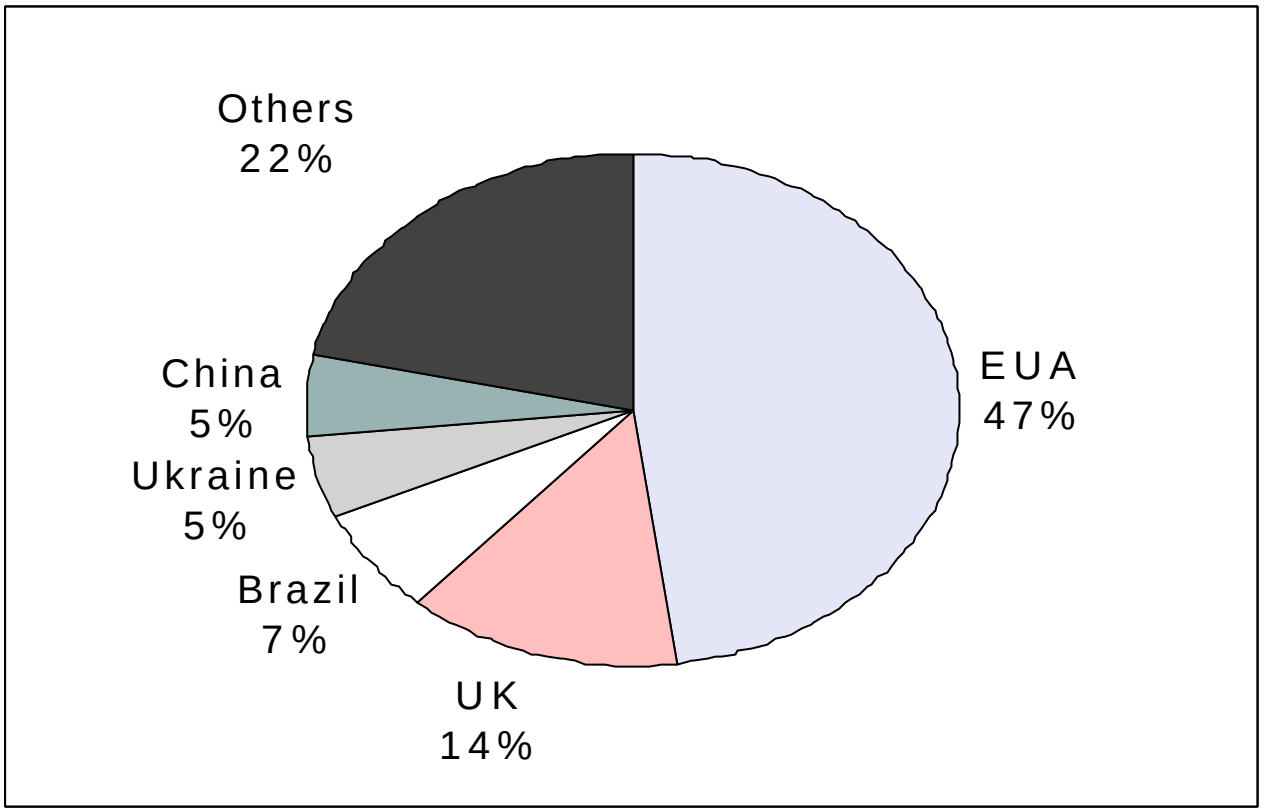
Source: Financial Times

In conclusion, it can be expected that there will be a decline in Brazilian tin exports, for two reasons. First, production will tend to reduce in next years, as a consequence of exhaustion of the main mine. The largest tin company in Brazil needs to invest more than US$ 100 million in the development of new mines. Second, Peru mining is increasing capacity with a small investment in its richest mine, improving its competitiveness. Third and last, the international price trend is negative, reducing the turnover per ton sold.

4. Kaolin

World kaolin production increased from 13 million tons in 1971 to 22.8 million tons in 1994 then reduced to 19.2 million tons in 1997. The market structure is extremely concentrated, because only five countries control 78% of the world supply (Chart 16). The largest producer is United States, with 9.18 million tons in 1997 (almost 48% of the world production). North-American kaolin production is concentrated in the State of Georgia. Producers in this state have one strong disadvantage: the cost of transportation amounts to approximately US$ 35.00 per ton from the inner area of the State to the closest port (MORFIN & CARVALHO, 1998). The second largest producer is United Kingdom with 2.6 million tons. Brazil, Ukraine and China produce around 1.0 million tons of kaolin per year.

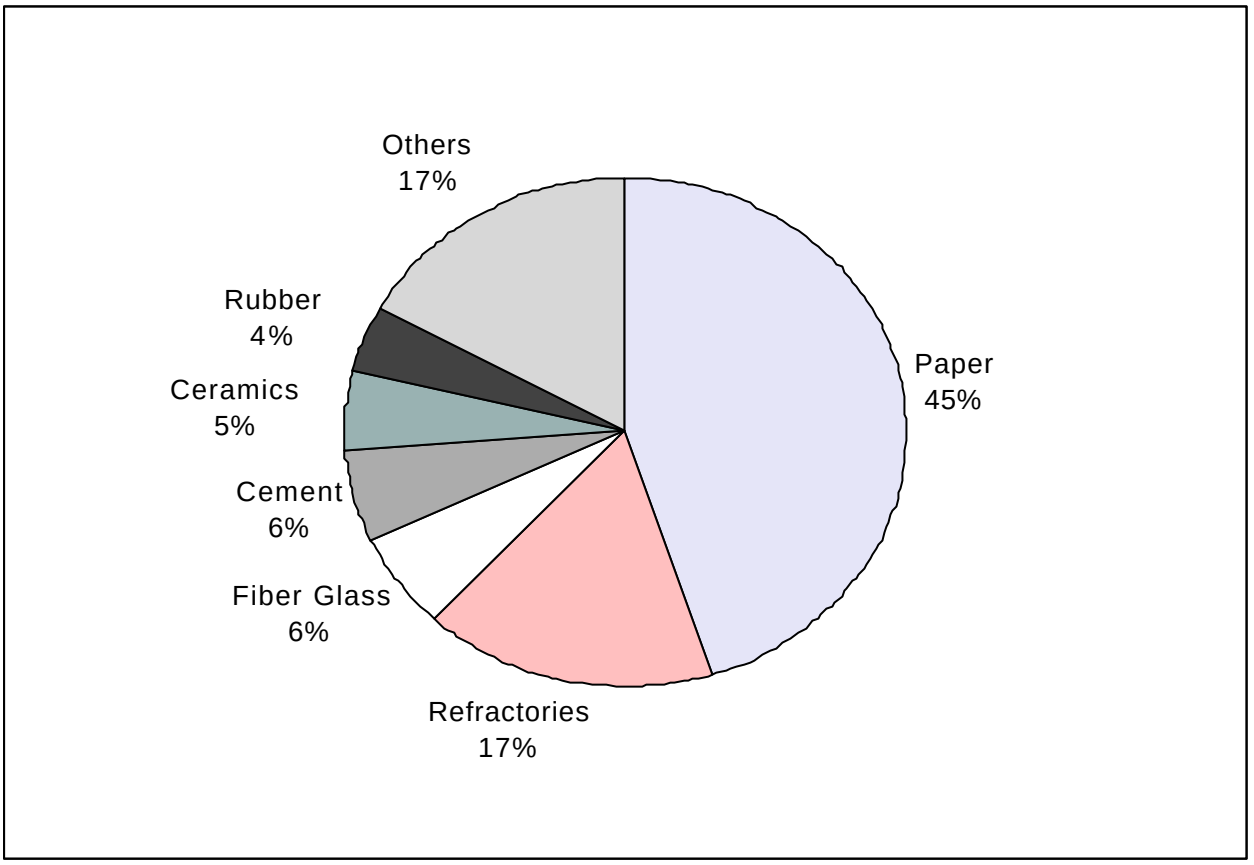
Chart 16: Percentage shares of world kaolin production by country, 1997



Source: Silva (1998)

China, the pure white porcelain used by the Chinese, was discovered many thousands of years ago and has always been a very prized material. But the modern history of kaolin, or china clay, started in 1746, when it was discovered in England. The first use of kaolin was to produce porcelain. In 1810s, kaolin became to be used in paper manufacture and since mid-19th Century the paper industry has been the principal consumer of this mineral. Nowadays, the main end uses of kaolin are paper, refractories, fibreglass, cement, ceramics and rubber (Chart 17).

Chart 17: Kaolin end uses

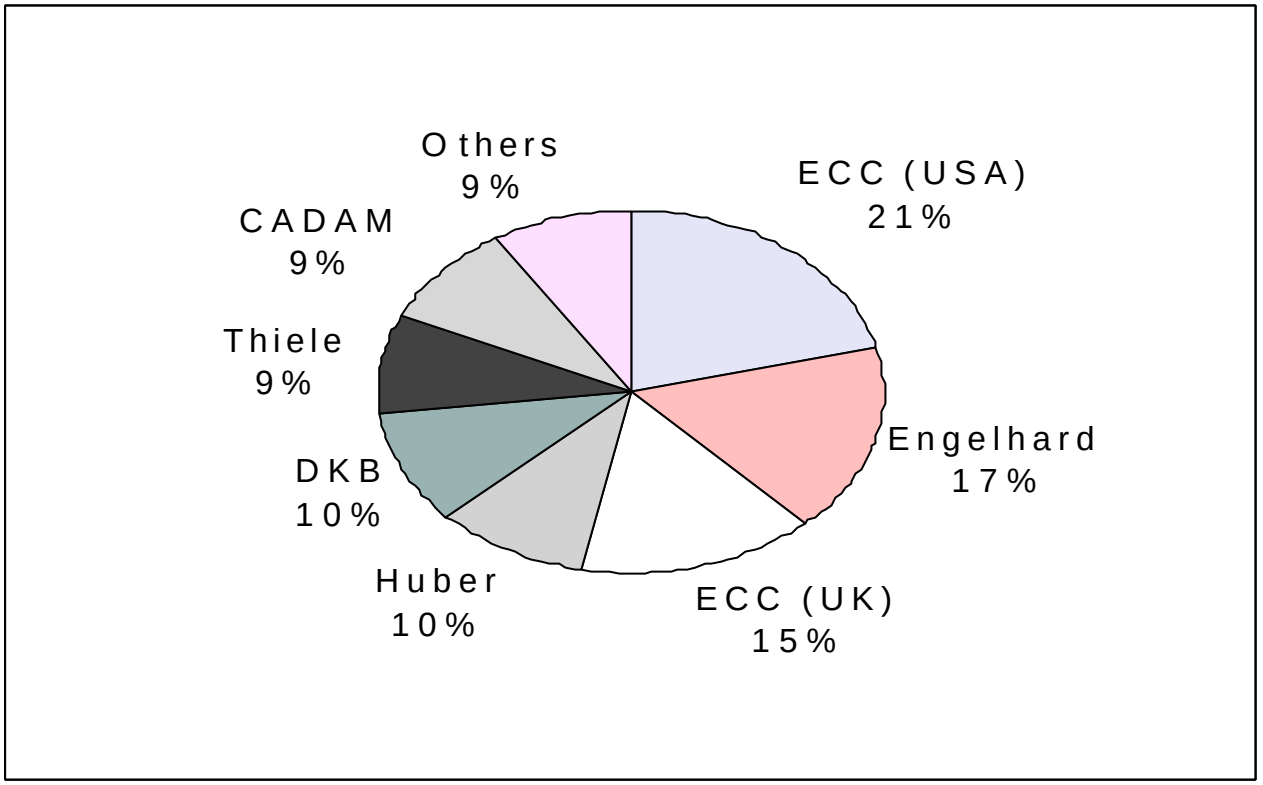


Source: Gomes *et al* (1997)

According to MONTEIRO (1988, p. 29): *"Kaolin consumption is strongly correlated to the performance of the paper industry. Kaolin used by the paper industry is divided in two groups: kaolin for 'coating' and kaolin for 'filler'. The first type is a premium kaolin, since its quality is based on high whiteness, low viscosity, particle size distribution and particle morphology (needle-like particles). Kaolin 'coating' is a raw material for high quality paper. Kaolin used as 'filler' does not require the same stringent whiteness and particle morphology specifications. Most importantly, kaolin 'filler' has been losing market share to substitutes such as 'precipitated, calcium carbonate' (PCC) or 'ground calcium carbonate' (GCC)."* The same author also estimated that in 1997 the kaolin market for paper applications was 11 million tons, of which 7.2 million tons was coating kaolin. This market is

also too concentrated, because 7 companies hold 91% of the world market (Chart 18). Among these companies, Caulim da Amazônia S.A. (CADAM) is a Brazilian one.

Chart 18: Percentage shares of the world coating kaolin production, by company, 1997



Source: Monteiro (1998)

The largest coating kaolin mining company is English China Clay (ECC), with a market share of 36%. It was formed, in 1919, by the merger of three companies: West of England China Clay Co., Martyn Brothers and North Cornwall China Clays. In 1932, ECC acquired its major competitors in UK, John Lovering and H.D. Pochin. In 1956, it bought its first US kaolin production unit at Sandersville, Georgia; and in 1990, it acquired Georgia Kaolin. Finally, in 1993, ECC was split into two geographic businesses, ECC International (Europe, Africa and the Middle East) and ECC International AmPac (North and South America, Asia and the Pacific Rim). The other largest kaolin mining companies, Engelhard, J.M. Huber, Dry Branch Kaolin (DBK) and Thiele, are all North Americans. These four companies and ECC International are members of the China Clay Producers Associations (CCPA). The CCPA's

aggregate financial results were a loss of US$ 45 million in 1996 and a profit of US$ 74 million in 1997.

The Brazilian kaolin industry can be divided into two groups: export-led large projects in the northern states and inward-orientated medium projects in the Southeast region. CADAM, the largest kaolin mining company in Brazil, was acquired by CAEMI in 1991. It has an installed capacity of 750,000 tons per year in its operations located on the Jari River, on the border between the States of Pará and Amapá (close to Guiana). It produced 633,000 tons of kaolin in 1995 and 710,000 tons in 1997. In 1996, two new projects in the northern states started their operations: Pará Pigmentos and Rio Capim Caulim, both at the Capim River deposits, approximately 140 km south of Belém. In spite of the fact that this deposit was discovered in 1974, logistical (lack of infrastructure) and political reasons, and the abundance of US reserves, made development by US kaolin companies unattractive at that time (ATHERTON, 1997).

Pará Pigmentos is a joint venture with CADAM, which holds 40% of the voting capital, CVRD (40%) and Mitsubishi group (20%). The IFC also has a small participation in the company (9% of total capital). Pará Pigmentos has a nominal capacity of 300,000 tons, and in its first phase consumed US$ 140 million in investments. It entered in operation in July 1996, but experienced a longer than expected delay in reaching full capacity. It produced 35,000 tons in 1996 and 93,000 tons in 1997, expecting to reach its full capacity only in 1999. The ultimate objective is to reach an international scale of 600,000 tons, which might occur in 2001; however, this would demand US$ 40 million of additional investments (MORFIN & CARVALHO, 1998).

Rio Capim Caulim also has an installed capacity of 300,000 tons per year. Mendes Júnior Industrial group originally controlled the project, but it was shelved until 1989. When Mendes Júnior decided to go ahead with the kaolin project, it looked for partners. Today, Mendes Júnior holds only 17% of the project, and the others shareholders are: Amberger Kaolinwerke Eduard Kick of Germany (AKW, 34%), Dry Branch Kaolin of United States of America (witch belongs to Imetal of France, 44%) and Sumitomo Corporation of Japan (5%). The first shipment of processed kaolin was delivered to Europe in September of 1996 (MEADOWS, 1997). In 1996, Rio Capim Caulim produced 47,000 tons (SILVA, 1998). So, these two new

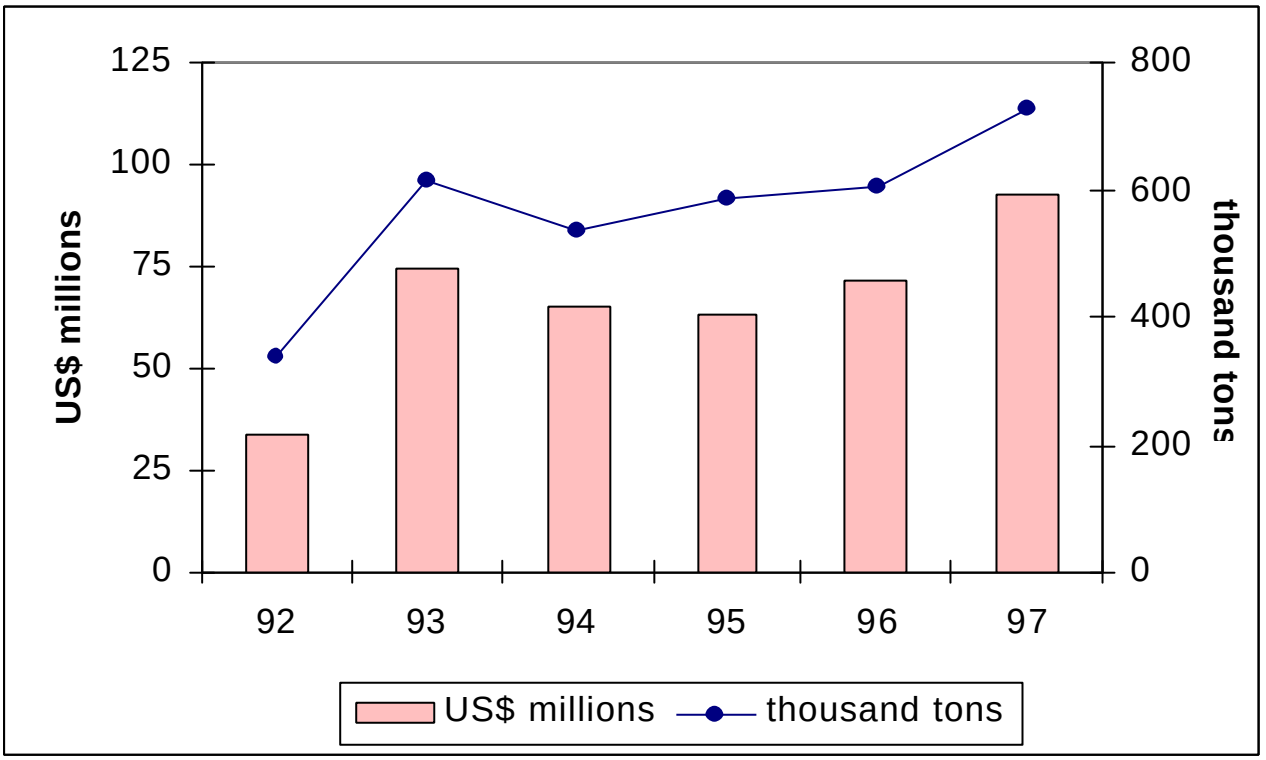
projects are in their initial phase, and will probably increase Brazilian kaolin production until the beginning of the new decade.

Until 1995, CADAM was responsible for 98% of the Brazilian kaolin exports, because the other producers are directed towards the domestic market. Another important difference between northern and southern production is that the former produces coating kaolin and the latter mainly filler kaolin. In 1995, ECC do Brasil and Mineração Horli, both at Sao Paulo State, produced together 247 thousand tons. And Empresa de Caulim and Mineração Caolinita, both in Minas Gerais State, jointly produced 102 thousand tons (GOMES *et al,* 1997).

Kaolin is not a commodity and demands high technical assistance for its consumers. CADAM, for example, operates a slurrying station in Antwerp and a technical assistance centre in Woerden, in The Netherlands. Thiele Kaolin operates specialised paper coating laboratories in Sandersville, Georgia and in Helsingborg, Sweden. For this reason, the sector can expect low price volatility for its products. In Brazil, the price usually fluctuates between US$ 82–120 per ton (GOMES *et al,* 1997). According to CCPA, the price of Calcined Clay dropped 27% in period 1987-1996, Coating Clay n. 1 dropped 4.5%, and High Brighting Coating Clay remained at 1987 prices. Of eight clay grades, only Regular Filler Clay made gains (3.6%) during the ten-year period (CCPA Internet Printout).

As could be expected, Brazilian kaolin exports have experienced an important increase in the last six years (Chart 19). In 1993, Brazil exported US$ 33.5 million for 335,000 tons of kaolin. Last year, these figures were US$ 92.5 million and 769,200 tons, respectively. However, Brazilian imports of kaolin are growing fast, passing from US$ 3.8 million in 1995 to 11.3 million in 1997.

Chart 19: Brazilian kaolin exports, 1993-1997

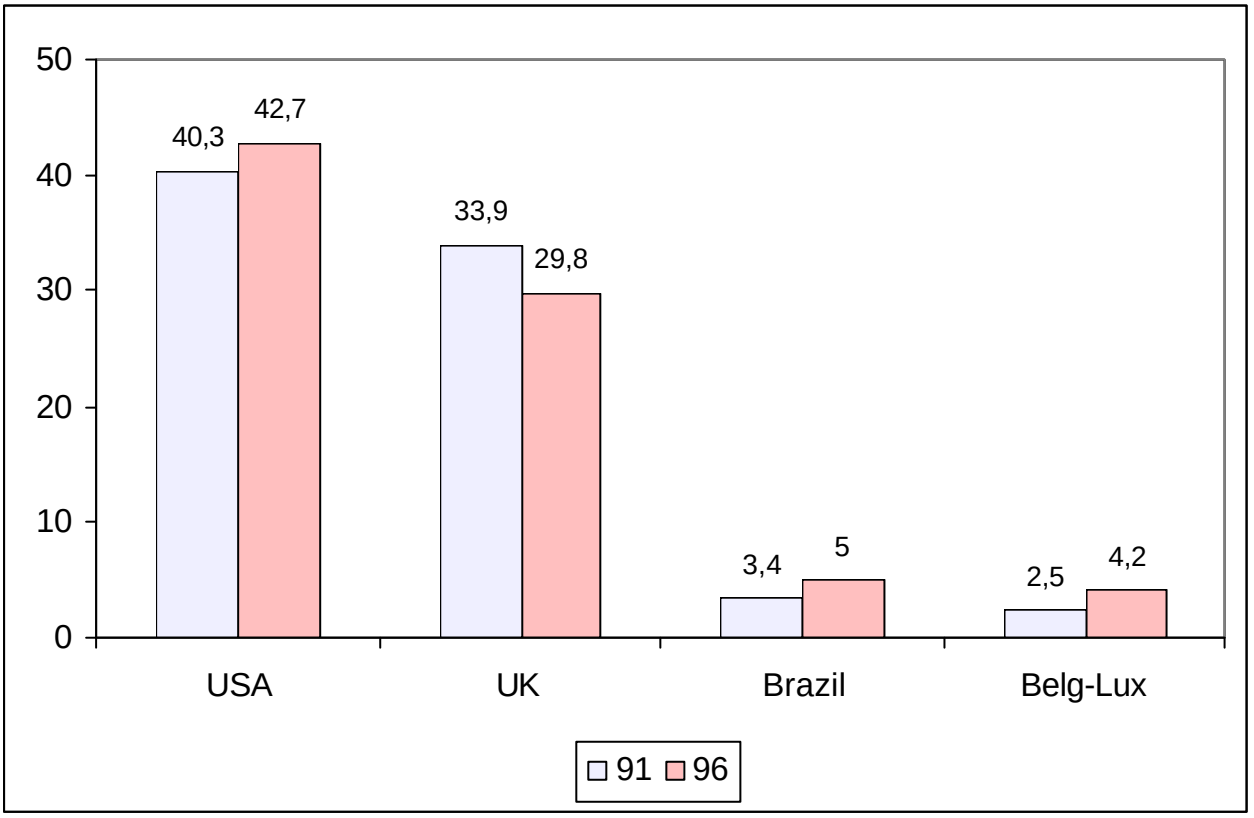


Source: Silva (1998), Gomes *et al* (1997), DNPM

As a consequence of increasing production and exports in a mature and stagnant market, the Brazilian market share rose significantly in the period 1991-1996 (Chart 20). According to UNCTAD's data, the share held by the Brazilian companies in the kaolin world market jumped from 3.4% in 1991 to 5.0% in 1996, in financial terms. In summary, there is a high probability that Brazil will continue to increase its share in the international kaolin market. The main

reason for this is that, until the beginning of the next decade, Pará Pigmentos and Rio Capim Caulim should reach their nominal capacity and exports should increase by the same quantity.

Chart 20: Country share in the international kaolin market (financial terms), 1991-1996



Source: UNCTAD (1997)

Concluding Remarks

The aim of this paper has been to discuss recent trends in Brazilian mineral exports as well as their future perspectives. As there is a great diversity of market structure, competitiveness and also different states of the reserves' exhaustion, we decided to analyse four products in

depth: iron ore, gold, tin and kaolin. This choice was motivated by the importance of these minerals in total Brazilian exports, remembering that iron ore and gold jointly represent almost three quarters of total mineral exports. Tin was chosen as a representative case of the non-ferrous metals and kaolin was selected as a representative non-metallic one. It is important to stress that iron ore and kaolin cannot be considered as commodities at all, in that sense they are completely different from gold and tin.

The Brazilian market share in these selected minerals is also diverse. In iron ore, Brazilian mines are increasing their capacity (new pelletising plants, one new port and the augmentation of mining capacity itself), and this will assure the country as one of the two largest exporters. In fact, together, Brazil and Australia will tend to increase their market share. In gold mining, Brazil was the sixth largest producer in 1998, but it fell to 10th place in 1997 and probably will finish this year (1999) as the 12th largest producer. The most probable trajectory will be a stabilisation of Brazilian production, in the context of an increasing global market. In tin, there is a lot of similarity with gold, because in the 1980s there was a strong increase in Brazilian production and the country became the world's largest producer in 1989. Since then, Brazilian tin producing has been declining and this is continuing to be the tendency. It is important to stress that the largest tin mine in Brazil has just four years of extraction life left. Kaolin faces a completely different situation, because the Brazilian share will tend to increase in the international market at least until the beginning of next decade. Although Brazil is the third largest producer, there is a great difference between its total production in comparison with USA and England.

The prices of mineral commodities experienced a strong decrease, as can be observed in the case of gold and tin. Next January, when the annual price will be set, it is expected that there will be an 8-10%-decline in iron ore prices. We did not find data on kaolin's price for the period 1997-1998, but it is fair to assume that probably it has not registered a price increase. Over the next year, considering the total Brazilian mineral exports, although there may be a price recovery, it is most probable that prices will remain at low levels in comparison with the first half of this decade. Especially for this reason and also because of a decline in the production of gold and tin, next year, Brazilian mineral exports will decline. In the short run, mineral exports will only contribute a small proportion, if any, to an increase in Brazilian exports. As is well known, the Brazilian government has projected an increase in exports of

10-12% per year, reaching US$ 100 billion in year 2.002. Recently, the government recognised that this figure was only likely to be 6% for 1999, even under an optimistic scenario (JORNAL DO BRASIL, November 30, 1998). In spite of this change in the export target, it is hard to believe that minerals can reach this goal.

In the long run, the main conclusion of this paper is that iron ore mining will tend to consolidate its position as the most important mineral export. Brazilian iron ore miners are investing heavily while production of other minerals will, as we have seen, face problems. In the period 1993-1997, iron ore represented 58% of Brazilian mineral exports. In the next five years, its share may improve to 65%, or perhaps even higher, to 70%. This outcome has at least one great disadvantage: increasing dependency on one specific product and, consequently, the enhanced vulnerability of Brazilian mineral export performance.

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Main Internet Sites

China Clay Producers Association (CCPA): **www.kaulin.com**

International Tin Research Institute (ITRI): **www.itri.co.uk**