Global Commodity Markets: Intense Competition Despite Increasing Concentration

As in other sectors, the process of globalisation in the mining industry has been under way for many years now. The increasing concentration among the suppliers of certain commodities on a small number of international mining corporations had given rise to fears that this could have negative repercussions on competition, and indeed could endanger the security of supply to the German economy, which has so far encountered virtually no problems in securing the minerals it requires on the global market.

The German Institute for Economic Research (DIW), commissioned by the Federal Ministry of Economics and Technology, has studied, in close cooperation with the Federal Institute for Geo-Sciences and Natural Resources (BGR) in Hanover, the impact of the global concentration of mining output on the supply of minerals to the German economy. The analysis was conducted for a number of metals considered to be of critical importance in this regard (iron ore, manganese, copper, chromium, niobium, tantalum, titanium, vanadium, rare earth and tungsten).[1]

Concentration trends in the global mining industry

The trend towards increasing concentration in the global mining industry is linked to the globalisation of the economy, which has been boosted by privatisation, deregulation and the international capital market. To a considerable extent the competitiveness and profitability of mining companies are determined by their position in the global rankings. The goal of producing on a global scale by acquiring or merging with other companies has been behind the wave of takeovers in the minerals sector during the last decade (cf. table 1).[2] These mergers have often been between producers of a single mineral or a group of minerals (e.g. precious metals, non-ferrous metals, steel alloys). Some of the largest mining corporations now cover almost the entire spectrum from the mining of metal ores to industrial minerals and coal.

Mining activities are now concentrated in firms located in the traditional western mining countries of Australia, Canada, the USA and the Republic of South Africa. In 1990 the 50 largest mining companies accounted for just under 55% of global output; by 1996 this had already risen to more than 60%. Contrary to earlier assumptions that the number of producers would increase, mergers and extensions of business activities were concentrated in the leading group. The rising demands concerning the quality of ores (metal content, tolerated impurities) led to the closure of mines whose ores were of inadequate quality; investment focused on cost-effective new projects. Yet high-quality deposits are only to be found in a small number of countries (cf. table 2). In most cases the decisive factors are the size and metal content of the deposits and the costs of extraction.

Concentration and the intensity of competition

There is no unambiguous causal relationship between the degree of concentration and the intensity of competition. Although concentration indices do offer a guide in evaluating competitive intensity, they do not enable direct conclusions to be drawn on the past or future behaviour of these firms. In particular, a high degree of concentration does not automatically imply that individual firms can exert market power, and thus a restriction on competition, if the market shares of even the large companies are highly unstable. Moreover, the way in which industries are classified and their individual degrees of concentration do not necessarily coincide with the markets in which firms operate. What is decisive in evaluating the intensity of competition in each case is the definition of the 'relevant market' in both substantive and geographical terms. Competition policy makers take into account not only market shares, but also dynamic elements, in particular potential competition, the extent of barriers to market entry, imports and export quotas, advertising costs, the degree of product differentiation, the growth rate of the industry, and minimum firm size. The European Commission, for instance, takes the view that high market shares, taken by themselves, are insufficient to justify the claim of market dominance. At least, they do not indicate market dominance in cases where other structural influential

[1] An abridged version of the full report is available in German under the title 'Auswirkungen der weltweiten Konzentrierung in der Bergbauproduktion auf die Rohstoffversorgung der deutschen Wirtschaft' (Dokumentation no. 463) from the Federal Ministry of Economics and Technology (see also the Ministry's website: http://www.bmwi.de).

[2] The extent of mergers and takeovers in the petroleum sector, however, is greater by a factor of 10.

Table 1

Takeovers, Mergers and Privatisations[1] in the Global Mining Industry, 1987 to 1998

Year	Non-ferrous metals, iron, steel alloys[2]		Gold[3]	
	Number	Balance sheet total US-$ millions	Number	Balance sheet total US-$ millions
1987/89	15	6 270	20	7 090
1990	13	1 600	14	3 700
1991	8	500	17	980
1992	15	1 950	11	800
1993	13	3 700	10	1 140
1994	17	2 860	16	3 270
1995	23	8 870	24	2 680
1996	17	9 740	28	5 300
1997	35	11 770	33	6 650
1998	20	6 330	9	7 660
Total	176	53 590	182	39 270

1 More than US-$ 20 million. — 2 In both 1997 and 1998 including a partial uranium takeover in Canada and the USA. — 3 In both 1997 and 1998 including two partial platinum takeovers in South Africa.
Sources: Metals Economic Group, various years; Bundesanstalt für Geowissenschaften und Rohstoffe.

factors are evident which, in the foreseeable future, may change competitive conditions and qualify the importance of the market share of the merged companies.[3]

The world markets for selected metallic raw materials

The range of metals used in industry encompasses both iron and non-ferrous metals, some of which are used in very large volumes, and special metals whose market volume is extremely small. Our analysis focused on ten raw materials where the increasing concentration of supply on global markets had given rise to concern that the German economy might experience supply problems. By way of example, six of these markets studied are presented below. The analysis of supply and demand since 1986 is followed in each case by an outlook on expected trends to the year 2006.[4]

Demand for *iron ore* comes almost exclusively from the steel industry; non-metallurgical uses are of only very minor importance. The growth in the output of steel, the most important metal used in construction, has been restrained by partial substitution and the increasing use of high-quality steels that perform the same functions as standard-quality steel, while requiring less material input. Iron ore output initially stagnated after 1989 (at around 980 million tonnes gross weight), due to the sharp contraction of crude steel production in the former Eastern Block; it was not until 1995 and 1996 that it grew to over one billion tonnes. By the year 2006 the iron ore market is expected to expand to just under 1.3 billion tonnes.

In spite of trends towards concentration, the danger of monopolisation still appears rather small given the relatively widespread distribution of deposits. The frequent changes between firms in the market-share rankings suggests that competition is intense.[5] Moreover, the main consumers are large, heavily capitalised firms from a single branch (steel industry). The repeated steel crises have been reflected in favourable iron ore prices for consumers. In the past, ore producers have clearly sought to avoid provoking evasion strategies on the part of consumers, and have ensured long-term supply. The steel firms also benefit from the substantial use of scrap metal in steel production. Overall, the increase in concentration among iron ore mining companies has not had any negative effects on consumers. Although ores are to some extent imported from countries whose political and/or economic stability is potentially in danger, the option of drawing on numerous other countries with iron ore deposits means that even a process of continued corporate concentration can be viewed with equanimity.

Its ease of production and its favourable mechanical qualities meant that *copper* became an important material in construction very early on; today the range of application is extended by virtue of its high electrical and thermic conductivity (electrical engineering, machinery and apparatus, automobile construction). However, due to its high price compared with competing materials (aluminium, stainless steel, glass fibre etc.),

[3] Cf. Announcement by the European Commission on the definition of the relevant market for use in Community competition law, *Official Journal of the European Communities (97/C 372/03)*.

[4] The assumptions on which this forecast is made are indicated in Chapter 4 of the report (see footnote 1), which specifies the linkages between commodity markets and economic growth to the year 2006.

[5] Ignoring, for a moment, the Brazilian company Cia Vale do Rio Doce (CVRD), which has maintained its pole position since 1986 with a market share of between 15% and 16%, competition for second place has been tough. In 1986 Rio Tinto was in second place with a market share of 7.6%, followed by the Australian mining company Broken Hill (7.5%); by 1996 Broken Hill (11.2%) had moved into second place, ahead of Rio Tinto (8.9%). They were followed by a large number of smaller, not infrequently state-owned, firms with market shares of between 1% and 5%. In 1996 the 25 largest firms had a market share of 61% of global output.

Table 2

Concentration of Mining Output for Selected Raw Materials by Country, 1996

Raw material	Share produced by the three largest mining countries in %		
	Countries	National shares	Total
Chromite	South Africa	42	68
	Turkey	14	
	India	12	
Copper	Chile	28	51
	USA	17	
	Canada	6	
Iron ore	Brazil	21	52
	Australia	17	
	China	14	
Tungsten	China	75	88
	Russia	9	
	Portugal	4	
Ilmenite	Australia	27	66
	South Africa	20	
	Canada	19	

Sources: F.-H. Wellmer, H. Schmidt und U. Berner: Untersuchungen über Konzentrierungstrends in der Rohstoffversorgung. BMWi-Dokumentation, No. 402, 1996; calculations by the Bundesanstalt für Geowissenschaften und Rohstoffe.

consumers are constantly seeking to deploy substitutes. Although copper has been driven out of a number of established deployment areas, consumption has continued to rise (1986: 10.2 million tonnes of refined copper; 1996: 12.6 million tonnes), as new application areas have opened up, particularly in construction. While a considerable volume of scrap copper is recycled, copper ore output rose in the same period from just over 29 million tonnes (gross weight) to almost 38 million tonnes. A further increase to 43 million tonnes is expected by 2006. Although copper ore deposits exist in many countries of the world, more than half of copper output is controlled by six companies, and recently concentration has increased further.[6] However, early attempts by a cartel of state-owned suppliers (Conseil Intergouvernemental des Pays Exportateurs de Cuivre – CIPEC) to raise prices failed due to over-production by its members and the influence of independent suppliers. The leading producers have also been unsuccessful in their attempts to stabilise the falling price of copper on the metal exchange against the general market trend: global over-supply, the widespread use of scrap copper, and competition from substitute materials have rendered this impossible. Consequently, those countries, such as Chile, that depend heavily on the export revenue from the sale of copper have no interest in excessive prices and exacerbating uncertainty among consumers. Although output is becoming increasingly concentrated, the supply of copper to consumers can be considered secure.

Chromium ores are used largely to produce chrome alloys for the high-grade steel industry; non-metallurgical uses (fireproof and chemical industry) are of only minor importance. Chromium is an indispensable alloy metal in metallurgy; recycling is only possible from high-quality, high-grade steel scrap. By 1989 consumption of chromium ore had risen to 14.4 million tonnes (gross weight), but it subsequently declined significantly (1996: 12.5 million tonnes). This largely reflected the cooling-down of the boom in high-grade steel production, the sharp decline in the output of high-grade steel in the former Eastern Block, and the latter's forced exports of chrome alloys and high-grade steel scrap. Allowing for the economic growth forecast for the coming years, by 2006 chromium ore consumption is expected to have risen to just under 15 million tonnes. The heavy concentration of large and cheap-to-mine deposits in southern Africa means that it is there that the largest chromium ore mining industry is located. For this reason and because of low energy costs, the world's largest ferro-chromium industry is also based in the region.[7] On top of this, the fall in the value of the South African rand enabled the industry to sell at unbeatable prices, temporarily driving a number of competitors out of the world market. Particularly in the case of ferro-chromium, producers outside South Africa lacking their own chromium ore no longer had a serious chance of remaining competitive, partly also because of their relatively high electricity and labour costs. Fears were raised that the producers, characterised by interlocking ownership structures, could establish a monopoly in the longer run, enabling them to dictate world prices. However, recent acquisitions have led to fundamental changes in supply structures and have defused the market situation. The Swiss company Südelektra Holding AG (now Xstrata AG) purchased two South African chromium producers, creating a worthy competitor to the established suppliers in that region. It is scarcely conceivable that under the new circumstances South African producers could raise prices or reduce output on

[6] Interestingly, the company which long held a substantial lead over its rivals, Cobre del Chile (market share in 1990: 17%) has marginally lost market share against its competitors (Broken Hill, Ph. Dodge, Rio Tinto), and by 1996, with a market share of less than 14%, was virtually sharing pole position with Broken Hill (11%).

[7] Whereas in 1986 the six leading firms accounted for just 28% of western ferro-chromium output, by 1996 the figure was as high as 63%, with the leading South African firms Anglo American and Gencor predominant at 16% and 15% respectively.

their own, all the more so as supply disruptions and excessive prices would be likely to induce other producer countries (Kazakhstan, Turkey, India and others) to increase their presence on the world market.

The relatively 'new' alloy metal *niobium* is primarily used in the production of micro-alloyed steels (pipeline and special construction steels) and of heat-resistant super-alloys (turbine construction); it cannot be easily substituted. Between 1986 and 1996 the consumption of niobium rose from 11 600 to 15 400 tonnes; it is forecast to rise to as much as 22 000 tonnes by 2006. The supply of niobium is extremely high concentrated. For many years now the main source of supply to the western world (75% in 1996) has been the Brazilian company Companhia Brasileira de Metalurgia e Mineração (CBMM). The remainder is split between a Canadian and another Brazilian company. So far the market leader has pursued a moderate price policy, refraining from inducing price wars in order to drive out its smaller competitors. The aim was clearly to avoid destabilising the well-developed market with a view to competing alloy metals (especially vanadium). It is to be expected that the two-track strategy of avoiding attracting new competitors, while obtaining 'comfortable' prices, will be maintained in future.

Vanadium is an important alloy metal for the production of tool, engineering and construction steels. Smaller volumes are also used to produce titanium-aluminium alloys, catalytic converters, electrical engineering products (TV tubes, batteries) and vanadium metal. As far as can be determined, world consumption rose from just over 24 000 tonnes in 1986 to more than 30 000 tonnes in 1995 and 1996. A figure of almost 35 000 tonnes is expected for 2006. Of primary supply, more than 47% comes from South Africa alone, and the three largest suppliers account for as much as 92%. A single South African firm now accounts for 69% of the vanadium supplied to the western world; a further 13% is derived from recycling material. Through sudden bursts of demand, the steel industry has repeatedly caused supply bottlenecks among the few supplying firms and extreme jumps in prices. These only came to an end following capacity expansion in South Africa. This clearly reveals the dominant position of South Africa in supplying the West with vanadium, and the lack of flexibility on the part of the next two most important suppliers, Russia and the PR China, in responding to short-term boosts in demand. It seems, though, that the market presence of these countries, among other things, has prevented the main supplier from raising prices substantially over the longer run, and the market can still be considered competitive. Until 1993 the sluggish rise in consumption was accompanied by a declining price trend towards the end of that period; the sharp rise in consumption in 1994, however, led to supply bottlenecks and sustained and substantial price rises. Alongside the reasons already given, this suggests that, in the short run at least, supply is relatively price inelastic.

The deployment structure of *tungsten* is determined by its extremely high melting point, its resilience and its durability. It encompasses in particular materials for metal and stone processing, steels for the tools used in processing metal and plastics, tungsten metal (bulb filaments, switches, valves, heat shields), and heat-resistant alloys. The supply of primary ore is supplemented to a considerable extent by secondary material. Consumption initially rose to just under 62 000 tonnes metal in 1988 and 1989, but has stagnated since 1991 at less than 50 000 tonnes per annum. An increase to 56 000 tonnes is expected by the year 2006.

During the Cold War the high degree of supply concentration in the former Eastern Block and high prices led to optimisation in the utilisation of tungsten and/or its substitution by other materials (molybdenum, ceramics) in many areas. In 1996 around 88% of primary supply originated from three countries, 75% from the PR China alone. The predominance of Chinese exports in this market appears problematic to the extent that Chinese supply policy is unpredictable. Demand reacts sensitively to cyclical changes in the metal-processing industry and drilling for natural oil and gas. Depressed economic activity in these areas in recent years has led to over-supply and falling prices. Although there are no problems in the supply of intermediate goods, the fact

Table 3
Ore Reserves of Selected Minerals

Mineral	Unit	1992	1996	Metal content[1] (%)
Iron	million t Fe	64 600	63 700	37 to 62
Manganese	1000 t Mn	812 600	672 100	30 to 55
Copper	1000 t Cu	321 000	310 000	ca. 30
Chromium	million t Cr-ore	1 361	3 685	27 to 42
Niobium	1000 t Nb	3 549	3 542	20 to 42
Tantalite	1000 t Ta	21.8	21.8	10 to 50
Titanium	1000 t TiO_2	288 500	304 440	ca. 49[2]
Vanadium	1000 t V	4 268	10 075	13 to 14[3]
Rare earth	1000 t REO	84 302	103 954	ca. 60
Tungsten	1000 t W	2 350	2 144	48 to 56

1 In the ore or in concentrate. — 2 Ilmenite concentrate. — 3 Highveld slag.
Sources: US Bureau of Mines; US Geological Survey; Bundesanstalt für Geowissenschaften und Rohstoffe.

Table 4

Output and Export of Selected Metallic Raw Materials

1 000 tonnes gross weight

Raw Material	1986		1991		1996	
	Output	Export	Output	Export	Output	Export
Iron	865 137	369 754	946 522	400 692	1 018 275	435 709
Manganese	25 611	8 765	23 320	7 054	22 494	7 818
Copper	29 194	5 261	31 821	7 484	37 859	10 621
Chromium	11 691	3 630	13 158	4 816	11 961	3 486
Niobium	15.3[1]	6.6	16.5[1]	4.9	16.0[1]	0.3
Tantalum	0.3[1]	6.0	0.5[1]	5.9	0.4[1]	1.2
Titanium	5 364	3 795[2]	5 602	3 635[2]	6 695	4 030[2]
Vanadium	34.1[1]	12.0[3]	32.2[1]	8.2[3]	31.7[1]	21.4[3]
Rare earth	48.7[4]	25.7[4]	50.6[4]	27.9[4]	84.8[4]	65.5[4]
Tungsten	52.6[1]	23.3[1]	49.6[1]	11.3[1]	32.6[1]	.

1 Metal content. — 2 Ores, concentrates, slag and residues. — 3 Slag, ash and residues. — 4 Rare earth-oxide content.
Source: DIW calculations.

that the PR China has reduced the price differential between ore concentrates and intermediate products has in some cases led to existential problems for foreign ore processors.

Tables 3 to 6 provide an overview of changes in the deposits, output, exports and consumption of all the ten metals considered.

Implications of concentration for commodity markets

The analysis of the ten selected raw materials has revealed that, by virtue of the location of deposits, there is a high to very high supply-side concentration, up to and including oligopoly, in the case of chromium, niobium, vanadium, rare earth and tungsten. In the case of the other raw materials, on the other hand, there are a large number of supplier firms distributed among deposit regions throughout the world. In view of the very different concentration levels, it is not possible to define a typical trend for global mining as a whole.

So far, rising degrees of concentration have not incurred perceptible disadvantages for consumers in the form of supply bottlenecks and higher prices. Attempts in this direction made by various (often state-owned) commodity cartels in the 1970s came to grief on the lack of discipline within the cartel and evasion strategies on the part of consumers (alternative supply sources and substitution by other primary raw materials). So far effective competition has largely prevented dominant commodity producers abusing their power, primarily reflecting the influence of smaller producers, potential competition by new producers, efforts to extend the market in the case of 'new' raw materials, the power of large consumers, the risk of provoking the increased use of secondary (recycled) material and loss of market to alternative commodities.

Political and economic factors will continue to exert an influence on the competitive situation. Commodity-specific restrictions on competition may occur – by way, for instance, of mergers between firms currently competing with one another, or by permanently driving smaller producers out of the market (perhaps by conscious price dumping) – to the extent that the market power potentially created by concentration is exploited for a selective supply policy and price discrimination. Fears of such trends were raised in the 1990s for, among others, the chromium market. Joint ventures between leading ferro-chromium consumers from Japan, South Korea and the PR China with South African ferro-chromium firms were clearly aimed at ensuring supply stability.

The precarious political-economic situation of a number of leading commodity-producing countries, particularly the CIS, was recently reflected in a downgrad-

Table 5

Leading Mining Countries' Shares of Global Ore Reserves (R) and Global Output (O), 1996

in %

Raw Material	Russia		Australia		Brazil		Canada		USA		PR China		South Africa		India		Turkey		Ukraine		Chile		Kazakh-stan	
	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O	R	O
Iron	38	7	16	17	10	21	7	4	6	7	6	14	4	3	5	8		1		5		1		1
Manganese			4	9	3	11					6	27	55	14	3	8			20	14				2
Copper	7	5	2	5			4	6	15	17	1	4		1							28	28	5	2
Chromium		1				3						1	84	42	1	11		14					9	9
Niobium					93	85	4	15																
Tantalum[1]			21	59	4	16	8	10																
Titanium (Ilmenite)			12	27	7	1	11	19	3	5	11	2	23	20	11	4			2	4				
Vanadium[2]	50	26								14	20	14	30	40										
Rare earth	18	7	5				1		13	24	41	65			1	3								
Tungsten	12	14			1		12		7		45	74												1

1 Output, western world only. — 2 Output includes recycling.
Source: DIW calculations.

ing in the German government's risk rankings for its export guarantee programme (Hermes). It may be that China, South Africa or Brazil will in future also be seen as higher risk. Following the end of the Cold War the territory of the former Soviet Union, with its important deposits of minerals, was opened up directly to the world market; some of its extraction firms are not internationally competitive, however. In the cases of China (rare earth, tungsten), South Africa (chromium, vanadium) and Brazil (iron ore, niobium) the supply of minerals depends on the economic viability of extraction and the political stability of the country. It cannot be precluded that risks will increase in the future. Moreover, it must be recognised that the over-supply conditions experienced in recent years have been partially due to one-off circumstances: the substantial fall in demand in the former Eastern Block and increased exports from these countries were a major factor behind global overcapacity, a trend exacerbated by the economic crisis in south-east Asia and the continued sluggish pace of global economic growth. As the global economy picks up, the demand for primary goods will once again expand more rapidly.

Indicators of commodity supply conditions

The German government takes the view that the supply of primary goods is, in principle, the responsibility of industry. German firms, for their part, have put their faith in the effectiveness of international commodity markets, while seeking to protect themselves against possible risks, primarily by diversifying their import sources and concluding long-term supply contracts. Indeed, existing involvement by German industry in the countries of origin of the mineral raw materials has actually been reduced. The government has underpinned industry's activities in the area of commodities by providing export guarantees (Hermes) and other sup-

Table 6
Global Consumption of Selected Metals Between 1986 and 1996 and Estimated Consumption in 2006
in 1 000 t

Metal	1986	1991	1996	2006
Iron (crude steel)	713 000	718 000	724 000	882 000
Manganese alloys	7 421	7 491	6 908	7 360
Copper	10 183	10 674	12 585	15 340
Chromium alloys	3 475	3 896	4 086	5 571
Niobium	12	13	15	22
Tantalum	1	1	1	1
Titanium (TIO_2)	2 555	2 965	3 589	4 660
Vanadium	24	25	30	35
Rare earth (REO)	45	64	85	108
Tungsten	55	49	48	56

Source: DIW calculations and estimates.

portive measures. Between 1971 and 1990 financial support was provided for exploratory activities both at home and abroad. In contrast to other countries (the USA, France, Great Britain, Japan and Russia), no attempt has been made to create a national stockpile of reserves.

Although neither the current political environment nor the competitive situation on the supply side currently gives cause for concern regarding the security of supply, the global commodity markets should be subjected to continual observation in order to identify any signs of major distortions at an early stage. In order to evaluate all the potential influences, the DIW has weighted the relevant geological, political and competitive factors and condensed them into a single indicator, enabling the situation on the international commodity markets in 1996 to be evaluated.[8] The indicator takes account, both quantitatively and qualitatively, of the competitive situation prevailing in each case and of political and economic risks. The most important criteria on the supply side are deposits, exports, output and the secondary supply of the commodity, and competition factors on the supply side (the intensity of competition, barriers to market entry, the flexibility of producers and the variability of commodity prices). On the demand side consumer power, the scope for substitution and price elasticity are considered. A correction factor is used to allow for the extent of recycling.

The political/economical risks can be derived in terms of the concentration of global deposits, the concentration of output or that of exports as a share of the world market.[9] In all three models copper and iron ore emerge as the minerals for which risks are lowest, followed by manganese and chromium ore. The supply risk is relatively highest for niobium, tungsten and vanadium. Significant shifts in the rankings would occur, however, if there were changes in the perceived risk in specific countries. If, for instance, the PR China were reclassified from 2 to 5, in line with the country classification used as a basis for Hermes export guarantees, the risk level for tungsten and rare earth would be significantly more unfavourable.

Conclusion

The process of global economic integration has served to internationalise virtually all markets. The opening up of national markets, leading to new sales opportunities, but also to increased competitive pressure on domestic firms, has intensified the international division of labour and accelerated national structural change. In Germany the mining industry, in particular, has become increasingly unprofitable. For many years now, Germany, one of the world's leading consumers of ores and metals, has been unable to supply its needs out of domestic production.

Given the substantial deposits and productive capacity on the ten global commodity markets analysed here, there is currently little risk of supply-side problems arising. Nor do the prevailing competitive structures pose a threat to adequate supply at acceptable prices. Yet as with other factors, market structures change over time. Effective competition may be endangered in the future

[8] This initially static approach generates coefficients for the minerals under consideration here of between 3 and just under 5, whereby a higher number indicates a higher supply risk. If corresponding calculations were conducted over an extended period, it would be possible to detect commodity-specific risk trends.

[9] While output is an indicator of the current supply situation, to some extent it is irrelevant to the world market (own consumption by producers). The reserves take account, in addition to current output, of the scope for exploiting alternative sources (longer run aspect). The economic life expectancy of the measured and indicated reserves varies because of differences between commodities in the costs of exploration. Exports indicate the actual quantity of the commodity available on the world market, and are thus decisive for the supply situation.

by mergers between firms that currently compete with one another or by small suppliers being driven out of the market. Nor can it be entirely precluded that supply bottlenecks or sharp price increases may arise in the case of minerals that, by virtue of the high regional concentration of their deposits, are particularly susceptible to government interference or political instability. Consequently, such commodity markets should be subjected to continual observation.

Alfred Haid and Eberhard Wettig