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NONFERROUS METALS

SEVEN METALS—copper, aluminum, nickel, silver, zinc, tin, and lead—accounted for over 90 per cent of the nonferrous metals exports of the developed countries in 1963; copper and aluminum each constituted about one-third of the nonferrous exports, and nickel one-eighth (see Table 10.1). Over two-thirds of the exports consisted of “unwrought” forms such as ingots, billets, anodes, cathodes, and pellets; and the rest consisted of “worked” metals, which are rolled, extruded, drawn, or forged into plates and sheets, foil, tubes, pipes, and fittings.¹ These proportions, however, understate the importance to the economies of the OECD countries of exports of worked metals relative to exports of unwrought metals. The reason is that, for most of the countries we cover, value added by the country itself represents a much higher fraction of the export proceeds from worked metals than from unwrought metals, for which the value added is mainly in the smelting and refining processes.² The United States and Canada, which are important producers of some of the ores, are the main exceptions to this generalization. We have not tried to adjust our weights to a value-added basis, particularly since the problem is negligible in other parts of our study.

Note: SITC 68. Value of OECD exports in 1963: \$2.7 billion; 6.1 per cent of study total. Coverage: Silver and platinum, copper, nickel, aluminum, zinc, tin. Uranium and thorium (SITC 688), which accounted for a little under 1 per cent of nonferrous trade in 1963, has been omitted. Ores are excluded since they are not regarded as manufactured products (they are in SITC 28). Gold is excluded from the trade classification and from our study, since gold transactions predominantly involve monetary settlements rather than ordinary merchandise transactions.

¹ We use the terms “unwrought” and “worked” in this report even though they do not appear to be widely used in the nonferrous metal trades of the United States, because they are used in the SITC, which we follow in this study. Those that are in wider use, such as “ingot,” “semis,” and “fabricated,” would not correctly convey the precise coverage of the SITC categories.

² Conceptually, the prices for processing ores into metals would be more appropriate measures for our purposes than the prices of the metals, but these could not have been obtained without a much more intensive field effort, and perhaps not even then.

Table 10.1
 OECD Exports of Nonferrous Metals (SITC 68), by Origin, Destination, and Commodity Group, 1963
 (dollars in millions)

Destination	Value of Exports	Share in OECD Exports (per cent)									
		Per Cent of		Share in OECD Exports (per cent)							Belg.-
		OECD Exports in 68	OECD	U.S.	U.K.	Total	Germany	France	Lux.	Canada	Japan
Total, all destinations and groups	\$2,725	100.0	100.0	16.5	12.8	30.7	9.4	5.3	13.1	26.0	1.6
U.S.	587	21.5	100.0		6.5	16.7	6.0	3.6	6.1	63.4	2.6
OECD Europe	1,540	56.5	100.0	17.1	12.4	39.2	10.6	6.2	18.6	16.0	0.3
U.K.	314	11.5	100.0	22.0		8.9	2.9	1.0	3.8	55.1	0.3
EEC total	897	32.9	100.0	19.3	15.1	47.5	8.8	8.6	25.3	4.8	0.2
Germany	329	12.1	100.0	20.1	12.5	37.4		6.1	23.7	6.7	0.1
France	189	6.9	100.0	21.2	13.2	57.1	11.1		42.3	3.2	0.5
Belgium-Luxembourg	100	3.7	100.0	6.0	21.0	65.0	17.0	47.0		3.0	
Canada	83	3.0	100.0	71.1	25.3	2.4	1.2	a	1.2		0.4
Japan	47	1.7	100.0	38.3	19.1	14.9	4.3	2.1	8.5	25.5	
Latin America	84	3.1	100.0	39.3	6.0	19.0	8.3	4.8	3.6	27.4	2.4
Other	384	14.1	100.0	19.8	22.1	28.9	12.5	6.2	7.0	14.1	5.7

(continued)

Table 10.1 (concluded)

SITC commodity group or subgroup ^c	Value of Exports	Share in OECD Exports (per cent)									
		Per Cent of OECD Exports in 68		EEC							
		OECD	Exports	OECD	U.S.	U.K.	Total	Germany	France	Belg.-Lux.	Canada
Silver (681)	\$226	8.3	100.0	19.5	35.0	28.8	17.3	2.7	6.6	12.8	0.1
Copper (682)	932	34.2	100.0	22.7	11.2	40.0	12.9	2.9	22.2	16.6	1.6
Unwrought copper (682.1)	621	22.8	100.0	30.3	8.2	35.7	7.7	1.6	26.1	20.5	0.2
Worked copper (682.2)	312	11.4	100.0	7.7	17.0	48.4	23.1	5.4	14.4	9.0	4.5
Nickel (683)	327	12.0	100.0	6.7	18.3	7.6	3.4	3.7	0.1	53.2	0.1
Aluminum (684)	853	31.3	100.0 ^b	14.2	6.1	25.1	7.0	10.0	5.4	32.9	2.0
Unwrought aluminum (684.1)	527	19.3	100.0	12.5	0.6	12.3	1.3	10.8	0.1	50.5	1.1
Worked aluminum (684.2)	326	12.0	100.0	16.9	14.7	45.7	16.6	8.6	14.1	4.6	3.4
Lead (685)	60	2.2	100.0	1.7	16.7	46.7	10.0	8.3	23.3	25.0	0.6
Zinc (686)	120	4.4	100.0	9.2	3.3	42.5	6.7	3.3	26.7	32.5	0.8
Tin (687)	67	2.4	100.0	7.5	40.3	49.3	6.0	0.6	25.4		0.5
Miscellaneous (689)	137	5.0	100.0	24.4	8.9	35.6	5.9	3.4	19.3	10.4	6.7

Source: Appendix A.

^aLess than 0.05 per cent.^bIncluding Norway, 13 per cent of SITC 683, 11 per cent of SITC 684, and 10 per cent of SITC 689.^cSITC 688, uranium and thorium, was omitted from the table. Total OECD exports were less than \$1 million.

In any event, the price movements of worked metals are often closely related to those of unwrought metals.

Nonferrous Metals as a Whole

Canada was the leading OECD exporter of nonferrous metals, having a pre-eminent position in nickel and aluminum and being a significant source of other metals as well (see Table 10.1). Among the other major OECD exporters, the United States was important in copper and aluminum, while Belgium and the United Kingdom were significant factors in a wider range of metals. The special elements affecting the roles of the individual countries in the more important nonferrous metals are considered below.

The share of the United States in nonferrous metal exports more than doubled between 1953 and 1961 (Table 10.2), and declined slightly after that. Export shares of the United Kingdom, the EEC countries as a group, and Canada all declined over the whole period.

International Price Indexes

The prices of nonferrous metals relevant to international trade have usually moved in the same direction in the different countries, but often in different degrees (Table 10.3). The main changes over time were price increases between 1953 and 1957 and again, larger ones this time, between 1963 and 1964.³ The U.K. and German indexes reflect greater price variability over time than does the U.S. index. The smaller U.S. price increases in the face of booming metal markets in 1964 are the clearest indication of this difference.

The temporal variability of prices was also great for Belgium, the most important nonferrous exporter in the Common Market.⁴ However, this variability cannot be seen in the EEC index because the fluctuations were damped when Belgian price changes were averaged with those of other member countries to calculate the EEC index as a whole.

³ Price changes within the period 1953 to 1961 were larger than is suggested by our reference years. See, for example, our discussion of copper prices further on in this chapter.

⁴ Although Belgium is a more important factor in nonferrous metals than any of the other EEC countries, the data are more adequate for the larger EEC countries, particularly Germany, because the effort made to collect prices was in accordance with the relative importance of the various countries in aggregate exports of metals, metal products, and machinery.

Table 10.2
 OECD Exports of Nonferrous Metals, 1953, 1957, 1961-64
 (dollars in millions)

Value of OECD Exports	Share in OECD Exports (per cent)								
	EEC								
	OECD	U.S.	U.K.	Total	Germany	Belgium- Luxembourg	Canada		
1964	\$3,232	100.0	15.4	12.0	32.7	9.2	13.0	24.7	1.8
1963	2,685 ^a	100.0	15.3	13.0	31.2	9.5	13.3	26.4	1.6
1962	2,629	100.0	15.6	14.0	29.8	10.0	12.1	26.7	1.3
1961	2,625	100.0	16.5	13.0	30.6	10.0	11.9	26.6	1.1
INCLUDING SPAIN AND SWITZERLAND									
1961	2,574	100.0	16.8	13.2	31.2	10.2	12.1	27.1	1.1
1957 ^b	2,321	100.0	13.5	15.0	25.5	8.4	9.8	30.1	1.1
1953 ^b	1,418	100.0	7.9	15.0	35.5	9.0	14.4	31.0	1.1
EXCLUDING SPAIN AND SWITZERLAND									

Source: Appendix B.

^aThe figure here is \$40 million less than that given in Table 10.1. The reason is that, for that table, U.S. and OECD exports were increased by this amount to take account of the failure of the United States to report silver, platinum, and other metals of the platinum group (SITC 68.1) or copper foil (682.23). These adjustments were not made for the other years, and the country-of-origin distribution above is based on unadjusted data for all years.

^bIn 1953 and 1957 the division includes waste and sweeping of silver (285.02) copper matte (283.12), nickel matte and speiss, etc. (283.22), and zinc dust (284.08).

Table 10.3
International Prices of Nonferrous Metals, 1953, 1957, 1961–64
(1962 = 100)

	1953	1957	1961	1962	1963	1964
U.S.	96	100	101	100	100	108
U.K.	95	101	101	100	102	115
EEC	100	102	101	100	101	117
Germany	100	105	101	100	100	115

Source: Appendix C.

Price Competitiveness

The price competitiveness of the United States in nonferrous metals was about the same relative to the United Kingdom every year until the last two, when it improved (Table 10.4). In 1964 U.K. prices had risen 6 per cent more from the 1962 base than U.S. prices. U.S. price competitiveness vis-à-vis Germany and the Common Market as a whole was lower in 1961–63 than in earlier years, but there was a sharp improvement in 1964.

Price Levels

European price levels were almost always somewhat below those of the United States, as can be seen in Table 10.5. The difference in 1964 can probably be considered negligible, given the possible margins of error in these calculations, but the earlier price differences do appear to have been significant, particularly in 1961–63.

Table 10.4
U.S. Price Competitiveness, Nonferrous Metals, 1953, 1957, 1961–64
(1962 = 100)

	1953	1957	1961	1962	1963	1964
Relative to						
U.K.	100	101	100	100	102	106
EEC	105	102	100	100	101	108
Germany	104	105	100	100	99	107

Source: Appendix D.

Table 10.5
 Price Levels, Nonferrous Metals, 1953, 1957, 1961-64
 (U.S. for each year = 100)

	1953	1957	1961	1962	1963	1964
U.S.	100	100	100	100	100	100
U.K.	92	93	93	92	94	98
EEC	96	93	91	91	92	99
Germany	98	98	93	94	93	100

Source: Appendix E.

These price differences, however, do not necessarily indicate that the United States was able to export at prices 8 or 10 per cent above those prevailing in Europe. In certain cases the United States did sell at prices above those in Europe, as will be pointed out later for specific commodities. However, some of the data reflect unsuccessful bidding by U.S. companies, especially on certain fabricated or semifabricated products which the United States did not export to any substantial degree.

Comparisons with Wholesale Price and Unit Value Data

In Table 10.6, the NBER indexes of international prices, presented as percentage changes for individual periods, are compared with wholesale price series and, in the case of the United States, with export unit value series also. To minimize gaps in coverage, official wholesale price series were supplemented by price series from trade journals. Both the wholesale prices and the export unit values are weighted by the same world trade weights used in making the NBER indexes. As is to be expected, the wholesale prices of each country show more country-to-country differences in the direction and amount of movement than the export prices, since the latter refer more nearly to a common market than the former. Thus, the four international price index series are more alike than either set of the corresponding four wholesale price indexes except when export prices responded differentially to boom conditions in 1964.

The figures suggest that, in periods of price instability, the wholesale price indexes are not reliable indicators of international price competitiveness. There are larger differences between the wholesale and NBER indexes for 1957/1953, 1961/1957, and 1964/1963 (all intervals of relatively large price changes) than for 1962/1961 and 1963/1962

Table 10.6
 Nonferrous Metals Price Indexes: NBER, Domestic, and Unit Value,
 1953, 1957, 1961-64

	<u>1957</u> <u>1953</u>	<u>1961</u> <u>1957</u>	<u>1962</u> <u>1961</u>	<u>1963</u> <u>1962</u>	<u>1964</u> <u>1963</u>
NBER INTERNATIONAL PRICE INDEXES					
U.S.	104	101	99	100	108
U.K.	106	100	99	102	112
EEC	101	99	99	101	116
Germany	105	96	99	99	116
WHOLESALE PRICE INDEXES ^a					
U.S.	111	103	99	99	106
U.K.	110	101	99	103	112
EEC	100	88	98	101	107
Germany	96	105	95	100	111
WHOLESALE PRICE INDEXES ^b					
U.S.	113	106	97	98	105
U.K.	114	108	98	101	111
Japan	100	102	97	100	107
EEC	103	84	98	100	105
Germany	97	105	96	98	109
France	107	97	99	102	110
U.S. EXPORT UNIT VALUE INDEXES					
Total	122	90	101	98	102
Copper	111	96	103	101	104
Aluminum	135	84	99	94	100

Note: The NBER series are derived from Table 10.3; the index from wholesale prices, from Appendix F and notes; and from Irving B. Kravis and Robert E. Lipsey, *Comparative Prices of Nonferrous Metals in International Trade, 1953-64*, NBER Occasional Paper 98, 1966, Table 5; and the unit value series, from Appendix G.

^aOfficial series and trade journal prices.

^bOfficial series only.

(intervals of relative price stability). The largest discrepancy between the two sets of data is for the change between 1953 and 1957 in U.S. price competitiveness relative to Germany; according to the wholesale indexes, the U.S. position deteriorated by 14 per cent,⁵ while the NBER indexes indicate a slight improvement.⁶ In this case, the German wholesale price index is probably at fault, since it comprises only five series.

That narrow commodity coverage may be responsible for other differences between the two sets of indexes is suggested by the closer conformance to the NBER indexes of the wholesale price indexes when supplemented by trade journal prices. However, while many of the discrepancies between the NBER and wholesale price series may be explainable in these terms, it should not be forgotten that the latter are based on formally quoted prices which may differ from actual transactions prices, particularly when prices are changing.⁷ Indeed, sometimes, it has been alleged, a published price has been maintained at one level by the firms reporting the price to the trade journal or other publisher while different prices were in effect for selling.⁸ In addition, as will be indicated in the discussions of particular metal markets, actual transactions prices sometimes differ for domestic sales and exports.

We included a series on Japanese wholesale prices of nonferrous metals, although we were unable to gather enough primary data to construct our own indexes for Japan. The Japanese wholesale price indexes show less variation in these years than any other price series in the table. In view of the great dependence of Japan upon foreign supplies of many nonferrous metals, it would be surprising if the Japanese index of international prices for nonferrous metals—if it could have been constructed—would have shown such stability relative to the United States and Europe.

⁵ $(96 \div 111) \times 100 = 86$.

⁶ $(105 \div 104) \times 100 = 101$.

⁷ George J. Stigler and James K. Kindahl found, for the United States, larger discrepancies between list and transactions prices in nonferrous metals than in iron and steel. Transactions prices fell more rapidly during periods of declining prices and rose more rapidly during periods of rising prices. The largest discrepancy was at the end of their period, when there was a large rise in prices. (*The Behavior of Industrial Prices*, New York, NBER, 1970).

⁸ "Perhaps the most insidious evil of all inherent in current trends in pricing practice is the way in which, in certain markets, a price can be kept running on a certain basis—of historical validity—while the trade contrives to effect much of its business at lower prices, the effect of which is, however, not allowed to reflect back on the published price, because the basis on which it is concluded is different from the basis on which the published price is fixed" (*Metal Bulletin*, October 6, 1961, p. 12). See also *Engineering and Mining Journal, Metal and Mineral Markets*, June 24, 1963; *Metal Bulletin*, July 19, 1963, p. 21; and *Engineering and Mining Journal*, February 1965, p. 94.

The NBER international price index for U.S. nonferrous metals has also been compared in Table 10.6 with an index of U.S. export unit values weighted by our standard foreign trade weights. The unit value index is based on eight series of export unit values chosen to conform to those used by the Department of Commerce in its official unit value indexes. Four of the series are unit values for copper, three for aluminum, and one is for pipe fittings of copper or other nonferrous alloys.

There are sometimes wide discrepancies between the unit value index and the NBER international price index, which seem to us to cast serious doubt upon the reliability of unit value indexes—even when the underlying series are carefully selected—even in so relatively simple a product area as nonferrous metals.⁹

The large differences between the U.S. export unit value index and the NBER international price index are not due primarily to the fact that the unit value index covers only copper and aluminum. The differences between the separate unit value indexes for those two metals and the corresponding international price indexes of Tables 10.8 and 10.9 are as great as those for nonferrous metals as a group, and the discrepancy between the two total indexes is almost an average of those for the two main components. There could, of course, be differences in coverage within the individual metals, but these are not likely to be important, since the unit value data cover both unwrought and worked metals in both groups. The main differences probably come about because the commodity composition of the trade classifications used for computing unit value indexes may change markedly, particularly when there are significant changes in demand and supply relationships that cause prices to change.

Factors Affecting Competitiveness in Individual Metal Groups

In considering nonferrous metals, an observer is likely to think that they fall into the category of highly standardized commodities in universal

⁹ Part of the smaller range of price movements in the NBER international price indexes may be attributed to the inclusion of a much larger number of series. However, it would probably be difficult to increase substantially the number of unit value series included in the calculations because most of those available are characterized by erratic fluctuations due to wide variability in the product mix of the trade classifications to which they refer.

demand, for which prices will act to localize production at the cheapest source. This view may be fundamentally correct as a description of the long-run tendencies at work, but to understand the actual role of prices in the real world, it is necessary to consider some of the geographical and institutional factors that influence or interfere with the operation of the price mechanism in nonferrous metal markets.

Geographical Influences

A conspicuous influence on the direction of trade in nonferrous metals is the location of ores in relation to markets. Among the major metals mentioned above, copper, silver, lead, and zinc ores are relatively common, while deposits of tin and nickel ores are less widespread. Lead and zinc ores are found, for example, both in the United States and in western Europe. In most cases, however, the advanced industrial countries do not possess sufficient quantities of these ores to meet their needs. This is true even for the United States, which is one of the world's greatest sources of each of these metals. The pressure of demand and the exhaustion of the cheaper sources have forced recourse to less desirable ores and thus have tended to make the domestic metals expensive compared with those available from Canada, Latin America, Africa, and elsewhere. In many instances, the absolute volume of output in these places is smaller than in the United States, but much or all of it is exported because domestic demand is small. Thus the net exports of a country depend not merely upon access to ore supplies; the supplies must be in quantities that are abundant relative to its home needs. The possession of domestic ore supplies may not be an advantage in the nonferrous metals trade, however, if they can be exploited only at a relatively high cost. A high-cost domestic mining industry frequently demands protective policies that result in high domestic prices which put domestic metal refining and fabricating industries at a competitive disadvantage. Many of the price differences between the United States and Europe are attributable, in part, to the relative freedom of Europe to acquire ore supplies from the cheapest sources.

Some countries without domestic ore supplies, notably Great Britain and Belgium, have been important metal-refining and metal-exporting countries because they have had access to foreign sources of ores and because their metal-refining industries have been close to great markets. The history of the exploration and settlement of the Americas, Africa, and Oceania, the search for ores, and the financing of mining operations

has left its mark on today's trade flows. Thus, the United States obtains copper from Chile and lead from Mexico; Britain gets tin from Malaya and lead from Australia; Belgium imports copper from the Congo; and France relies upon New Caledonia for nickel ore. New forces of nationalism and development are weakening many of these trading and financial ties. Many underdeveloped countries are encouraging the processing of their ores at home and even the fabrication of refined metal into semifinished or finished products. The smelting of tin, for example, has been declining in the United Kingdom and Benelux and rising in Malaya and other ore-producing areas.

Another important factor determining the location of some nonferrous metal industries, particularly those dependent upon electrolytic refining, is the availability of cheap power. This appears to be the chief explanation for the development in Canada of an aluminum industry second in the free world only to that of the United States, even though Canada must rely on bauxite supplies from the Caribbean area. Cheap power is the basis also for the Norwegian aluminum industry, whose capacity is exceeded in western Europe only by the French. To a smaller degree, abundant power is helpful in nickel refining also. In this metal, however, Canada's position as the world's leading producer depends mainly on the possession of rich and extensive ore deposits. The location of a nickel refinery in Norway, even though it has to use Canadian raw material, is due to the availability of low-cost power.

Institutional Influences

In assessing the role that price may play in international competition in nonferrous metals, it is necessary to take account not only of the way in which geographical factors affect trade patterns but also of the manner in which the structure of the metal-refining industries and the organization of metal markets make it possible for differences in price levels to exist. In these respects there are, as might be expected, important differences from one nonferrous metal to another, but there are also some striking similarities. We shall deal with the similarities first.

1. The two main markets for most of the major nonferrous metals in their unwrought form are New York and London. The importance of the New York market for some metals, such as copper, lead, and zinc, arises in part from the large volume of United States output. However, the more basic factor, one which applies to all the nonferrous

metals, is the role of the United States as a consumer. In 1963, for example, the United States accounted for about one-third of total free world consumption of copper, lead, zinc, and tin and for around half of the consumption of nickel and aluminum (see Table 10.7). The London market is important because it is the great world trading center where the forces of supply and demand can meet without the restrictions on metal trade that have been imposed in the United States to protect domestic mines. The London Metal Exchange is the world's most important organized metal market, and substantial quantities of copper, lead, zinc, and tin that are not actually sold through the market are transferred at prices prevailing on the market.

2. As is implied in the foregoing, government laws and regulations tend to separate metal markets along national boundaries, each market having its own price level. The most common justifications for these interferences are defense, foreign currency shortages, and economic development, although the element of protection is usually large and clearly visible. Contrary to the common impression that trade barriers are being eroded, government impediments to free trade in unwrought nonferrous metals were probably increasing in the period covered by this study.¹⁰ Certainly, this is true of the United States for a number of important metals, although not for aluminum; within the period covered by this study, the United States reimposed a 1.7 cents per pound duty on copper and placed imports of lead and zinc under quota. The effects of such restrictions can be seen in copper, for which the U.S. price tended to be a cent or two a pound higher than the London price in these years. In other countries that protect domestic mining operations, such as Australia, Japan, and Spain, copper prices were 3 to 6 cents above the London price.¹¹ One of the most extreme illustrations was a report from India that domestic prices of tin, lead, and zinc were about twice as high as those being quoted on the London market.¹²

Tariffs and quotas are not, however, the only ways in which governments have affected metal markets. One of the most important influences on nonferrous metal markets was the building up and then dimin-

¹⁰ See the statement of an official of a U.S. metal-refining company quoted in the *Metal Bulletin*, July 5, 1963, p. 29. Since 1964, the terminal year of this study, the United States, faced with sharply rising metal prices, has eased some of its protective measures on imports, but has placed controls on certain exports and intervened vigorously in the domestic pricing of several metals.

¹¹ J. L. Chender, "Copper," in *Engineering and Mining Journal*, February 1965, p. 114.

¹² *Metal Bulletin*, July 17, 1962, p. 10.

Table 10.7
Major Nonferrous Metals: Geographical Distribution of and Changes in
Production and Consumption, 1954 and 1963
(per cent)

Metal ^a	Share in World Production				U.S. Share in Consumption		
	U.S.	Europe ^b	Eastern Bloc ^c	Rest of World	Total World	World Excl. Eastern Bloc	World
1954 Shares							
Copper	37	22	14	27	100		
Aluminum	47	18	15	20	100		
Nickel	16	22	20	43	100		
Zinc	32	30	16	22	100		
Tin	14	36	9	41	100		
Lead	25	28	13	34	100		
1963 Shares							
Copper	32	19	18	31	100	36	29
Aluminum	39	20	22	20	100	54	42
Nickel	6	23	24	48	100	48	33
Zinc	24	26	23	27	100	34	27
Tin	1	18	26	55	100	34	26
Lead	16	31	23	29	100	31	25
Changes in Production or Consumption							
			1963 Production as Per Cent of 1954 Production		1963 U.S. Consumption as Per Cent of 1954 U.S. Consumption		
			U.S.	World			
Copper			134	154	136		
Aluminum			158	193	186		
Nickel			59	160	132		
Zinc			110	146	122		
Tin			4	99	101		
Lead			82	125	104		

Notes to Table 10.7

Source: Computed from data in *Metal Statistics, 1954-1963*, Metallgesellschaft Aktiengesellschaft, Frankfurt, 1964. Some figures, especially those for centrally planned economies, are necessarily rough estimates.

^aRefinery production for copper and lead; smelting output for nickel, zinc, and tin.

^bEurope includes Finland, Yugoslavia, and all European OECD countries except Turkey.

^cEastern block includes all countries in the Soviet sphere in Europe and all countries in the Chinese sphere in Asia.

ishing of its stockpiles by the U.S. government. During a four-year period beginning in the middle of 1954, for example, the U.S. government bought up the equivalent of 20 to 25 per cent of the domestic production of lead and zinc and acquired substantial quantities of foreign lead and zinc in exchange for agricultural surpluses. The program buoyed up prices, and production also, but when it ended, prices slumped. At the end of the period covered by this study, when there were supply shortages, U.S. disposals served to curb the tendency for prices to rise.

Government intervention may also have other motives. Illustrations are provided by two U.S. regulations on silver. A U.S. prohibition against dealing in silver originating in mainland China led to a premium for non-Chinese silver on the London market which was sometimes greater than half a cent an ounce.¹³ U.S. law also prevented the export of silver purchased from the Treasury, with the result that in 1959-61, when Treasury sales were an important source of silver for industrial uses, New York silver prices were slightly lower than those in London.¹⁴ Perhaps government neutrality is impossible in the market for a monetary metal, but neither of these regulations appears to have been necessitated by the monetary use of silver.

3. Another common characteristic of nonferrous metals is their susceptibility to alternating phases of overcapacity and extreme shortage. Mining capacity cannot be altered rapidly, and even changes in the rate of utilization of existing capacity apparently cannot be made quickly.¹⁵ The impact of cyclical and secular changes on the demand for a given

¹³ *The Silver Market in 1962*, New York, Handy and Harman, 1963, p. 8.

¹⁴ *The Silver Market in 1959*, p. 9; *The Silver Market in 1960*, p. 8; and *The Silver Market in 1961*, p. 7. Dependence on Treasury silver was attributable in part to a widespread strike in the nonferrous refinery industry during the last half of 1959.

¹⁵ For example, the manager of a large lead and zinc company was quoted as saying that "... a decision today to change the rate of mine production in Australia would probably take six months or longer to be reflected in the physical metal available in the large consuming markets" (*Metal Bulletin*, May 3, 1963, p. 14).

metal is difficult to foretell, as can be readily ascertained from past forecasts in the trade journals. In these circumstances, nonferrous metal prices are almost inevitably subject to sharp fluctuations; within the dozen years covered by this study, for example, there have been year-to-year upswings and downswings in the annual average price in excess of 25 per cent for copper, 20 per cent for lead, and 15 per cent for zinc.¹⁶ As is pointed out below in connection with copper prices, many of these fluctuations, because of their timing, are not reflected in the indexes published here.

Many of the differences among the markets for the various nonferrous metals stem from differences in the number of producers and other facets of the structure of those industries. For none of the nonferrous metals can the number of primary producers outside the centrally planned countries be counted in terms of hundreds, and for most not even in tens. However, the degree of concentration varies from one metal to another, and the same degree of concentration does not always have the same market significance. The number of producers of worked metals is larger, but the big primary producers are often also producers of worked metals. Their pricing policies thus affect worked metal prices directly and also indirectly, since worked metals such as sheet are often priced in terms of a margin over the prevailing primary price. Producers of the major unwrought metals have generally integrated backward into ore production, although to varying degrees. In aluminum, for example, important producers of the metal typically control their own bauxite sources. In tin, on the other hand, the market in ore concentrates is more independent, although ties between smelters and ore producers are quite common.

The production of nickel is perhaps the most concentrated among the nonferrous metals. One producer—a Canadian firm which has its own ore supply—accounts for over half of the free world output, and the world price of nickel follows closely the price set by this firm.¹⁷ The policy of the company has been to seek stable prices, making price changes at relatively long intervals.¹⁸

The organization of the world aluminum industry has been in flux

¹⁶ Based on data in *Engineering and Mining Journal*, February 1965, p. 83.

¹⁷ *Inquiry into the Strategic and Critical Material Stockpiles of the United States, Hearings*, Senate Committee on Armed Services, 87th Cong., 2nd sess., 1962, Part 8, pp. 2591 and 2647.

¹⁸ Statement of the company president, quoted in *Metal Bulletin*, September 4, 1964, p. 11.

during the past decade. For few, if any, other metals was the prospect for rapid growth in consumption so clear: New companies entered the industry, and existing ones tried to break into new geographical markets.¹⁹ In the United States the number of primary producers rose from three in 1953 to seven in 1963; in 1963 the largest of these accounted for 34 per cent of U.S. capacity and the top three for 86 per cent. In Canada, the leading producer had 85 to 90 per cent of the nation's capacity, and in almost all the other aluminum-producing countries of the free world primary production was limited to two to four firms, with the largest usually accounting for somewhere between 50 and 80 per cent of output.²⁰ Most of these firms are integrated into the worked metals stage; in the United States, for example, producers consume around two-thirds of the ingot they make.²¹

There has been a growing internationalization of the aluminum industry, which has involved the United States as both a capital importer and a capital exporter. By the end of 1964 aluminum metal was being produced in the United States by a subsidiary of a Swiss company, and subsidiaries of French and Canadian companies were producing worked aluminum products. However, U.S. residents owned a large part of the shares of the leading Canadian producer. Elsewhere, one or more of a half-dozen large U.S., Canadian, Swiss, or French producers were to be found with interests in almost every aluminum-producing country of the non-Communist world.²² In the struggle for new markets, production has often been established in new countries to gain or retain access to markets in the face of protective measures or subsidies.

The structure of the world copper industry has been relatively stable during the period of our study. In each of the major producing areas of the free world, the bulk of refinery output is accounted for by a few firms—five in the United States, three in Africa (two are British, and one is Belgian), and two in Canada. Two of the American firms are also responsible for a large fraction of copper output in Chile, by far the most important of the Latin American copper-producing countries, and U.S. firms also have interests in African production. In addition, some smaller producers market their copper through one of the

¹⁹ Aluminum was also pushed into new uses by the aggressive research and promotion of its producers.

²⁰ *Minerals Yearbook, 1963 and 1953*, U.S. Bureau of Mines, 1964 and 1956.

²¹ *Aluminum Factbook*, U.S. Dept. of Commerce, 1963, pp. 16-17.

²² *Minerals Yearbook, 1963*.

large firms. Thus, there are perhaps ten sellers who market 80 to 90 per cent of the free world production of primary copper.²³

Among the other major nonferrous metals, the production of tin is most highly concentrated: Two smelting companies in Malaya and Singapore supply a major share of the metal consumed outside the Eastern bloc.²⁴ The smelting and refining of silver, lead, and zinc are much less concentrated partly because these metals are mined and refined in a larger number of countries. Within individual countries, however, the number of producers is usually small. In the United States, for example, at the end of 1964 there were only five firms which smelted or refined primary lead.²⁵

Several factors, however, limit the market power that small numbers may confer upon the producers. In aluminum, very rapid growth in consumption has stimulated competitive expansion in which the leading firms have struggled to keep their market position. More generally, an important restraint is imposed by intermetal competition (including steel) and by the availability of nonmetallic materials, especially plastics, as substitutes. The expansion of aluminum, in particular, has sometimes occurred in uses formerly served by copper, notably in the electrical and automotive industries. While overlapping financial interests in different metals exist—particularly in lead and zinc but also in copper and other metals—by and large the interests which have large stakes in aluminum differ from those involved in copper, and the same tends to be true of other pairs of major nonferrous metals.

Another limitation which varies in importance from one metal to another and, for a given metal, from one country to another is the availability of metal recovered from scrap.²⁶ This source of metal appears to be most important compared to primary production in the case of lead; in the United States, for example, it accounts for about one-half of total production.²⁷ The production of secondary metal tends to be

²³ The statements in this paragraph are based in part upon information in the *Minerals Yearbook, 1963*, and in part upon information obtained from trade sources.

²⁴ *Minerals Yearbook, 1963*. See also *Inquiry into the Strategic and Critical Material Stockpiles*, Part 5, p. 1740. The extraction of ore in Malaya is much more dispersed.

²⁵ *Lead and Zinc: Report to the President*, U.S. Tariff Commission, 1965.

²⁶ The impact of scrap is affected also by its spectrum of uses, which varies from one metal to another; in some cases, such as aluminum, scrap can be used for fabricating a wide range of products and thus competes directly with the primary metal, while in others, such as copper, it may compete with the primary metal in a more limited range of uses.

²⁷ Based on data in *Minerals Yearbook, 1963*. About 40 per cent of primary production has been from foreign ore supplies.

less concentrated than that of primary metals; again taking lead in the United States as an example, there are over a score of major secondary smelting firms excluding the six primary producers, some of which also produce secondary metal.

A different aspect of the organization of the metal industries that must be considered in analyzing price competitiveness is the practice of treating metals on a toll or conversion basis. Much of the copper, lead, and zinc exported by Belgium and Germany represents metal smelted or refined in those countries for a fee paid by the foreign owner, usually the sales organization of a mining company. It is true that comparative costs of conversion in different countries may influence the owner's choice of country of conversion, but the determining factor may be the availability of capacity and of the technical skill and facilities required to obtain maximum recovery of the metal content, including subsidiary elements such as silver, cadmium, and others. To measure the price competitiveness of the processing country, we would have to know the toll charges; the prices of the smelted or refined metal may reflect the price competitiveness of the country of the owner of the metal to a greater degree than that of the processing country.

Another factor at times, particularly in aluminum, zinc, tin, and silver, has been sales in Western markets by the Soviet Union, other eastern European countries, and China. As may be seen from the figures in Table 10.7, production of nonferrous metals expanded more rapidly in the centrally planned countries than in the free world; these countries probably account for close to one-fourth of the world output. The U.S.S.R. is by far the most important producer in the bloc, accounting for the bulk of output and particularly for sales of aluminum in Western markets. China has been a sporadic source of exports of tin and silver to the West.

Copper

The United States is the world's leading producer of mine copper (23 per cent of world production), followed by the U.S.S.R., Zambia (Northern Rhodesia) and Chile (12 to 15 per cent each), Canada (9 per cent), and the Congo Republic (6 per cent).²⁸ Very little ore moves in

²⁸ F. L. Wideman, "Copper," *Minerals Yearbook*, 1963, Table 44.

world trade; it is generally more economical to ship copper after it has been extracted from the ore by concentration, roasting, or, most commonly, by smelting. Latin American copper exports have been divided in roughly equal proportions between Europe and the United States. A good part of the Latin American copper reaching the United States is refined and re-exported to Europe, and this copper accounts for the bulk of U.S. exports. Canada has shipped more copper to Europe than to the United States. African copper has gone mainly to Europe, with the United Kingdom receiving over 40 per cent of Zambia's output; and Belgium, about two-thirds of the Congo's production. African and Latin American exports of unwrought copper were more than one and a half times greater than the exports of the advanced countries (shown in Appendix A).²⁹

While the United States used to be an important exporter of copper, it has generally been a net importer in recent years. Most of its imports have consisted of blister copper (the unwrought product obtained by smelting the ore), mainly from Chile and to a lesser extent from Peru and Mexico. At the same time the United States has been importing refined copper; most of these imports, mainly from Canada, have apparently been absorbed domestically. Exports of refined copper in the form of cathodes, ingots, and wire bars to western Europe, India, and Japan, and other destinations have not been large enough to offset all the imports of copper.

OECD countries' exports of worked copper, such as sheet and tube, have been about half the dollar volume of their exports of unwrought copper. Germany and Belgium are the leading exporters of worked copper, and European destinations account for most of the shipments.

While the large producers of primary copper have generally preferred to sell directly to fabricators, some copper, chiefly secondary metal, is traded on the London Metal Exchange (LME). The prices established on the LME are free market prices. The 1961 turnover on the LME amounted to only 16.6 per cent of estimated world consumption, and, as a result of speculation and hedging, only a fraction of the copper traded was for actual consumption.³⁰ The price of copper on the LME, however, has a significance (which varies at different times) beyond that

²⁹ See *Metal Bulletin*, September 24, 1963, pp. ii-iii.

³⁰ According to one source, deliveries amounted to about 20 per cent of the trading volume (*Economist*, February 22, 1964, p. 733). The estimate of trading turnover as a share of world consumption was reported in *Metal Bulletin*, March 20, 1962, p. 8.

indicated by the amount of metal traded. At times, the large producers sold copper to markets outside the United States under long-term contracts setting minimum and maximum quantities, with the price for each lot to be determined by the quotation on the LME at the time of shipment or delivery. However, the LME tends to be very sensitive to changes in supply and demand conditions and to produce sharp fluctuations in price. In 1956, for example, the price of copper was driven up to £437 per ton only to fall back by the end of the year to £240. Such fluctuations led the European producers to abandon the system of pricing based on freely determined LME prices. They controlled the LME price through open market operations while simultaneously curtailing production and accumulating stocks. From the latter part of 1961 to the beginning of 1964, the producers succeeded in stabilizing the LME price of copper at £234 per ton (29.25 cents per pound).³¹ In the United States the price remained at 30.6 cents per pound (31.0 cents delivered) during this period. It was reported that the producers had disposed of the surplus stocks they had acquired in their price support operations through cut-rate sales to eastern Europe, Japan, and India.³² A new, and apparently unanticipated, surge of demand in 1964, coupled with strikes in the United States and Chile, caught the producers without the stocks necessary to prevent price increases. The Chilean government also was pressing for price increases.³³ In January 1964, the producers abandoned their efforts to control the LME price, and toward the end of the year they were rationing supplies to their customers at £260 per ton while the LME price was £520.

The producers made these determined efforts to keep prices down for fear that high copper prices would, beyond a certain point, encourage the long-run substitution of aluminum and plastics and thus adversely affect the value of their ore deposits. Price instability was also thought to encourage such substitution, particularly because aluminum prices were very stable until the last few years of the period.³⁴ Finally, the

³¹ Altogether about 160,000 tons of copper (worth over \$100 million) were purchased in this operation (*Metal Bulletin*, June 19, 1964, p. 12). According to one estimate, the 1962 price might have been about £220 per ton (27.5 cents per pound) without producer support (J. Zimmerman, "Copper," *Engineering and Mining Journal*, February 1963, p. 101). For a brief assessment of the copper price operations of the producers, see the *Economist*, October 9, 1965, pp. 185-187.

³² See *Metal Bulletin*, June 19, 1964, p. 12, and *Engineering and Mining Journal*, February 1964, p. 115.

³³ *New York Times*, October 6, 1964.

³⁴ It was reported, for example, that aluminum was substituted for copper in making lamp bulb bases when the price of copper soared to 46 cents a pound in 1956 and that

producers feared that the high temporary profits created by high prices would have a ratchet effect on wages, leaving copper less able in the long run to compete with other materials.

Although these motives were common to all the major producers, it does not mean that they always acted together. The U.S. producers were enjoined by law from collaborating to fix prices,³⁵ and the European producers did not always agree on the proper course. In 1955-56, for example, one British firm, in an effort to keep prices from rising, sold its copper at prices lower than the LME prices which were used by the other major producers. On the other hand, the U.S. and the European-based primary producers apparently have not competed in each others' home markets. For example, one large U.S. buyer of unwrought copper stated in the course of an interview that his company could never obtain foreign copper at a price lower than the domestic price. In general, the United States producers appear to have been better able than European-based ones to curtail and expand production to meet the swings in demand, with the result that the producers' price in the United States tended to be more stable than that in Europe. The U.S. producers' price also tended, within the period covered by this study, to be slightly higher, the main exceptions being in the years 1953-55. The reimposition of the 1.7 cents per pound duty by the United States in July 1958 helped to maintain a differential between the European and U.S. producers' prices.³⁶

Merchants were critical of the pricing policies followed by the producers in 1961-64. They argued that the producer-controlled prices did not permit the price mechanism to provide guidance to consumers and producers. The producers, on the other hand, felt that the merchants

bulb makers feared to switch back to copper even after the price fell to 25 cents (*New York Times*, March 15, 1964).

³⁵ See the *New York Times*, December 29, 1963, for a report that describes one U.S. copper mining official as resenting the notion of U.S. collaboration in price maintenance; the official referred to the attitude of U.S. producers as one of "benevolent neutrality" toward the price stabilization efforts of foreign producers. The U.S. producers could hardly avoid taking account of the pricing policies of the foreign producers and the impact that their own production policies would have on the worldwide copper situation. Thus, as was pointed out by a copper merchant, the U.S. producers cut their production by 5 to 10 per cent in July 1962 when foreign firms were supporting the LME prices even though U.S. consumption exceeded U.S. production. See Zimmerman, *op. cit.*, p. 102.

³⁶ The statements about prices in this paragraph are based largely on the *Engineering and Mining Journal* average prices for copper sales in the United States and abroad. The prices are taken from reports of producers accounting for 80 to 85 per cent of the copper trade (*E & MJ Metal and Mineral Markets*, June 24, 1963).

Table 10.8
International Prices, Price Competitiveness, and Price Levels, Copper,
1953, 1957, 1961-64

	1953	1957	1961	1962	1963	1964
INTERNATIONAL PRICE INDEXES (1962 = 100)						
U.S.	98	95	100	100	100	107
U.K.	98	94	99	100	100	112
EEC	100	96	101	100	100	119
INDEXES OF U.S. PRICE COMPETITIVENESS (1962 = 100)						
Relative to						
U.K.	100	99	99	100	100	105
EEC	102	102	101	100	100	111
INTERNATIONAL PRICE LEVELS (U.S. FOR EACH YEAR = 100)						
U.S.	100	100	100	100	100	100
U.K.	94	93	93	94	94	99
EEC	96	96	95	94	94	105

Source: International price indexes from Appendix C; price competitiveness indexes, Appendix D; price levels, Appendix E.

were more interested in the active trading that would come with frequent price changes than in the long-run trend of copper consumption.

In any case, producer pricing led to a multiple price system for copper. In periods of slack, consumers in the United States and Europe were able to obtain merchant copper at prices lower than those maintained by producers, and in periods of tightness they had to pay higher prices for a part of their supplies. According to one estimate, for example, about 25 per cent of free world copper was purchased at premium prices in 1964; in the United States about 20 per cent was exchanged at premium prices.³⁷ In markets outside the United States and Europe, the producers themselves were reported sometimes to have departed from their regular prices, particularly, as we have already noted, in the case of occasional sales to eastern Europe, Russia, and Japan.

The price relationships produced by these structural and market features of the world copper industry are shown in Table 10.8. The

³⁷ J. L. Chender, "Copper," *Engineering and Mining Journal*, February 1965, p. 113.

time-to-time indexes indicate that the levels of world copper prices were not very different at the various dates of reference used in our study, except for the last one (see top panel). While this is true, it gives a misleading impression of the stability of copper prices over the twelve-year period; prices soared to high levels between 1953 and 1957 and sank to low levels between 1957 and 1961.⁸⁸ Using the midyear prices of U.S. producers to indicate the magnitude of the changes, we find that the price of primary copper was between 28.5 and 32 cents a pound at every one of our reference dates, but it was over 45 cents in 1956 and less than 25 cents in 1958.

For our reference years, movements in U.S. and U.K. prices corresponded closely, and until the very last year U.K. prices were 6 or 7 per cent lower than those of the United States (see bottom panel of Table 10.8). The Common Market, where Belgian prices were the most important, was characterized by the same relationship in 1962 and 1963, but EEC prices were a little closer to U.S. levels at the beginning of the period and higher than U.S. prices in the final year. Germany, with less direct access to primary copper, was sometimes in a less favored position relative to the United States than were the United Kingdom and Belgium.

The European export prices of worked copper products, such as sheet and pipe, tended to be lower relative to the United States prices than those of unwrought copper; this was particularly true of brass products. U.K. export prices were only a few percentage points below those of the United States for unwrought copper, but around 12 per cent lower for worked copper in 1962, for example. However, unwrought copper was about twice as important as worked copper in the exports of the advanced countries, and this relationship is reflected in the weights used in preparing the indexes.

Until the final year of our period, the price position of the United Kingdom and the Common Market as a whole relative to that of the United States hardly changed (see middle panel). There is some evidence, on the other hand, that the German position relative to the United States improved; this improvement appears to reflect the movement of German prices, initially high, to levels closer to those prevailing in Belgium, the other important Common Market exporter (see Appendix A).

⁸⁸ See, for example, the price reports in the *Metal Bulletin*.

The indexes for 1964 are subject to additional margins of error because, while in general we had rather comprehensive information, there was a key piece missing. For 1964 as for other recent years, we have extensive data covering sellers' prices of unwrought copper abroad, as well as a good sample of prices of worked copper products. We also have good information about the premium prices that were paid for unwrought copper; these varied widely during the year and from market to market, but the mean premium seems to have been in the range of 25 to 40 per cent above the producers' price. What we do not know is the fraction of each country's exports of unwrought copper that was sold at premium prices. On the basis of information gleaned from trade journals³⁹ and from conversations with people in the trade, we have taken the premium-priced exports to be 10 per cent for the United States, 25 per cent for the United Kingdom, 100 per cent for Germany, and 50 per cent for the Common Market as a whole. The possible margins of error introduced by this assumption may be indicated by applying the alternative assumption that premium-priced exports constituted 10 per cent of the unwrought copper exports of each country. The results in 1964 are price levels lower by two points for the United Kingdom and four points for the EEC than the figures shown in Table 10.8 (bottom panel). Corresponding adjustments in the indexes of price competitiveness would affect the magnitude but not the existence of a relative improvement in the competitive position of the United States between 1963 and 1964.⁴⁰

Aluminum

The United States, the U.S.S.R., and Canada accounted for about 68 per cent (38, 18, and 12 per cent, respectively) of primary aluminum production in 1962-63. World production has been expanding rapidly, and has become more dispersed. In 1953-54, for example, world output was only about half of the 1962-63 level, and the three leading countries accounted for about 78 per cent of production (47, 12, and 19 per cent, respectively). Production has been rising most rapidly in Japan,

³⁹ See, for example, *Metal Bulletin*, October 6, 1964, p. 15, and Chender, *op. cit.*, p. 113.

⁴⁰ Actually, the figures in the table probably understate slightly the improvement in the U.S. position, since the 10 per cent estimate is more likely to be too high than too low.

India, and the Soviet sphere. The number of producers has tended to expand within each country, although it still remains small.⁴¹

About 20 per cent of unwrought aluminum production enters world trade. The pattern of trade differs substantially from the pattern of production. The United States, with its high absorptive capacity for metals, has played a smaller role in world trade than might be inferred from its importance in world production. In recent years, U.S. exports of primary aluminum have been less than 15 per cent of the free world total, with the United Kingdom, Germany, and Latin America the main destinations. U.S. exports have been equivalent to 7 or 8 per cent of domestic production; imports, to 17 or 18 per cent, well over half from Canada, and the rest almost entirely from Norway and France.

Canada, which consumes about 15 per cent of its own production of unwrought aluminum, supplies about half of the world's exports. Norway and France are also important exporters; the former, like Canada, sells most of its output abroad.⁴² A limited number of destinations tend to account for a large share of each country's exports. Over half of French exports are to the Common Market and over a quarter to the United States; about two-thirds of Canadian exports are sent to the United States and the United Kingdom; and about three-quarters of Norwegian exports are shipped to the United Kingdom, the United States, and Germany. U.S. exports, however, have a more varied list of destinations.

The smaller trade in worked aluminum is more dispersed. Canada and Norway are smaller factors; and Germany, Belgium, the United Kingdom, and the United States (with about equal export volumes) furnish about two-thirds of the exports of the advanced countries. Germany and Belgium send their exports largely to European destinations; the United Kingdom and the United States to more varied markets.

Aluminum was not traded on any metal exchange during the period

⁴¹ The data in this and the following paragraphs are based mainly on *Minerals Yearbook, 1963*, and earlier editions, and *Metal Statistics, 1954-1963*, and other issues (Frankfurt am Main, Germany, Metallgesellschaft Aktiengesellschaft). These sources also show the patterns of production and trade in bauxite. The U.S. imports over 80 per cent of its bauxite requirements; the U.S.S.R., less than one-fourth. France alone of the major aluminum producers is a net exporter of bauxite; most others, like Canada and Norway, import virtually all they use. Almost half of the world's supply of bauxite is produced in the Caribbean area, particularly in Jamaica, Surinam, and British Guiana. In Europe, Hungary, Yugoslavia, and Greece follow the U.S.S.R. and France in production. (Production data for the centrally planned economies are necessarily rough estimates made in the sources cited.)

⁴² The U.S.S.R. is also a significant exporter, with the bulk of its shipments going to other Communist countries.

of this study and hence was producer priced. The price leadership of the major Canadian producer appears to have been widely accepted at least for nominal purposes in world trade. The Canadian firm has generally avoided any challenge to other price leaders in their domestic markets (as in the United States);⁴³ the existence of tariffs and transport costs has permitted small differences between prices in different countries. While changes in the posted world prices of aluminum ingot—the key item in the price structure—have not been frequent,⁴⁴ sales below the nominal world price have been common, especially in the last few years of our study when the struggle among the major producers for the growing world market seems to have intensified. Sales of Russian aluminum added to the competitive pressures. Price cutting appears to have been common in sales made by major producers of one country in the markets of other major producing countries. Large buyers in these markets, willing to follow aggressive purchasing policies and not setting a high premium on the continuity of their sources of supply, could usually find aluminum at 1 or 2 cents below the list price.⁴⁵ As a result there was cross shipping of identical products between the United States and Europe; indeed, more than one reliable source reported occasional purchases of U.S. aluminum in Europe for reshipment to the United States. The market for European aluminum in the United States appears to have been confined largely to the coastal areas, particularly the eastern seaboard, and the Great Lakes region. The aluminum industry is more highly integrated vertically than the copper industry, and competition sometimes focused on worked aluminum products as well as on ingot.⁴⁶

The dispersion of prices makes the average relationships shown in Table 10.9 less representative than others in this volume. Furthermore,

⁴³ On price leadership, see the *Metal Bulletin*, April 1, 1958, p. 13; February 16, 1962, p. 13; and December 13, 1963, p. 13. See also Carl M. Loeb, Rhoades & Co., *Aluminum Industry*, September 1965, p. 10.

⁴⁴ Although the ingot price changed three times in 1964, there were only twenty changes in the previous eighteen years (Irving Lipkowitz, in *Engineering and Mining Journal*, February 1965, p. 98).

⁴⁵ Public statements about these practices are naturally infrequent, but the head of the largest French aluminum firm was quoted in the press near the end of 1962 as acknowledging that French aluminum was being offered in the United States at 22.5 cents a pound at a time when the U.S. list price was 24 cents. (The U.S. duty of 1.25 cents and freight were apparently paid by the seller.) He was also cited as saying that foreign aluminum—U.S., Canadian, or Japanese—was being offered in France at less than the French domestic price of 22.5 cents despite a duty of 15 per cent (*New York Times*, November 16, 1962).

⁴⁶ *Metal Bulletin*, January 1, 1963, p. 18.

Table 10.9
International Prices, Price Competitiveness, and Price Levels, Aluminum,
1953, 1957, 1961-64

	1953	1957	1961	1962	1963	1964
INTERNATIONAL PRICE INDEXES (1962 = 100)						
U.S.						
Aluminum	99	108	103	100	97	103
Unwrought	104	109	103	100	94	103
Worked	92	107	102	100	101	103
U.K.	98	111	105	100	100	107
EEC	107	109	103	100	97	104
INDEXES OF U.S. PRICE COMPETITIVENESS (1962 = 100)						
Relative to						
U.K.	99	103	102	100	104	104
EEC	108	101	101	100	100	101
INTERNATIONAL PRICE LEVELS (U.S. FOR EACH YEAR = 100)						
U.S.	100	100	100	100	100	100
U.K.	90	94	94	92	95	95
EEC	96	90	90	89	90	90

Source: Same as Table 10.8

the time-to-time figures for the United Kingdom and the underlying figures for some of the Common Market countries are not based on a broad enough sample of prices to produce reliable averages.⁴⁷ The figures for the United States and Germany, on the other hand, are believed to be reliable. The former are based on producers' data that represent a high fraction of U.S. exports, as well as on buyers' information of more limited scope; and the latter, on both purchasers' data and on more than a score of export price series.

The time-to-time indexes of the United States, the United Kingdom, and the EEC (top panel) show similar directions of change for the most part, although there are sufficient differences to cause variations in relative price levels. In general, the European prices have been 5 to 10 per cent

⁴⁷ However, the place-to-place comparisons for the Common Market and the United States in 1961 and 1962 are reliable, each being based on several hundred observations.

lower than those of the United States (see bottom panel). Within Europe, EEC prices have generally been lower than U.K. ones.

The differences between U.S. and European prices have generally been significantly smaller for ingot and other forms of unwrought aluminum; indeed, European export prices have in some instances been higher than those of the United States. For worked aluminum, however, European prices have in many cases been 15 to 20 per cent lower than those of the United States. In 1962, a year for which there was a substantial number of observations, the international price levels were as follows (U.S. = 100):

	U.K.	EEC	
		Total	Germany
Aluminum (684)	92	89	94
Unwrought aluminum (684.1)	95	95	101
Worked aluminum (684.2)	86	80	82

Within the EEC, French prices have tended to be relatively low for unwrought aluminum, while German and Belgian prices have been relatively low for worked aluminum. As in the case of copper, where a similar situation prevailed between U.S. and European prices, trade in the more highly fabricated stage is only half as important as trade in the less processed material, and the indexes are weighted accordingly. The overall changes in price competitiveness (middle panel) have been relatively small and, with the exception of the improvement of the EEC and German positions after the earlier years, there does not seem to have been any trend.

Other Nonferrous Metals

For the one-third of world nonferrous trade that does not consist of aluminum and copper, we do not present separate indexes. However, our comments on the more important of these metals follow.

Nickel

Canada accounted for 58 per cent of the world's mine production of nickel in 1962-63; about 80 per cent of Canadian output came from one company. The other major producing countries are the U.S.S.R.

(23 per cent), and New Caledonia (8 per cent).⁴⁸ The sole U.S. producer accounted for only about 3 per cent of the world's supply of mine nickel. The United States, which uses over a third of all the nickel consumed in the world, imports about 90 per cent of its requirements.

As might be expected from this situation, Canada is by far the most important factor in world nickel trade; it accounts for about two-thirds of free world exports of unwrought nickel and its alloys. Most of the rest of the export trade is carried on by Norway and the United Kingdom, which rely almost entirely on Canadian ore. Canada exports little ore to the United States, but around 75 to 85 per cent of her exports of unwrought metal have gone there. The United States also gets some unwrought nickel—about 20 per cent of its imports—from Norway, France, and the United Kingdom. In European and other markets outside North America, the United Kingdom and Norway often match and sometimes exceed Canadian sales. France, using New Caledonian ore, is a smaller exporter.

The countries with the most advanced metallurgical industries—the United States, the United Kingdom, and Germany—accounted for about 75 per cent of 1963 trade in worked nickel and nickel alloys in such forms as bars, sections, wire, plates, sheets, and tubes. The main destinations were other industrial countries. Canada and France, mentioned above as exporters of unwrought nickel, were net importers of worked nickel.

As already noted, the Canadian firm that is the world's largest producer acts as a price leader and has followed a policy of stable prices. During the early part of the period covered by this study, nickel was in short supply owing in large measure to the impact of the Korean War upon U.S. government demands for current use (jet engines, among others) and stockpiling. During these years of shortage (1953–57), the posted price of nickel rose only by 20–25 per cent, but smaller producers sometimes got higher prices, and free market sales at extremely high prices were reported.⁴⁹ By 1957 free world output was

⁴⁸ These figures are based on data in G. C. Ware, "Nickel," *Minerals Yearbook*, 1963. Metallgesellschaft Aktiengesellschaft data (*Metal Statistics*), give a little higher share for Canada and a somewhat lower share for the U.S.S.R. The latter source also indicates that both the Canadian and U.S.S.R. shares have fallen in the period since 1953–54 while the successive editions of the *Minerals Yearbook* indicates a sharper drop for Canada (from 67 per cent) and a slight rise for the U.S.S.R. (from 20 per cent).

⁴⁹ *Metal Bulletin*, May 29, 1962, p. 9. The *Engineering and Mining Journal* reported free market prices of \$3 a pound when the producers' price was 64.5 cents (February 1963, p. 142).

50 per cent higher than in 1953, and U.S. government demands had eased. The producers' price remained constant for a period of four and a half years beginning in December 1956. At the end of June 1961, there was a 10 per cent price increase, but because of lagging demand small producers were reported to be shading the official price.⁵⁰ The price was reduced by about 2.75 per cent in May 1962, but even at this level production had to be cut in the latter part of the year. Demand strengthened in 1963 and even more markedly in 1964, but no further price changes were made that year.

The evidence we have, from a half dozen sources, mainly foreign, suggests that European export prices have been slightly lower than those of the United States. The differences are more marked for worked nickel products, but these were only about one-fourth as important as unwrought nickel, for which price differences appeared to be small. Prices seem to have moved largely along parallel lines in the different countries.

Silver and Platinum Metals

At least small amounts of silver are produced in a large number of countries, but the Americas (chiefly Mexico, Peru, the United States, and Canada) accounted for about three-quarters of free world output in 1963.⁵¹

In most years the United States consumes more silver than it produces, and it imports significant quantities from Canada, Mexico, and Peru. Germany and Belgium have also been important in the world silver markets (mainly as re-exporters), and China disposed of large quantities in 1960-62 (probably in large part from the demonetization of coins) although the United States was not, of course, a buyer of silver from this source. Until recently, consumption of silver for coinage and for industrial uses had been expanding at about equal rates, with coinage absorbing between 20 and 35 per cent of world silver consumption. The enormous increase in U.S. coin requirements in the last few years covered by our study greatly altered the world silver market; the *increase* in silver absorbed for U.S. coinage in 1964

⁵⁰ *Metal Bulletin*, May 29, 1962, p. 9.

⁵¹ J. P. Ryan, "Silver," *Minerals Yearbook*, 1963, Table 14. According to estimates given in this source, the main producer in the Soviet bloc is the U.S.S.R. with more than 10 per cent of world output.

compared with 1962 was equivalent to more than one-third of all world silver consumption in 1962. In addition, world consumption of silver for industrial uses alone, for some years, exceeded world production.⁵²

Despite the homogeneity of silver and its worldwide use, its prices in different places are not always equal, even allowing for transfer costs. Some U.S. regulations causing price differences have already been mentioned, but other illustrations may easily be found. The difference between the Indian price and others—the result of strict controls over imports and exports—has been one of the largest. The lowest Indian price during 1964, for example, was \$1.58 an ounce compared to a U.S. high of \$1.293 and an English high of \$1.302.⁵³

Silver prices in New York and London rose from around 83 cents an ounce in 1953 to 85 cents in 1954–55 and then to an 89–91 cent range in 1956–61. The suspension by the U.S. Treasury of sales of nonmonetized silver at the end of 1961, an action related to growing coinage requirements, led to a sharp increase in prices to \$1.293 (in September 1963), a ceiling established by the availability of Treasury silver at this price through the redemption of silver certificates.

London and New York silver prices have moved in close accord, with the London price usually slightly higher. Prices have moved somewhat more independently on the Continent, apparently at a higher level than U.S. or U.K. prices. The only deviation from published prices that was reported to us referred to silver originating in the Soviet bloc.

Of the platinum metals grouped with silver in the SITC, platinum and palladium are the most important; iridium, osmium, rhodium, and ruthenium are also included. These metals have properties of chemical inertness, hardness, and ability to withstand heat that make them useful as catalysts in chemical processes, as refractory materials, and as durable electrical contacts in communications switchgear.⁵⁴

The U.S.S.R., Canada, and South Africa are the major sources of supply. The United States, which accounts for half to two-thirds of free world consumption, has obtained its platinum metals chiefly from Canada and the United Kingdom, with smaller supplies coming from

⁵² *The Silver Market in 1964*, p. 19. Beginning in 1965, however, U.S. coinage requirements were sharply curtailed by a shift to the use of filler materials in "silver" coins.

⁵³ *Ibid.*, pp. 12, 16, and 22.

⁵⁴ G. C. Ware, "Platinum Group Metals," *Minerals Yearbook*, 1963, pp. 4–5.

the U.S.S.R. and Switzerland.⁵⁵ The United Kingdom is by far the most important exporter of these metals, supplying not only the United States but also the Common Market, Japan, and even Canada.

Platinum metals have been exported from the United Kingdom at prices slightly below those of the United States, and Continental prices have been only a shade above those of the United Kingdom. There was, however, a relatively sharp rise in the German price of platinum between 1963 and 1964, and, as a result, the German and EEC indexes of price competitiveness for SITC 681 as a whole moved favorably for the United States.

The NBER indexes for this group are based in part on prices published by trade sources and in part on information from about a score of other sources.

Zinc

Lead and zinc are linked together because they are frequently found in the same ores. Since zinc is more important in trade, it will be discussed first.

About 40 per cent of the mine production of zinc is accounted for by the New World and about one-third by Europe; the United States is responsible for about one-third of the output of the Americas, and the U.S.S.R. for a similar share of European output. Australia is the third most important producer, providing about 10 per cent of the world supply. U.S. production plummeted from high Korean War levels, and the gradual comeback since the 1958 low had not, by 1964, restored output to its former level. World production, on the other hand, showed a more persistent expansion; 1963 output was 30 per cent above 1954.⁵⁶

Most of the ore-producing countries also export unwrought zinc, particularly Canada, the U.S.S.R., and Australia. However, as with lead, smelter production tends to be located in industrialized areas. The United States and Europe account for over two-thirds of world smelter output, with the United States and the U.S.S.R. accounting for

⁵⁵ The United Kingdom refines ores from South Africa and the U.S.S.R., and Switzerland is a trading center for metals primarily of U.S.S.R. origin.

⁵⁶ *Metal Statistics*, p. 21. Belgium, the United States, France, the United Kingdom, and Germany were the big importers of zinc ores and concentrates. In general, the United States relied heavily on Canada and Latin America for supplies while the European importers drew upon European as well as Latin American and Canadian supplies. The United Kingdom obtained over three-quarters of its raw material from Australia.

23 and 13 per cent, respectively. The shares of Japan, Canada, Belgium, France, Poland, and Australia fall in the 5 to 8 per cent range.⁵⁷ Belgium, without ore supplies of its own, is a major factor in the world zinc trade. The leading importers are the United Kingdom, the United States, and Germany.

U.S. government intervention has been a more important factor in the lead and zinc markets than in other metals. Although at times, especially in wartime, the United States has adopted measures to stimulate exploration and production, during most of the past decade U.S. policy has been faced with a high-cost domestic industry in a world in which other sources of supply were capable of substantial expansion in output. The basic fact is that U.S. deposits of high-grade ores have been so depleted that in recent years the domestic mining industry has been working ores that are only half as rich in metal content as ores mined in foreign countries.⁵⁸ The U.S. industry thus has required higher prices than foreign producers. In the slump after the Korean War boom, the U.S. government rejected the domestic producers' application for additional protection against imports and embarked upon a stockpiling program that absorbed the equivalent of one-fifth to one-fourth of the domestic mine production of lead and zinc in the four years beginning in mid-1954.⁵⁹ A still larger quantity of lead was acquired from foreign producers in 1956-61 by bartering surplus agricultural commodities. Zinc was also acquired from foreign sources through barter in 1956-57 in an amount equal to a little more than 70 per cent of the quantity acquired from domestic producers in 1954-58.⁶⁰ This program was accompanied by efforts to induce foreign producers to restrict production.

It seems likely, however, that the net effect of government stockpiling was not only to push up prices but also to stimulate lead and zinc production, especially in the United States, where acquisitions from domestic sources were confined almost entirely to metal from newly mined ore.⁶¹ As long as the government was absorbing substantial quantities of lead and zinc, the excess of production over consumption

⁵⁷ H. J. Schroeder, "Zinc," *Minerals Yearbook*, 1963, p. 29.

⁵⁸ *Lead and Zinc: Report to the President on Escape-Clause Investigation No. 65*, U.S. Tariff Commission, 1958, p. 18.

⁵⁹ Based on data in *Inquiry into the Strategic and Critical Material Stockpiles*, Part 4, p. 1240.

⁶⁰ *Ibid.*, pp. 1264-1265.

⁶¹ *Lead and Zinc: Report to the President*, 1958, p. 29.

did not depress prices. When the government announced the curtailment of its procurement programs in 1957, there was a worldwide decline in lead and zinc prices. Indeed, foreign prices fell below those in the United States by more than the cost of freight and insurance, with the result that foreign refined pig lead and slab zinc were sold in the United States at substantial discounts below the U.S. producers' prices.⁶²

In these circumstances, the United States abandoned its effort to avoid protective measures in the course of aiding its domestic producers. Effective in October 1958, the U.S. limited imports of unmanufactured lead and zinc to 80 per cent of the average annual commercial imports in 1953-57. The effect was to raise U.S. prices and to increase the difference between the U.S. and foreign prices.⁶³

The demand for zinc was stronger than that for lead, and the operation of market forces outside the United States changed the price relationship of the two metals earlier than in the United States; the price of zinc, which had been 2 or 3 cents lower per pound than the price of lead for a number of years, first exceeded the lead price in London at the end of 1958, whereas the price crossover did not occur in the United States until a year later. The resumption of a notable upward trend in the free world consumption of lead and zinc began in 1959, but the expansion in zinc was greater.⁶⁴

The recovery of metal markets in early 1964 caused first a narrowing of the differential between New York and London zinc prices and then a reversal of the historical pattern, in which the London price had been lower than the New York price.

In July 1964 zinc producers outside the United States, fearful of the adverse effect of rising London Metal Exchange zinc quotations upon the competitive position of the metal, began an effort to maintain a producers' price as in copper. The United States released 75,000 tons—equivalent to about 7 per cent of a year's domestic production—from its stockpile to alleviate the shortage.⁶⁵

As a result of these developments the U.K.-to-U.S. index of com-

⁶² *Ibid.*, pp. 39-42. The duty on lead has been 1.0625 cents per pound and on zinc 0.7 cents per pound since 1951. Freight and insurance costs have of course varied but they have generally been less than 1 cent per pound.

⁶³ See *Lead and Zinc: Report to the President*, 1960, Tables 10 and 11; and 1965, p. 26, and Tables 11 and 12.

⁶⁴ *Metal Statistics, 1954-1963*, pp. 11 and 23.

⁶⁵ F. R. Jeffrey, "Zinc," *Engineering and Mining Journal*, February 1965, p. 108.

petitiveness fluctuated more than the indexes for other nonferrous metals; it wound up in 1964 in a position reflecting much higher relative U.K. prices than in any former year. Zinc export prices from the Continent tended to conform to the U.K. pattern of changes over time.

Lead

The Americas account for about one-fourth of the world's mine production of lead; the centrally planned economies, for one-fourth; Australia accounts for one-sixth, and non-Soviet Europe, for one-seventh. U.S. mine output, which still makes up over one-third of the New World production, declined by nearly 25 per cent from 1953-54 to 1962-63. World output increased by about the same percentage, expansion being most rapid in the Soviet bloc.

Belgium, Germany, the United States, and France import large quantities of the ore from Canada, Latin America (especially Peru and Bolivia), and Australia. The European countries also rely upon closer sources such as Sweden, Bulgaria, and Morocco. Belgium and the United States obtain substantial supplies from southern Africa. There has been a growing tendency to process ores in the countries in which the mines are located.

The geographical distribution of smelter lead production nevertheless is still dominated by the pattern of industrialization. The Americas and non-Soviet Europe each produce one-third of the world total, and the Soviet bloc produces one-fourth. The United States accounts for half of the New World output, its production having declined in absolute as well as relative terms during the past decade.

The most marked increases in the consumption of lead have been in the Soviet bloc and non-Soviet Europe; U.S. consumption has hardly increased over the past decade. In the United States, over half of current consumption is supplied by recovered scrap.

Manufactured lead is traded predominantly in unwrought form. The chief exporters are Australia, Mexico, the U.S.S.R., and Canada. Belgium, without ores of its own, is a significant net exporter of lead. Germany and the United Kingdom also export small quantities, but they are net importers by a substantial margin. The United States, an important net exporter of lead before World War II, is the largest importer, followed at some distance by the United Kingdom and Germany.

With only brief exceptions at the very end of the period, the New

York price of lead exceeded the London price during the period covered by this study. In the early years the difference between lead prices in New York and London fluctuated around the transfer costs of approximately 2 cents a pound (1.0625 cents duty plus freight and insurance). With the announcement of the end of stockpile purchases, in 1957, and the subsequent imposition of quotas by the U.S. government, the differential tended to be larger—around 3 or 4 cents a pound—and more variable. It shrank again with the recovery of metal markets in 1964 as U.S. producers restrained the extent of price increases in the face of tightening supplies; in the latter part of the year it actually reversed direction for a time. The United States released 50,000 tons of lead from its stockpile in 1964.

As in the case of zinc, official prices tend to reflect actual transactions prices more fully when supply and demand are in balance and prices are stable. In periods of excess supply, a number of export transactions take place at lower prices, and in periods of shortage, some exports are sold at premium prices. Even where producers attempt to maintain the published quotations, secondary metal is readily sold at a discount or premium. Thus, in the case of the U.S. price movement for lead exports between mid-1963 and mid-1964, for example, we have estimated the export price increase at 26 per cent, although the several publicly available wholesale and producers' price series show increases ranging from 18 to 22 per cent.

Our indexes show that European prices were lowest relative to the United States in 1961 and 1962 when there was a differential of about 20 per cent, with U.K. prices slightly lower than those of Germany and the EEC. Differences were much smaller in 1964 and, in the case of the EEC, prices were almost up to the U.S. level.

Tin

Tin is one of the few important metals which were not marked by rising world production during the period under review. Mine production of tin in 1962-63 was within 1 per cent of the 1953-54 level. The major sources of supply in the terminal years were Malaya (32 per cent), China (15 per cent), Bolivia (12 per cent), the U.S.S.R. (10 per cent), and Indonesia and Thailand (8 per cent each). Increases in output in China, the U.S.S.R., and Thailand were offset by declines in Indonesia, Bolivia, and the Republic of the Congo. Only

as the period drew to an end did it appear that serious supply shortages and premium prices might begin to stimulate a new surge in output.

In some cases, such as Malaya and the U.S.S.R., tin concentrates are smelted, and only tin metal is exported. In others, particularly Bolivia and Indonesia, tin concentrates are exported. Bolivian concentrates have gone mainly to the United Kingdom, while the destination of Indonesian concentrates has varied with political circumstances including, at times, the Netherlands, Malaya, and the United States, among others. Toward the end of the study period some developing countries which exported concentrates, such as Nigeria, began to establish local smelting facilities. The result of these changes, already noted, was that the share of the United States and western Europe in world tin smelting declined from more than 50 per cent in 1953-54 to around 20 per cent in 1962-63.

Malaya has been the world's major exporter of unwrought tin, probably accounting for more than 75 per cent of world trade. The United Kingdom, the Netherlands, Belgium, the U.S.S.R., China, and Germany accounted for most of the balance. A large part of the tin consumed in the United States and western Europe is used to make tinplate (SITC subgroup 674.7), which is five times more important in international trade than tin itself.

The price of tin has been influenced by the International Tin Agreement, which came into effect in 1956. A buffer stock financed by the producer countries was established, and its manager was required to buy tin when the price was below the floor (successively raised from £640 per long ton in 1956 to £1,000 near the end of 1964) and to sell when the price was over the ceiling (£800 in 1956 and £1,200 by the end of 1964). When the price was between the floor and ceiling but near one or the other, the manager could buy or sell (according to the case) at his discretion, but when the price was in a middle £50 or £100 range between the floor and ceiling he could not come into the market. Export quotas were also assigned to the six producing member countries from December 1957 to October 1960; quotas were curtailed during 1958 but expanded in 1959-60.

In the first few years of the period covered in this study, U.S. stockpile purchases buoyed up the world tin market.⁶⁶ By 1957, these pur-

⁶⁶ Deliveries to the United States under stockpile contracts in 1953-56 were equivalent to more than one year's world production (*Inquiry into the Strategic and Critical Material Stockpiles*, Part 5, pp. 1724-1725).

chases had been ended; and this shift, combined with low tin demand due to recession conditions and with Russian sales, forced the buffer stock manager to buy tin to keep the price from falling below the floor. Nevertheless, the producer members insisted upon raising the floor price in 1958, and the buffer stock manager ran out of money. In the final years of the period, the opposite difficulty appeared; the buffer stock manager had no tin to sell. This situation first appeared in mid-1961, when it was attributed to speculation.⁶⁷ Prices subsequently declined partly because of a U.S. decision to release 50,000 long tons (nearly a third of a year's world production) from its stockpile, and the buffer stock manager was led to buy tin again in the latter part of 1962. However, the basic situation was one of shortage, since consumption had exceeded production for several years; and prices began to climb again. In October 1963 the buffer stock of tin ran out once more, and prices rose, first moderately and then at an accelerating rate, reaching a peak in October 1964 that was about twice the October 1963 level. The price increases came despite U.S. stockpile releases of 6,000 tons in 1963 and 22,000 tons in 1964.⁶⁸

The three major tin markets are the London Metal Exchange, which includes both spot and future transactions and which is the focus of consumers, traders, and speculators from all over the world; the Penang market (Singapore before May 1964), which deals in tin for physical delivery; and the New York market, which caters chiefly to U.S. consumers. All three markets are closely related, but short-run divergent price movements are possible within narrow limits, since it takes four to six weeks to move tin from Malaya to London or New York and one or two weeks between London and New York. Transfer costs usually ensure that the London and New York prices will be higher than the Malayan price; the New York price, in turn, has tended to run slightly higher than the London price. The index of price competitiveness has thus not varied very much from year to year.

We had to rely on published prices to a considerable extent in making up our indexes for this group, as we had independent data only from a few U.S. and German sources, all buyers. However, our U.S. sources rather consistently showed smaller fluctuations than the published prices, and we based our indexes for the United States mainly on these private data.

⁶⁷ *Engineering and Mining Journal*, February 1963, p. 111.

⁶⁸ K. Friedlander, "Tin," *Engineering and Mining Journal*, February 1965, p. 93.

Miscellaneous Nonferrous Metals

This category covers about a score of nonferrous metals. Belgium is the largest exporter, followed by the United States, the United Kingdom, Japan, and Germany. Our time-to-time indexes are based on the more important metals in the group such as magnesium, tungsten, molybdenum, antimony, cobalt, chromium, cadmium, titanium, and manganese. We used wholesale price data more extensively here than in any other nonferrous group. For example, five of the seventeen series used in preparing the U.S. index represent published wholesale price data. The German indexes are based on the smallest number of series, six, although in this case none of them represents a published series. The indexes for all of the areas (the United States, the United Kingdom, Germany, and the EEC) reveal a sharp drop in prices between 1953 and 1957. Aside from a further decline in the United States between 1957 and 1961, prices tended to remain stable through 1961 and 1962, only to rise again in 1963 and more sharply in 1964. The rise in these recent years carried European prices beyond the levels that had prevailed in 1953, whereas the same was not true of the U.S. prices. Thus, European miscellaneous nonferrous metal prices, which had often been 15 to 20 per cent below U.S. prices, were about the same as U.S. prices in 1964 (U.K. prices were actually still a little lower, while German prices were a little higher, than U.S. prices).

Conclusions

During most of the years covered by this study, European international prices of nonferrous metals were 5 to 10 per cent below U.S. prices, taking the bundle of nonferrous metals exported by the advanced countries as a whole. The gap between American and European prices was widest in 1961 and 1962, but had diminished substantially, to only a couple of percentage points, by 1964. Among the European countries, Germany appeared to have less of a price advantage over the United States than either the United Kingdom or the EEC countries as a group. In both copper and aluminum, the two most important nonferrous metals in the exports of developed countries, the difference between U.S. and foreign price levels was larger for worked than for unwrought metals. In some instances, such as lead in 1962, European

international prices were as much as 20 per cent below those of the United States, and in other, less frequent cases European prices were higher. The latter was true, for example, of EEC copper prices in 1964, German prices of primary aluminum in 1962, European silver prices more often than not, and U.K. zinc prices in 1964. Quite generally the United States was least price competitive in 1961-62, and its position in 1964 was more favorable than at any other time except, possibly, the very beginning of our period.

For primary metal products, direct price competition in the sense of cutting prices in order to enter new markets including the home markets of rival producers, appears to have been confined to the aluminum industry. For worked metals, price competition has been somewhat more common.

In a number of the other major nonferrous metals, U.S. prices have often been maintained at comparatively stable levels, usually higher than those abroad. In slack markets the U.S. producers have not been completely immune to pressures from lower foreign prices because, when the price difference becomes large enough, foreign primary metal is brought into markets ordinarily served by U.S. producers, and, more frequently, because products fabricated out of foreign metals begin to displace those produced from U.S. metals. Pricing policies, particularly in copper, have been influenced by the threat of price competition from rival metals and other substitute products.

The pricing policies followed in Europe tend to differ from those of the United States. The tendency in Europe is to differentiate between home and foreign markets and to export metals at prices reflecting current world supply and demand conditions, although by the end of the period under study both primary copper and primary zinc were being sold in Europe at prices established by producers rather than at those set on the free market. Concentration in the nonferrous metal industries is high in both the United States and Europe, particularly at the primary stage, and cannot account therefore for the differences in pricing policies between the two. They are more likely the natural outcome of the difference in the capacity of the nonferrous metal industries relative to home demand in the two areas. The home market is of overwhelming importance to U.S. producers, and since it is protected—always by transport cost and time, and frequently by trade restrictions as well—it is only sensible to gear price policies to it. Of course, sep-

arate pricing policies can be applied to exports, and sometimes they have been.

The nonferrous industries of the European countries, on the other hand, are built to serve external markets; in some extreme cases such as Belgian copper and Norwegian aluminum, for example, the domestic market absorbs only a small part of output. The pressure on firms in this position to meet world supply and demand condition is, of course, much greater. This situation also leads to differential pricing for various markets.

Thus, the imperfections and fragmentation of world nonferrous metal markets are greater than might have been expected for goods which, in their homogeneity and ubiquity of use, conform so well to the stereotype of standardized internationally traded goods. Tariffs and quotas, the division of markets, the tendency to maintain customary trade channels, technical know-how, and other factors operate to varying degrees, not so much in the dynamic aluminum industry as in the slower-growing copper industry, to reduce the impact of price differences on trade flows.

Although, as noted, the direction of trade in nonferrous metals is influenced by a great variety of nonprice factors, probably to a greater extent than in other products included in this study, much of the trade pattern is consistent with price relationships. For example, the ranks of the 1963 ratios of U.K. and EEC exports to U.S. exports, for the five categories of metals for which price ratios were considered at least partially publishable, were, as expected, inversely related to the price ratios (Table 10.10).

An element of chance may be involved, since the data are somewhat rough and the differences between some of the price ratios are quite small; but there is, in any case, considerable consistency between the prices and export movements of these metals.

One result of the computation of these indexes of international prices is to show that for nonferrous metals, as for iron and steel, the existing wholesale price and export unit value indexes are at times seriously misleading as measures of international price movements and of international price competitiveness.

Some of the deficiencies of the official data are due to the inadequacy of commodity coverage. The improvement of coverage through the addition of trade journal prices for commodities not in the official

Table 10.10
 Copper, Aluminum, and Lead: Ranking of Export Value and Price Ratios,
 United Kingdom to United States, EEC to United States, and
 United Kingdom to EEC
 (value ratios ranked from high to low; price ratios from low to high)

	U.K./U.S.		EEC/U.S.		U.K./EEC	
	V	P	V	P	V	P
682.1 Copper, unwrought	4	4	4	4	4	4
682.2 Copper, worked	2	3	2	3	2	1
684.1 Aluminum, unwrought	5	5	5	5	5	3
684.2 Aluminum, worked	3	2	3	1	3	5
685 Lead	1	1	1	2	1	2

V = ranking of value ratios.

P = ranking of price ratios.

Note: Price ratios are from detailed data underlying Appendix E. Values are from Appendix A.

series moves the index of U.S. wholesale prices closer to the NBER index in every period, and the effect is usually, although not always, the same for foreign-country indexes.

The unit value index differs more from the NBER index than the wholesale price indexes in most years. Part of this discrepancy may again reflect coverage differences, since the unit value data used for the index cover only copper and aluminum. However, NBER and unit value indexes even within copper and aluminum show large differences, apparently the result of defects in the basic unit value data for individual commodities.

We conclude, therefore, that even in a relatively uncomplicated group such as nonferrous metals, the existing official wholesale price and unit value measures give inadequate or misleading impressions of international price competitiveness.