Volume Title: Price Competitiveness in World Trade

Volume Author/Editor: Irving B. Kravis and Robert E. Lipsey

Volume Publisher: UMI

Volume ISBN: 0-870-14227-5

Volume URL: http://www.nber.org/books/krav71-1

Publication Date: 1971

Chapter Title: TRANSPORT EQUIPMENT

Chapter Author: Irving B. Kravis, Robert E. Lipsey

Chapter URL: http://www.nber.org/chapters/c3408

Chapter pages in book: (p. 422 - 483)

14

TRANSPORT EQUIPMENT

TRANSPORT EQUIPMENT accounted for nearly a quarter of OECD exports of manufactured metals and machinery in 1963. Over half of these exports represented trade among the OECD countries themselves; an even higher proportion of aircraft exports (probably near 75 per cent) had OECD destinations while railway equipment was exported mainly (nearly 80 per cent) to non-OECD countries (Appendix A and sources cited). The United States accounted for about one-fourth of OECD transport equipment exports; and Germany, for almost as much. The addition of the United Kingdom raises the three-country share to nearly two-thirds of the OECD total (Table 14.1). At over 50 per cent, the U.S. share was highest in aircraft, one of the highest single-country proportions for any major manufactured product. The German share was highest in road motor vehicles. In ships, Japan was already by 1963 the most important single exporter. Import sources among markets differed greatly, with the United States dominant in the Western hemisphere and Japan; and the EEC countries, in Europe.

The U.S. share of OECD exports declined from almost half in 1953 to a quarter in 1964, with the main change taking place before 1961 (Table 14.2). The U.K. share also fell, although not quite as sharply. Large gains were made by Germany, the other EEC countries, and Japan. Between 1961 and 1964 the U.S. and U.K. shares in transport equipment exports declined, while the EEC and Japan gained.

International prices of transport equipment rose by 10 to more than 20 per cent between 1953 and 1964 (Table 14.3). Most of the increases occurred in the earlier years, prices having been rather stable in 1961–64 except for a U.K. rise. During these recent years the decline in the

Note: SITC 73. *Value of OECD Exports in 1963:* \$10.5 billion; 23.6 per cent of study total. *Coverage:* Railway and road vehicles, aircraft, ships, and boats.

Table 14.1
OECD Exports of Transport Equipment (SITC 73),
by Origin, Destination, and Commodity Group, 1963
(dollars in millions)

	Value of Exports	Per cent of OECD Exports in 73	Share in OECD Exports (per cent)					
						EEC		
			OECD	U.S.	U.K.	Total	Germany	Japan
Total, all destinations and groups	$10,496	100.0	100.0	25.8	16.8	42.6	22.3	6.0
Destination								
U.S.	866	8.3	100.0		20.0	58.1	45.7	5.1
OECD Europe	4,233	40.3	100.0	7.1	14.6	65.7	32.6	1.9
U.K.	262	2.5	100.0	11.5		56.1	17.9	10.7
EEC total	2,186	20.8	100.0	7.2	12.7	76.3	30.4	0.2
Germany	529	5.0	100.0	7.6	7.0	79.0		0.4
Canada	690	6.6	100.0	86.7	5.9	5.9	4.9	0.1
Japan	73	0.7	100.0	64.4	11.0	21.9	12.3	
Latin America	946	9.0	100.0	55.6	7.7	22.3	9.7	6.8
Other	2,969	28.3	100.0	17.3	28.7	31.0	14.6	14.7
Unaccounted for by destination	719	6.9	100.0	100.0				a
SITC commodity group								
Railway vehicles (731)	459	4.4	100.0	30.5	12.6	35.5	16.1	10.9
Road motor vehicles (732)	6,802	64.8	100.0	24.7	20.4	47.2	28.1	3.1
Other road vehicles (733)	221	2.1	100.0	11.4	30.3	43.0	20.4	7.2
Aircraft (734)	1,543	14.7	100.0	53.0	8.4	32.1		0.4
Ships and boats (735)	1,467	14.0	100.0	2.7	8.1	34.4	17.4	23.1

Source: Appendix A.
[a]Less than 0.05 per cent.

Table 14.2
OECD Exports of Transport Equipment, 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	Japan
		INCLUDING SWITZERLAND AND SPAIN					
1964	$11,924	100.0	25.1	15.3	42.6	22.1	7.0
1963	10,496	100.0	25.8	16.8	42.6	22.3	6.0
1962	9,437	100.0	29.0	16.8	40.9	20.8	5.0
1961	8,882	100.0	28.0	18.3	41.0	21.4	5.4
		EXCLUDING SWITZERLAND AND SPAIN					
1961	8,865	100.0	28.0	18.3	41.0	21.4	5.4
1957	7,226	100.0	36.3	20.3	30.1	16.2	5.9
1953	4,720	100.0	46.9	22.0	21.5	9.1	2.5

Source: Appendix B.

U.K. share is thus in the direction that would be expected from changes in relative prices. The same cannot, on the other hand, be said of the decline in the U.S. share; U.S. price competitiveness improved after 1961, markedly with respect to the United Kingdom and marginally vis-à-vis the EEC countries. However, the largest share gainers during this period were Japan and other OECD countries, for which we do not have price indexes except for some individual groups for Japan. U.S. price levels in 1964 were notably above those of Germany and the United Kingdom and slightly above those of the EEC as a whole.

These overall average price relationships conceal widely differing situations for the major types of transport equipment. In railway vehicles and aircraft, price trends were favorable to the United States, and its prices were lower, particularly at the end of the period, than those of its chief OECD competitors. For ships and boats the opposite was true: EEC and Japanese prices declined from around two-thirds of U.S. prices in 1953 to roughly half in 1964. The picture was more mixed in the important road motor vehicle group.

Table 14.3
International Prices, Price Competitiveness, and Price Levels, Transport Equipment, 1953, 1957, 1961–64

	1953	1957	1961	1962	1963	1964
INTERNATIONAL PRICE INDEXES (1962 = 100)						
U.S.	89	94	96	100	99	100
U.K.	87	94	100	100	102	107
EEC	94	98	97	100	101	102
Germany	90	95	96	100	101	101
INDEXES OF U.S. PRICE COMPETITIVENESS (1962 = 100)						
Relative to						
U.K.	98	100	104	100	103	107
EEC	107	105	101	100	101	102
Germany	102	101	100	100	102	101
INTERNATIONAL PRICE LEVELS (U.S. FOR EACH YEAR = 100)						
U.S.	100	100	100	100	100	100
U.K.	85	87	90	87	89	93
EEC	102	100	96	96	97	98
Germany	94	94	92	93	94	93

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

Railway Vehicles [1]

Trade

Most OECD exports of railway vehicles were to the less developed countries. The OECD countries were the destination of only about $110 million of railway vehicle exports in 1963 (Appendix A), and only Germany sold most of its exports within Europe. The United States, the United Kingdom, and Japan had practically no sales to European countries; the great bulk of their sales went to less developed countries. Exports to all the main railway vehicle exporting countries—the United

[1] SITC 731. *Value of OECD exports in 1963:* $0.5 billion; 1.0 per cent of study total. *Coverage:* Railway locomotives, freight and passenger cars, and parts.

States, the United Kingdom, Germany, and Japan—came to less than $15 million.

To some extent, the country pattern of trade reflects its commodity composition. The United States specialized in diesel locomotives (SITC 731.3), in which it was the dominant exporter (Table 14.4), and these were mainly imported by less developed countries. Germany, on the other hand, specialized in freight and passenger cars, of which a much higher proportion was bought by European countries. Freight cars in particular are bulky to ship and comparatively easy to manufacture or assemble, and therefore have been more subject to competition from local manufacture in less developed countries than locomotives. Electric locomotives, a minor item in which the EEC countries were the chief exporters, were sent almost entirely to less developed countries.

A specialization not revealed by the published trade data is that within diesel locomotives, U.S. firms produced mainly diesel electric locomotives,[2] while European firms led in production of diesel hydraulic locomotives. This specialization produced the rare phenomenon of locomotive imports into the United States: Twenty-one high-horsepower diesel hydraulic locomotives were ordered from Germany by two western railroads, operating along mountainous routes.[3] In these very high horsepower ranges, European, rather than U.S., producers, have been the technological leaders.

Railway vehicle exports by OECD countries have been relatively stagnant during the years covered by the study, ranging only between $400 and $500 million except in 1961 (Table 14.5). Export origins changed, however. The chief trends were a drastic decline in the U.K. share—from 28 per cent in 1953 to only 12 per cent in 1964—which involved a fall in the absolute value of exports as well, and a gain in the share of Canada and Japan from 4 to 12 per cent. The fall in the U.K. export share took place mainly between 1953 and 1961, and was accompanied by a substantial rise in the shares of both the United States and Japan, but the U.S. share fell back sharply by 1964.

Within the EEC, Germany gained at the expense of its partners, whose exports in 1964 were lower in absolute value than in 1953.

U.S. dominance in locomotive exports goes back at least to 1957,

[2] As can be seen in the locomotive orders data for the earlier years of the study published in various issues of *Railway Age* (January 14, 1957, for example).

[3] *Railway Age,* November 23, 1959, January 18, 1960, and January 7–14, 1963.

Table 14.4
OECD Exports of Railway Vehicles (SITC 731),
by Origin, Destination, and Commodity Subgroup, 1963
(dollars in millions)

	Value of Exports	Per Cent of OECD Exports in 731	Share in OECD Exports (per cent)					
						EEC		
			OECD	U.S.	U.K.	Total	Germany	Japan
Total, all destinations and subgroups	$459	100.0	100.0	30.5	12.6	35.5	16.1	10.9
Destination								
U.S.	4	0.9	100.0		17.1	12.2	2.4	
OECD Europe	90	19.6	100.0	4.4	5.6	81.1	51.1	
U.K.	2	0.4	100.0	5.6		55.6	5.6	
EEC total	38	8.3	100.0	5.4	4.7	80.5	43.6	
Germany	6	1.3	100.0	6.2	14.1	62.5		
Canada	16	3.5	100.0	93.8	6.2	a		
Japan	a	a	100.0	a	a	a	a	
Latin America	115	25.1	100.0	39.8	1.7	28.7	1.7	8.7
Other	234	51.0	100.0	32.5	20.9	23.9	11.1	17.1

(continued)

Table 14.4 (concluded)

	Value of Exports	Per Cent of OECD Exports in 731	Share in OECD Exports (per cent)					
						EEC		
			OECD	U.S.	U.K.	Total	Germany	Japan
SITC commodity subgroup								
Steam locomotives (731.1)	$ 1	0.3	100.0		6.8	16.6	16.6	76.6
Electric locomotives (731.2)	28	6.1	100.0	20.3	1.1	65.9	11.6	10.1
Other locomotives (731.3)	173	37.7	100.0	56.9	7.1	15.6	3.5	1.4
Mechanically propelled cars (731.4)	23	5.0	100.0	8.4	4.0	47.1	23.3	38.3
Passenger cars, not mech. prop. (731.5)	36	7.8	100.0	6.1	1.1	52.1	34.3	32.3
Freight and maintenance cars, not mech. (731.6)	61	13.3	100.0	10.9	18.6	56.1	28.7	11.2
Parts of locomotives and rolling stock (731.7)	139	30.3	100.0	18.7	23.8	39.4	21.3	12.4

Source: Appendix A.
[a]Less than 0.05 per cent.

Table 14.5
OECD Exports of Railway Vehicles, 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	Japan
		INCLUDING SWITZERLAND AND SPAIN					
1964	$446	100.0	25.2	11.6	43.1	23.7	5.7
1963	459	100.0	30.5	12.6	35.5	16.1	10.9
1962	442	100.0	35.0	12.7	33.5	15.2	14.4
1961	404	100.0	38.6	9.7	36.4	19.2	8.4
		EXCLUDING SWITZERLAND AND SPAIN					
1961	399	100.0	39.1	9.8	36.8	19.5	8.5
1957	478	100.0	30.9	24.5	30.2	13.0	7.0
1953	426	100.0	25.4	27.9	40.5	14.2	2.2

Source: Appendix B.

but it has declined since then, and the U.S. share in other rolling stock has fallen substantially. The United Kingdom has lost ground as an exporter in both major types of rolling stock, while Germany has gained substantially in exports of railway vehicles other than locomotives.

Over time, the horsepower range of locomotives exported from the United States shifted considerably (see Table 14.6). More than 40 per cent, by number, of the locomotives exported in 1953 were of less than 600 horsepower, while in later years the proportion was rarely as high as the 16 per cent of 1964. On the other hand, locomotives of more than 2,400 horsepower, which did not appear in the export records at all before 1962, accounted for almost a quarter of exports in the last two years shown. In value of exports, of course, the more powerful locomotives are of still greater importance, since their prices are as much as twice as high as those of the smaller locomotives.

Nonprice Factors in Trade

One feature of the trade pattern for railway vehicles that suggests the unlikelihood of finding a close relationship between our measures

Table 14.6
U.S. Exports of Diesel Locomotives, by Horsepower, 1953, 1957, 1961–64

H.P. Range	1953	1957	1961	1962	1963	1964
			NUMBER OF LOCOMOTIVES			
Under 600	52	4	29	40	18	39
600–1,200	55	101	276	78	164	58
1,300–2,400	13	206	267	313	209	104
Over 2,400			6	40	133	60
Total	120	311	578	471	524	261
			PER CENT DISTRIBUTION			
Under 600	43	1	5	8	3	16
600–1,200	46	32	48	17	31	22
1,300–2,400	11	66	46	66	40	40
Over 2,400				8	25	23
Total	100	100	100	100	100	100

Note: Data are from *Railway Age*, January 20, 1964, and from corresponding Review and Outlook issues for earlier and later years.

of prices and the flow of trade is the concentration among sources of supply for particular importing countries; that is, many importing countries tend to purchase all, or almost all, of their locomotives or freight cars from a single exporter in any one year and even over considerable periods of time.

A possible explanation for this concentration is that the flow of trade might be determined almost without regard to current prices, by long-standing supplier relationships, by the need for compatibility between existing and new equipment, by the economy of taking advantage of existing stocks of spare parts and of employees' familiarity with previously purchased equipment, by special financing arrangements, and by other factors not reflected in price as we measure it. The operation of such factors is suggested by some aspects of the trade pattern.

The operation of nonprice factors is suggested by the tendency of many importers to buy from countries with which there is, or was, a political relationship. The formerly French territories of Mauritania, Senegal, the Malagasy Republic, Niger, and Algeria, for example, purchased more than 96 per cent of their imports of railway vehicles and parts from France during the period 1958–64, while Kenya, Rhodesia, and Tanganyika imported almost entirely from the United Kingdom. The concentration is even greater for diesel locomotives in the four years for which data are available, 1961–64. The former French territories mentioned above imported all their locomotives from France.

Some flows of trade may have been associated with military or foreign aid relationships (South Korea and South Vietnam purchasing locomotives from the United States), and some may be examples of the influence of price, or of the other factors mentioned above. Peru, Israel, and Tunisia bought their diesel locomotives in the United States; New Zealand, in Canada; and Nigeria, in Germany. Data on freight cars are available only for 1961–63, but the same pattern emerges, with many countries buying all or almost all of their imports from a single source.

Because railroad investment for any particular line, and often for a whole country, is made in large lumps, the tendency to stay with one supplier is reinforced. A frequent pattern is of large-scale re-equipping for a few years followed by several years of small purchases, for which a change in supplier would be even more uneconomical than for a large investment. For example, Algeria made large purchases in 1958–59, and then much smaller ones in the following years. Nigeria's purchases were concentrated in 1958–60; Greece's in 1958–59 and 1962–63; Chile's in 1962–63; and those of the Union of South Africa, 1958–60. This concentration in time implies active bidding in one or two years, followed by several years in which at least part of the trade flow is determined by the results of the first year's competition.[4]

If the entire country is taken as a unit in examining trade data, the degree to which one year's purchase source determines the next year's tends to be underestimated. The larger countries have more than one railway line, and for any particular railroad the tendency to remain with the same supplier, ignoring current prices, would be stronger than for the country as a whole. Whatever the reason, the origin of a country's imports in any one year is clearly not independent of the origin

[4] *Trade by Commodities,* OECD Statistical Bulletin, Series C, 1964, and earlier volumes.

of the previous year's imports, and this correlation goes far beyond what could be explained on grounds of geographical proximity.

The pattern of trade in railway vehicles may be determined more by sources and types of financing than by what are usually regarded as price considerations. A large fraction of railway equipment imports were financed outside the importing countries, particularly in the case of imports by less developed countries. Total exports of railway vehicles by OECD countries to non-OECD countries amounted to almost $4 billion for 1953–63. As of the end of 1963, the International Bank had disbursed approximately three-fourths of a billion dollars in railroad loans signed in the years beginning with fiscal year 1953, the Export-Import Bank disbursed almost one-half a billion dollars for the same purpose in that period, and the Agency for International Development and its predecessor agencies lent more than $200 million for railroad equipment.[5]

World Bank loans have always involved international competitive bidding, but Eximbank and, in the later years of the study, AID financing were tied to the purchase of equipment in the United States. It is likely that a substantial proportion of other countries' aid has also been tied to the purchase of equipment from the lending country.

For the United States alone, total exports of railway vehicles were about $1.2 billion between 1953 and 1963, and U.S. aid financing was large enough to have accounted for a substantial part of that sum. However, it is difficult to make direct comparisons because the proceeds of a railroad development loan can be spent on products outside of SITC 731, such as rail or ties, construction or repair of vehicles, track, or other facilities, machine tools for repair shops, or various iron or steel products. On the other hand, some purchases of locomotives or other railway vehicles may be financed under loans for port or mining development or under mixed-purpose loans.

Price Trends

Information on price trends for all railway vehicles since 1953 is available only for the EEC, Germany, and the United States. All show price increases over the period as a whole, somewhat greater in the

[5] See *Statement of Loans*, IBRD, December 31, 1963; *Report to the Congress*, Export-Import Bank of Washington, annual issues, 1952–63, Part II; and various issues of the *Operations Report* of the Agency for International Development and the International Cooperation Administration, and *Paid Shipments* reports of the Mutual Security Agency.

Table 14.7
International Prices, Railway Vehicles, 1953, 1957, 1961–64
(1962 = 100)

	1953	1957	1961	1962	1963	1964
ALL RAILWAY VEHICLES (SITC 731)						
U.S.	83	96	102	100	101	102
U.K.	NA	NA	103	100	104	NA
EEC	74	84	95	100	101	103
Germany	74	84	95	100	101	103
LOCOMOTIVES (SITC 731.1–731.3)						
U.S.	100	108	103	100	99	98
U.K.	NA	NA	106	100	98	NA
Germany	74	83	94	100	101	103

Source: Appendix C.

EEC and Germany than in the United States, where the 1964 level was only six percentage points above that of 1957 as compared with nineteen percentage points in the other cases (Table 14.7).

Locomotive export price behavior for the two areas contrasted particularly strongly: U.S. prices apparently fell after a rise in 1957, while German prices, the only EEC prices available, increased by more than 25 per cent. Both countries' prices rose substantially between 1953 and 1957, but after that date U.S. locomotive prices fell in every year shown, while German prices increased in every year. The German price indexes are supposed to be free of the influence of quality changes, but it is possible that, with the aid of a larger amount of information on the relationship of horsepower to price of locomotives, we were more successful in producing a quality-adjusted index for the United States than for Germany, for which we relied heavily on the official export price data. However, there is evidence that almost any kind of index for the United States would show a smaller increase in price than the German series.[6]

[6] The index in Table 14.7 indicates a fall of 2 per cent in U.S. prices between 1953 and 1964, and the alternative indexes listed in the appendix to this chapter offer a range from a 10 per cent decline in U.S. prices to a 10 per cent rise. The 10 per cent decline is given by a price index constructed by valuing all locomotives purchased in 1963 at the prices that would have been charged in each of the other years, as estimated from regressions of price on horsepower for each year; and the 10 per cent rise, by

The German index can be compared with additional U.S. indexes for 1961–64. All the U.S. indexes, some derived from completely independent basic data, show stability in U.S. locomotive prices and even some decline in the last two years, while the German index continued to rise.[7]

Like the U.S. index, the U.K. locomotive index, in the few years for which it is available, declined substantially.

In railway vehicles as a whole in the first few years, U.S. prices rose more rapidly than Common Market prices. After 1961, American prices were stabilized, while EEC prices continued to increase. U.S. prices of freight cars rose much more than European ones, and much more than U.S. parts prices.

Possibilities for comparing the NBER indexes for the United States with other time-to-time measures, such as unit values and wholesale prices, are very few. No railroad equipment is included in the export unit value index of the U.S. Department of Commerce, and the Bureau of Labor Statistics wholesale price index covers railway rolling stock only since 1961.

The BLS index was very stable, showing only a rise of half a percentage point in 1962 and a decline, later reversed, of about the same amount after mid-1963. The NBER international price index declined slightly in 1962 and then rose, but ended in 1964 at virtually the 1961 level. Thus, the two indexes were almost identical in this period. Unfortunately, the components of the BLS index have not been published, and we do not know, therefore, whether the stability in the BLS index results, as in the NBER index, from a rise in freight car and parts prices offset by a decline in locomotive prices.

The Department of Commerce does not use locomotives in its export unit value index; but the unit value for diesel electric locomotives, except switching, was quite stable. For 1961–64 the unit value (dollars per locomotive) rose by about 2 per cent, while the NBER index fell by 4 per cent. The direction of the difference is as expected: Because

an ICC price index, the method of construction of which is not revealed by the source. The index actually used lies between the other two for 1953–61 and 1953–64. The first segment is constructed by linking indexes for locomotives of identical horsepower from year to year. The second segment, based on company reports of export prices, includes some adjustments, based on the regression, for changes in horsepower of specific locomotive models.

7 See, however, the section on price competitiveness, below, and the appendix to this chapter for alternative measures of German price movements.

the average horsepower of locomotives has been increasing, the unit value should be biased upward as a measure of price.

International Price Levels

The United States appears to have been the lowest-priced exporter of diesel locomotives, except at the beginning of the period, and the lowest-priced exporter of railway vehicles as a whole, but by a smaller margin (Table 14.8). Indexes for railway vehicles other than locomotives, not shown in the table except as part of the total, indicate that the United Kingdom offered lower prices than the United States for parts of railway vehicles and that EEC prices were higher than those of the United States by more than 25 per cent in 1953 and by between 5 and 15 per cent in later years. Japanese prices for locomotives also

Table 14.8
Price Levels, Railway Vehicles, 1953, 1957, 1961–64
(U.S. for each year = 100)

	1953	1957	1961	1962	1963	1964
ALL RAILWAY VEHICLES (SITC 731)						
U.S.	100	100	100	100	100	100
U.K.	NA	NA	103	102	105	NA
EEC	109	105	115	122	123	125
DIESEL LOCOMOTIVES (SITC 731.3)						
U.S.	100	100	100	100	100	100
U.K.	NA	NA	112	110	115	NA
EEC	NA	NA	114	NA	NA	NA
Japan	NA	NA	104	NA	NA	NA

Note: Some of these indexes can be compared with indexes derived entirely from place-to-place data. Taking the United States as 100 in each case, the alternative indexes are as follows:

	1953	1957	1961	1962	1963
ALL RAILWAY VEHICLES					
EEC	101	113	115	133	111
DIESEL LOCOMOTIVES					
U.K.		118	112	128	111
EEC	94	112	114	140	110

Source: Appendix E.

were substantially higher than U.S. prices for the few years in which data are available.[8]

In most of the place-to-place comparisons, of which the indexes of Table 14.8 are composed, the equivalence, but not exact identity, of the locomotives offered by the various countries was insured by the requirement that each one meet the purchasers' specifications. In a number of instances, U.S. companies bid against their European licensees on the same locomotive models, and these give something of a check on the other bidding data, since the locomotives offered are alike in more respects than specified. Unfortunately, these cases are confined to 1959 and 1960, years for which we did not compute most of our measures. The ratios of European to U.S. prices for the same locomotive models ranged from 99 to 116 per cent, with an average of not quite 110 per cent. These comparisons confirm the finding of a U.S. price advantage in diesel locomotives but suggest a somewhat smaller difference than that shown in the more comprehensive listing.

The bid data on which the place-to-place indexes are based fall far short of covering all trade in railway vehicles. Particularly in locomotives, however, some very crude estimates suggest that they cover a significant part of the trade. The total value of contracts for which bidding data were examined was over $80 million, and almost all of them yielded some useful price comparisons, roughly $60 million in locomotive bids and $15 million in freight car bids. The coverage of the bids is uncertain, but it is clear that intra-OECD trade and exports under tied loans or grants are not covered at all. Exports of diesel locomotives by OECD countries to countries outside the OECD amounted to about $430 million from 1961 through 1963. Over $200 million in loans for railroad equipment were made by U.S. government agencies, mostly under arrangements which tied purchasers to U.S. suppliers. These figures suggest that purchases of locomotives not so

[8] Some price level comparisons can be made from place-to-place data alone, but they are more erratic and may be less reliable than those in Table 14.8 because they are based on a smaller number of observations. As summarized in the note to the table they confirm that diesel locomotive prices in both the United Kingdom and the EEC tended to be higher than U.S. prices, and that EEC prices for railway vehicles as a whole were also generally high. They confirm the upward trend in relative EEC prices from 1953 to 1961, but the picture for later years is not clear because of the very large rise in 1962 and fall in 1963. The low 1963 EEC-U.S. ratio casts some doubt on the steadily rising trend of German locomotive prices after 1961, a trend which is in any case doubtful because of the reportedly fierce competition in this area. However, the Germans had not, until 1964, been notably successful in this competition.

Table 14.9
U.S. Price Competitiveness, Railway Vehicles, 1953, 1957, 1961–64
(1962 = 100)

	1953	1957	1961	1962	1963	1964
ALL RAILWAY VEHICLES (SITC 731)						
Relative to						
U.K.	NA	NA	102	100	103	NA
EEC	89	86	94	100	100	102
Germany	88	85	94	100	100	101
LOCOMOTIVES AND SELF-PROPELLED CARS (SITC 731.1–731.4)						
Relative to						
U.K.	NA	NA	102	100	102	NA
Germany	74	77	91	100	102	105

Source: Appendix D.

tied were somewhat above $200 million in these three years, and some of these may have been tied to other countries' exporters. During that period our bid data on locomotives covered roughly $40 million in contract values.

Price Competitiveness

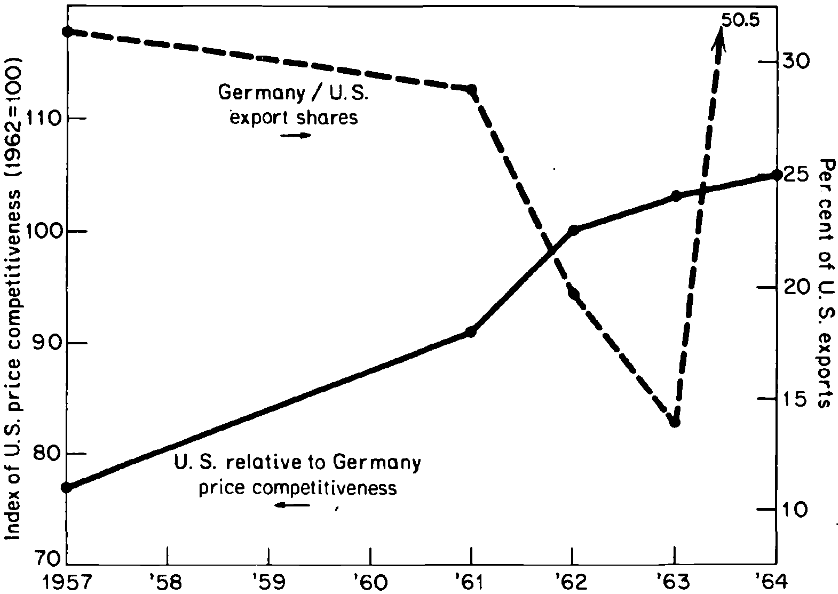
For railway vehicles as a whole, and notably for locomotives, U.S. price competitiveness relative to the EEC improved substantially over 1953–64, particularly in the five years 1957–62 (Table 14.9). The index for all railway vehicles declined from 1953 to 1957 and was almost stable after 1962, while that for locomotives shows constant improvement.[9] The data for U.S. price competitiveness relative to the United Kingdom run for too short a period to indicate a trend, but suggest little change from 1961 through 1963.

Since there were such large changes in price competitiveness of locomotives, it might be expected that they would be reflected in shifts in trade. We compare U.S. price competitiveness relative to Germany with ratios of German to U.S. exports in Chart 14.1. The shifts in trade do

[9] The alternative indexes, derived from the bid data, which are more erratic and are composed of a smaller number of observations, confirm the great improvement in U.S. price competitiveness between 1953 and 1962 and between 1957 and 1962, but suggest a reversal in 1963.

Chart 14.1

Price Competitiveness and Export Shares in Locomotives, United States and Germany, 1957, 1961–64



Note: Export values are from Appendix B; the index of U.S. price competitiveness is from Table 14.9.

seem consistent with the changes in price competitiveness, except in 1964. In the other three cases the directions of movement are opposite, as we would expect, and the rates of change appear to be in the appropriate order.

The high 1964 ratio of German to U.S. exports might be an accident, not related to price movements, but it might also reflect on the validity of the German export price indexes we use. As is mentioned in the appendix to this chapter, bidding data suggest a considerable decline in German prices in 1963 and 1964, but there were so few observations that we did not calculate an index past 1963. The same data also suggest that the price ratio may have moved sharply against the United States to the extent that the German place-to-place index relative to the United States may have gone below 100. However, because of the lack of adequate data, this must be considered only a suspicion, somewhat reinforced by the change in trade flows.

Just as changes in trade appear to be consistent with changes in price competitiveness, the structure of trade seems to fit the estimated price level relationships reasonably well. U.K. price competitiveness relative to the United States appears high in railway vehicle parts but low in locomotives, and U.K. exports of locomotives are much smaller than those of the United States, while U.K. exports of railway parts are higher. The EEC price position relative to the United States is more favorable in freight cars than in locomotives, and EEC exports of freight cars are far larger than those of the United States, while locomotive exports are lower.

In summary, we can say that the United States had a dominant competitive position in locomotives, as measured by both price relations and trade flows, but a lower and declining position in other railway vehicles, and that these indicators of price competitiveness were apparently reflected in the trade flows despite the many interferences with price competition mentioned earlier.

Road Motor Vehicles [10]

Trade

Motor vehicles, which constitute over 15 per cent of the total OECD exports covered by our study, have been one of the most dynamic commodity groups in the world economy. During the period of the study (1953–64) motor vehicle production grew more rapidly than industrial production as a whole, and world trade in motor vehicles expanded more rapidly than world vehicle production, total world commodity exports, or world exports of manufactured goods.[11]

[10] SITC 732. *Value of OECD exports in 1963:* $6.8 billion; 15.3 per cent of study total. *Coverage:* Passenger cars, buses, trucks, road tractors, and motorcycles.

[11] These statements are based on the following data:

	1953	*1964*	*Ratio: 1964/1953*
1. Motor vehicle production, excl. motorcycles (millions of units)	10.5	22.0	210
2. World industrial production (1958 = 100)	78.0	155.0	199
3. Motor vehicle exports (billions of dollars)	2.4	7.8	338
4. Manufactured exports (billions of dollars)	35.6	96.7	272
5. Total exports (billions of dollars)	78.3	169.8	217

The data above and in the two following paragraphs of text are from: Line 1: *Statistical Yearbook, United Nations,* 1962 and 1966; line 2: *Monthly Bulletin of Statistics,* United Nations, September 1964, September 1967; line 3: OECD exports (see Table 14.11); lines 4–5: *International Trade, 1965,* GATT, p. 1.

World production of both passenger and commercial vehicles doubled in terms of units, between 1953 and 1964. U.S. output expanded only by about a quarter, while in western Europe, where there was a smaller starting degree of market saturation, the rate of expansion was much more rapid. The output of commercial vehicles doubled in the four leading European producing countries, and the production of passenger cars increased more than threefold in the United Kingdom and France and more than sevenfold in Italy and Germany. Japan, starting from very low levels, developed an important motor vehicle industry with a commercial vehicle capacity second only to that of the United States.[12]

Despite a decline in its share of world production—from 71 per cent in 1953 to 42 per cent in 1964, the U.S. industry still produced more than three times as many units as Germany, the next biggest producer; and in value terms the gap was greater. Production became less concentrated not only as a result of the rise in the shares of the main European countries and Japan vis-à-vis the U.S. share, but also because of rapid growth in other countries including the U.S.S.R., Australia, Sweden, Brazil, Argentina, Spain, and East Germany.[13]

The growth in the output of the major European producers was stimulated by their ability to sell motor vehicles, particularly passenger cars, in foreign as well as home markets.[14] In 1964, for example, about half of German vehicle output was exported. For the United Kingdom and France exports were about a third of production; and for Italy, about a quarter. The great growth in Japanese output, on the other hand, was, at least through 1964, largely directed toward the home market; only about 10 per cent of output was exported. The United States, with its major producers owning many foreign manufacturing subsidiaries, exported only around 3 per cent of its output.

By 1964 Germany was the leading exporter of motor vehicles, having increased its share of OECD exports from 11 per cent in 1953 to 28 per cent (see Table 14.11). France and Italy also expanded their shares. The United States and the United Kingdom, on the other hand, dimin-

12 The relative changes described in the text are generally valid descriptions of what took place, but the actual ratios would vary if other terminal years were compared. Between 1952 and 1965, for example, U.S. passenger vehicle output more than doubled, while that of France and the United Kingdom nearly quadrupled and that of Germany and Italy increased more than ninefold.

13 All these countries produced at least 100,000 vehicles in 1964, with the U.S.S.R.'s 835,000 by far the largest output.

14 See Chapter 15.

Table 14.10
OECD Exports of Road Motor Vehicles (SITC 732), by Origin, Destination, and Commodity Subgroup, 1963
(dollars in millions)

	Value of Exports	Per Cent of OECD Exports in 732	Share in OECD Exports (per cent)							
						EEC				
			OECD	U.S.	U.K.	Total	Germany	France	Italy	Japan
Total, all subgroups	$6,802	100.0	100.0	24.7	20.4	47.2	28.1	9.9	5.7	3.1
Destination										
U.S.	697	10.2	100.0		20.9	64.7	53.4	6.0	3.7	5.2
OECD Europe	2,816	41.4	100.0	6.8	18.2	69.8	39.3	14.5	8.6	0.5
U.K.	94	1.4	100.0	14.9		68.1	23.4	14.9	13.8	8.5
EEC total	1,596	23.5	100.0	6.3	14.9	76.1	35.3	18.8	10.6	0.2
Germany	266	3.9	100.0	10.9	8.6	75.2		36.1	28.2	0.4
France	284	4.2	100.0	6.0	19.7	73.2	44.7		19.0	0.1
Italy	326	4.8	100.0	1.5	20.2	77.6	48.2	28.5		0.3
Canada	605	8.9	100.0	87.4	5.3	6.4	5.6	0.8	0.2	0.2
Japan	26	0.4	100.0	46.2	15.4	38.5	34.6	1.7	1.4	
Latin America	643	9.5	100.0	65.8	7.9	20.7	12.3	3.9	4.0	2.5
Other	1,879	27.6	100.0	20.9	34.4	32.7	16.5	10.4	5.1	7.7
Unaccounted for	137	2.0	100.0	97.4						2.6

(continued)

Table 14.10 (concluded)

	Value of Exports	Per Cent of OECD Exports in 732	Share in OECD Exports (per cent)							
						EEC				
			OECD	U.S.	U.K.	Total	Germany	France	Italy	Japan
SITC commodity subgroup										
Passenger cars and chassis (732.1, 732.6)	$3,360	49.4	100.0	8.8	19.8	66.5	39.4	14.8	7.5	1.2
Buses (732.2)	90	1.3	100.0	28.3	21.0	44.8	21.1	2.7	5.4	4.3
Trucks (732.3)	1,032	15.2	100.0	30.6	23.6	31.7	20.5	6.2	3.1	7.3
Special purpose trucks (732.4)	155	2.3	100.0	72.8	8.3	13.8	6.1	4.3	0.8	2.3
Road tractors (732.5)	18	0.3	100.0	a	15.6	71.5	31.8	14.5	14.0	3.4
Chassis (excl. passenger cars) (732.7)	138	2.0	100.0	a	57.0	25.3	19.4	0.7	1.2	9.8
Bodies and parts (732.8)	1,842	27.1	100.0	50.5	19.1	25.1	15.8	4.9	3.2	1.0
Motorcycles and parts (732.9)	166	2.4	100.0	0.8	10.6	47.2	13.1	8.3	23.3	35.3

Source: Appendix A.

[a]Not reported separately by United States.

Table 14.11
OECD Exports of Road Motor Vehicles, 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	France	Italy	Japan
	INCLUDING SWITZERLAND AND SPAIN								
1964	$7,792	100.0	24.6	19.3	46.9	28.2	8.3	5.9	3.8
1963	6,802	100.0	24.7	20.4	47.2	28.1	9.9	5.7	3.1
1962	6,040	100.0	25.2	20.8	47.0	27.1	9.7	6.5	2.7
1961	5,336	100.0	24.8	20.8	47.6	28.0	9.9	6.4	2.6
	EXCLUDING SWITZERLAND AND SPAIN								
1961	5,324	100.0	24.8	20.8	47.7	28.1	10.0	6.4	2.6
1957	3,929	100.0	37.9	22.0	35.6	20.7	8.4	4.5	0.7
1953	2,367	100.0	46.0	26.1	22.9	11.1	7.4	2.6	0.2

Source: Appendix B.

ished in relative importance, the former dropping from 46 to 25 per cent and the latter from 26 to 19 per cent. Even their smaller shares in the rapidly expanding market, however, gave the United States and the United Kingdom substantially larger motor vehicle export proceeds in 1964 than they had in 1953.

Exports of the major countries differed substantially in their geographical destination and commodity composition. U.S. exports went largely to Canada (31 per cent) and to the less developed countries of Latin America and Asia (48 per cent); only a small fraction (11 per cent) went to European OECD countries (Table 14.10). The dominant markets for the United Kingdom and Japan were in Asia and Oceania, with OECD Europe a close second destination for the United Kingdom. Well over half of Germany's exports went to OECD Europe, but another third went to the United States and Asia.

The United States and Japan, unlike the European countries, exported more commercial vehicles (SITC 732 subgroups 2, 3, 4, 5, and 7) than passenger cars. Commercial vehicles comprise a wide range of products that vary in size and purpose. Their single most important use is to haul goods from one place to another. Within this category light vans and trucks with gross vehicle weights (GVW) of three tons or less are the most numerous.[15] The vehicles at this smaller end of the range are mass produced like automobiles, often under the same brand names and largely from the same parts. Numbers diminish and the large automobile producers' shares of the market decline with increasing size of vehicle, since the comparative advantage shifts to smaller and more specialized truck manufacturers. Styling becomes less important, and the difficulties of standardization increase with size, especially as purchasers with large freight volume have greater incentives to seek cost savings through trucks closely adapted to their specific needs. Thus, in the United States, for example, the big-three auto manufacturers accounted for nearly 90 per cent of new-truck registrations in 1965 for vehicles with a GVW of 6,000 pounds or less but for only around 30 per cent of those with a larger GVW.[16] The lighter vehicles almost all use gasoline engines even in Europe, while the heavier ones are more likely to be diesel, even in the United States. However, the proportion of diesel vehicles is higher in Europe; it has recently been estimated at 35 per cent, while diesels have been accounting for only 5 to 6 per cent of U.S. factory sales of trucks.[17]

Aside from goods delivery, commercial vehicles are designed for passenger transport (buses) and a variety of special purposes including fire fighting, street cleaning, concrete mixing, and mobile lighting, generating, and testing equipment.

Both in production and in international trade, however, trucks per se are of overwhelming importance, and we therefore do not regard it as a serious disadvantage that we rely on truck prices for our time-to-time index of commercial vehicle prices. In 1963, trucks (SITC 732.3) accounted for over 70 per cent of OECD commercial vehicle exports. Most of the balance was made up of special-purpose trucks (SITC 732.4) and chassis for trucks (included with bus chassis in SITC 732.7).

Japan and Italy were the main exporters of motorcycles. Japan's exports of motorcycles, which exceeded its passenger car exports in

[15] Gross vehicle weight is the weight of the vehicle plus its payload. The proportion of the payload rises from around 25 per cent for small vans to more than 75 per cent for very large trucks. On this and other points see the informative report in the *Economist*, July 8, 1967, pp. vii ff.

[16] *Automotive Industries*, March 15, 1967, p. 103.

[17] *Economist*, July 8, 1967, p. xxv; and *Automotive Industries*, March 15, 1967, p. 97.

value in 1963, more than tripled between 1962 and 1964, and Japan replaced Italy as the largest motorcycle exporter.

Over half of U.S. exports in this division consisted of parts. For the European exporters complete vehicles, particularly passenger cars, dominated exports (see Appendix A). The reason for the difference is probably that, to a much greater extent than the other countries, the United States had direct investments in automobile plants in Canada, Latin America, and other areas to which parts that could not be produced locally on an economical basis were shipped. In many of these markets, government policies were directed toward the local production of an increasing proportion of the completed vehicle; however, the expansion of production in those areas was great enough to keep U.S. parts exports rising. It is interesting to note that in Latin America where Germany was also involved with direct investment, the share of parts in German exports approached that of the United States. The United States also had a relatively favorable price position for parts (see below), but the low share of parts in U.S. exports to Europe does not support the hypothesis that price was the main factor accounting for large U.S. parts exports.[18]

Price Trends

For passenger cars, which accounted for about half of 1963 trade in motor vehicles, regression methods were used to estimate price changes. The nature of the data, the problems encountered in their use for our purposes, and the results, which are merely summarized in part of Table 14.12, are considered more fully in the next chapter. Regression methods were applied also to trucks for U.S. and U.K. indexes.[19]

18 It is possible also that the U.S. reporting system tended to classify incomplete vehicles with parts to a greater extent than that of other countries. The Europeans followed the Brussels nomenclature while the United States did not. The Brussels classification, which underlies the SITC, calls for the assignment of incomplete vehicles to the same category as complete ones as long as they have "the essential character" of the completed vehicle (e.g., a vehicle without its engine or interior fittings). Cf. *Explanatory Notes to the Brussels Nomenclature,* Customs Co-operation Council, 1955, Vol. III, p. 990. The U.S. classification, at least before 1965, contained a category of "parts and accessories, n.e.c.—for assembly" which seemed to include all except "complete knockdown vehicles," and these incomplete vehicles were classified as parts in U.S. export data. Cf. *Schedule B—Statistical Classification of Domestic and Foreign Commodities Exported from the United States,* January 1, 1958 Edition. Changes effective through July 1, 1964, U.S. Bureau of the Census.

19 The indexes were derived from double log equations using as independent variables GVW, wheelbase, displacement, and dummy variables for trucks equipped with a cowl, for those with a diesel engine (for the United States after 1962 and for the United Kingdom), and for forward control (United Kingdom only). The method of flexible

Table 14.12
International Prices, Road Motor Vehicles, 1953, 1957, 1961–64
(1962 = 100)

	1953	1957	1961	1962	1963	1964
United States						
Passenger cars	90	89	94	100	100	100
Commercial vehicles	86	92	93	100	97	93
All motor vehicles	89	91	94	100	99	98
United Kingdom						
Passenger cars	98	93	99	100	101	106
Commercial vehicles	81	95	98	100	100	102
All motor vehicles	92	95	100	100	101	106
EEC						
Passenger cars	102	100	95	100	102	102
Commercial vehicles	81	84	94	100	101	102
All motor vehicles	95	95	96	100	102	103
Germany						
Passenger cars	95	95	94	100	102	100
Commercial vehicles	81	84	94	100	100	100
All motor vehicles	90	92	95	100	102	101

Source: Appendix C.

The independent variables in the equation relate only to certain standard features of trucks. Truck sales, especially in the larger sizes, usually involve custom combinations of features that fit the special needs of buyers more sophisticated and more expert than passenger car purchasers. Not only are there many body styles [20] that can be combined with a given model having a certain gross vehicle weight and displacement, but many of the manufacturers offer a wide choice of options

pooling (see Chapter 5 on regression methods) was applied to successive pairs of years for each country. The resulting estimates of price changes for U.S. and U.K. commercial vehicles, shown in Table 14.12, would not have been radically different if alternative equations with almost equal economic and statistical claims to selection had been used. The price changes between successive years were usually within one or two percentage points of those in Table 14.12 and rarely different by more than three or four points. The differences for successive periods tended to be offsetting, so that the consistent use of an alternative equation would have in most cases produced a similar estimate of price change between 1953 and 1964.

[20] However, truck manufacturers generally build only the smaller truck bodies.

with respect to engines, rear axles, and transmissions, and other features. However, the high proportion of price variation that our variables were able to explain is encouraging.

For motor vehicle parts, which account for over one-fourth of the total trade for the group, we based our indexes partly on the car and truck price indexes and partly on direct price observations for parts. Car and truck prices are relevant because a large portion of the so-called parts trade probably consists of partially completed cars and trucks.

Over the period 1953–64 the international price indexes for motor vehicles as a whole rose about 10 per cent in the United States and Germany (with generally similar timing) and by somewhat more in the United Kingdom (see Table 14.12). However, there is an important difference in the pattern of the price changes: In the United States, passenger car prices rose more and truck prices substantially less than in Europe.

Our data are presented in Table 14.13 in the form of price relatives for successive pairs of years so that they may be more readily compared with official wholesale and export price series reweighted by our international trade weights. For the United States and Germany, the major differences between the NBER international price indexes and the wholesale indexes are in the 1957-to-1953 comparisons, when the former show only slight price increases whereas the latter show a notable rise in U.S. prices and a fall in German ones. These differences dominate the results for the period as a whole, and lead to opposite conclusions about the change in the relative price position of the United States vis-à-vis Germany. Our indexes show a relative decline in U.S. prices of commercial vehicles but little overall change, while the wholesale price indexes show a fairly large rise in U.S. prices. In France, the wholesale prices seem to be biased downward, relative to the NBER indexes for passenger cars, while in Japan they appear to have an upward bias. Since our prices for the motor vehicle group for the most part refer to domestic list prices rather than to export prices (which have been gathered for virtually all other parts of our study), we attribute the differences to method and, possibly, to sampling variation. As we stated in Chapter 5, we believe that our regression methods take account of a wider segment of the market and are more consistent and more systematic than those that underlie the official indexes.

Table 14.13
Official Wholesale and Export and NBER International Price Indexes for Total, Passenger, and Commercial Motor Vehicles, 1953, 1957, 1961–64

	1957/1953	1961/1957	1962/1961	1963/1962	1964/1963
UNITED STATES					
NBER					
Passenger cars	99	105	107	100	100
Commercial vehicles	107	101	108	97	96
Total	102	104	106	99	99
Wholesale price index					
Passenger cars	112	104	99	99	100
Commercial vehicles	113	106	100	99	100
Total	113	105	100	100	99
GERMANY					
NBER					
Passenger cars	100	99	106	102	98
Commercial vehicles	103	113	106	100	100
Total	101	104	106	101	99
Wholesale price index					
Passenger cars	88	105	103	101	100
Commercial vehicles	97	110	102	101	100
Total	93	107	102	101	100
Export price index					
Passenger cars	99[a]	103	100	99	100
Commercial vehicles	NA	104[b]	101	100	100
Total	100	105	100	100	101
FRANCE					
NBER					
Passenger cars	101	86	105	103	105
Wholesale price index					
Passenger cars	103	77	102	102	101
Commercial vehicles	110	86	103	103	104
Total	105	80	102	102	102

(continued)

Table 14.13 (concluded)

	1957/1953	1961/1957	1962/1961	1963/1962	1964/1963
		JAPAN			
NBER					
Passenger cars	NA	71	95	95	97
Wholesale price index					
Passenger cars	73	82	99	99	97
Commercial vehicles	105	92	99	99	100
Total	90	88	99	99	98
Export price index					
Passenger cars	NA	NA	98	98	100
Commercial vehicles	NA	NA	100	99	100
Total	NA	NA	99	99	100

Source: International prices from Appendix C; wholesale prices from Appendix F. Export prices for Germany are from *Preise-Löhne-Wirtschaftsrechnungen,* Reihe 1, Preise und Preisindices für Aussenhandelsgüter, Statistisches Bundesamt, Wiesbaden, various issues; for Japan, *Export and Import Price Index Annual*, Bank of Japan, various issues.

[a]For 1957/1954.

[b]For 1961/1958.

Another way of looking at these changes is through the indexes of price competitiveness in Table 14.14. In passenger cars, U.S. price competitiveness declined relative to Germany and the EEC; it declined relative to the United Kingdom also, but recovered in the final year as U.K. prices rose relative to all the others. Larger changes in price competitiveness, rather consistently favorable to the United States, were found for trucks. This finding seems consistent with the relatively better export performance of the United States in commercial vehicles as compared to passenger cars.

Price Levels

We are able to provide only very rough estimates of differences in levels of export prices for motor vehicles.

Even in the case of passenger cars, where we had relatively extensive data (see Chapter 15), product differentiation and differential pricing between markets made it difficult to summarize price relationships between each pair of countries in a single average figure. We obtained

Table 14.14
U.S. Price Competitiveness, Road Motor Vehicles, 1953, 1957, 1961–64
(1962 = 100)

	1953	1957	1961	1962	1963	1964
BASED ON NBER INTERNATIONAL PRICE INDEXES						
Relative to U.K.						
Passenger cars	109	105	106	100	101	106
Commercial vehicles	94	104	106	100	103	110
All motor vehicles	104	105	106	100	102	107
Relative to EEC						
Passenger cars	114	113	102	100	102	102
Commercial vehicles	95	91	102	100	104	110
All motor vehicles	107	105	102	100	103	104
Relative to Germany						
Passenger cars	106	107	101	100	102	100
Commercial vehicles	95	91	102	100	103	107
All motor vehicles	102	102	101	100	102	102
BASED ON WHOLESALE PRICE INDEXES						
Relative to Germany						
Passenger cars	121	95	96	100	102	102
Commercial vehicles	111	95	98	100	102	102
All motor vehicles	118	95	97	100	100	102
Relative to France						
Passenger cars	143	132	97	100	103	104
Commercial vehicles	124	120	98	100	104	108
All motor vehicles	137	128	98	100	103	105
Relative to Japan						
Passenger cars	196	128	101	100	100	96
Commercial vehicles	126	117	101	100	100	100
All motor vehicles	169	124	101	100	99	98

Note: Figures show ratios of foreign to U.S. international price indexes. The international price indexes used in each foreign-U.S. comparison for the table are comparable in coverage and method, while those in Table 14.12 represent the best estimates that could be made for each country, regardless of comparability. The differences, however are slight.

Source: Appendixes D and F.

different results in each of the four comparisons we made—of home prices, of prices in the U.S. market, of prices in the U.K. market, and of prices in the French market. We regard the comparisons made for the domestic markets and for the French market as the most reliable, but knowing that some motor car manufacturers pursue pricing policies that discriminate between various markets, we do not feel warranted in discarding the other two sets of results.

Even if all four sets of results were perfectly reliable, their valid combination into overall averages for each pair of countries would require knowledge that we do not possess. That is, we would have to know to what extent the price relationships observed in these comparisons represent other export markets for which we have no data. In the absence of this information, we used the U.S. market price relationships to represent the 18 per cent of world exports that went to the United States and Canada, the U.K. market data to carry the 21 per cent weight of exports to OECD Europe other than the EEC, the French market data to stand for the 33 per cent of exports to the Common Market, and the home market comparisons to represent the 28 per cent of world exports that went to other destinations.[21] The results for 1964 are: United States, 100; United Kingdom, 84; Germany, 89; France, 114; and Italy, 102.

Thus, this method of averaging indicates that U.S. and Italian passenger car export prices were about the same, that U.K. and German passenger car export prices were lower (and not very different from one another), and that French prices were higher.

Regression methods like those used to derive the automobile results could be employed in the case of trucks only for the U.K.-U.S. comparison.[22] Our data indicated widely differing U.K.-U.S. price relationships for diesel- and gasoline-powered trucks, and since U.S. diesel

[21] The weights refer to 1963, the year used for weighting purposes in the study as a whole.

[22] The numbers of trucks included in the sample by size and type of engine, were as follows:

	United States			*United Kingdom*		
GVW (lbs.)	*Diesel*	*Gas*	*Total*	*Diesel*	*Gas*	*Total*
Under 6,000	0	3	3	2	4	6
6,000–9,999	0	2	2	2	2	4
10,000–14,999	0	3	3	4	4	8
15,000–19,999	0	3	3	12	14	26
20,000–24,999	5	21	26	14	20	34
25,000–29,999	2	8	10	11	3	14
Total	7	40	47	45	47	92

observations were available only for large trucks, it seemed best to treat the two kinds of trucks separately. A pooled U.K.-U.S. double log regression for gasoline trucks indicated that U.K. list export prices were 9 per cent higher than those of the United States.[23] When, on the other hand, the United Kingdom prices of the seven U.S. diesel trucks were estimated from a U.K. equation for diesels only,[24] the U.K.-U.S. price relatives ranged from 41 to 53 and averaged 49. Our overall estimate for trucks thus turns critically on the relative importance of diesel and gasoline trucks in OECD exports. On the basis of very incomplete information,[25] we place the share of diesels at one-third. On this basis, the U.K.-U.S. relative for trucks comes to 88. We also had more than a score of direct export price comparisons for 1961–64 from foreign purchasers, including a number of comparisons based on bidding procedures. Many of these were for heavy trucks designed for construction projects, such as dump trucks and cement mixers, and the United States tended to show up more favorably; U.K. prices were 8 per cent higher on the average. Ideally, we should have had trade data on the importance of these kinds of trucks relative to urban or interurban delivery trucks, but we simply averaged the results of the direct comparisons and the regressions. When we added bid data for special-purpose vehicles (e.g., trucks equipped with cranes) and road tractors, allowing these to represent 15 per cent of total commercial vehicle exports and trucks, the other 85 per cent, our final estimate of the U.K.-U.S. price relative for commercial vehicles came to 100.

The evidence on the price position of German trucks relative to that of the United States and the United Kingdom pointed fairly consistently to higher German prices. The list export prices of the four rather small trucks used for the measurement of time-to-time price changes were about 5 per cent higher than U.K. prices estimated from a U.K. equa-

[23] $\bar{R}^2 = .9840$. Independent variables: GVW, wheelbase, displacement, and dummies for cowl and forward control. Coefficients more than two times their standard errors except forward control (1.9). Retained slope dummies: cowl and displacement.

[24] $\bar{R}^2 = .91$. Independent variables: GVW, wheelbase, displacement, and dummies for cowl and forward control. The forward control coefficient was 1.5 times its standard error; all others were more than two times their standard errors.

[25] Diesels were 18 per cent of the total dollar value of 1964 truck exports for the United States and probably between 40 and 45 per cent of the value of U.K. exports. If it is assumed that the other OECD countries had diesel ratios of around 40 per cent the trade shares of Table 14.6 indicate that diesels accounted for about one-third of truck exports (*United States Exports of Domestic and Foreign Merchandise; Commodity by Country of Destination,* 1964 Annual, U.S. Dept. of Commerce, Report FT 410, June 1965; *Accounts Relating to the Trade and Navigation of the United Kingdom,* U.K. Board of Trade, December 1964).

tion for gasoline trucks.[26] However, two private purchasers, one in the United States and one abroad, reported German prices for smaller vehicles at about the same level as or lower than the U.S. prices. In international bidding, on the other hand, German prices turned out to be substantially higher (not as much higher for special-purpose vehicles as for ordinary trucks). Putting together these various sources of information as in the U.K.-U.S. comparison, we arrived at a German-U.S. price relative for commercial vehicles of 105. Scattered bid data and price comparisons by purchasers indicate that French and Italian commercial vehicle export prices were in general slightly higher than German ones.

The estimates for bodies and parts (SITC 732.8), the remaining major component of SITC 732, were based on direct U.K.-U.S. comparisons of about sixty parts and on direct German-U.S. comparisons of about forty parts. Most of the data came from a survey made by a major manufacturer to select its own sources of supply; the rest of the information came from two equipment manufacturers and several purchasers. Although there was a wide dispersion of price relatives, U.K. prices tended to be higher than those of the United States, and German and EEC prices higher still.

Our final 1964 indexes for motor vehicle price levels are: United States, 100; United Kingdom, 93; EEC, 106; Germany, 100.

Aircraft[27]

Trade

The United States was by far the chief exporter of aircraft and parts, accounting for more than half of all exports in 1963 (Table 14.15). Next in importance, but far behind, came the Netherlands, the United Kingdom, France, Belgium-Luxembourg, Canada, Italy, and Germany. The EEC countries as a group were responsible for almost one-third of OECD exports.

[26] The equation ($\bar{R}^2 = .98$) is analogous to that used in the pooled U.K.-U.S. regression and gives the same result for the U.K.-U.S. price relative (108) when used in conjunction with a corresponding U.S. equation. We did not estimate U.S. prices for the German specifications because the displacement of the German trucks was smaller than that of any trucks in the U.S. sample.

[27] SITC 734. *Value of OECD exports in 1963:* $1.5 billion; 3.5 per cent of study total. *Coverage:* Almost entirely heavier-than-air aircraft and parts.

Table 14.15

OECD Exports of Aircraft and Parts, by Subgroup, 1963, and by Year, 1953, 1957, 1961–64
(dollars in millions)

	Value of OECD Exports	Share in OECD Export (per cent)					
					EEC		
		OECD	U.S.	U.K.	Total	Germany	Japan
SITC commodity subgroups; 1963	$1,543	100.0	53.0	8.4	32.1	3.9	0.4
Heavier than air (734.1)	847	100.0	56.0	6.7[a]	32.6	0.5	0.4
Parts and airships (734.9)	697	100.0	49.3	10.5	31.4	8.1	0.3
Group as a whole							
1964	1,764	100.0	48.4	6.9	31.7	2.3	0.3
1963	1,543	100.0	53.0	8.4	32.1	3.9	0.4
1962	1,507	100.0	65.0	7.6	18.6	0.7	0.3
1961	1,436	100.0	63.9	11.5	17.2	0.5	0.4
1957	1,125	100.0	71.8	17.3	6.2	b	b
1953	975	100.0	80.2	12.1	2.7	b	

Source: Appendix A and B.
[a]Includes airships
[b]Less than 0.05 per cent

The statistics on aircraft exports, particularly those on destination, have a number of deficiencies. Almost 40 per cent of OECD exports are U.S. special-category items for which no destinations are shown. Furthermore, the figures for the United States published by the United Nations and the OECD contain numerous errors resulting from misclassification in the translation of U.S. export data into SITC categories. (These errors, and the corrections made in the U.S. figures, are described in the notes to Appendix A.) Another indication of unreliability in the published information are the very large differences between import and export records for the same pairs of countries. Germany, for example, is reported as the destination for $133 million in exports of complete aircraft (SITC 734.1) from EEC countries, but reports only $6 million in imports from these countries. Belgium reports exports of $18 million in complete aircraft to the United Kingdom, but the United Kingdom reports less than $9 million in imports of all aircraft and parts (probably mostly parts) from all countries except the United States, France, Canada, and the Commonwealth. The most likely explanation for at least some of these discrepancies is that military aircraft were involved, and therefore importing countries did not report them for security reasons or because they were for the use of international forces.

The destinations of U.S. aircraft and parts exports, as far as they could be surmised from the data, were less concentrated in Europe than those of the EEC countries (see sources listed in Appendix A). Almost two-thirds of EEC exports were to other EEC countries; and more than three-quarters, to OECD Europe. The U.S. ratios, estimated from import data, were one-third to the EEC and one-half to OECD Europe. The U.K. export ratios to Europe were even lower. The true U.S. ratios were undoubtedly lower than the reported ones because unreported exports must have been mainly to countries outside Europe.

Exports by countries other than the United States and the United Kingdom are, in a sense, inflated by the process of subcontracting large portions of the total cost of an aircraft to other countries. The individual part is thus frequently reported twice in the export data, once as a part and once as part of a complete aircraft. The Fokker Friendship, one of the main factors in Netherlands aircraft exports, includes elements manufactured in the United Kingdom, Germany, and France.[28] The

[28] "That Company, Fokker," *Economist*, August 28, 1965.

building of F104 and F104G fighter aircraft, some of which were exported by four European countries, Canada, and Japan, at a cost of $2.8 billion, resulted in $1.2 billion of expenditures in the United States, more than 40 per cent of the total.[29] The largest element of "duplication" in aircraft exports probably consists of engines (SITC 711.4 when reported separately), but electronic equipment and other items are also important.

Parts of aircraft, with other minor items, make up about 45 per cent of exports. The United Kingdom showed a considerably higher ratio of parts to complete aircraft than the United States or the Continental countries; and Japan, a lower ratio. One reason for the high U.K. ratio may be its decline as an aircraft supplier, which means that the ratio of old aircraft in use to new aircraft exported is higher for planes of U.K. manufacture than for aircraft produced by other countries.

The main change in the direction of trade in aircraft and parts was the rise of the EEC countries from a negligible level in 1953 to almost 30 per cent of OECD exports in 1963 and 1964 (Table 14.15). The U.S. proportion, around 80 per cent in 1953, had shrunk to less than 50 per cent by the end of the period.

Nonprice Factors in Trade

Clearly, many factors governing the flow of trade in aircraft and parts are not reflected in prices as we are able to measure them. Among these are the early availability of new types of aircraft, delivery time, reliability of service, subsidies, free services included as part of sales contracts, compatability with existing equipment, trade-in deals, and the cost of credit. These could, theoretically, be priced if we had adequate information, and the purchasing agencies presumably do put prices on them. That is, each purchaser evaluates the utility of these factors to his own company.

Some nonprice factors cannot be evaluated by the purchasers. These involve governmental decisions based on interests outside those of the purchasing agency; for example, consideration of employment levels in the domestic aircraft industry or prospects of promoting exports by that or other domestic industries.

An example of the influence of nonprice factors was the purchase of

29 "U.S. Balance Fattened by Plane Purchases," *New York Herald Tribune,* July 1965.

the Super VC-10 by BOAC in the early 1960s. The decision to buy this aircraft was widely reported to be contrary to the wishes of the management of the airline, and was clearly a measure of support for the British aircraft industry.[30]

Other cases of the influence of factors external to the purchaser involved the purchase of aircraft as a *quid pro quo* for the purchase of parts or other items by the aircraft supplier. A possible arrangement for building British jet plane parts in Germany was expected to involve the requirement that a German airline would be committed to buying British aircraft. A British purchase of U.S. military aircraft included, as part of the trade, a waiver of buy-American rules to enable British firms to compete on equal terms with U.S. firms for American defense contracts. The arrangement included a suspension of buy-American provisions for some amount of British military sales to the United States and an agreement by the Americans not to compete with the British for military sales in the Middle East market, so that Great Britain's military orders there could balance the cost of its U.S. purchases.[31] Military aircraft and parts, again, are purchased under a number of different types of arrangement, including substantial subsidies not reflected in quoted prices. In the case of the $2,753 million program for equipping European countries with F104 fighter aircraft, the United States contributed $215 million of the $1,159 million which was spent in the United States. It was reported that U.S. and British bidders for an Argentine civil aircraft order offered military aircraft at low prices as part of a tie-in sale. Quite commonly an aircraft supplier will take an existing fleet in trade-in as part of a sale of new aircraft.[32]

Among the larger civil airlines the most important factors are probably service and the economy of standardization. The size of American aircraft companies, a result of the large scale of U.S. military procure-

[30] "Over the Atlantic," *Economist*, March 13, 1965; "The New Battle of Britain: Can Air Industry Survive," *New York Herald Tribune*, March 12, 1965; "BOAC Buys British, Boeing 707's Stymied," *ibid.*, July 20, 1964; "Britain Expected to Ask BOAC to Make Good Order for VC-10 Planes," *Wall Street Journal*, July 14, 1964; "Second Best?"*Economist*, June 16, 1962.

[31] "America Expects Every Briton . . . ," *Economist*, January 13, 1968; "Arms Exports, On the Warpath," *ibid.*, February 4, 1967; "Arms Sales: Markets Are Where You Find Them," *ibid.*, May 7, 1966; "Defence: The Next Orders," *ibid.*, February 26, 1966.

[32] "West German Company Is Discussing Making British Jet-Plane Parts," *Wall Street Journal*, June 22, 1964; "The Next Orders," *Economist*, February 26, 1966; "U.S. Balance Fattened by Plane Purchases," *New York Herald Tribune*, July 1965; "Argentina Given War Plans Offers," *New York Times*, March 3, 1965; "3 Companies Woo Mideast Airlines," *ibid.*, March 22, 1965.

ment and civilian aircraft purchases, is probably of great benefit in international competition, partly because a purchaser, faced with two similar aircraft, will buy from the larger firm in the expectation that service will be superior.[33] The large company has another, related, advantage, in that it can offer a wider variety of aircraft, all sharing certain spare parts. An airline can standardize on one supplier for several types of aircraft, thus economizing on stocks of parts and probably on the learning time of its mechanics as well. This economy, among other factors, may explain the speed with which American companies came to dominate the short-range jet market despite a very late start compared with the British.[34]

Changes over time in the type of aircraft purchased also affect market shares of the main exporters. The market for commercial jet aircraft has gone through several phases, each of which favored one or the other major exporter. During 1955–57, for example, purchases of long-range aircraft were particularly important, and the United States met virtually no competition in that class. At the end of the period demand surged for small jets to replace piston aircraft on shorter flights. This demand was beneficial to British manufacturers, who began production of such aircraft two years before the first American company to enter the field. The advantage may have been temporary, but it did affect the flow of orders for several years.[35]

Price Trends

Prices for aircraft and parts sold by the United States, the United Kingdom, and France rose steadily during this period (Table 14.16). U.S. prices for complete aircraft rose less than those of the other two countries, but parts prices seem to have risen at least as quickly in the United States as in the European countries.

The French index is very weak. For one thing the data cover essentially one aircraft, the middle-range Caravelle, in various versions, while the U.K. and U.S. prices cover a range from the comparatively small jets, such as the Douglas DC-9, and the BAC-111, through the large

[33] "That Company, Fokker," *Economist,* August 28, 1965.

[34] "War of Small Jets," *Economist,* February 27, 1965; "British Pin Hopes on Selling Shorter-Range Craft in the U.S.," *New York Times,* April 11, 1965; "Boeing is Making Short-Range Jets," *ibid.,* February 20, 1965.

[35] "Industry Awaits UAL Jet Choice," *New York Herald Tribune,* March 22, 1965; "United to Buy 75 Jetliners for Record $375 Million," *New York Times,* April 6, 1965; also see sources in previous footnote.

Table 14.16
International Prices, Aircraft and Parts, 1953, 1957, 1961–64
(1962 = 100)

	1953	1957	1961	1962	1963	1964
AIRCRAFT AND PARTS (SITC 734)						
U.S.	83	89	99	100	102	108
U.K.	NA	NA	NA	100	108	112
France	NA	76	93	100	102	104
COMPLETE AIRCRAFT (SITC 734.1)						
U.S.	80	86	95	100	103	104
U.K.	NA	74	97	100	106	107
France	NA	69	93	100	103	107

Source: Appendix C.

transatlantic aircraft. Also, improvements in the Caravelle have probably not been adequately accounted for, and the price increase therefore includes more unidentified quality change than the U.S. index, for which we had a finer breakdown of aircraft by type.

All these time-to-time indexes are based on price series for individual aircraft types, in which an attempt was made to compare the price of an identical aircraft in several years. However, this method does not measure the decline in the efficiency price of air transportation equipment, mostly decreases in costs resulting from the shift to larger and faster planes, and particularly the shift from piston to jet aircraft. The older aircraft were forced from the market altogether, or pushed into different types of route, where they did not have to compete with the new models. We can rarely observe the decline in price of older models which would permit us to measure the degree of quality improvement contained in the new models, although a study of the active market for secondhand aircraft might permit some judgments on this score.[86]

Some indication of the degree of quality improvement involved in the change from piston to jet aircraft is given by data on operating costs of various types of aircraft.[37] We can compare the 1963 direct operating

[86] A method for using secondhand prices is described in Phillip Cagan, "Measuring Quality Changes and the Purchasing Power of Money: An Exploratory Study of Automobiles," *National Banking Review*, December 1965.

[37] "A basic reason for the sizable and continuing acquisition of jet aircraft by the trunk airlines is evident from . . . unit cost data. . . . In 1963, as in previous years,

costs per seat-mile for the types of aircraft delivered to U.S. airlines in 1963 (mainly four-engine jets) with the 1963 costs for the types of aircraft delivered in 1953 (mainly two- and four-engine piston aircraft).[38] Costs for the older plane types were 2.49 cents per seat-mile; and for the newer types, only 1.65 cents per seat-mile, mainly because the new planes were larger and faster than the old ones but partly also because jet engines are cheaper to maintain.

For many reasons this comparison cannot be used as a direct measure of the decline in price of air transport equipment. The piston aircraft in use in 1963 may have cost more to operate than the jets not only because of their size and engine characteristics but also because they were older than the jet aircraft and because they were used on shorter routes for which jets might have been uneconomical. However, it does not seem likely that these factors account for most of the difference in cost, in view of the difference in seating capacity (around 50 for the older planes as compared with more than 100 for the later types), and in speed (200 miles an hour as compared with more than 450).

It seems reasonable to conclude, therefore, that a quality- or productivity-adjusted index of U.S. aircraft prices would show a decline between 1953 and 1963 instead of the price increase of almost 30 per cent given in Table 14.16.

Price Levels

Very little information on comparative aircraft price levels was collected in the course of this study. Ideally we would have wished to gather data on comparative capital costs and operating costs for various aircraft from the airlines that were contemplating purchases. Lacking these, we can only suggest a rough approximation derived from press discussion and other published information.

We estimated that U.K. prices in 1964 were more than 10 per cent above U.S. prices for roughly comparable aircraft (Table 14.17). Price ratios for the other years suggest that U.K. prices were higher

unit costs of the 4-engine jets were substantially lower than those of either piston-engine or turboprop aircraft. Direct operating costs of the jets . . . averaged . . . 1.50 cents per seat-mile . . . 4-engine piston aircraft averaged . . . 2.61 cents per seat-mile while . . . 4-engine turboprops averaged . . . 2.36 cents per seat-mile" (*Direct Operating Costs and Other Performance Characteristics of Transport Aircraft in Airline Service, Calendar Year 1963,* Federal Aviation Agency, July 1964, p. 5).

38 These are not, of course, necessarily the same aircraft as were delivered in 1953. A single model is sold for several years, and those of 1953 type in operation in 1963 may have been purchased in 1954 or later.

Table 14.17
U.K. International Price Levels, Aircraft, 1957, 1961–64
(U.S. = 100)

Year	Index	Year	Index
1957	93	1963	111
1961	110	1964	111
1962	107		

Source: Appendix E.

than U.S. prices by close to 10 per cent in each year except 1957, when they were lower. These ratios apply to complete aircraft, but we did not combine them with our parts price ratios. The latter varied widely and therefore produced an unreliable index; furthermore, the data covered parts of American aircraft, the price ratios for which might not have been typical of aircraft in general. For these parts the data we collected showed U.K. prices more than twice as high as U.S. prices.

Among the various types of aircraft, the U.S. price position appeared to be strongest in the long-range aircraft and weakest in those of shortest range. During 1961–63 the ratio of U.K. to U.S. aircraft orders was, correspondingly, lowest for the very long-range planes and highest for the short-range ones. The relationship, which was calculated on the basis of gross orders, would have been even stronger if it had taken account of the large number of cancellations of orders for British aircraft during these years, for planes ordered earlier, and in later years, for planes ordered in 1961–63. The data on aircraft sales thus tend to confirm the order of the price ratios.

A different measure of place-to-place price differences can be derived from the operating cost data discussed earlier. Only a few foreign aircraft were in service in the United States in 1963, but these permit some very rough price comparisons. Neither the British nor the French aircraft had exact U.S.-made counterparts, but both were in the high ranges of direct operating costs per seat-mile: 2.88 cents for the Caravelle and 2.19 and 2.87 cents for the two Vickers planes. These levels were similar to the costs of U.S. piston aircraft (2.61 cents) and U.S. turboprops (2.29 and 2.55 cents—the latter for a local-service aircraft), but were considerably more expensive than the American jet aircraft which were replacing them. The large American jets in operation in 1963 had average costs of 1.50 cents per seat-mile, and the smaller Boeing, the 727, appearing in the records for the first time in 1964, had costs of slightly over 1.50 cents.

Price Competitiveness

U.S. price competitiveness in aircraft and parts apparently increased from 1957 to 1963 but declined somewhat in 1964 (Table 14.18). However, since the parts indexes are a very narrow selection of the total trade in parts, the indexes for complete aircraft, which do not show the 1964 decline, might represent price competitiveness in aircraft and parts better than the indexes that include parts prices.

The indexes of U.S. price competitiveness relative to the United Kingdom do not seem unreasonable in relation to the trade data of Table 14.15. The least favorable price relationship for the United States was in 1957, and that was the year in which U.K. exports were relatively (and absolutely) highest. The U.S. price position improved greatly by 1961, declined slightly, and then improved somewhat, while U.S. exports reached their peak relative to those of the United Kingdom in 1962 and then fell back somewhat. Thus the trade flows for the United States and United Kingdom do not seem inconsistent with the price competitiveness indexes we have compiled, particularly in view of the coverage differences.

Table 14.18
U.S. Price Competitiveness, Aircraft and Parts, 1957, 1961–64
(1962 = 100)

	1957	1961	1962	1963	1964
AIRCRAFT AND PARTS					
Relative to					
U.K.	NA	NA	100	106	103
France	85	94	100	100	96
COMPLETE AIRCRAFT					
Relative to					
U.K.	86	102	100	103	103
France	80	98	100	101	103

Source: Appendix D.

On the other hand, the movement of United States prices relative to France does not explain the great increase in the EEC share of world trade in aircraft and parts, from 3 to 32 per cent of OECD exports. The bulk of the growth in EEC exports after 1961 took place in Belgium and the Netherlands, for which we have no price data. We suspect that much of the growth must have taken place in military aircraft, Belgium was not an important competitor for civil aircraft orders and the Netherlands' main civilian aircraft, the highly successful F-27 Friendship (perhaps involving roughly $300 million in sales over a ten-year period, including spare parts)[39] could not account for sales reaching beyond $130 million in 1963 and over $200 million in 1964.

Ships and Boats[40]

Trade

Japan was the leading exporter of ships and boats in 1963, accounting for nearly one-fourth of OECD exports, with Germany, Sweden, Great Britain, and France as the other major shipbuilders for the world market (Table 14.19).

The figures on exports to the United States understate its role as a source of the orders that give rise to other OECD countries' exports.[41] The reason is that purchases of foreign-built ships by U.S. companies were often made through affiliates and subsidiaries which then operated the vessels under Liberian, Panamanian, or other foreign flags.[42] Such arrangements seemed to be most common in connection with bulk carriers, which are specially designed for the low-cost loading, transport, and unloading of some particular material—most often oil and, less frequently, iron ore, bauxite, or coal. The owners of these vessels were

39 "Fokker Planes Keep Role in Europe," *New York Times,* December 4, 1965; "That Company, Fokker," *Economist,* August 28, 1965.

40 SITC 735. *Value of OECD exports in 1963:* $1.5 billion; 3.5 per cent of study total.

41 Recreational craft, which are of minor importance in world trade, loom large in U.S. trade. It should also be mentioned that the export figures for the United States, and probably for other countries, include used ships even where the transfers of registry change only the legal form and not the ultimate beneficiary of ownership.

42 More than one-fourth of the tonnage launched "for registration in other countries" in the six reference years of our study (1953, 1957, and 1961–64) was for Liberian registry, and U.S. firms were probably responsible for a large percentage of these orders (*Lloyds Register of Shipping, Annual Summary of Merchant Ships Launched During 1964,* London, 1965, and earlier issues). Aside from the United States, Greek shipowners are the largest users of "flags of convenience," as the Liberian, etc., registries are often referred to.

Table 14.19
OECD Exports of Ships and Boats (SITC 735), by Origin and Destination, 1963
(dollars in millions)

	Value of Exports	Per Cent of OECD Exports in 735	Share in OECD Exports (per cent)							
						EEC				
			OECD	U.S.	U.K.	Total	Germany	France	Sweden	Japan
Total, all destinations	$1,467	100.0	100.0	2.7	8.1	34.4	17.4	7.1	17.2	23.1
Destination										
U.S.	38	2.6	100.0		1.6	54.7	45.9			8.5
OECD Europe	714	48.7	100.0	1.3	8.0	42.2	19.5	9.0	26.7	9.2
U.K.	120	8.2	100.0	0.2		47.5	18.3	11.7	25.0	16.7
Sweden	57	3.9	100.0			66.7	21.0	22.8		
EEC total	90	6.1	100.0	3.3	10.0	67.8	17.8	4.4	5.6	1.1
Germany	19	1.3	100.0	3.7	15,3	38.4		7.4	15.8	2.1
France	22	1.5	100.0	6.0	14.7	63.6	7.4			
Canada	4	0.3	100.0	53.8	20.5	17.9	a	a	a	5.1
Japan	1	0.1	100.0	15.4	7.7	15.4				
Latin America	98	6.7	100.0	8.2		26.5	10.2	4.1	7.1	37.8
Other	596	40.6	100.0	0.9	10.0	26.1	15.0	5.8	9.2	39.1
Unaccounted for	16	1.1	100.0	96.1						1.9

Source: Appendix A.
[a]Less than 0.05 per cent.

freer to buy ships in the cheapest shipbuilding country than the operators of general cargo or passenger vessels. As a result, bulk cargo vessels tended to be more important in exports than in world production.[43]

Japan, which accounted for only about 11 per cent of world launchings and 12 per cent of exports (on a gross tonnage basis)[44] in 1953, emerged during the period as the world's greatest shipbuilding country; in 1964, its total launchings were 40 per cent and its export launchings 50 per cent of the world totals. The United States virtually disappeared from the world market; and the United Kingdom, which was the leader at the beginning of the period, had its share reduced from over 20 per cent in 1953 to 3 per cent in 1964 (Table 14.20).[45] The German share also declined, while Sweden was able to maintain its position in the rapid expansion of the 1961–64 period largely by continuing its domination of the important Norwegian market. The Japanese ascendancy cannot be ascribed to efficient imitation of Western methods with low-wage labor; it is attributable, in part at least, to leadership in designing and building larger and more automated ships, particularly tankers, that have enabled their owners to achieve substantial economies.[46] Another factor favorable to Japan, according to U.S. and U.K. shipbuilders, was the high rate of utilization of its shipyards, made possible in part by the rapid expansion of its own maritime fleet.[47]

[43] Tankers, for example, accounted for about 45 per cent of all tonnage launched in the six reference years of our study, but for about 55 per cent of tonnage launched for registration in countries other than the country of construction (*ibid.*).

[44] Gross tonnage is a measure of space available for cargo, crew, and passengers. The other common measure of ship size, deadweight tonnage, is a measure of capacity to carry weight; it is defined as the difference between the ship's displacement at load and light drafts. Deadweight tonnage (DWT) runs higher than the gross tonnage; see, for example, the figures on Japanese export ships in Table 14.26, below.

[45] The relative importance of the EEC and Japan in 1963 as measured by the value figures (Table 14.19) differs from that measured in tonnage (Table 14.20) because of differences in coverage and in units of measurement. The OECD data used for exports are expressed in dollar values and include all kinds of vessels, such as ferries, tugs, and small fishing craft, while Lloyd's launchings are expressed in tons and are confined to merchant ships of 100 gross tons or more.

[46] See, for example, *Wall Street Journal,* August 22, 1963, and *Journal of Commerce,* February 28, 1964, March 2, 1964, March 29, 1965, and September 30, 1965, for accounts of developments in the Japanese industry. On the economy of large tankers, an oil company estimated that fuel and crew economies enabled a 90,000 ton tanker to carry oil at one-third to one-half the cost of the standard 16,600 ton tankers used during World War II (*New York Times,* September 1, 1963). See also S. G. Sturmey, *British Shipping and World Competition,* London, 1962, p. 265.

[47] About 13 per cent of all tonnage launched in 1961–64 was Japanese built for Japanese registry; Japan's launchings for foreign and domestic owners accounted for about 30 per cent of the world total in the same period (*Lloyds Register*). The statement in the text about the advantage of high utilization implies either that it encourages the rapid adoption of new techniques or, what is more questionable, that average cost rather than marginal cost pricing is followed in the shipbuilding industry.

Table 14.20
Tonnage and Distribution of Ships Launched for Registration in Other Countries, 1953, 1957, 1961–64

Country of Origin	1953	1957	1961	1962	1963	1964
			1,000 GROSS TONS			
U.S.	106	64	2			2
U.K	365	261	281	165	284	149
Germany	364	778	542	684	644	588
France	93	181	172	309	282	239
Netherlands	185	157	317	244	143	175
Italy	18	159	12	27	148	130
Sweden	242	437	479	596	698	830
Japan	201	1,513	748	877	1,497	2,721
World	1,728	3,886	3,178	3,450	4,335	5,421
			PER CENT			
U.S.	6.1	1.6	0.1			a
U.K.	21.1	6.7	8.8	4.8	6.6	2.7
Germany	21.0	20.0	17.1	19.8	14.9	10.8
France	5.4	4.7	5.4	9.0	6.5	4.4
Netherlands	10.7	4.0	10.0	7.1	3.3	3.2
Italy	1.0	4.1	0.4	0.8	3.4	2.4
Sweden	14.0	11.2	15.1	17.3	16.1	15.3
Japan	11.6	38.9	23.5	25.4	34.5	50.2
World	100.0	100.0	100.0	100.0	100.0	100.0

Source: *Lloyd's Register of Shipping, Annual Summary of Merchant Ships Launched During 1964,* London, 1965, and earlier issues. Excludes ships under 100 gross tons, sailing vessels, and nonpropelled craft and ships built of wood.

[a]Less than 0.05 per cent.

Nonprice Factors in Trade

Operators of general cargo or passenger vessels of the major industrial countries were under a variety of pressures to have their ships built in domestic yards. Each country wished to maintain its own merchant marine and shipbuilding capacity, the usual justification being the need for such facilities for defense purposes. The measures adopted to carry out this policy were varied; they included the restriction of coastwise and government cargoes to domestic flag vessels, direct subsidies for construction and operation, and tax relief, accelerated depreciation, and special credit provisions.[48] The United States, for example, reserved its coastwise trade exclusively to U.S. flagships and required that at least 50 per cent of government-sponsored cargoes be transported in American bottoms. Operating subsidies and cargo preferences were restricted to ships constructed in U.S. yards, and construction subsidies were paid to offset the higher cost to the operator as a result of building in U.S. rather than foreign yards.[49] Both operating and shipbuilding subsidies were confined to vessels used in foreign commerce. Shipbuilding subsidies were used by other countries, notably France and Italy, not only to build ships for the domestic flag lines but also for foreign owners. U.K. shipowners got more favorable tax treatment on new investment than firms in other industries, and for a time the government provided favorable credit terms for ships built in British yards. In Germany, shipbuilders received a turnover tax reimbursement equal to 7 per cent of the final price to foreign buyers when a ship was constructed for foreigners, and in Japan, shipbuilders' exports were supported by the provision of government credit on favorable terms.[50]

These governmental measures not only caused ships flying the flags of the main industrial countries such as the United States, Germany, France, and Japan to be constructed domestically regardless of cost,[51] and thus to reduce the volume of trade in ships, but also to maintain larger world shipyard capacity than there otherwise would have been. Given the large overhead costs of shipyards and the sensitivity of unit costs to the rate of capacity utilization, the intense competition for busi-

48 *Economic Policies and Practices: Subsidies to Shipbuilding by Eleven Countries*, Joint Economic Committee, 88th Cong., 2nd sess., 1964. See also Sturmey, *op. cit.*

49 For a review of the construction subsidy program see Statement of G. F. Nuse, *Construction Differential Subsidies*, House Subcommittee on Merchant Marine, Committee on Merchant Marine and Fisheries, 89th Cong., 1st sess., March 3, 1965, pp. 40 f.

50 Japanese shipyards were also able to buy steel at especially low prices. The European Economic Commission, the executive body of the Common Market, concluded that Japanese aids to shipbuilders, including low interest rates, long-term credits, and subsidies for steel plate, were equivalent to a 10 per cent subsidy (*European Community*, Washington, D.C., EEC Information Service, May 1966, p. 14). It was reported at the same time that French and Italian shipyards were receiving subsidies of about 15 per cent (*New York Times*, April 18, 1965). See also *Economist*, September 15, 1962, pp. 1035–36 and March 20, 1965, p. 1293; the 1962 *Economist* article reported subsidy rates in France and Italy higher than 15 per cent.

51 *Hearings, Construction Differential Subsidies*, 88th Cong., 2nd sess., April 7, 8, and 9, 1964, pp. 9–10. The United Kingdom and the Netherlands were exceptions; at the end of 1962, for example, 29 per cent of ships under construction for U.K. registry and 21 per cent of those for Netherlands registry were being built abroad.

Table 14.21
International Price Indexes, Ships and Boats, 1953, 1957, 1961–64
(1962 = 100)

	1953	1957	1961	1962	1963	1964
U.S.	98	116	101	100	96	97
EEC	111	130	99	100	91	90
Germany	108	124	95	100	93	92
Japan	112	140	99	100	86	87

Source: Appendix C.

ness is not surprising. From time to time determined efforts of secondary builders such as Yugoslavia and Spain to obtain orders added to the price pressures.[52]

Whatever the competitive, technological, or other forces responsible, world ship prices were substantially lower in 1964 than in 1953 despite increases in wages and in the prices of materials used in shipbuilding.[53]

Prices

Prices in Europe and Japan rose more sharply than in the United States under the impetus to demand given in 1957 by the Suez crisis, but foreign prices also fell more drastically after that date, especially the Japanese (Table 14.21). Japanese prices were more than 25 per cent and Common Market prices about 15 per cent lower in 1964 than in 1953, while U.S. prices were at about the same level at the two terminal dates.[54]

We do not have enough direct information to produce a time-to-time index for the United Kingdom. However, a widely recognized source prepared estimates of the costs of ship construction for two or three

[52] For further details about the statements made in this paragraph see *ibid.*, pp. 76 and passim.; Committee of American Steamship Lines, *Shipbuilding Survey*, July 1961, July 1962, and July 1963. In addition, an estimate made in 1960 placed Polish and Yugoslav prices at 35 to 40 per cent of the United States at a time when German and Japanese prices were estimated at 46 per cent of the United States (J. J. Henry, "Shipbuilding Costs," *Marine News*, April 1960).

[53] Average hourly earnings in U.S. manufacturing rose by 45 per cent (*Economic Report of the President*, January 1966, p. 24) and more in the other industrial countries. One key material for shipbuilding, steel, increased in price by around 15 per cent (Chapter 9). The steel price increase taken by itself might have been expected to increase ship prices approximately 3 per cent (*Metal Bulletin*, May 8, 1964, p. 12), and there were, of course, other materials that increased in price.

[54] See the appendix to this chapter for a regression analysis of Japanese ship prices.

vessels of standard design and, also, of the prices of used vessels of the same specifications. In order to convey a general impression of the order of magnitude of export price changes in the United Kingdom, we have tried to adapt these data to our purposes.[55] The resulting index is as follows:

1953—93	1962—100
1957—113	1963—101
1961—101	1964—107

In Table 14.22 the price competitiveness of the U.S. vis-à-vis each foreign area is calculated by dividing each foreign index by the U.S. international price index for ships. It is clear that except for a small improvement relative to Europe between 1961 and 1962, the price competitiveness of the United States declined, particularly between 1957 and 1961.

[55] The indexes in the text are based on the estimates of ship prices for June of each year made by the *Fairplay Shipping Journal.* The estimates refer to two or three vessels of standard design, and larger and more modern vessels are substituted from time to time for vessels formerly priced. The "building cost price" includes cost plus "full overheads and a fair profit margin" . . . "not in competition with other firms . . ." (*ibid.,* January 11, 1962, pp. 77 and 79). The "ready ship price" is the market price of such a ship already in service. The relationship between these prices fluctuates with changes in the cost of ship construction and changes in the demand for shipping (freight rates). For our dates of reference, the prices (£1,000) follow:

	Cargo Vessels					
	9,500 DWT		*11,000–13,000 DWT*		*Bulk Carrier, 24,000 DWT*	
June	*Bldg. Cost*	*Ready Price*	*Bldg. Cost*	*Ready Price*	*Bldg. Cost*	*Ready Price*
1953	620	600				
1957	775	900	1080	1250		
1961	730	650	1015	900		
1962			1020	875	1320	1200
1963			1025	850	1330	1250
1964			1035	975	1340	1400

The data are from *Fairplay Shipping Journal,* January 11, 1962, pp. 77 and 79; *ibid.,* January 13, 1966, pp. 89 and 91. Comments in the *Fairplay* articles presenting its estimates make it clear that at least during the 1960s and perhaps also in 1953, actual contracts were concluded at less than the building cost price. We based the index in the text on the averages of the building cost and ready prices for each vessel, except for 1957 for which we used the building cost price.

The time-to-time indexes were derived by linking up price changes between successive dates (and taking simple averages for the four out of the five links for which price changes were available for two different ships). Indexes, based on building costs and ready prices, are compared below with the index offered in the text (1962 = 100):

	1953	*1957*	*1961*	*1962*	*1963*	*1964*
Building cost	85	106	100	100	101	102
Ready price	95	143	103	100	101	114
Index in text	93	113	101	100	101	107

Table 14.22
U.S. Price Competitiveness, Ships and Boats, 1953, 1957, 1961–64
(1962 = 100)

	1953	1957	1961	1962	1963	1964
Relative to						
EEC	114	112	98	100	95	93
Germany	110	106	94	100	97	95
Japan	114	120	98	100	90	90

Note: The U.K. index given in the text produces the following index of U.S. price competitiveness relative to the United Kingdom: 1953, 97; 1957, 97; 1961, 100; 1962 100; 1963, 105; and 1964, 110.

Source: Appendix D.

This is shown also in Table 14.23 where the levels of ship prices are compared. For the last few years of the period prices in Japan were about half or even less and prices in Germany and the other EEC countries a little more than half those of the United States. We have less information about the U.K. levels. At the beginning of our period, U.K. prices seem to have been as low as any in the world, but by 1957 they appear to have been well above those of Germany.[56]

It seems clear that the exclusion of the United States from the world ship market is due to high prices and that the dominance of Japan is due to low and declining prices. The role of prices is apparent in the changes between 1953 and 1964 involving the other countries as well: [57]

	Rank with Respect to	
	Price Change	*Increase in Export Tonnage*
U.S.	4	5
U.K.	5	4
Germany	3	3
Other EEC	2	2
Japan	1	1

[56] An official report relating to 1959–61 summarized United Kingdom and Continental European bidding for 34 vessels by stating that over half of the Continental bids were 12 to 17 per cent below the U.K. bids. See *Shipbuilding Orders Placed Abroad by British Shipowners,* Report to Minister of Transport by Messrs. Peat, Marwick, Mitchell & Co., London, 1961, p. 5.

[57] Price change is based on the ratio of 1964 to 1953 prices, and the ranking is from low to high (from Table 14.21 and text). Export tonnage is ranked from high to low (from Table 14.20). "Other EEC" covers France, Italy, and the Netherlands.

Table 14.23
Price Levels, Ships and Boats, 1953, 1957, 1961–64
(U.S. for each year = 100)

	1953	1957	1961	1962	1963	1964
U.S.	100	100	100	100	100	100
EEC	68	66	58	59	56	55
Germany	62	60	53	56	54	53
Japan	59	62	50	51	46	46

Source: Appendix E.

The role of prices in this group cannot be ascertained simply by a juxtaposition of contemporaneous price and quantity changes as can be seen in the data below for German and Japanese prices and exports: [58]

	Movements of German Prices Relative to Japanese Prices	*German as Percentage of Japanese Export Tonnage*		
		Current	*1-yr. Lag*	*2-yr. Lag*
1953	96	180	366	69
1957	88	51	68	95
1961	97	73	78	43
1962	100	78	43	22
1963	108	43	22	23
1964	106	22	23	—

If the terminal years are compared, we find, as already noted, a rise in German relative prices and a substantial decline in relative exports. However, if successive pairs of years are examined, we find a contraction of the German export share between 1953 and 1957, when German price competitiveness improved, and a large expansion in German relative exports between 1957 and 1961, when German prices increased. The connection between the price changes and relative exports is not any better if a one-year lag is allowed for between the date of order, to which the prices refer, and the date of launching, to which the tonnage figures refer, but there is an improvement with a two-year lag. Even so,

[58] The German-Japanese price ratios are computed from data in Table 14.21. The German-Japanese tonnage ratios are from Table 14.20 and sources cited there.

the decline in relative German exports which came in the last two years seems quite large relative to the German prices. Among a number of possible explanations for such situations, two seem to apply to this case.

First, some of the expansion in Japanese sales in the last two years was to Dutch and other European shippers who had formerly bought ships from European yards. By 1962, the differential between European and Japanese prices had widened enough to make worthwhile the inconvenience and extra inspection costs of shifting purchases from Europe.[59] A second factor is that the German yards were able to stay in the price range in which they were bidding in the early 1960s only by setting prices below their costs.[60] The effort to maintain high utilization of capacity could not, however, be sustained, particularly in the face of further declines in Japanese prices. At least one large German yard was forced out of business in 1962, and German shipbuilding contracted. Total tonnage launched was 11 per cent less and export tonnage launched was 14 per cent less in 1964 than in 1962, while for the world as a whole the corresponding figures increased by 21 and 57 per cent.[61]

Delivery time is another element that has sometimes played a role in determining trade flows. The closing of the Suez Canal in the fall of 1956, for example, created a large demand for shipping. Freight rates soared, and there was a rush to place orders for large ships to move oil. Delivery periods in major yards rose to three years. With freight rates so high that the cost of a vessel might be paid off in a few trips, orders were placed in U.S. yards which could offer quick delivery, albeit at high prices.

In summary, in the period under study, competition in the world shipbuilding industry was intense. The period was marked by a shift to larger-size vessels, and by the emergence of Japan as the leading shipbuilding nation. There were notable changes in international price relationships. Japanese prices declined most sharply, but there were also price cuts in Germany and the other EEC countries. U.S. prices were about the same at the end of the period as at the beginning, and U.K. prices

[59] For example, Dutch shipping officials reportedly stated in connection with one order that went to Japan that if the 20 per cent differential had been reduced to 6 or 7 per cent it would have paid to place the order in Europe (*Journal of Commerce*, February 16, 1965). Our estimates for 1964 do not place the average difference between Japanese and EEC prices as high as 20 per cent (cf. Table 14.23).

[60] *Economist*, September 5, 1962, pp. 1035–36.

[61] Cf. *Lloyds Register*.

were higher. The changes in prices in the different countries, at least for the period as a whole, were well correlated with the changes in shares of the world market for ships.

Appendixes

Comparisons Among Various Measures of Diesel Locomotive Price Trends

Diesel locomotives (SITC 731.3) provide an unusual opportunity for comparing measures of price trends derived from different sets of data and by different methods. We are interested in this comparison not only because of the importance of locomotive exports, but also because it has implications for measures of price change and price competitiveness in other commodity areas.

Two types of data entered into the time-to-time indexes actually used in this paper: ICC reports on locomotive purchases by railroads in the United States, classified by type of locomotive; and export price data, collected by the National Bureau from American locomotive producers for this study. There is, in addition, a locomotive price index published by the ICC without any detailed description of its construction. This index does not appear to have been derived from the ICC purchase data which we used for our index.

A further source of data is the information on bidding that is used to calculate the place-to-place indexes described earlier. The chief defect in the bidding data is the incompleteness of our knowledge of the characteristics of the locomotives offered. This information on characteristics could have been much more complete, but more detailed specifications were not collected because they were not necessary for the primary purpose of the bid data collection: place-to-place comparisons. For these, it was only necessary to know which of the offers were comparable and met the specifications, whatever the specifications were. For this reason we could standardize for only some of the characteristics in making time-to-time comparisons, particularly horsepower, type of transmission, and wheel arrangement. At times, however, there were additional data giving type of body, more detailed information on transmissions, or even specific model numbers.

Table 14.24
Comparison of U.S. Time-to-time Indexes from Various Sources, Diesel Electric Locomotives, 1953, 1957, 1959, 1961–64

	1957/1953	1959/1957	1961/1959	1962/1961	1963/1962	1964/1963
NBER indexes from ICC data						
1. Linked	108	104	92	104	95	97
2. Regression	107		88[a]	105	94	97
3. ICC index	110	100	100	100	100	100
4. NBER index from company export data	NA	100	97	98	99	99
NBER index from bidding data						
5. Selected data	NA	NA	103	97	98	100
6. All data	NA	NA	109	94	98	100

Note: For sources and general descriptions of series see text of this appendix. Figures for 1964 in lines 4–6 include some early 1965 prices. The year 1959, in lines 5 and 6, represents a combination of observations for dates ranging from fall 1959 through the first half of 1960.

Lines 1 and 2 are based on virtually full coverage of domestic locomotive purchases, from data published in various issues of *Transport Statistics of the United States*, Interstate Commerce Commission. The company data of line 4 are from no more than six observations for each link, but the major producers and items are represented. The selected bidding data of line 5 contain a somewhat larger number of observations, also with coverage of all major U.S. producers, and the index of line 6 is based on at least ten observations for every link except the last.

[a]1961/1957.

Several measures of time-to-time price movements, comparing pairs of years, are given in Table 14.24. The indexes from ICC data on purchases by U.S. railroads are shown in lines 1 and 2. The first of these is a conventional index constructed by comparing each year's prices with those of the preceding year for locomotives of identical horsepower and wheel arrangement, with numbers purchased in the earlier year as the weights. The second is a regression-based index, calculated by fitting a linear regression line to price and horsepower of B-B [62] locomotives for each year, and pricing the locomotives actually bought in 1963 at

[62] Single-unit locomotives with two four-wheel trucks, all driving axles.

the prices (as described by the regression lines) of the other years. The regression lines and coefficients of determination were as follows (Y = price, in dollars; X = horsepower):

Year	*Constant Term*	*Coefficient of X*	$\bar{r}^2$	*Number of H.P. Categories*
1964	$74,246	$ 54.80	.89	6
1963	13,766	84.97	.94	13
1962	17,995	88.80	.98	8
1961	21,970	82.73	.97	8
1957	10,971	100.29	.94	14
1953	28,912	85.20	.89	17

The regression-based index was not used for a number of reasons. One was that differences in the coefficients from year to year were substantial, particularly in 1957 when the marginal cost per horsepower was $100 instead of the $83–$89 of the other years through 1963. The last year, 1964, is a special case because the data were from a different source [63] and were less complete. Another problem affecting the regression-based index was the shift toward higher-horsepower locomotives. This shift meant that the earlier regressions contained more observations at the lower horsepower levels while the later ones were concentrated at the 2,000 horsepower and over range. The 1957 data in particular were all for locomotives of 1,800 horsepower or less.

In any case, the trend in the price-horsepower regression line does appear to have been downward, at least within the horsepower ranges actually built.

The ICC indexes (line 3) are not fully annotated in any public source but they are briefly described in one publication [64] as having been "developed from analyses of major construction contracts and projects . . . studies of carriers' returns to Valuation Order No. 14, joint studies made with various railroad committees, well-known engineering and trade publications, and information furnished by suppliers, manufacturers, and individual carriers." However, the great degree of stability in the diesel electric locomotive index (no change from 1957 through 1963) suggests that it is not derived from data on prices actually paid.

[63] *Joint Equipment Committee Report, Costs of Railroad Equipment and Machinery,* Association of American Railroads, July 1, 1965.

[64] "Schedule of Annual Indices for Carriers by Railroad, 1914 through 1963," Bureau of Accounts, Interstate Commerce Commission, mimeo., n.d.

The NBER index from company export data is derived from information on the prices at which U.S. producers actually offered specific locomotive models. The number of observations is small, but all the major producers and most of the important models are represented. Some list prices are included, and the major consequence of their exclusion would be to lower the 1961/1957 index by a few points. There would be virtually no effect after 1962.

The bidding data on which the last set of NBER indexes is based are quite imperfect. However, their coverage of trade in locomotives is more comprehensive than the company data, and they are therefore of interest as a check on other measures. The time-to-time estimates do not necessarily refer to the lowest bid from a country but rather compare bids at two dates on comparable locomotives, identified by specifications on horsepower, body style, wheel arrangement, and, usually, model number. Line 5 is an index derived from a selection of the bidding data for which a high degree of comparability was insured by the completeness of specifications. It excludes incompletely identified locomotives; and, in particular, it omits a large amount of data from several major bids in 1961 which drew particularly low offers from most countries on smaller locomotives and very high bids on the larger ones. These bids are, however, included in line 6, for which the standard of selection was not as high. For this index we tried to make comparisons for every pair of bids, even where offers from two different companies had to be matched or where locomotives of somewhat different horsepower had to be compared, after a rough price adjustment for the differences in power.

Despite the wide diversity of sources and the considerable defects of the basic data, the various NBER indexes in Table 14.24 are alike in several ways. In all of them U.S. prices decline from 1962 to 1963, and decline or remain unchanged from 1963 to 1964. They all also show a 1964 price level lower than that for 1961. There are greater differences in 1961–62, and the bid data here support the company reports of price declines. The widest range occurs in 1959–61, but the reason for these large discrepancies is not clear.

The bid data, rough as they are, provide the only time-to-time comparisons available for the United Kingdom and Japan, and for the EEC countries as a group. These comparisons, for three subperiods between 1959 and 1963 and for the period as a whole, are shown in Table 14.25.

Table 14.25
Comparison of Time-to-time Indexes from Bidding Data, Diesel Electric Locomotives, 1959, 1961–63

	1961/1959	1962/1961	1963/1962	1963/1959
All locomotives, all data				
U.S.	109	94	98	99
EEC	95	124	87	102
All locomotives, selected data, U.S.	103	97	98	98
Locomotives of 800–1,500 H.P., all data				
U.S.	91	108	96	95
U.K.	93	106	98	97
EEC	85	116	97	96
Japan	85	117	96	95
Locomotives of 800–1,500 H.P., selected data				
U.S.	102	96	96	95
U.K.	104	95	98	97

Note: U.S. data are described in notes to Table 14.24, lines 5 and 6. The U.K. and EEC indexes are each based on from 5 to 20 bids in each link, and the Japanese on only 1 to 7 observations. The comparison of the data from selected bids with the data from all bids for the United States was used for some decisions on the comparability of specifications from one bidding to another for foreign offers, since we had a greater amount of detail, including company data, to aid in interpreting the U.S. bids.

EEC indexes are a combination of indexes for France, weighted twice, and Germany, weighted once.

Data for 1959 include bids ranging from the fall of 1959 through June 1960 and those for 1961 cover offers from late 1960 through the fall of 1961. The timing of the comparisons is thus somewhat blurred, but it is comparable from one country to another.

All the indexes for countries outside the United States, except the EEC index for all locomotive sizes and all data, declined over the four years, 1959–63, taken as a whole, as did the U.S. indexes. There are very slight indications that U.S. prices fell more than those of the other countries, but the differences are too small to deserve confidence. However, their combined evidence reinforces the impression of falling prices derived from some of the other data presented earlier.

A rough comparison can be made between the German bidding data underlying the EEC indexes in Table 14.25 and the German export price information used in the text of this report, for Table 14.7. The bidding data are weak, and for that reason are not shown separately in Table 14.25. The export price data cover not only diesel locomotives but also electric locomotives and self-propelled railway cars, which together account for more of German exports than diesel locomotives. Even within diesel locomotives, the export price data cover not only diesel electric but also diesel hydraulic locomotives, for which we lack bidding data.

Given these limitations of the comparison, the differences between the two indexes shown below are not startling, although they cumulate over time. The indexes for the first two years are quite close, but the last period and the total for the four years show large discrepancies.

	1961/1959	*1962/1961*	*1963/1962*	*1963/1959*
Bidding data	110	104	95	110
Export price data	112	107	101	121

The bidding data for the link for 1963/1962 are particularly sparse and might be dismissed on that account were it not that the decline in prices is confirmed by bidding and other data from most of the countries other than Germany.

If the bidding data were continued for one more year the index would show an even larger decline, while the export price index would rise slightly. However, the number of observations in the bidding data is too small to provide a reliable estimate of the change in price.

Regression-based International Price Index for Japanese Ships[65]

Tabulations were obtained covering all contracts between Japanese shipyards and foreign firms signed during the Japanese fiscal years 1957, 1961, 1962, 1963, and 1964.[66] Of the total of 256 contracts, 229 related to cargo ships, tankers, and bulk carriers and the other 27 to a variety of ships such as trawlers and scientific vessels. The latter were deleted; so too were 24 contracts for which information was incomplete or so far out of line with the other data as to make it seem either erroneous or the consequence of special factors not known to us. As a result

[65] This summary is based on the work of Steven Hitchner, a Swarthmore College student who was an undergraduate research participant in a National Science Foundation program at the University of Pennsylvania during the summer of 1966.

[66] The Japanese fiscal year begins on April 1; thus our 1957 data, for example, refer to the period April 1, 1957, to March 31, 1958. For 1964, data were available only for the first nine months of the fiscal year.

Table 14.26
Japanese Export Ship Contracts, Summary of Data, 1957, 1961–64

	1957	1961	1962	1963	1964[a]	Total
No. of contracts	32	25	21	79	48	205
Average						
Price ($1,000)	7,019	3,968	5,710	5,253	4,476	5,287
Gross tons (1,000)		17.6	28.6	31.4	25.1	23.1
Deadweight tons (1,000)	36.0	27.2	44.8	49.5	39.7	42.1
Horsepower (1,000)	13.2	10.7	15.4	16.8	13.9	14.8
Speed (m.p.h.)	15.2	15.3				
Ships per contract	1.65	1.56	1.90	1.61	1.44	1.61
Proportion of contracts calling for turbine engine		24%	29%		8%	9%
Proportion of contracts for						
Tankers	56%	28%	57%	63%	36%	51%
Bulk carriers	9	40	19	28	54	32
Cargo vessels	35	32	24	9	10	17

[a]Data for first nine months of fiscal year (i.e., April–December 1964).

the analysis was based on 205 contracts. The characteristics of the data are summarized in Table 14.26. About one-third of the contracts called for the building of more than one vessel; the average contract involved 1.6 ships. We treated each contract rather than each ship as a unit of observation.

In addition to price and number of ships, information was available, for at least one of the years, for gross tons, deadweight tons, horsepower of the main engine, normal operating speed, type of engine (diesel or turbine), and kind of ship (tanker, bulk carrier, or other). However, only deadweight tons, horsepower, and number and type of ship were available for all five of the years.

The basic procedure was to regress price against the variables relating to the size, power, and other characteristics of the vessels. After substantial experimentation with various ways of calculating the relationship, a logarithmic equation, in which the data for all the years were pooled, was chosen as the best means for estimating changes in price during the period. The equation, which was computed in natural logarithms, had an $\bar{R}^2$ of .94 and a standard error of estimate equivalent to 3.1 per cent of the (geometric) mean price:

$$\text{Log } P = \underset{(.3378)}{6.0874} + \underset{(.0377)}{.3290} \log DWT + \underset{(.0450)}{.4356} \log HP - \underset{(.0228)}{.0513} BC -$$

$$\underset{(.0415)}{.0597} C + \underset{(.0263)}{.4810} Y_{57} + \underset{(.0294)}{.1369} Y_{61} + \underset{(.0301)}{.1488} Y_{62} + \underset{(.0230)}{.0174} Y_{64}$$

The first three terms on the right represent the constant and the "prices" of deadweight tons (DWT) and horsepower (HP).[67] In the next two terms, the prices of bulk carriers (BC) and cargo vessels (C) are compared to the prices of tankers; the coefficients indicate that on the average, bulk carriers were 5 per cent and cargo vessels 6 per cent cheaper than tankers, holding everything else (i.e., deadweight tons, horsepower, and year) constant. The last four terms (in Y) in the equation show the differences in prices between 1963 and each other year. For example, the natural logarithm of price in 1957 was .4810 higher than in 1963, all other things being equal; this is equivalent to a 62 per cent difference. Converting this and the other coefficients to index numbers on a 1963 base yields the following series:[68] 1957, 162; 1961, 115; 1962, 116; 1963, 100; 1964, 102.

In the balance of this appendix we discuss alternative computations we made and explain our reasons for rejecting them in favor of the estimates just summarized.

The log form produces directly, in the form of regression coefficients, the estimates of the percentage change in prices between the observed years. The arithmetic equation, on the other hand, gives the absolute amount of the difference between two years. This seems less reasonable, since we would ordinarily expect, for example, that the price increase for an expensive ship would be in the same proportion rather than in the same absolute amount as the price increase for a smaller, less costly vessel. In the arithmetic form we must estimate a price from the equation by inserting appropriate values for the various vessel specifications included in the equation.

[67] Observations for prices, deadweight tons, and horsepower are in thousands. The figures in parentheses are the standard errors of the coefficients.

[68] The 1964 index is taken as 101 in Table 14.21, since a 1 per cent rather than a 2 per cent increase was indicated by a regression in which observations for similar nine-month periods in 1963 and 1964 were included.

Table 14.27
Ship Price Indexes Computed from Pooled Regressions, 1957, 1961–64

	1957	1961	1962	1963	1964
Logarithmic	162	115	116	100	102
Semilogarithmic	162	114	120	100	101
Arithmetic					
1961 specifications	211	133	134	100	107
1963 specifications	163	119	119	100	104
Average specifications	174	122	123	100	105

Note: Independent variables: deadweight tons, horsepower, type of ship, and year.

The measure of percentage price change varies according to the choice of specifications. In Table 14.27, for example, the indexes derived from the arithmetic form on the basis of 1961 and 1963 average specifications, which differed more than any other pair, are compared with the indexes derived from the logarithmic equation described above. If we were using the arithmetic form, we would select the 1963 trade weights in our study of international competition.

Aside from its other advantages, the log form gives a better fit to the data; its $\bar{R}^2$ is .94 compared to .87 for the arithmetic form.

The semilog form, in which the log of price is regressed against the variables in natural numbers, shares many of the advantages of the log form but for Japanese ships, its $\bar{R}^2$ was only .89 compared to .94 for the log form. Its correlation was lower than the arithmetic one for most of the combinations of independent variables we employed, except for the combination reported upon, where it was slightly higher. It can be seen from Table 14.27 that our indexes would not be much different if we had used the semilog equation.[69]

Another question concerns the choice of independent variables used in the equation to explain price. In addition to the variables we used in the log equation described above, we had data on number of ships per contract for all years, and on gross tons, operating speed, and type of engine for some years.

[69] A semilog regression of price in arithmetic numbers on the logarithms of the independent variables consistently gave a poorer fit to the data than any of the other forms; for the variables included in the above equation, for example, it yielded an $\bar{R}^2$ of .81.

The number-of-ships variable was excluded because its coefficient was usually positive. It was ordinarily not large enough to be statistically significant, but we would normally expect a multiple order to reduce the price per ship. If contract prices on multiple orders were indeed higher, the reason may have been that shipowners with enough financial strength to place multiple orders also were in a position to set special requirements concerning the equipment of a ship or its general quality which could not be measured through the variables about which we had information. In any case, the inclusion of the number-of-ships variable in the log equation did not change any of the price indexes.

The price indexes computed from the regressions do not, indeed, appear to be sensitive to the inclusion or exclusion of marginal variables once enough are included to achieve high $\bar{R}^2$'s. When gross tonnage, for example, was added to the variables in the logarithmic equation set out above, the indexes were changed by one or two points at the most. (The pooled data in this case omitted 1957, for which gross tonnage figures were not available.)

Of the variables that were included, deadweight tons and horsepower obviously are important indicators of the capacity and power of a vessel. They represent major cost factors to the shipbuilder and major elements of utility to the shipowner. It also seemed desirable to differentiate among tankers, cargo vessels, and bulk carriers.

Aside from questions of mathematical form and the appropriate independent variables to include in the regression, the remaining important issue is whether we should compare prices estimated from separate regressions for each year rather than use the pooled regression we have selected. The assumption underlying the pooled regression is that the relative prices (i.e., coefficients) of horsepower, deadweight tons, and type of ships were the same in all the years. Regressions computed for individual years in fact yield very different coefficients from one time to the next. The coefficients do not, however, appear to change in any systematic or other way which can be rationalized in economic terms. Furthermore, the individual-year regressions are necessarily based on a smaller number of observations and their coefficients are therefore more likely to be erratic. We prefer, therefore, to rely upon the pooled regression.[70]

[70] For further discussion of these choices see Chapter 5.

The indexes derived from the individual-year regressions are compared below with those based on our preferred pooled regression:

	1957	*1961*	*1962*	*1963*	*1964*
Pooled, logarithmic	162	115	116	100	102
Individual year					
Arithmetic					
1963 specifications	171	119	120	100	100
1961 specifications	156	111	127	100	98
Average specifications	168	117	122	100	99
Logarithmic					
1963 specifications	167	114	118	100	101
1961 specifications	144	109	115	100	100
Average specifications	159	113	117	100	101

It is necessary to present both arithmetic and log forms because the log form is not consistently superior to the arithmetic for the individual years.[71] There are not, however, substantial differences between the two sets of results. Furthermore, at the 1963 specifications, the ones of most interest to us, the logarithmic regressions produce indexes that are close to those of the pooled regression. The individual arithmetic regressions yield measures of price change that are a little further away from those derived from the pooled regression, but even between these sets of results the largest difference is less than 6 per cent.

[71] Each, however, is consistently superior to either of the semilog forms; the differences in $\bar{R}^2$'s are generally around .10.