Federal Trade Commission

Staff Report on

The UNITED STATES STEEL INDUSTRY and Its INTERNATIONAL RIVALS: Trends and Factors Determining International Competitiveness

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THE UNITED STATES STEEL INDUSTRY AND ITS INTERNATIONAL RIVALS: TRENDS AND FACTORS DETERMINING INTERNATIONAL COMPETITIVENESS

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Federal Trade Commission

This is a staff report, prepared by the Commission's Bureau of Economics. The Commission has not adopted the report in whole or in part. Hence, all statements, conclusions, and recommendations contained herein are solely those of the staff responsible for its preparation.

PREFACE

In 1974 the demand for steel was at an all-time high in the United States and the world. U.S. producers allocated steel to their customers, imported steel sold at substantial premiums in the U.S., a worldwide shortage of steel was predicted for the early 1980's, and steel producers everywhere drafted plans for major expansions.

Despite these exhilarating conditions, we initiated the research for our study at that time because Frederic M. Scherer (then Director of the Bureau of Economics) predicted that when the boom went bust, steel imports would become an important public issue.

That day has come. The demand for steel is down, producers are operating well below capacity, expansion plans have been postponed, and governments are considering proposals that would restrict international trade in steel. It was our intent to prepare a study that would contribute to the policy debate. We hope that we have done so.

AUTHORS

All the authors of the study participated in the planning of the study and the review of all its chapters. The authors of the individual chapters (and the appendixes, except where otherwise noted) are:

Richard L. Johnson wrote chapter 2 and assisted with the appendix to chapter 7.

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Richard M. Duke wrote chapter 5 and appendix C to chapter 3.

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This study was written under the direction of Darius W. Gaskins, Jr., Director of the Bureau of Economics, and P. David Qualls, Assistant Director for Industry Analysis.

F. M. Scherer, former Director of the Bureau of Economics, initiated the study and supervised its early development. James M. Folsom, Deputy Director, read and commented on drafts. Michael Lynch, former Assistant Director for Industry Analysis, and Philip Jaynes, former Deputy Assistant Director for Industry Analysis, participated in the supervision of the study in its early stages.

Professor Roland H. Koller of Brigham Young University (formerly on the FTC staff) was instrumental in establishing the methodology of the study. Kent E. Calder provided valuable assistance in conducting interviews in Japan and in obtaining and translating Japanese data. Donald T. Sant provided advice on applying probit analysis to the study of price controls and wrote appendix B to chapter 5 (explaining probit analysis).

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In the European Community these include: The British Steel Corporation, the Estelle Group, Korf Industries, the

Office of Fair Trading and the Monopolies and Mergers Commission of the United Kingdom, the West German Cartel Office, the International Institute of Management, and Metal Bulletin. In Japan: the Japanese Fair Trade Commission, the Japan Iron and Steel Federation, Nippon Steel, Nippon Kokan Steel, Kawasaki Steel, Sumitomo Metals, the Tekkororen Steel Workers Federation, and the Mitsui Company.

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The authors owe a great debt to the many FTC employees who contributed to this report. Dianne Jones and Betsy Zichterman (under the supervision of Ronald Lewis) and Patricia Allen, Vera E. Chase, Deborah A. Haynes, and Barbara Wynn typed successive drafts of the report. Barbara Battle and Steve Milmoe assisted with data processing; Bess Townsend provided editorial assistance; Emily Robinson helped with computer programming; and the FTC librarians provided considerable help.

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Chapter 1

INTRODUCTION

This is a study of the world steel industry. In a very real sense, steel is an international industry. Approximately 22 percent of world steel production flows in international trade.

The role of American steel on the international scene has changed markedly. Prior to World War II, the United States produced one-third of the world's steel. More importantly, the United States was a substantial net exporter of steel. Currently, the U.S. produces approximately 17 percent of the world's steel and has been a net importer of steel every year since 1959.

In 1955, imports of steel into the U.S. constituted 1.2 percent of domestic apparent consumption of finished steel products. 1/ Between 1955 and 1971, the trend was upward, with the import figure reaching an alltime yearly high of 17.9 percent in 1971. Since 1971, the upward trend appears to have been arrested. Between 1972 and 1976, the figures were in the 12 to 15 percent range. In early 1977, however, imports were entering at almost the 1971 rate.

Many of those sympathetic to the "plight" of American steel producers allege that the relative decline of American steel, at least in large measure, is the result

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1/ Domestic apparent consumption is total net shipments of steel mill products, minus exports, plus imports of these products.

of "unfair" competition by foreign producers supported by activities of their host governments. It is contended that foreign producers, particularly in cyclical downswings, price their exports at lower levels than they do their steel intended for home consumption and thereby "dump" in the American market. This, it is asserted, has unfortunate consequences. It renders American steel production unprofitable when demand is low, and it makes for domestic supply "shortages" when demand is high. And the foreign producers are not the only culprits. Their governments are friendly and provide them with all manner of subsidy and assistance which reduces their costs and fosters low pricing, technological change, and growth and expansion, all to the detriment of American steel.

No such assistance is forthcoming to American producers from their Government. On the contrary, it is asserted that the Federal Government adopts an unfriendly stance and singles out American steel producers to be the "whipping boys" of anti-inflation and antipollution campaigns, all to the benefit of foreign steel. American steel is beleaguered and is deserving of help.

Critics of the American industry, on the other hand, are inclined to dismiss these charges as being "silly" and point to other factors. The relative decline of American steel, while perhaps in part caused by shifts in the underlying worldwide pattern of comparative advantage, is mainly the result of bad management decisions by American producers, mostly with regard to choices of technological processes. American producers were niggardly, it is asserted, with their profits and failed to invest in the new technologies which would have kept them closer to the forefront of the international competition. At the same time, American firms adopted pricing policies that exacerbated the erosion of their domestic markets to imports. Now the day of reckoning has come, and aid for American steel producers would constitute an "unfair" burden on American consumers.

The authors of the present study purport to be neither critics nor friends of the American steel industry. Nevertheless, it was recognized that public policy with regard to international trade in steel would be determined, in large measure, by the perceived relative merits of the various viewpoints in regard to these issues. Yet, at the same time, it was known that in no one place had thoroughgoing and in-depth, theoretical and empirical analyses of all these issues been conducted. Hence, the need for this study. It attempts to do just that. It is hoped that the study will significantly raise the information level of the public policy debate.

Chapter 2 of the study is a description and analysis of the structure and institutions of the international and the U.S. steel industries.

Chapter 3 examines the relative trends in steel producing costs for Japan, the U.S., and the European Community. It quantitatively assesses the impact of relative costs as a determinant of the flow pattern of steel in international trade.

Chapter 4 analyzes and assesses the international impact of the pricing behavior of U.S., Japanese, and European producers.

Chapter 5 is a discussion and analysis of U.S. price control policies, both formal and informal ("jawboning"), on American steel firms. By econometric methods, it estimates the effect of such policies on the profitability of the industry.

Chapter 6 discusses government subsidy programs in the various national industries. It renders quantitative estimates of the impacts of the various programs on the unit costs of producing steel in the U.S., Japan, and the nations of the European Community.

Chapter 7 addresses industry performance questions--profitability, and adoption rates of new technologies--for the various countries. The determinants of international differences in industrial performance are investigated by econometric techniques.

Finally, chapter 8 summarizes the findings and discusses their implications for public policy. The arguments favoring import controls are analyzed, and the potential costs to consumers and the economy at large are estimated.

Each chapter (including appendixes where relevant) is followed by a reference bibliography. Sources frequently cited are referenced in the text (or relevant footnotes) by bracketed numbers corresponding to their listing in the bibliography.

Chapter 2

THE UNITED STATES' POSITION IN THE WORLD STEEL INDUSTRY

The basic purpose of this chapter is to describe the major characteristics of the U.S. steel industry and its international rivals. It covers a variety of subjects including the structure of the international market, technological trends, relative endowments with raw materials, and changes in the pattern of international steel trade.

Section I provides an overview of the world steel industry and the major rivals of the United States. A description of the Japanese, European Community, and developing countries' steel industries is provided. Some of the important technological advances and their economic impact as well as the shifting influence of raw materials are discussed.

The United States steel industry is the focus of section II. Basic facts about the role of steel in the U. S. economy, how steel is made, and the markets and uses of steel are provided. Considerable detail is provided on steel: industry market concentration, merger history, diversification, and (in the appendix) vertical integration. The chapter also discusses the role of imports, the Voluntary Restraint Agreements (general and on specialty steel), and the Experimental Negotiating Agreements.

I. OVERVIEW OF THE WORLD STEEL INDUSTRY

World production of raw steel has risen steadily since 1950 when production was approximately 207 million net tons. By the end of 1974, world steel production reached a record

783 million net tons. From 1950 to 1974, the annual growth rate for world production was 5.5 percent. The United States, however, has lagged behind growth in the rest of the world, displaying an annual growth rate of only 1.6 percent over the same period. The rapid increase in production of raw steel abroad has resulted in a continual drop in the share of world raw steel production attributable to the United States. The United States accounted for approximately 47 percent of the total world production of steel in 1950, but by 1976 this share had decreased to approximately 17 percent. The importance of the United States has declined with respect to other countries in competing for world steel markets.

There has been a dispersal of the steelmaking capability throughout the world. In 1950 there were 32 steel producing nations. The number was 71 in 1976. 1/ The effect of this growth was the participation of a much greater number of countries in international trade and the development of new patterns of trade. Many nations which formerly relied on imports are attempting to become self-sufficient and export steel.

Although steel is produced in a large number of countries, production remains concentrated in the industrialized, developed regions of the world, which are the major consuming regions. The relative importance of the United States steel industry

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1/ For a comprehensive discussion of geographic changes, see [32].

in contributing to world steel supply is brought into clearer focus when domestic steel production tonnage is compared with steel production tonnage of the other major producer nations. With 116 million metric tons of production in 1976, the United States was the second largest steel producing country, trailing the U.S.S.R. which produced 147 million tons. The American steel industry is well established and, by world standards, must be considered relatively mature. The countries of the European Community (EC) produced 134 million metric tons of steel. Japan has expanded rapidly during the past 25 years to become the third largest steel producing nation, with 107 million metric tons. The United States, U.S.S.R., European Community, and Japan produce about three-fourths of the world's steel. Table 2.1 summarizes world production of raw steel in 1976.

As the growth of steel capacity outside the United States occurred, there was also a rising volume of imports of steel into the United States. These imports demonstrate a weakening position of the United States industry. In 1976, the share of apparent consumption commanded by imports was 14.1 percent. A comparison of the overall growth in exports among leading industrialized countries shows that the United States was below average.

The amount of steel entering international trade has increased more rapidly than actual steel production. As a share of world steel production, the volume of exports expanded from 10 percent

TABLE 2.1

World Raw Steel Output: 1976 a/

Country	Million metric tons
U.S.S.R.	147.0
United States	116.3
Japan	107.4
West Germany	42.4
China	26.0
Italy	23.4
France	23.2
United Kingdom	22.7
Poland	15.9
Czechoslovakia	14.7
Canada	13.2
Belgium	12.1
Spain	11.0
Rumania	10.5
India	9.4
Brazil	9.2
Australia	7.8
South Africa	7.1
East Germany	6.6
Mexico	5.3
The Netherlands	5.2
Sweden	5.1
Luxembourg	4.6
Austria	4.5
Hungary	3.8
South Korea	3.5
North Korea	3.0
Yugoslavia	2.7
Bulgaria	2.5
Argentina	2.4
Turkey	1.9
Finland	1.6
Taiwan	1.6
Others	9.9
Total	683.5

a/ Preliminary

Source: International Iron & Steel Institute.

TABLE 2.2

Steel Exports by Principal Producing Countries: 1970-74
(Million Metric Tons)

Country	1970	1971	1972	1973	1974
Japan	17.6	23.2	20.9	24.8	32.2
Belgium-Luxembourg	12.5	12.2	14.3	15.7	16.6
France	6.5	7.7	8.2	8.3	9.7
West Germany	12.0	13.2	13.9	17.3	22.2
Italy	1.7	3.1	3.8	3.5	4.8
The Netherlands	3.1	3.7	4.7	5.0	5.1
United Kingdom	4.1	4.9	4.6	4.2	3.4
United States	6.4	2.6	2.6	3.7	5.3
Canada	1.3	1.3	1.2	1.3	1.1

Source: United Nations, Economic Commission for Europe, *The Steel Market in 1974*, table 8.

in 1950 to 22 percent in 1975. Industrialized, developed producers, other than the United States, have become increasingly active in international trade. A strong export position can be an important indication of a country's competitive position. The role of the leading steel producers in the world market is clearest from the absolute export levels given in table 2.2. The ten countries shown in table 2.2 together account for 75 to 80 percent of total world trade. The trade analysis shows that Japan has become the leading steel exporter by a considerable margin. In 1974, the EC's market share of total world steel exports (including intra-EC trade) was 46.7 percent; Japan held 25.7 percent, and the U.S. stood well behind with 4 percent. Foreign trade plays a much more important role in other nations than in the United States. The importance of the U.S. in the world steel industry lies mainly in the size of its domestic market rather than in an overwhelming share of world exports. The large market of the United States has become a favorite target for other countries.

TABLE 2.3

Trends in Raw Steel Production by Major Non-Communist Steel Producing Countries: 1960 and 1974

Country	Production (million metric tons) 1960	1974	Percent change	Average annual rate of growth (percent)
United States	93.3	132.2	41.7	2.52
Japan	21.8	117.2	437.6	12.76
West Germany	32.9	53.2	61.7	3.49
Italy	8.1	23.9	195.1	8.03
France	17.2	27.0	57.0	3.27
United Kingdom	24.7	22.4	-9.3	-.70
Belgium	6.9	16.2	134.8	6.28
Luxembourg	4.0	6.5	62.5	3.52

Source: International Iron and Steel Institute.

Rates of growth among the major national producers provide another important basis for evaluating the relative standing of the United States among the world's steel producing nations. Table 2.3 provides a breakdown by country of the tonnage and percentage changes for eight non-communist steel producing nations in 1960 and 1974. Japan showed an amazing 437 percent increase in output over this time, or an annual rate of 12.76 percent. Luxembourg, France, and West Germany all had modest annual rates of growth from 3.27 to 3.52.

The world steel market is subject to wide cyclical fluctuations. This is attributable to the sharp responsiveness of steel demand and output to the fluctuating nature of the various markets which it serves. These ups and downs have caused the industry to alternate between periods of excess capacity and shortages of capacity. 2/ The intensity of competition in the world market at any given time is determined by the demand fluctuations in the major producing countries. Concurrent demand cycles might cause the price of imported steel to fluctuate widely. When the worldwide demand for steel is high, customers increasingly accept shipments of lower quality steel which would have been rejected when supplies were more abundant.

2/ For an explanation of the cyclical determinants of investment decisions in the steel industry, see [7].

TABLE 2.4

World Production of Raw Steel: 1950-76
(In millions of net tons)

Year	Raw Steel Production: United States	World	U.S. percentage of world production
1950	97	207	46.9
1951	105	232	45.3
1952	93	234	39.7
1953	112	259	43.2
1954	88	246	35.8
1955	117	298	39.3
1956	115	313	36.7
1957	113	322	35.1
1958	85	299	28.4
1959	93	337	27.6
1960	99	382	25.9
1961	98	390	25.1
1962	98	395	24.8
1963	109	422	25.8
1964	127	479	26.5
1965	131	503	26.0
1966	134	519	25.8
1967	127	548	23.2
1968	131	583	22.5
1969	141	632	22.3
1970	132	654	20.2
1971	121	633	19.1
1972	133	692	19.2
1973	151	767	19.7
1974	146	783	18.6
1975	117	712	16.4
1976	128	753	17.0

Source: American Iron and Steel Institute, Annual Statistical Report, various issues.

Major Companies Throughout the World

There are many big companies competing in steel products throughout the world. Excluding the Communist bloc, 20 steel companies produced approximately 60 percent of the free world steel output. In 1976, two producers had an annual output of 20 million metric tons each, and eight produced over 10 million tons each. The largest steel companies are located in the the major industrialized countries. Of the 10 largest non-Communist steel firms of the world in 1976, 4 were in Japan, 3 in the original European Community, and 2 in the United States. The remaining company was the British Steel Corporation. Of the 20 largest steel producers, 7 are in the United States, 6 in the original European Community, and 5 in Japan. The other 2 are in England and Australia. (See table 2.5.)

It is very difficult to make exact comparisons on seller concentration across nations simply because the statistics on the extent of concentration are not nearly as detailed as in the United States. Summary statistics of the raw steel production and the market shares for the leading firms in the United States, Japan, and the European Community are presented in table 2.6. We used the six original EEC member countries to compute concentration ratios for that group. Excluded from the ratios, then, was the nationalized British Steel Corporation which accounts for about 90 percent of total United Kingdom

TABLE 2.5

Largest Steel Producing Companies by Size: 1976

Rank	Company	Country	1976 Output (million metric tons)
1	Nippon Steel	Japan	33.97
2	U. S. Steel	U.S.A.	25.67
3	British Steel Corp.	U.K.	19.07
4	Bethlehem	U.S.A.	17.14
5	Nippon Kolan a/	Japan	15.67
6	Finsider group	Italy	13.43
7	Sumitomo	Japan	13.30
8	Kawasaki	Japan	13.30
9	ATH	Germany	12.82
10	Estel b/	Germany-Netherlands	10.40
11	National	U.S.A.	9.77
12	Arbed group c/	Luxembourg	9.72
13	Usinor d/	France	8.90
14	Republic	U.S.A.	8.73
15	Kobe Steel	Japan	7.81
16	BHP	Australia	7.78
17	Inland	U.S.A.	7.17
18	Armco	U.S.A.	6.80
19	Sacilor group e/	France	6.60
20	Jones & Laughlin	U.S.A.	6.32

a/ Includes 1.01 million metric tons from subsidiaries.

b/ Hoesch 5.6 million metric tons, Hoogovens 4.8 million metric tons.

c/ Includes 5.7 million metric tons from subsidiaries.

d/ Includes subsidiaries - Alpa, share in Solmer, etc.

e/ Includes share in Solmer.

Source: "Annual Review," Metal Bulletin Monthly, March 1977.

TABLE 2.6

Comparative Concentration of Steel Production in the United States, Japan, and the European Community: 1974

(million metric tons)

Firm Rank	U.S.		Japan		EC (6)	
	Metric tons	Percent of total	Metric tons	Percent of total	Metric tons	Percent of total
1	30.8	22.8	38.5	32.8	16.9	10.9
2	20.2	14.9	16.2	13.8	13.6	8.7
3	9.6	7.1	14.9	12.7	12.4	8.0
4	9.6	7.1	14.6	12.5	12.2	7.8
5	8.1	6.0	8.1	6.9	9.9	6.4
6	7.3	5.4	3.3	2.8	8.2	5.3
7	7.3	5.4	---	---	6.6	4.2
8	5.4	4.0	---	---	5.5	3.5
Total All Producers	135.3		117.2		155.7	
Top 4		51.9		71.8		35.4
Top 8		72.7		81.5		54.8

Source: Adapted from Metal Bulletin Handbook, 1975 (London: Metal Bulletin Limited), pp. 563 & 565.

production. 3/ Concentration in Europe is lower than in either Japan or the United States. The market share of the largest U.S. firm is less than that of the largest firm in Japan. 4/

Japan

Japan is the world's largest steel exporter and the largest single country supplier of steel mill products to the U.S. The Japanese steel industry has experienced the highest growth rate (12.9 percent) of steel production of any major country during the 1960's and early 1970's, its share of world steel production having risen from 6 percent in 1960 to about 18 percent in 1975. Japan is the world's third largest producer of raw steel with total output of 132 million metric tons in 1973. (If the EC countries are taken as a whole, Japan ranks fourth, after U.S.S.R., EC, and U.S.). The Japanese have the newest and largest steel plants in the world. Several plants have an annual capacity ranging from 10 to 16 million metric tons and some of these are being further expanded. Japan's

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3/ Fourteen previously independent steelmaking concerns were nationalized July 28, 1967. The firms were: Dorman, Long & Co., Stewarts & Lloyds, English Steel, Lancashire Steel, Richard Thomas & Baldwins, United States Colvilles, Consett Iron, G.K.N. Steel, John Summers & Sons, Park Gate Iron & Steel, Round Oak, South Durham, and Steel Co. of Wales. See [8, p. 5].

4/ In Japan, the two largest producers, Yawata and Fuji, merged in 1969 to form Nippon Steel. This merger made Nippon the largest steel company in the world, a position that had been held for decades by United States Steel Corporation.

blast furnaces include six of the world's ten largest, and eleven of the top twenty. 5/

Most of Japan's integrated steel plants are located on deep ocean harbors, and most of them are near major industrial centers. They have constructed special deepwater facilities capable of receiving the new generation of large ore carriers. The seaboard locations offer freight advantages in handling transportation of both raw materials and the industry's large exports. Japan is at a relative disadvantage with respect to sources of raw materials, principally iron ore, coking coal, scrap, and oil. Japan imports a high proportion of iron ore and coking coal, as shown in table 2.7.

TABLE 2.7

Import Dependence of the Japanese Steel Industry: Selected years, 1955-74

(percent)

	1955	1960	1965	1970	1974
Iron ore	84.7	92.0	97.1	99.2	99.4
Coking Coal	22.0	35.9	55.1	79.2	86.1
Iron & Steel Scrap	19.5	28.6	15.5	13.4	12.9

Source: Japan's Iron and Steel Industry, Tokyo, Kawata Publicity, Inc., 1973 Edition, pp. 249, 250; and 1975 Edition, p. 35.

5/ Metal Bulletin Monthly, April 1975, p. 31.

In 1974, for example, Japan imported more than 99 percent of its ore and 86 percent of its coking coal. The Japanese use long-term contracts, and more recently began participation in exploration and mineral production in other countries to ensure stable supplies. Japanese steelmakers have sought major new sources of iron ore in Canada, South America, Africa, and Australia in an effort to assure themselves of reliable supplies in the future. Until 1960, the Japanese imported coking coal primarily from the United States, but since then, several other countries, Australia and Canada in particular, have joined the list of major suppliers.

The Japanese steel industry differs structurally from the U.S. industry in three important ways. First, Japanese steel firms are much less vertically integrated. That is, they purchase most of their raw materials, whereas many U.S. producers own their own iron ore and coal mines. Japanese trading companies purchase most of the required coal, ore, and other materials. Large volume purchases of raw materials on a long-term contract basis generally result in a lower price than if purchases are made in smaller volume by individual producers. Second, the Japanese companies sell 80 percent or more of product to Japanese trading companies. In contrast to U.S. producers who market the largest portion of their products through their own outlets, these trading companies resell products to domestic and export consumers and service centers.

The trading companies handle a wide range of products besides steel which is another important element in Japan's international competitiveness. The major significance of Japanese trading companies is that they perform specialized marketing capabilities abroad--a service difficult for steel industries of other nations to match. The third structural trait of the Japanese steel industry is the close relationship between steel firms, government, and commercial banks. 6/ Japanese steel firms generate the bulk of their financing for capital expenditures through long-term debt rather than from internal sources or sale of equities.

Only moderate expansion is predicted for the Japanese steel industry over the next decade. The industry now plans to increase the size of present facilities rather than build new steel complexes. Over the long run, the industry will have to cope with continued increases in costs of imported raw materials, energy supply constraints, and the relative costs of meeting environmental problems.

The European Community 7/

The founding members of the European Community were Belgium, France, Italy, Luxembourg, The Netherlands, and West

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6/ In Japan, the Ministry of International Trade and Industry (MITI) provides the steel industry with market guidance and long-term forecasting.

7/ The collective name for the European Coal and Steel Community, the European Economic Community, and the European Atomic Energy Community. Until July 1967, the three Communities had separate executive commissions (known as the High Authority in the ECSC). Since 1967, there has been a single commission and a single council.

Germany. The group was enlarged in 1973 to include Denmark, Ireland, and the United Kingdom. The European Community produces one-third of the free world's raw steel. Its combined raw steel output was 133.6 million metric tons in 1976, with West Germany producing 42.4 million metric tons; Italy, 23.4 million metric tons; France, 23.2 million metric tons; the United Kingdom, 22.7 million metric tons; Belgium and Luxembourg, 16.7 million metric tons; and The Netherlands, 5.2 million metric tons.

The trend in the European Community has been toward greater concentration (the percentage of the market supplied by the largest firms) in steel production, and this trend has been encouraged by the national and supra-national authorities [9]. The areas of the individual member countries are no longer relevent markets because the elimination of tariff barriers between the member countries of the European Community has now created a unified market. The European Community countries recognize their commonality of interests with respect to export markets.

Developing Countries

The share of developing countries in international trade is low at the present time. Developing countries with rich ore and energy reserves deserve special attention. Several developing countries, especially some of the leading iron ore exporting countries, are not satisfied with their role as suppliers of raw materials. There is a general movement to a more active role including a greater share of the manufacturing. There are possibilities for future expansion of primary iron reduction activities in these countries. One possibility is that the stage of production at which trade occurs may change so that developing countries would produce primary billets and slabs and transport them for re-rolling at other locations. In 1975, nine countries accounted for more than 90 percent of the steel output in developing countries.

TABLE 2.8

Developing Countries: Production of Raw Steel in 1975
(Thousand metric tons)

Brazil	8,330
India	7,745
Mexico	5,350
Argentina	2,240
South Korea	1,985
Venezuela	1,100
Iran	600
Chile	635
Taiwan	500

Source: Metal Bulletin, May 4, 1976.

Although a number of developing countries are in the process of constructing additional steel mill capacity, it is doubtful that the developing countries as a group can become self-sufficient in steel production by 1980. 8/ A large number

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8/ Many of the developing nations are protecting their domestic markets on the basis that their firms need protection until they grow and become internationally competitive.

of elements, such as lack of skilled labor and capital, hamper the development of iron and steel industries in these countries.

Technology and Innovation

This section briefly describes the major operations involved in steelmaking and types of products produced for those readers unfamiliar with the industry. 9/ The purpose is to provide a basic understanding of the steel production process because changes in technology have affected the structure of the industry. Figure 2.1 presents a flow chart of the steel production process.

The chief method of producing steel from raw materials relies on the use of blast furnaces and on iron ore, coal, and limestone as the principal raw materials. The method involves three basic steps. First, coal is converted to coke used as a fuel and reductant for smelting iron ore. 10/ The second step is the production of pig iron by combining ore, scrap iron, coke, and limestone in blast furnaces. Third, the molten iron is transported to a furnace (open hearth, basic oxygen, or electric), where it is converted to steel by mixing it with scrap metal and other alloy materials. The proportion of ore inputs to the steelmaking "heat" varies with the processes used to produce the raw steel. An open hearth furnace can use

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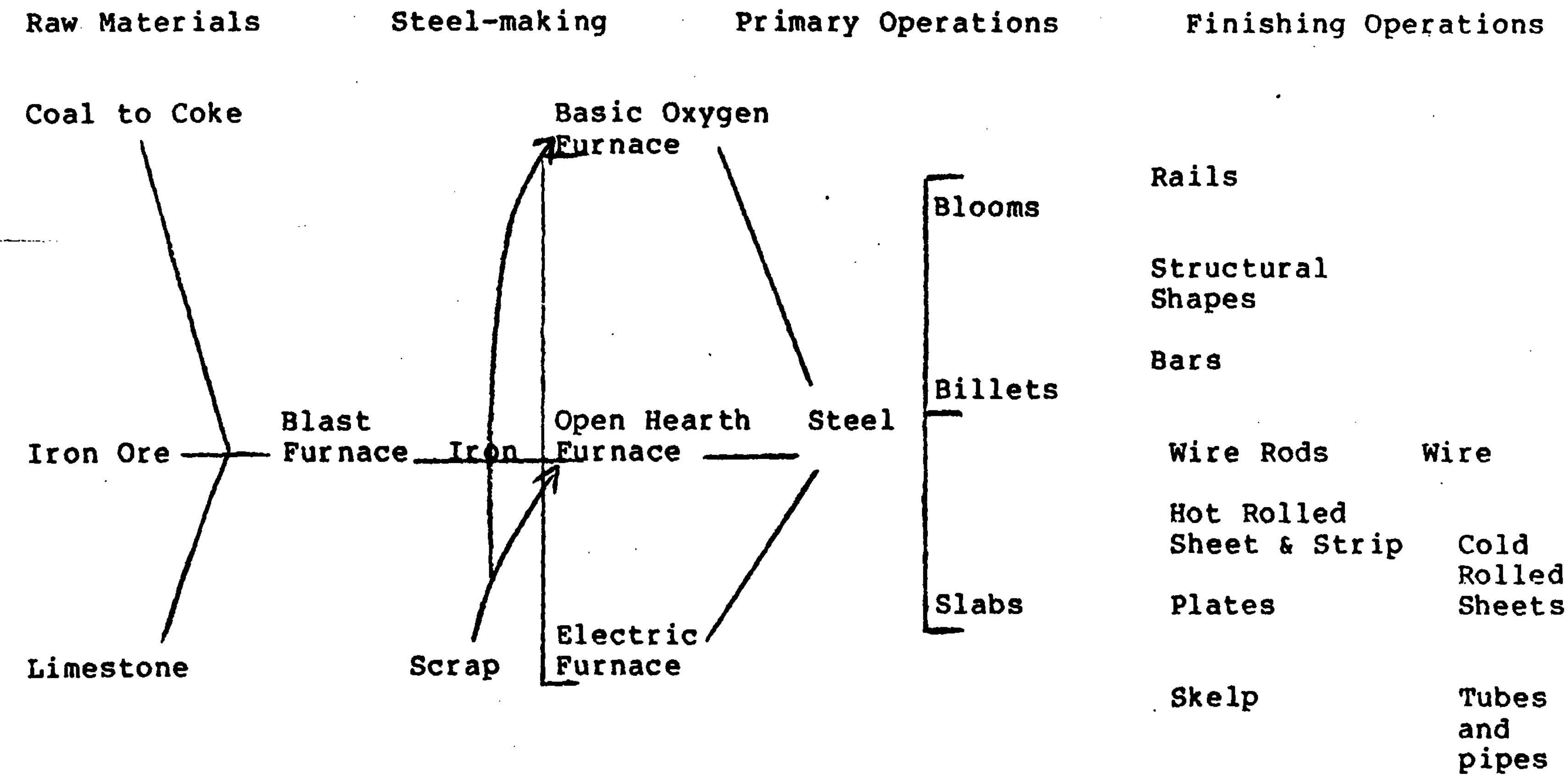
9/ For fuller treatment of steel technology and the steel production process, see [3].

10/ Coal is expected to continue as the principal provider of energy as well as the primary reducing agent for the steel industry.

FIGURE 2.1

Flow Chart of Conventional Steelmaking



from 20 to 80 percent scrap metal in the charge; an electric furnace may use from 30 to 100 percent scrap iron, but the basic oxygen furnace (BOF) converter is generally restricted to a maximum of 30 percent scrap iron content. 11/ The molten steel is poured into molds where it solidifies into ingots; or, alternatively, it is poured into a continuous casting machine which bypasses the ingot and primary rolling stages and directly produces blooms or slabs. Ingots are reduced in primary mills into forms suitable for further shaping. This is done in hot finishing mills in order to produce plates, sheets, bars, rods, pipes, and structural shapes. Steel producers sell their product in these forms and also in more finished forms, such as wire, nails, galvanized sheet, and tin plate. A substantial amount of home scrap is generated in converting steel ingot into semi-finished and finished products. In contrast, the continuous casting method generates very little scrap and is, thus, more productive. Steel is transported to its markets by road, rail, or water.

There are two modern steelmaking methods, the oxygen converter 12/ and the electric furnace. These two methods

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11/ A disadvantage of the BOF process is its lack of flexibility in the use of scrap metal in the charge.

12/ The oxygen process, which we refer to as the basic oxygen furnace (BOF) is frequently call L-D for Linz-Donawitz process. The percentage of steel produced by the BOF process in the United States is lower than in other major steel producing nations. Sixty-one and a half percent of steel in the United States was produced in the basic oxygen furnaces in 1975 compared with 82.5 percent in Japan and 69.3 percent in West Germany. See [31].

accounted, respectively, for 52 and 17 percent of world steel production in 1974. The remainder was produced by the obsolete open hearth method (29 percent), the basic Bessemer method (2 percent), and various other processes (0.4 percent). The oxygen converter, characterized as the major technical breakthrough at the steelmaking stage, involves a reactor vessel that looks like a cement mixer which in some cases holds up to 400 tons of hot iron and scrap metal. As oxygen is blown with lances from the top (or more recently, through the bottom), the steel is stirred to ensure thorough reaction without damaging the vessel's lining. Depending on the size of the vessel, a heat can be produced in 35-50 minutes. The BOF has replaced the open hearth furnace as the principal steelmaking unit in the United States. The BOF process has lower capital and operating costs than the open hearth process. It also offers the advantage of lower capital costs for pollution control equipment. A converter shop with 2 or 3 vessels can produce the same amount of steel as an open hearth shop with 15 to 20 furnaces.

In addition to the basic oxygen furnace, three other major innovations which greatly affect the steelmaking process have occurred in recent decades: (1) direct reduction which eliminates the need for blast furnaces and may become commercially important in the future; (2) the ultra high power electric furnace which provides a method of producing steel at relatively low capital costs; and (3) continuous casting which changes the method of shaping molten steel into semi-finished products.

Direct reduction is actually a general term referring to a variety of practices all of which have one basic feature in common: They bypass the coke oven/blast furnace smelting system of making iron. The technique consists of passing hydrogen and carbon monoxide (obtained from natural gas, residual fuel oil, or coal) over iron ore, thereby stripping away the oxygen without melting the ore. This reduces iron ore and ore pellets, without melting, into a briquette or pellet of better than 90 percent iron content for use in electric arc steelmaking furnaces. In contrast with molten iron, the products obtained from most direct reduction processes can be stored and shipped over long distances. Only countries such as Australia, Venezuela, and Iran with large reserves of low-cost natural gas could give serious consideration to the installation of large-scale direct reduction plants. This is because direct reduction is commercially advantageous only where natural gas is cheap in relation to coking coal. It is unclear whether direct reduction will make a significant impact in the United States in the future. There are three active direct reduction plants in the United States. 13/ Direct reduction processes are still in the development stage.

13/ For direct reduction plants in operation and on order see Jack R. Miller, "Update: Direct Reduction Capacity - January 1, 1977," IS&M, October 1976.

In 1976 only about one percent of world iron production was attributable to direct reduction plants with Latin America, notably Mexico and Venezuela, leading other areas.

Another important development is that of small mills, commonly called minimills [21]. Minimills are relatively inexpensive electric arc furnaces which convert scrap or pre-reduced pellets into steel products. Steelmaking in basic oxygen requires a much lower proportion of scrap than does steelmaking in electric furnaces. Most electric furnace steelmakers are far smaller than the blast furnace steelmakers. These plants offer a more limited line of steel products than blast furnace plants and concentrate on simple and unsophisticated products. They compete mainly in local markets. The levels of scrap prices and electric power costs greatly affect the viability of minimills. Electric steelmaking has increased in both absolute and relative terms. Electric arc furnaces have also been adopted at blast furnace mills where there is a surplus of scrap to complement their other furnace capacity. A minimill establishes a steelmaking capacity at considerably lower capital investment than a coke oven, blast furnace, and basic oxygen converter complex.

A major technical change at the primary stage of steel rolling is continuous casting, already referred to above. In conventional steelmaking, molten steel from a BOF vessel or an open hearth furnace is poured into ingot molds. After cooling, the molds are stripped off, the ingots are reheated in soaking pits to raise and make even the temperature and are then passed through a primary mill. This shapes the ingot into a semi-finished product. In continous casting, steel is poured directly from the furnace ladle into a casting machine that produces semi-finished steel. The new process eliminates the stripping, trimming, and rolling of ingots into semi-finished steel, and does away with the need for soaking pits.

Since the continuous casting process does not require a soaking pit to maintain steel temperatures, considerably less energy is needed. Continuous casting has the advantage of producing a considerably higher yield (the amount of finished steel made from a ton of crude steel) than the older ingot casting and primary hot rolling process. It has much lower investment and operating costs than the traditional method.

In spite of this, however, primary mills are still being installed in modern steelworks. One reason is that conventional mills turn out certain products that cannot be obtained from continuous casting. In addition, continuous casters for slabs are very complex machines whose breakdown would paralyze the rolling and finishing operations. Most integrated producers of flat rolled steel products, therefore, seem to prefer to have both continuous casting and the conventional methods in the same facility.

Other areas with promise of significant new technology in steelmaking in the years ahead include formcoke, higher rolling speed automated procedures leading to superior quality control, and eventual use of nuclear energy. The direction of technological change is influenced by relative factor prices, with the greatest efforts being made to devise technologies that save the scarcest and most expensive inputs.

One promising possibility for a technological breakthrough in the steel industry is the development of formcoke. Formcoke is the generic name for a number of different processes, all of which share common characteristics in that prepared coal is broken down physically, carbonized with a binder added, and shaped (usually as a briquette to more or less uniform dimensions), and is capable of withstanding the blast furnace burden. Because of its greater strength, formcoke is less liable to degradation and could be transported easily and economically. Additionally, it can utilize a certain proportion of non-coking coal, which is abundant in many parts of the world.

Raw Materials

According to the theory of comparative advantage, nations tend to export those goods or commodities for which they have a comparative advantage and import those for which they have a comparative disadvantage. Since the U.S. is one of the great repositories of the basic raw materials from which steel is made, this factor should favor U.S. competitiveness in world markets.

Steelmaking requires large amounts of raw materials. The production of one ton of steel requires on the average about

2.5 tons of iron ore, coal, limestone, and scrap. The major steel producing countries vary in the extent to which they rely on imported raw materials; however, the steel industries in Europe and Japan are more dependent than is the U.S. steel industry. Table 2.9 shows the extent to which the major producing countries rely on imports of scrap, iron ore, and hard coal.

TABLE 2.9

Imports of Raw Materials by Nation: 1975
(percent)

	Scrap	Iron Ore	Hard Coal a/
United States	0.4	38.0	0.1
Japan	7.5	99.4	77.0
West Germany	8.9	93.1	7.6
United Kingdom	0.6	77.8	3.9
France	5.8	25.0	42.9
Italy	28.6	96.8	N.A.

a/ Hard coal was used because statistics for coking coal were not available.

Source: Organization for Economic Co-operation and Development, The Iron and Steel Industry in 1975 and Energy Statistics 1973-75, Paris: 1977.

The United States is a major exporter to other nations of such basic materials as steel scrap and coking coal, although it is an importer of iron ore, ore concentrates, and alloying materials. The U. S. has large deposits of coking coal and taconite ore.

Iron Ore. Iron ore is one of the most abundant of all minerals throughout the world. Deposits are well distributed geographically with vast reserves found on all continents. Although quantitative estimates are not available, much evidence supports the conclusion that the elasticity of supply of iron ore traded internationally is high; that is, a small increase in price will call forth large additional quantities of ore.

The Japanese import iron ore from Australia, Brazil, and Canada, mostly under medium- or long-term contracts. In recent years they have become involved in the development of new mines. Steel producers in Western Europe make a substantial proportion of their ore purchases under short-term (usually one year) contracts, and the rest under long-term arrangements. United States producers tend to own their own mines and to operate them principally for their own use. (See the appendix to this chapter.)

The United States is a net importer of iron ore (table 2.10). About 70 percent of the iron ore consumed by the U.S. steel industry comes from domestic sources; of the imported supplies, about one-half comes from Canada and most of the remainder from Latin America. U. S. dependence on foreign iron ore was necessitated by the diminution of quality domestic ores. The major sources of U. S. iron ore in 1972 are shown in table 2.11.

TABLE 2.10

U. S. Iron Ore Production,
Exports and Imports: 1960-74
(Gross weight in million net tons)

	Domestic Production a/	Exports	Imports
1960	88.8	5.3	34.6
1961	71.3	5.0	25.8
1962	71.8	5.9	33.4
1963	73.6	6.8	33.3
1964	84.8	7.0	42.4
1965	87.4	7.1	45.1
1966	90.1	7.8	46.3
1967	84.2	5.9	44.6
1968	86.9	5.9	44.0
1969	88.3	5.2	40.7
1970	89.8	5.5	44.9
1971	80.8	3.1	40.1
1972	75.4	2.1	35.8
1973	87.7	2.7	43.3
1974	84.4	2.3	48.0

a/ Represents usable iron ore mined, including direct shipping ore, agglomerates produced at mines, concentrates, and by-product ore. Cinder and sinter obtained by treating pyrites are not included.

Source: U. S. Department of the Interior, Bureau of Mines, Minerals Yearbook, Metals, Minerals and Fuels, vol. 1, Iron Ore chapter, various years.

TABLE 2.11

Source of Iron Ore Used in the U. S.: 1973

Source	Percentage Supplied
Domestic production	66.4
Canada	16.4
Latin America	14.3
Africa	2.2
Australia	0.4
Other	0.3

Source: Steel Industry Economics and Federal Income Tax Policy, Washington, D.C., American Iron & Steel Institute, June 1975, table 6.

Large iron ore mines that were developed by American steel companies have been nationalized in Chile, Venezuela, and Peru. Venezuela, the second largest ore exporter to the United States, expropriated the Orinoco Mining Co., a wholly-owned subsidiary of United States Steel Corp., and the Iron Mines Co. of Venezuela, a wholly-owned subsidiary of Bethlehem Steel Corp. Both companies secured long-term contracts for the continued delivery of ore from the now nationalized companies. These were the only major steel companies to import iron ore from Venezuela. U. S. companies are increasingly hesitant about becoming reliant on foreign supplies and have tended to avoid further overseas ventures (except in Canada) in favor of developing and upgrading the large, lower grade U. S. resources.

Another potential problem concerning the supply of iron ore from foreign sources stems from the fact that ten countries agreed to form an Association of Iron Ore Exporting Countries (AIEC). The producing countries included in the pact are Algeria, Australia, Chile, India, Mauritania, Peru, Sierra Leone, Sweden, Tunisia, and Venezuela. The organization was set up to act as a clearing house for information on prices and markets. To date, these countries have not established a unified price for iron ore, nor is an attempt to fix prices expected to be successful in the future. Such an event should have a significant impact on steel producers in Europe and Japan. Excepting the imports from Canada, the United States depends on the world market for only a relatively small portion of its iron ore needs.

The domestic supply of iron ore is rather elastic because of the vast potential stocks of taconite that could be exploited if foreign iron ore prices were to rise substantially. Taconite is already being used in large quantities by steel firms in the United States. The development of taconite in the United States gives U.S. producers the bargaining power necessary to defend their own and the Nation's interest in obtaining adequate supplies of iron ore. If necessary, iron ore requirements could be met entirely from domestic resources. Vast quantities of taconite are found in the United States, most of them in the Mesabi Range of Minnesota, and the Marquette Range of Michigan, thus having the advantage of close proximity to much of our steelmaking capacity. Low-grade ores must be upgraded through pelletization for use in blast furnaces. In the event that international iron ore prices should be forced up dramatically by means of cartel action, American steel producers will probably have little difficulty expanding the mining and beneficiation of low-grade taconite ores and the output of their operations in Canada.

Coal. Roughly 80 percent of the world output of coking coal is produced by six countries: the United States, the United Kingdom, West Germany, the U.S.S.R., China, and Poland. The United States has vast reserves of coal [5] and exports over 10 percent of its total production, most of it metallurgical coal. A substantial part of the United States output is exported to Japan, Canada, and Western Europe.

Bituminous coal is classified into two general grades--steam coal and metallurgical coal. The most important market for steam coal is the electric utility industry. Domestic steel producers require metallurgical coal for the production of coke, which is a basic material required in blast furnaces for the production of pig iron. Coking coal must be of high caloric value, of low to medium volatility, and of low ash and sulfur content. Since all desired properties are not often inherent in any one type of coal, blends of coal are quite common. Steel producers closely coordinate their coke production with their blast furnace operations.

Iron and Steel Scrap. The third major raw material for the production of steel is iron and steel scrap. As seen in table 2.12, the United States has had a strong position in the exporting of scrap. The U.S. has traditionally been the world's largest exporter of scrap.

Scrap iron is usually divided into three general classifications: home scrap (sometimes call "mill revert"), prompt industrial scrap, and obsolescence scrap. Home scrap originates in steel mills in the processing of steel into various shapes and products; prompt industrial scrap originates in companies that stamp and machine metal; and obsolescence scrap consists of junked cars, appliances, and other metal items. In volume, home scrap is by far the largest, amounting to approximately 66 percent of total scrap consumed in 1970. About 20 percent of the total is prompt industrial scrap, and about 13 percent is obsolescence scrap (primarily old cars).

Home scrap is essentially the difference between liquid steel production and steel mill shipments, and consists of ingot scrapings, spills of hot pig iron, and steel mill or foundry product trimmings, ends, and rejected materials. In the short run, the supply of home scrap is completely price-inelastic, since the amount of scrap generated at steel mills varies directly with liquid steel production. Since the amount of home scrap recycled is essentially equal to the amount generated, it is simply inventory that is turned over rapidly. Increases in the supply of home scrap depend on increases in

TABLE 2.12
Iron and Steel Scrap Exports and Imports: 1950-73

Year	Exports	Imports	Net Exports
1950	217	785	- 568
1951	245	417	- 172
1952	353	154	199
1953	317	174	143
1954	1,696	239	1,457
1955	5,172	229	4,943
1956	6,446	256	6,190
1957	6,766	239	6,527
1958	2,928	333	2,595
1959	4,939	309	4,630
1960	8,040	179	7,861
1961	9,716	268	9,448
1962	5,112	210	4,902
1963	6,364	217	6,147
1964	7,898	282	7,616
1965	6,249	212	6,037
1966	5,750	406	5,344
1967	7,473	230	7,243
1968	6,444	294	6,150
1969	8,923	335	8,588
1970	10,111	301	9,810
1971	6,082	283	5,799
1972	7,177	312	6,865
1973	10,874	349	10,525

Source: U.S. Department of the Interior, Bureau of Mines, Minerals Yearbook, Metals, Minerals and Fuels, vol. I, Iron and Steel Scrap chapter, various years.

raw steel production and changes in mill inventory; the quantities generated and utilized are essentially equal to and independent of purchased scrap prices.

Prompt industrial scrap is that which is left over when products are manufactured from steel. For example, when a fender is stamped from a sheet of steel the unused portion is sold for scrap. It is "prompt" in the sense that manufacturers have to get rid of it promptly or be inundated with scrap. The mills prefer prompt industrial scrap because it is usually clean, of known composition, and chemically unchanged by use or exposure to weather. The supply of prompt industrial scrap is relatively stable.

Obsolescence scrap arises by aging and obsolescence of ferrous products until they are discarded as scrap iron (old car bodies, old steel rails, salvage from shipwrecks, etc). Not all ferrous products discarded have been recycled and these make up a reservoir of material, some of which could be collected and cut, bundled, or otherwise prepared for marketing by scrap processors, then resold for melting. The cost of collecting and processing these materials for sale as iron and steelmaking scrap will, of course, be determined by such factors as their geographic dispersion and the ease and speed with which they can be collected and processed. Because of domestic freight rates, obsolescence scrap generally must be processed at or near the place where it is collected. Collection and transportation of obsolescence scrap is a function of price. High prices for scrap encourage more investment in scrap-processing equipment and more collecting from areas that would not normally be scrap territory. World demand for scrap increased sharply in 1973 corresponding to the increased world production of iron and steel. Increasing domestic demand combined with high exports led to scarcity of quality scrap for use in domestic steel mills and foundries. As a result U.S. prices for ferrous scrap rose to a record height in the latter half of the year.

On July 2, 1973, the U.S. Department of Commerce imposed export restrictions on ferrous scrap under the "short supply" provisions of the Export Administration Act of 1969. No new orders for ferrous scrap of more than 500 net tons could be accepted for the balance of 1973. Individual allocations were distributed by exporter, country, and grade, based on each exporter's history of scrap exports during the base period from July 1, 1970, to June 30, 1973.

This quantitative limitation on the export of scrap from the United States precluded further expansion of the U. S. scrap industry, limited its profits during the recent boom, and benefited steelmakers at the expense of scrap dealers. Since the scrap industry appears to be one in which the U. S. has a comparative advantage, this limitation should be viewed as counterproductive. Permitting unrestricted exports of scrap would have resulted in foreign exchange earnings that would have been expected to raise the real income of the U. S. economy.

II. STRUCTURE OF THE UNITED STATES STEEL INDUSTRY

This section describes the domestic market structure. The dimensions of market structure are: (1) the number of sellers and their relative size, (2) major markets and end uses, (3) the degree of vertical integration, and (4) the extent of diversification. We will cover each of these. In addition, we will review the steel import situation of the United States and briefly trace recent developments affecting or likely to affect the international competitiveness of the U.S. steel industry. An understanding of these elements will provide a background for the hypotheses to be discussed in the remainder of the study.

The steel industry is of major importance to the U.S. economy, producing goods essential to expansion of the manufacturing sector. The industry contributed $12.7 billion to national income in 1972, amounting to 5.0 percent of U.S. manufacturing income and 1.4 percent of income from all industries (see table 2.13). Further, it should be noted that the percentage attributed to steel has been steadily declining as a proportion of both total manufacturing and all industries.

Members of the steel industry fall into three broad categories, production similarities serving as the basis of classification. These categories are somewhat arbitrary, however, since many steel products can be produced by alternative processes. Later discussions will blur the distinction of three relatively clear-cut segments of the industry, since

TABLE 2.13

National Income Originating in the Iron and Steel Industry, from Total Manufacturing, and from all Industries: Selected Years, 1950-72

Year	Iron and steel*	Manufacturing	All Industries National Income	Iron and steel as a percentage of total manufacturing	Iron and steel as a percentage of all industries
		(Millions of dollars)			
1950	5,679	76,223	241,074	7.5	2.4
1955	7,786	107,868	331,018	7.2	2.4
1960	8,127	125,822	414,522	6.5	2.0
1965	10,874	172,572	564,336	6.3	1.9
1970	10,853	217,505	800,462	5.0	1.4
1971	10,736	226,470	857,683	4.7	1.3
1972	12,733	253,352	946,534	5.0	1.3

*Iron and Steel was computed by taking value added in SIC's 331, 332, 3391, and 3399 as a percentage of SIC 33. This percentage was then multiplied by national income in primary metal industries.

Sources: U.S. Department of Commerce, Office of Business Economics. The National Income and Product Accounts of the United States, 1929-1965, Supplement, 1966; and U.S. Department of Commerce, Bureau of Economic Analysis Survey of Current Business, various issues.

the major steelmakers operate steelmaking plants of every possible variety including integrated, specialty, and ferrous scrap based units.

The first segment is the major vertically integrated producers of steel, operating coke ovens, blast furnaces, steelmaking furnaces, and rolling and finishing facilities. 14/ It is believed that the integrated firms product mix consists of heavier tonnage but lower valued products than industry average because some of the smaller firms specialize in such high valued products as stainless and tool steels or sell a large proportion of fabricated items. The second segment is the minimills that do not make their own pig iron, but rely on scrap or pre-reduced ores to make a limited range of products. The third segment is the producers that have no furnace facilities but start with semi-finished product and specialize in the finishing process itself. The specialty and alloy steelmakers are considered a different segment of the industry because they manufacture higher value products and a narrower range of products.

Number and Relative Size of Companies

Domestic establishments primarily engaged in the production of crude iron and steel are classified by the Bureau of the Census in the nine subdivisions shown in table 2.14. The

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14/ Many integrated steel producers in the United States also receive a large part of their iron ore and coking coal from mines owned and operated by them or owned and operated jointly with other companies.

largest category is the 4-digit Standard Industrial Classification (SIC) code 3312, "blast furnaces and steel mills." Approximately 58 percent of the employees and nearly 67 percent of the value of shipments come from establishments in this category. In all, there are 241 companies with 364 establishments in this category. Twenty companies are fully integrated producers (as defined in the Census of Manufactures), operating 39 fully integrated plants and accounting for 53 percent of the value of industry shipments in 1972. 15/

Table 2.15 shows concentration ratios in the blast furnaces and steel mills category (SIC 3312) computed by the Census Bureau for the census years on the basis of value added. These data disclose that the U.S. steel industry is characterized by slowly declining concentration over time at the 4-firm level. As table 2.15 also indicates, the number of steel companies rose from 148 in 1958 to 241 in 1972. This increase was due to an increase in the number of small firms on the industry fringe. About 40 miniplants have been built since 1960, and they are becoming increasingly important in the industry. 16/ The industry with a simple 4-firm national conentration of 45 percent in 1972 tends to be only slightly more concentrated than U.S. manufacturing generally. Table 2.16 shows the distribution

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15/ See [22, p. 6]. An integrated producer consists of coke ovens, blast furnaces, and rolling and finishing mills.

16/ "Mini-Mill Round Up," 33 Magazine (July 1974), pp. 36-44.

TABLE 2.14
Selected Iron and Steel Industry
Census Data: 1972

Standard Industrial Classification code	Industry group	Number of companies	Number of establishments	Number of employees (thousands)	Value of shipments (millions of dollars)
3312	Blast furnaces and steel mills	241	364	469.1	23,946.7
3313	Electrometallurgical products	27	40	9.5	550.1
3315	Steel wire and related products	234	289	30.6	1,227.7
3316	Cold finishing of steel shapes	85	125	20.1	1,635.7
3317	Steel pipes and tubes	115	152	23.6	1,292.1
3321	Gray iron foundries	893	993	138.4	3,876.5
3322	Malleable iron foundries	64	73	22.5	507.9
3323	Steel foundries*	292	334	57.9	1,329.6
3462	Iron and steel forgings**	252	280	34.3	1,416.1

* Combined total for industries 3324 and 3325 on the new SIC basis.

** The 1972 edition of the SIC Manual changed this to code number 3462 from code number 3391.

Source: U.S. Department of Commerce, Bureau of the Census, Census of Manufactures, 1972.

TABLE 2.15

Changes in Concentration in
SIC 3312 - Blast Furnaces and Steel Mills:
Selected Years, 1947-72

Year	Number of companies	Total shipments (millions of dollars)	Percentage of value added* accounted for by		
			4 largest companies	8 largest companies	20 largest companies
1972	241	10,304.7	45	65	84
1967	200	8,910.1	48	66	83
1963	161	7,699.5	48	67	85
1958	148	5,980.0	53	70	84
1954	(NA)	5,014.4	55	71	86
1947	(NA)	2,844.6	50	66	81

NA = Not available.

* For some industries, the Census Bureau prefers to state concentration ratios on the basis of value added by manufacture rather than value of shipments because, according to the Census Bureau, the latter includes a substantial and unmeasurable amount of duplication for those industries.

Source: U.S. Department of Commerce, Bureau of the Census, Census of Manufactures, 1972, Concentration Ratios in Manufacturing, MC76(SR)-2, p. 28.

of 4-firm concentration ratios in manufacturing in 1972. As table 2.16 shows, the weighted average 4-firm concentration in manufacturing was 40.2 percent for all 453 industries for which data were available.

There are at least three shortcomings in the Census Bureau's concentration data. First, the omission of foreign competition tends to overstate market concentration in this country. Second, in any country with a large geographic area such as the United States, concentration ratios derived from the Nation as a whole will frequently understate concentration prevailing in the relevant regional markets. For example, it is frequently argued that the western United States constitutes a separate market. Imports (particularly from Japan) have a considerable influence in the U.S. west coast market. Third, industries and markets may not be coterminous, with an indeterminate effect on concentration.

A more detailed examination of concentration is possible from the 5-digit SIC product categories. 17/ In 1972 the four largest firms accounted for 58 percent of the ingot and semi-finished shapes, 54 percent of the hot rolled sheet and strip, and 59 percent of the hot rolled bars, plates, and structural

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17/ Census data on value of shipments and concentration are reported on two bases: industry and product. Plants are reported in the industry for which the primary product accounts for the greatest value of shipments. All shipments for a plant are reported in the same industry under the industry concept. Under the product concept, all shipments of a given product are classified in the industry to which the primary product belongs, regardless of where the item is produced.

TABLE 2.16

Distribution of the Bureau of the Census Four-Firm Concentration for Manufacturing Industries: 1972
(Percent)

4-Firm concentration	Percentage share of value added
0 - 9	5.29
10 - 19	17.67
20 - 29	18.69
30 - 39	14.87
40 - 49	13.10
50 - 59	7.49
60 - 69	9.88
70 - 79	4.10
80 - 89	1.44
90 - 100 a/	7.47
Weighted average concentration	40.2

a/ For SIC 3661, telephone and telegraph apparatus, the 1967 figure of 94 was used. The Census Bureau could not disclose the data and indicated this industry with a "D".

Source: U.S. Department of Commerce, Bureau of the Census, Census of Manufactures, 1972, Concentration Ratios in Manufacturing, MC76(SR)-2, table 5.

shapes. The deconcentration trend is confirmed for the principal heavy-tonnage products of the industry. Between 1958 and 1972, 4-firm and 8-firm concentration declined for six of seven 5-digit product classes. There are seven Census categories of steel products shown in table 2.17. Four products (1) steel wire, (2) steel pipe and tubes, (3) cold-rolled steel sheet and strip, (4) cold finished steel bars and bar shapes, are separated into distinct categories depending on whether they are made in steel mills. Concentration is lower when the product is not made in a steel mill.

The Bureau of the Census is not permitted to disclose the market position of individual companies. There are, however, several alternative methods of determining market shares for individual companies. Commonly used measures of firm size are: sales, production, or shipments. Iron Age, a trade publication, publishes an annual tabulation showing production and shipments data for individual companies. With these data it is possible to measure the relative size of the major steel firms. The total industry aggregates which provide the denominators in the computation of the market shares were taken from the American Iron and Steel Institute (AISI). 18/ The national market shares of leading domestic steel firms are shown in descending order in table 2.18. This table is based on

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18/ The American Iron and Steel Institute production totals do not include production by foundries, which normally produce steel only for castings.

TABLE 2.17

Concentration in Major Steel Product Categories: Selected years, 1958-72

SIC	Products	Year	Value of shipments (millions of dollars)	4 Largest companies (percent)	8 Largest companies (percent)
33122	Steel ingot and semi-finished shapes	1972	2,502.9	58	79
		1967	2,526.5	67	83
		1963	2,030.1	70	84
		1958	1,846.9	71	85
33123	Hot-rolled sheet and strip including tin mill	1972	6,510.7	54	77
		1967	4,533.3	56	75
		1963	3,895.5	55	76
		1958	3,169.3	56	78
33124	Hot-rolled bars, shapes, plates, and pilings	1972	5,612.8	59	70
		1967	4,456.4	62	74
		1963	3,607.8	63	74
		1958	2,879.7	64	76
33125 33155	Steel wire	1972	726.3	35	53
		1967	678.1	33	51
		1963	619.4	37	54
		1958	564.7	44	61
33125 33176	Steel pipe and tubes	1972	2,758.5	36	54
		1967	2,629.1	37	56
		1963	1,887.5	40	58
		1958	1,723.6	43	63
33127 33167	Cold-rolled sheet and strip	1972	4,267.0	35	59
		1967	3,161.9	36	61
		1963	2,856.3	39	64
		1958	2,091.6	41	64
33128 33168	Cold finished steel bars and bar shapes	1972	827.5	41	62
		1967	629.2	43	64
		1963	472.7	43	66
		1958	338.9	45	67

Source: U.S. Department of Commerce, Bureau of the Census, Census of Manufactures, 1972, Concentration Ratios in Manufacturing, MC72(SR)-2, tables 6 and 7.

TABLE 2.18

Production and Shipments of Steel Products
by Major U.S. Companies: 1976

	Raw steel production		Steel shipments	
	Thousands of net tons	Percent of total	Thousands of net tons	Percent of total
United States Steel Corp.	28,278	22.1	19,486	2.18
Bethlehem Steel Corp.	18,900	14.8	12,800	14.3
National Steel Corp.	10,770	8.4	7,844	8.8
Republic Steel Corp.	9,621	7.5	6,535	7.3
Inland Steel Co.	7,947	6.2	5,600	6.3
Armco Steel Corp.	7,611	5.9	5,082	5.7
Jones & Laughlin Steel Corp.	6,979	5.5	5,097	5.7
Lykes-Youngstown Corp.	5,054	4.0	3,388	3.8
Wheeling-Pittsburgh Steel Corp.	3,948	3.1	2,816	3.1
Kaiser Steel Corp.	2,561	2.0	1,616	1.8
McLouth Steel Corp.	2,007	1.6	1,639	1.8
CF&I Steel Corp.	1,507	1.2	1,101	1.2
Interlake, Inc.	1,102	.9	797	.9
Northwestern Steel & Wire Co.	1,008	.8	839	.9
Cyclops Corp.	920	.7	849	.9
Allegheny-Ludlum Industries, Inc.	757	.6	383	.4
Industry Total	127,943		89,447	

Source: "1976 Steel Industry Financial Analysis," <u>Iron Age</u>, April 25, 1977.

physical units of production and shipments rather than on value of shipments. The two measures are quite similar. For example, United States Steel Corporation accounted for approximately 22 percent of both production and shipments in 1976. Measured by either production or shipments the top 4 firms produced about 53 percent of the Nation's basic steel, and the top 8 firms accounted for nearly 75 percent of the total.

A more complete time series trend of the conventional 4- and 8-firm concentration ratios based on annual averages of production is given in table 2.19. The Iron Age data also confirm the downward trend in the 4-firm concentration ratio and the relative stability of the 8-firm measure.

The disparity between the concentration in table 2.15 and that in table 2.19 is explained by the use of different definitions of the industry and by the fact that the Bureau of the Census figures measure value added while Iron Age data measure tonnage production. A company with multiple plants can be classifed in several Census industries. Only a portion of that firm's raw steel production would be shown in SIC 3312. Both tables 2.15 and 2.19 illustrate a declining trend in the 4-firm concentration ratio.

TABLE 2.19

Concentration Measured by Tons of Production: Selected Years, 1938-76

Year	4 Largest corporations	8 Largest Corporations
1938	62.0	*
1942	64.7	*
1946	62.1	*
1950	62.0	*
1954	60.8	*
1958	57.0	77.4
1962	54.7	75.1
1966	54.4	75.4
1967	54.4	75.5
1968	54.0	75.3
1969	53.9	74.9
1970	53.2	73.8
1971	51.5	73.5
1972	52.0	73.9
1973	53.9	74.8
1974	53.2	74.5
1975	52.5	73.6
1976	52.8	74.4

* National Steel Corporation did not publish production figures prior to 1956; hence, the eight-firm production concentration ratio is not available.

Source: Computed from data in Iron Age, "Steel Industry Financial Analysis," various years.

The general structure of the industry has remained fairly stable over the past 25 years. Industry growth has taken place primarily by the expansion of existing facilities. Very little additional capacity was added in the United States in the late 1960's or early 1970's. Nevertheless, structural adjustments did take place. Capital expenditures were mainly to recondition units, replace obsolete facilities, reduce costs, abate pollution, and improve existing facilities rather than to expand capacity. Investment costs are often lower at an existing plant site because there is less lead time required and because of the existing infrastructure. New facilities were often "shoe-horned" into existing facilities. As a result, most plants in the industry are a combination of old and new equipment. Installment of new integrated steelworks may require from 7 to 10 years from the time a decision is made. New capacity has to be added in large indivisible lumps. Only two integrated "greenfield" plants have been constructed in the United States during the past 25 years--the Fairless (Pennsylvania) plant of United States Steel Corporation was started up about 1953, and the Burns Harbor (Indiana) plant of Bethlehem Steel began production in 1967. 19/

Most of the major integrated producers in the United States have several plants of various sizes. The amount of steelmaking capacity in existence on a plant by plant basis in the United States is shown in table 2.20. 20/ Capacity is

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19/ U.S. Steel Corporation is considering a greenfield plant at Conneaut, Ohio; "U.S. Steel Sets Study of Conneaut, Ohio, as Possible Mill Site," Wall Street Journal, February 24, 1977, p. 7.

20/ The American Iron and Steel Institute (AISI) collected and published steelmaking capacity figures from the end of World War II until 1960. It stopped publishing these figures because of difficulty in interpretation, particularly the difficulty of determining what part of older facilities, which mostly stood idle, actually represented viable production capacity.

The AISI prefers the term capability to capacity. They define capability as tonnage capability to produce raw steel for a full order book based on current availability of raw materials, fuels, and supplies, and of the industry's coke, iron, steelmaking, rolling, and finishing facilities, recognizing current environmental and safety requirements.

TABLE 2.20

Approximate Size of Integrated Steel Plants in U.S.: 1976
(Millions of net tons of raw steel)

Company	Plants	Capacity
U.S. Steel	Gary	8.0
	South Works	5.3
	Fairless	4.4
	Homestead	4.0
	Fairfield	3.5
	Duquesne	3.0
	Lorain	3.0
	Geneva	2.8
	Edgar Thompson	2.5
	Youngstown	2.5
Bethlehem	Sparrows Point	7.5
	Lackawanna	6.0
	Burns Harbor	4.5
	Bethlehem	3.6
	Johnstown	2.4
	Steeltown	1.4
Republic	Cleveland	4.4
	Warren	2.7
	Chicago	2.0
	Gadsden	1.5
	Canton	1.4
	Buffalo	1.0
Wheeling-Pittsburgh	Steubenville	2.8
	Monessen	1.6
McLouth	Trenton	3.4

Company	Plants	Capacity
Sharon	Farrell	1.9
Cyclops	Portsmouth	1.0
Alan Wood	Conshohocken	1.5
Lukens	Coatesville	1.0
Jones & Laughlin	Aliquippa	3.8
	Cleveland	3.1
	Pittsburgh	1.8
National	Great Lakes	6.6
	Weirton	4.0
	Granite City	2.5
Armco	Middleton	3.8
	Ashland	2.0
	Houston	1.5
	Kansas City	1.1
Inland	Indiana Harbor	8.2
Youngstown	East Chicago	5.5
	Campbell	2.0
	Brier Hill	1.5
Kaiser	Fontana	4.0
Ford	Rouge	3.8
CF&I	Pueblo	1.7
Lone Star	Texas	1.5
International-Harvester	Chicago	1.2

Source: Institute for Iron and Steel Studies, "1976 - The Road Back," _Commentary_, vol. 5, no. 1, 2 (January-February 1976.)

the maximum amount of production possible. Only integrated plants with an estimated capacity of greater than 1 million tons were considered. There are 48 such plants in the United States. For multi-plant companies, individual plant capacities can vary, depending on the distribution of varying quality raw materials to these plants. Capacity of a plant could vary by 15 percent. United States Steel Corporation has 10 major plants which produce basic steel, the largest of which has a capacity of 8 million tons. The only major steel producer with a single steel works is Inland Steel Company at Indiana Harbor. The 8 largest corporations own the 15 largest plants and 23 of the largest 25 plants in the United States in 1976.

Mergers in the U.S. Steel Industry

An analysis of the mergers in recent years demonstrates that they have not had a strong influence on the structure of the steel industry. The mergers that have taken place in the steel industry in the postwar period have been principally among smaller companies and have had little impact on top 4 or top 8 concentration. The Federal Trade Commission lists 44 mergers involving steel companies since 1950. Of these, 5 were classified as horizontal; 12, as vertical; 17, as product extension; and 10, as conglomerate. These mergers are listed in table 2.21.

TABLE 2.21

Acquisitions Involving Steel Companies

Acquiring company	Assets of acquiring co. (millions of dollars)	Acquired company	Assets of acquired co. (millions of dollars)	Date of acquisition	Type of acquisition
Detroit Steel	16.9	Portsmouth Steel	28.5	01/04/50	Vertical
Kaiser Steel	157.3	Utah Fuel Co.	21.4	03/00/51	Vertical
Timkin Detroit Ax	89.9	Stand Steel Spring	59.8	09/30/53	Product Extension
Follansbee Steel	20.5	Consumers Co.	10.3	12/23/54	Conglomerate
Merritt Chapman	36.7	Newport Steel Co.	26.5	02/26/54	Conglomerate
Babcock & Wilcox	161.5	Globe Steel Tubes	12.6	01/01/55	Product Extension
Harrisburg Steel	19.6	Precision Castings	13.0	07/31/55	Conglomerate
Youngstown Sheet	573.5	Emsco Mfg. Co.	19.6	10/31/56	Product Extension
Acme Steel Co.	60.8	Newport Ste/Merrit	29.4	09/14/56	Product Extension
Jessop Steel Co.	11.7	Green River Steel	13.0	05/01/57	Horizontal
Carpenter Steel Co.	47.5	Northeastern Steel	14.2	11/19/57	Horizontal
Jones & Laughlin	732.1	Rotary Elec. Steel	33.2	04/30/57	Product Extension
Copperweld Steel	56.2	Superior Steel	16.5	11/30/57	Vertical
Armco Steel Corp.	612.8	National Supply Co.	154.7	04/30/58	Vertical
Armco Steel Corp.	612.8	Union Wire Rope	11.6	01/14/58	Vertical
Sharon Steel Corp.	99.4	Macomber Inc.	10.6	08/31/62	Product Extension
U.S. Steel	5033.5	Certified Inds. Inc.	11.1	04/ /64	Vertical
Allegheny Ludlum Steel	196.9	Special Metals Inc.	11.0	12/21/64	Product Extension
Interlake Iron	142.6	Acme Steel	134.4	12/17/64	Vertical
Screw & Bolt Corp.	19.4	Wyckoff Steel Co.	11.8	12/31/64	Vertical
Midland Ross Corp.	130.9	National Casting	43.7	04/00/65	Product Extension
Philadelphia & Reading Corp.	145.0	Lone Star Steel Co.	156.0	08/24/65	Product Extension
Old Ben Coal Corp.		Interlake Steel		10/12/65	
Teledyne Inc.	170.4	Firth Sterling	22.1	12/31/67	Product Extension
U.S. Steel	5609.3	Alside Inc.	26.9	12/05/68	Product Extension
Ling-Temco-Vought	485.1	Jones & Laughlin	1092.8	06/24/68	Conglomerate

TABLE 2.21 (Continued)
Acquisitions Involving Steel Companies

Acquiring company	Assets of acquiring co.	Acquired company	Assets of acquired co.	Date of acquisition	Type of acquisition
Wheeling Steel	404.9	Pittsburgh Steel	193.6	12/05/68	Horizontal
National Steel	1221.8	Republic Fol Inc.	15.9	12/31/68	Product Extension
Crane Co.	295.3	CF&I Steel Corp.	235.6	6/30/69	Product Extension
Republic Steel	1607.8	Finkl A. & Sons	14.5	9/30/69	Vertical
Colt Industries	197.1	Crucible Steel Co.	258.5	10/17/68	Vertical
American Cement Corp.	131.5	Pascoe Steel Corp.	11.2	3/05/68	Product Extension
Armco Steel Corp.	1633.2	Hitco	60.6	12/ /69	Product Extension
Allegheny Ludlum Steel	357.0	Jacobsen Mfg. Co.	21.4	8/ /69	Conglomerate
Athlone Industries	61.1	Jessop Steel Co.	48.5	5/06/69	Conglomerate
Lykes Corp.	376.9	Youngstown Sheet & Tube	1026.7	5/28/69	Conglomerate
NVF Co.	25.2	Sharon Steel Co.	190.3	2/07/69	Conglomerate
Cyclops Corp.		Detroit Steel Corp.	145.9	6/00/70	Product Extension
Bethlehem Steel	3224.2	Kusan Inc.	14.3	2/27/70	Product Extension
Inland Steel Co.	1175.1	Scholz Homes Inc.	25.2	2/17/70	Conglomerate
Marathon Ffg. Co.	94.1	Allison Steel Mfg.	17.4	12/27/71	Conglomerate
National Steel	1567.6	Granite City Steel	312.7	8/16/71	Horizontal
Cyclops Corp.	304.5	Smith Elwin G. & Co.	13.3	1/12/72	Horizontal
Bethlehem Steel	3919.3	Mastic Corp.	10.8	6/ /74	Vertical

Source: Federal Trade Commission, Bureau of Economics - Statistical Report on Mergers and Acquisitions, October 1975, "Table 23 - List of Manufacturing and Mining Companies Acquired with Assets of $10.0 Million or More, 1948-1974."

An attempt was made by Bethlehem Steel Corporation to acquire Youngstown Sheet & Tube Company in 1956, but it was thwarted by the Justice Department. 21/ One of the arguments made for the proposed merger was that Bethlehem could not afford to construct a fully integrated steel plant in the Chicago market. Bethlehem contended that the cost of rounding out and expanding the existing Youngstown plant in the Chicago area would be about $130 per ingot ton, but to construct a greenfield plant near Chicago would cost about $300 per ton. However, after the merger was denied, Bethlehem did construct a greenfield plant at Burns Harbor, Indiana.

In 1968, the Wheeling Steel Corporation and the Pittsburgh Steel Company merged to form the Wheeling-Pittsburgh Steel Corporation. Before the merger Wheeling and Pittsburgh were the industry's 10th and 16th largest producers, respectively. The new company became the 9th largest producer. The authors examined the Wheeling-Pittsburgh merger in order to determine whether there might be operating efficiencies and economies of operation gained through mergers.

This merger was chosen because it was the only recent horizontal acquisition in the industry in which a sufficient time period had elapsed so that any potential economies could have been implemented. The evidence shows that the plants operated substantially the same after the acquisition as

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21/ United States v. Bethlehem Steel Corp., 168 F. Supp. 576 (1958).

before. The corporation did not close any of its plants or make changes in plant specialization. 22/ In looking at the product shipments from various plants, no major shifts of products between plants was discernible. It is unknown whether, as a result of the acquisition, Wheeling-Pittsburgh was able to avoid some capital expenditures.

More recently, producers Jones & Laughlin and Youngstown Sheet & Tube have been acquired by conglomerates. LTV, a broadly diversified conglomerate, acquired Jones & Laughlin, the 5th largest producer of raw steel. The Justice Department filed suit in an attempt to apply the Clayton Act to this conglomerate merger. A consent decree was negotiated requiring LTV to divest itself of Okonite Company and Braniff Airways, Inc., in order to retain the steel company. 23/ Youngstown Sheet & Tube was acquired by Lykes Corporation, whose principal business had been the operation of a steamship line.

The steel industry's largest single horizontal merger since World War II involved National Steel Corporation and Granite City Steel Company in 1971. National was the Nation's 4th largest steelmaker and Granite City was 11th. As a result of this merger National moved into 3rd place. Although they

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22/ Wheeling-Pittsburgh sold its Thomas Strip Division in Warren, Ohio, to Hille & Muller, GMbH, of West Germany, in 1975. A company spokesman said that the sale of this division was not in any way related to the merger of the two companies.

23/ United States v. Ling-Temco-Vought, Inc., 315F. Supp. 1301 (W. D. Pa. 1971), 79.

did not compete geographically, both companies' product lines were substantially alike, with heavy emphasis on flat rolled sheet products and galvanized steel. In the case of Granite City, utilization of strip mill capacity was said to have improved from 19 percent to 50 percent after the acquisition.

In 1970, Kaiser acquired MSL Tubing and Steel Company (MSL Tube) and MSL Realty, a division and subsidiary of MSL Industries, Inc. Kaiser was then the Nation's 10th largest producer of steel and the only integrated steel producer located in California. Other mergers of significance were between Interlake Iron Company and Acme Steel to form Interlake Steel Company; Cyclops Corporation acquired Detroit Steel in 1970; and Timken Company and Latrobe Steel Company joined together in 1975. International Harvester Company recently sold the Wisconsin Steel division to EDC Holding Company, a subsidiary of Envirodyne, Inc.

Major Markets and End Uses of Steel

Steel is predominantly used as an input in the production of other commodities. The level of demand for these goods influences the demand for steel products. The principal markets for steel are quite diversified. Steel mill's produce a wide range of products for many uses. The wide variety of products manufactured by the steel industry makes it difficult to draw a simple profile of their characteristics. There is no market for steel as such; there are only submarkets such as

TABLE 2.22

Market Distribution of Steel Mill Product Shipments: 1974

	Shipments (thousands of net tons)	Percent
Steel service centers & distributors	20,400	18.6
Automotive vehicles & parts	18,928	17.3
Construction, including maintenance & contractors' products	18,519	16.9
Machinery, industrial equipment & tools, including electrical	9,682	8.8
Containers, cans, steel drums	8,218	7.5
Rail transportation	3,417	3.1
Oil & gas supply houses	2,779	2.5
Household appliances, utensils, cutlery, etc.	2,412	2.2
Other domestic & commercial equipment	1,941	1.8
Ordnance & other military equipment	654	.6
Shipbuilding & marine equipment	1,339	1.2
All others	21,183	19.4
Total shipments	109,472	100.0 a/

a/ Detail does not add to total due to rounding.

Source: American Iron and Steel Institute, *Annual Statistical Report*, 1974, table 15.

cold-rolled sheet, structural shapes, tin plates, rails, etc. 24/ There are so many types, shapes, and sizes that steel is generally produced only on the basis of particular orders. Within each product line, steel is relatively homogeneous; therefore, the product of one plant is physically substitutable for the product of another. The product mix varies substantially from firm to firm. The steel firms engage in a large amount of interplant transfers and interfirm selling to round out many of their orders. Table 2.22 indicates the major market categories to which steel shipments were made in 1974.

Steel service centers and distributors which function as middlemen between the steel mills and the final consumers sell about 18.6 percent of all steel products. The automotive industry consumes approximately 17 percent of all steel products. The construction industry absorbs approximately 16.9 percent; the container industry, 7.5 percent; and the balance is scattered among other consumers.

The steel industry must compete with substitute materials including aluminum, plastic, and glass. 25/ The relative price of these materials will determine to a large degree the extent

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24/ Cold-rolled sheet steel is vital material for the auto and appliance industries. Structural sheet, for example, is used in building oil drilling rigs and offshore drilling platforms. Steel plate is widely used in construction of such things as tanker ships and storage tanks.

25/ A more complete description of the substitution problem may be found in [30].

to which these products are substituted for steel. Further displacement of steel by other products is limited by technical factors. For example, in motor vehicles, these substitute materials have a much lower modulus of elasticity (rigidity) than steel which considerably reduces the possibility of substitution.

Extent of Diversification

Another facet of any industry's market structure is the degree of diversification of the firms. The largest integrated steel firms are among the giants of U.S. industry. Firms within the steel industry are absolutely large when compared to firms in other industries. The U.S. Steel Corporation was the 12th largest U.S. industrial firm (ranked by sales) in 1974 [13]. The 8 largest steel firms were among the 105 largest industrial firms, each having sales in 1974 exceeding $1 billion.

The fully integrated steel producers appear on most lists of highly diversified firms when the measure is the number of different industries in which a firm produces. United States Steel, besides being the Nation's largest steel producer, is also one of the largest cement producers, a major producer of coal and chemicals, and a developer of real estate. With its American Bridge division, it is one of the Nation's largest builders of bridges, office buildings, and other steel structures. Bethlehem is engaged in shipbuilding and repair and is also a producer of plastics. Armco Steel manufactures various kinds of machinery and recreational products and is engaged in equipment leasing and property insurance. National Steel is engaged in aluminum production. Inland Steel fabricates mobile homes and develops apartment buildings. Youngstown Sheet and Tube leases dock facilities. Allegheney Ludlum manufactures a variety of consumer products.

Each of the companies surveyed 26/ was asked to report its sales of steel mill products for each year since 1950. The steel sales of each firm as contained in its response was then divided by its total sales for each year. The percentage of the eight firms varied from year to year, but no discernible pattern was evident over time. Of the eight firms surveyed, three normally had over 90 percent of their total sales in steel, two had 70 to 80 percent of their total sales in steel, two had from 60 to 70 percent of their total sales in steel, and one had less than 60 percent of its total sales in steel. As a group, the eight firms had between 70 and 80 percent of their total sales in steel. The combined percentage was at 74 in both 1950 and 1974.

This study has made preliminary estimates that, relative to other industries, large steel companies have shown only a

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26/ Federal Trade Commission Steel Survey, 1975. A mandatory questionnaire was sent to each of the top eight firms under the authority of Section 6(b) of the Federal Trade Commission Act.

slight tendency to venture into fields outside of making steel and its products. 27/ Diversification into non-steel activities has occurred on a limited basis. In addition, it appears from

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27/ In order to obtain a quantitative measure of the degree of diversification of firms in the steel industry we utilized a data set prepared by Economic Information Systems, Inc. (EIS). EIS has developed estimates of plant value of shipments for each manufacturing plant in the United States employing 20 or more persons. Total shipments of the plant are estimated by multiplying an estimate of total employment in the plant by the average productivity of labor for plants of that size in that industry. For each plant the parent firm is identified, and its primary production is assigned a four-digit Standard Industrial Classification (SIC) code.

As a measure of diversification we summed the value of shipments of all four-digit industries contained in each firm's primary two-digit SIC industry. The ratio of a firm's value of shipments in its primary two-digit industry to its total sales in 1974 was taken as the measure of the diversification ratio. Sales were used as the denominator in order to capture all the firms activities including those outside the manufacturing sector.

Two samples were selected. One consisted of the 13 largest steel companies and the other was a control group of 90 firms taken from the Fortune Double 500 Directory. A stratified sample was used as the control group in order to hold size constant. The Fortune Double 500 Directory was segmented by size into groups of 25 firms each, and roughly the same percentage of control group firms was taken from each size segment as steel firms.

The analysis consisted of a statistical comparison between the mean values of the quotients of the two samples. The index was constructed such that a lower ratio of value of shipments to total sales indicates a higher degree of diversification. The calculated mean values were .507 and .329 for the steel firms and control group, respectively. Using a *t* test, we found this difference to be statistically significant at the one percent level, implying steel is less diversified. Due to fundamental limitations in the EIS data set, however, we do not believe these calculations provide a definitive answer to the comparative diversification question.

the survey of the eight largest U.S. steel companies that the firms do not have extensive operations outside the United States. There is a high degree of inter-relatedness of the product-market and service activities of the vertically integrated steel firms. The explanation for the lower diversification by steel firms is not entirely clear.

Ultimately, the longrun viability of an industry is determined by its level of profitability. A major concern of the basic steel industry has been its generally low rate of profit. Measured as a percent of stockholders' equity, steel profits have been consistently below the average for the entire manufacturing sector. Table 2.23 shows the historical profit performance measured by rate of return on stockholders' equity for the primary iron and steel industry and for all manufacturing during the years 1950 through 1976. For this 27-year period, rates of return on equity after taxes for steel averaged 9.1 percent while the all manufacturing average was 11.4.

There is no single "best" measure of profitability; the rate of return on equity is most commonly used. Owing to a host of factors, however, accounting rates of return may deviate from true "economic" rates of return. And the deviations may vary across industries. In order to render conclusive economic profitability comparisons, one would have to engage in analyses of risk differentials, differences in accounting

Table 2.23
United States Steel Industry Profits
As A Percent of Stockholders' Equity: 1950-76
(after taxes)

Year	Return on Equity: Primary iron & steel	Return on Equity: All manufacturing
1976	9.0	14.0
1975	10.9	11.6
1974	16.9	14.9
1973	9.5	12.8
1972	6.0	10.6
1971	4.5	9.7
1970	4.3	9.3
1969	7.6	11.5
1968	7.6	12.1
1967	7.7	11.7
1966	10.3	13.5
1965	9.8	13.0
1964	8.8	11.6
1963	7.0	10.3
1962	5.5	9.8
1961	6.2	8.8
1960	7.2	9.2
1959	8.0	10.4
1958	7.2	8.6
1957	11.4	11.0
1956	12.7	12.2
1955	13.5	12.6
1954	8.1	9.9
1953	10.7	10.5
1952	8.5	10.3
1951	12.3	12.1
1950	14.3	15.4

Note: The annual data represent the average of the quarters in the year.

Source: Federal Trade Commission, Bureau of Economics, Quarterly Financial Report, various years.

conventions, and differences in capital structure and capital intensities across industries. Nevertheless, comparison of accounting rates of return across industries does provide some gross (and perhaps tentative) information concerning relative profitabilities.

From the beginning of 1950 through 1957, such profit rates were relatively good. The period 1958-73 was relatively poor for the U.S. steel industry. Profits were below the all manufacturing average for each year during the period. A short-lived recovery took place during the steel boom of 1974. In 1974, the rate of return on stockholders' equity was a peak for recent years. The 1975 and 1976 rates of return again slipped below the all manufacturing average.

Overview of Impact of Imports

Discussions of structure are usually concerned with domestic firms, but foreign firms can also influence competitive conditions within an industry. Competition from imports has had a substantial impact on the steel industry. Table 2.24 indicates the relative importance of exports and imports to the U.S. steel industry. Prior to 1959, the United States was a substantial net exporter of steel mill products. Though imports were increasing during the late 1950's, in 1958 they amounted to only 1.7 million net tons, representing 2.9 percent of the domestic market. In 1958, the United States exported 2.8 million net tons of steel. The first major foreign penetration

TABLE 2.24
Growth Trends in Production, Shipments, Imports and Exports of Steel Mill Products: 1950-76

Year	Raw steel production	Net industry shipments	Imports	Exports	Apparent consumption	Imports relative to apparent consumption	Exports relative to net industry shipments
	(Thousands of short tons)					Percent	
1976	128,000	89,447	14,285	2,654	101,078	14.1	3.0
1975	116,642	79,957	12,012	2,953	89,016	13.5	3.7
1974	145,720	109,472	15,970	5,833	119,609	13.4	5.3
1973	150,799	111,430	15,150	4,052	122,528	12.4	3.6
1972	133,241	91,805	17,681	2,873	106,613	16.6	3.1
1971	120,443	87,038	18,304	2,827	102,515	17.9	3.2
1970	131,514	90,798	13,364	7,062	97,100	13.8	7.8
1969	141,262	93,877	14,034	5,229	102,682	13.7	5.6
1968	131,462	91,856	17,960	2,170	107,646	16.7	2.4
1967	127,213	83,897	11,455	1,685	93,667	12.2	2.0
1966	134,101	89,995	10,753	1,724	99,024	10.9	1.9
1965	131,462	92,666	10,383	2,496	100,553	10.3	2.7
1964	127,076	84,945	6,440	3,442	87,943	7.3	4.1
1963	109,261	75,555	5,452	2,180	78,827	6.9	2.9
1962	98,328	70,552	4,100	2,013	72,639	5.6	2.9
1961	98,014	66,126	3,163	1,990	67,299	4.7	3.0
1960	99,282	71,149	3,359	2,977	71,531	4.7	4.2
1959	93,446	69,377	4,396	1,677	72,096	6.1	2.4
1958	85,255	59,914	1,707	2,823	58,798	2.9	4.7
1957	112,715	79,895	1,155	5,348	75,702	1.5	6.7
1956	115,216	83,251	1,341	4,348	80,244	1.7	5.2
1955	117,036	84,717	973	4,061	81,629	1.2	4.8
1954	88,312	63,153	788	2,659	61,282	1.3	4.2
1953	111,610	80,152	1,674	2,907	78,919	2.1	3.6
1952	93,168	68,004	1,186	3,918	65,272	1.8	5.8
1951	105,200	78,929	2,178	3,051	78,056	2.8	3.9
1950	96,836	72,232	1,016	2,639	70,609	1.4	3.7

Note: Apparent consumption equals domestic shipments plus imports less exports. It differs from actual consumption to the extent that inventories are built up and drawn down by steel users.

Source: American Iron & Steel Institute, Annual Statistical Report, various years.

of the U.S. market occurred in 1959, partly as a result of the steel strike which lasted 116 days. Domestic users of steel began ordering from foreign sources to assure themselves of steady deliveries and adequate supplies. U.S. exports dropped to 1.7 million net tons and imports surged to the unprecedented height of 4.4 million net tons. For the first time in the 20th century, the United States turned from a net exporter to a net importer of steel. The gap between imports and exports rose steadily throughout the sixties. Apparent steel consumption taken by imports rose from 4.7 percent in 1960 to 16.7 percent in 1968. Since 1960, exports of steel by U.S. producers have fluctuated between about 2 million and 7 million tons per year.

Another element of the import situation is the importance of foreign manufactured goods that contain large amounts of steel. Indirect trade in steel consists of trade in vehicles, machinery, and other equipment manufactured from steel. The importance of indirect trade in steel should be emphasized. During the period 1962-73, indirect imports increased from 1.2 million net tons to 5.2 million net tons. The United States' balance of indirect steel trade became negative in the late 1960's, and in 1973 reached a minus 1,257,000 tons of finished steel. 28/

28/ This is a conservative estimate since exports of steel in table 2.25 are for both the U.S. and Canada while the imports shown in table 2.26 are exclusively for the United States.

TABLE 2.25

North America* Indirect Exports: Selected Years, 1962-73

(Thousands of finished tons)

	Commodity Group	1962	1965	1970	1973
1.	Intermediate goods	25.2	55.1	70.5	69.4
2.	Non-electrical machinery	660.3	694.1	1,209.8	1,423.7
3.	Electrical machinery & equip.	104.8	141.3	131.3	202.1
4.	Agricultural machinery & tractors	149.0	201.4	213.1	239.4
5.	Rolling stock	108.0	49.5	69.2	94.6
6.	Passenger cars	350.4	241.2	164.4	204.0
7.	Commercial vehicles	164.3	91.1	304.3	250.8
8.	Motor vehicle parts	(Included with Passenger cars)		365.5	422.9
9.	Domestic appliances	52.0	72.4	40.8	83.7
10.	Other manufactures	272.9	422.2	377.2	491.5
	Total**	2,090.7	2,151.6	3,124.5	3,977.1

* United States and Canada combined.

** Individual Commodity Groups may not sum to total because steel used in shipbuilding was excluded. Measuring indirect exports of steel used in shipbuilding posed special problems because each country's total consumption of steel in ships had to be considered as being for export.

Source: International Iron and Steel Institute, World Indirect Trade in Steel (Brussels, May 1974, and December 1975).

TABLE 2.26

United States Indirect Imports: Selected Years, 1962-73

(Thousands of tons of finished steel)

	Commodity Group	1962	1965	1970	1973
1.	Intermediate goods	427.7	608.8	643.2	856.0
2.	Non-electrical machinery	102.8	165.4	348.3	431.4
3.	Electrical machinery & equip.	36.7	67.5	227.7	169.8
4.	Agricultural machinery & tractors	22.8	21.1	44.6	71.2
5.	Rolling stock	1.2	6.3	71.5	122.7
6.	Passenger cars	335.6	513.5	1,300.0	1,811.7
7.	Commercial vehicles	16.8	28.1	165.8	659.2
8.	Motor vehicle parts	40.9	88.0	177.3	350.6
9.	Domestic appliances	16.7	21.2	78.4	151.8
10.	Other manufactures	155.7	315.2	587.7	610.2
	Total	1,156.9	1,835.1	3,644.5	5,234.6

Source: International Iron and Steel Institute, World Indirect Trade in Steel (Brussels, May 1974, and December 1975).

Members of the domestic steel industry, acting individually and collectively, have sought to obtain relief from foreign competition in a number of ways. In 1967, the domestic steel industry, with the backing of the United Steelworkers of America, began a concerted effort to gain protectionist legislation against foreign imports. The Senate Committee on Finance instructed its staff to undertake a study of the problems resulting from the expansion of imports of steel mill products [28]. Foreign steelmakers, recognizing the mounting pressure on the Government to provide some degree of protection, thwarted a possible mandatory quota by agreeing to voluntary restraints to limit shipments to the United States.

<u>Voluntary Restraints</u>

The Department of State, acting under the direction of the Johnson administration, negotiated with the major steel producers of Japan and the European Community (who together accounted for 80 percent of total U.S. steel imports) three-year Voluntary Restraint Agreements on steel exports to the U.S. The agreements were in the form of letters from the major Western European steel producing nations and Japan (Japanese Iron and Steel Federation) promising to restrict their exports of steel to the U.S. These agreements, which took effect on January 1, 1969, provided for specific tonnage limits on shipments to the U.S., allowing for a five percent annual growth and a commitment to maintain generally the product mix and geographic distribution of shipments.

One of the objectives in negotiating the arrangements was to provide the domestic steel industry with an interim in which to modernize its facilities so as to improve its competitiveness with foreign producers and thus avoid an inordinate U.S. dependence on foreign steel. According to the American Iron and Steel Institute, the steel industry has been spending over $1 billion a year since 1967 for modernization and expansion; and over the past 10 years, expenditures have totaled $18.1 billion. Capital expenditures for the U.S. steel industry were below the 1968 level throughout the 6-year period of voluntary restraints; however, capital expenditures for the other major countries were increasing.

An unusual facet of the voluntary restraints is that they restricted the tonnage rather than the value of steel imports. The VRA induced importers to concentrate on higher value types of steel to maintain foreign exchange earnings while adhering to the quantity limitations. Consequently, the composition of U.S. steel imports shifted to include an increasing proportion of high-value products, such as high-quality and coated sheets and stainless and other specialty steels. Additionally, the door was left ajar for other producing nations to increase their exports to us despite the existence of the quotas. Shipments from non-quota countries increased to 4.2 million net tons in 1971--50 percent more than the anticipated quantity of 2.8 million net tons. Table 2.27 shows how the voluntary limits compared with actual shipments from 1969 through 1974.

TABLE 2.27

Capital Expenditures of Steel Industries in Selected Major Steel Producing Countries (Millions of United States dollars a/)

	United States b/	European Community c/	United Kingdom	Canada	Japan
1965	1,823	932	139	141	510
1966	1,953	848	117	187	540
1967	2,146	730	136	114	843
1968	2,307	802	119	61	1,167
1969	2,047	1,005	102	95	1,494
1970	1,736	1,615	191	193	1,889
1971	1,425	2,310	414	236	2,607
1972	1,174	2,810	411	209	2,443
1973	1,400	3,033	401	215	2,039
1974	2,104	2,850E	400E	300E	2,700E

E = Estimated.

a/ At official exchange rates.
b/ Includes non-steel producing activities of steel companies.
c/ The original six nations.

Source: American Iron and Steel Institute, Steel Industry Economics and Federal Income Tax Policy, June 1975, p. 52.

TABLE 2.28

Comparison of U.S. Imports of Steel Mill Products with Voluntary Restraint Agreement Ceilings

	Actual Imports (thousand net tons)				Imports Relative to VRA Ceilings (percentage)	
Year	Japan	European Community	Other Nations	Total	Japan	European Community
1969	6,253	5,199	2,582	14,034	109	90
1970	5,935	4,573	2,856	13,364	98	72
1971	6,908	7,174	4,242	18,324	109	113
1972 a/	6,440	7,779	3,462	17,681	99	97
1973	5,637	6,510	3,003	15,150	85	80
1974	6,159	6,424	3,387	15,970	90	77

a/ Data for the European Community include the United Kingdom beginning with 1972, the year in which the producers of the UK joined the VRA.

Source: U.S. Department of Commerce, Bureau of Resources and Trade Assistance, Office of Import Programs.

Steel imports decreased from 18 million net tons in 1968 to 14 million net tons in 1969 and 13.4 million net tons in 1970. During 1971, the arrangements played a minor role in relation to supply and demand in the marketplace. Further, in December 1971, the United States devalued the dollar and the corresponding appreciation of foreign currencies increased the price of imported steel, thereby tending to ease competitive pressure from imports. The Voluntary Restraint Agreements were extended in revised form for another 3 years, running through 1974. They provided for firm commitments regarding the shipment of different products, lowered the 5 percent annual growth factor to 2.5 percent a year, and added the United Kingdom as a participant. The quotas were modified to place specific tonnage limitations on specialty (stainless, tool, and alloy) steels and to bring about firmer commitments with regard to product mix and geographic limitations.

In spite of the VRA, steel imports reached a peak of 18.5 million net tons in 1971. "Steel exports to the United States during 1972 and 1973 were less than the quotas; Government, domestic, and foreign industry representatives believe dollar devaluations and the high demand for steel in Europe, Japan, and other countries--not the voluntary restraint agreements--limited foreign exports to the United States" [10, p. 18]. Except for cyclical variations, the imports of steel were fairly stable after the VRA's went into effect. It is quite possible that they were successful in holding down imports. Insofar as

Japan is concerned, the VRA does appear to have had a significant effect in shifting exports to other markets. In the case of Europe, rising demand appears to have exerted a decisive influence. As a result of the worldwide boom for steel in 1974, combined with the revaluation of the dollar, the VRA's were not extended.

Experimental Negotiating Agreement

A typical pattern during a labor contract year would be a sharp rise in shipments as consumers try to protect themselves by building up inventories in anticipation of possible strikes and a sharp fall when an agreement is made. Initially, imports were stimulated by strike hedge buying in 1959 and before the expiration of each union contract throughout the sixties. Domestic consumers of steel ordered heavily from foreign sources to assure themselves adequate supplies as a protection against the possibility of a long strike [28, p. 152]. In March 1973, the top 10 steel companies worked out with the United Steelworkers of America the Experimental Negotiating Agreement (ENA). The ENA established a new procedure for contract negotiations by replacing the general strike threat with voluntary final and binding arbitration. "Both parties felt that because of the increasing threat of foreign imports and the long layoffs that became associated with stockpiling in advance of a possible strike, it made sense to enter into this new approach in collective bargaining." 29/ Fluctuations in the rate of output are relevant to cost for the firm since a steady rate of production is generally cheaper than a fluctuating rate. The Experimental Negotiating Agreement was renewed for the 1980 wage negotiations, so that there is now no apparent threat of an industrywide steel strike before 1983. 30/

During periods of low world demand, many foreign producers will attempt to penetrate the U.S. market with lower priced products. Foreign producers are quick to redirect these supplies in periods of higher demand abroad. 31/ In a period such as 1973-74 when the market was tight, imports were less than in 1972 and were priced far above the domestic price. During periods of tight supply, domestic steel producers allocate their production to customers on the basis of their previous purchases. In such periods, steel users have been unable to obtain all the steel they desired unless willing to pay substantially higher prices. Delivery times for most steel producers were slower than normal. Those users who relied heavily on imported steel, were not able to increase their purchases from domestic suppliers. Many of these buyers may

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29/ "The New Economics of World Steel Making," Business Week, August 3, 1974.

30/ "1977 Steel Settlement," Steel Labor, May 1977, p. 18.

31/ "Steelmakers Fret Over Imports Again," Business Week, Dec. 14, 1974.

have concluded since then that they cannot afford to become too reliant on foreign supplies, and that their long-term interests are closely tied to those of their domestic steel suppliers. By 1976, foreign producers were offering substantial discounts in order to capture customers from domestic producers.

Specialty Steel

It is plausible that the specialty steel industry was adversely affected by the Voluntary Restraint Agreements and their subsequent changes which distorted import levels of stainless steel and alloy tool steel. Mandatory quotas on specialty steel imports were sought by the specialty steel producers and steelworkers. A complaint was filed under provisions put into the Trade Act of 1974 32/ which require the Government to act against imports if it can be shown that they are a "substantial cause of serious injury" to a domestic industry. Most of the specialty steel comes from Japan, Sweden, Canada, France, Great Britian, Austria, and West Germany. The U.S. International Trade Commission, on January 17, 1976, proposed a limit of 146,000 net tons a year on imports of stainless and alloy tool steel. President Ford delayed imposing restrictions on specialty steel imports until June 14, 1976, while the U.S. Government attempted to negotiate volunatry cutbacks with foreign governments. Only Japan agreed to a program of

32/ 19 USCA 2551 et seq.

voluntary restraint within the 90 days alloted for negotiation. The Common Market and Sweden rejected the porposed "orderly marketing" arrangements and President Ford imposed import quotas for a 3-year period. 33/

33/ "Why Specialty Steel Won Its Case for Quotas," Iron Age, July 19, 1976, p. 21.

TABLE 2.29

Imports of Specialty Steel: 1964-75
(Net tons)

Year	Stainless steel	Alloy tool steel	Stainless steel and alloy tool steel
1964	44,145	8,295	52,440
1965	61,940	12,634	74,574
1966	85,875	17,234	103,109
1967	99,641	16,966	116,607
1968	138,113	13,453	151,566
1969	125,923	14,723	140,646
1970	137,488	17,356	154,844
1971	157,325	12,601	169,926
1972	126,163	14,695	140,858
1973	113,026	21,313	134,339
1974	149,828	25,048	174,876
1975	129,485	24,244	153,729

Source: U.S. Department of Commerce, Bureau of Resources and Trade Assistance, Office of Import Programs.

APPENDIX 2

The Degree of Vertical Integration

Another important aspect of the industry is the degree of vertical integration. The best illustration of vertical integration by steel companies is the backward integration into iron ore. Most of the major steelmakers in the United States own or control domestic iron ore mines and have substantial international iron mine investments, principally in Canada, that provide them with most of their ore requirements. The principal iron ore and taconite mines for the eight largest steel companies were determined in an attempt to discover to what extent the steel companies are self-sufficient in iron ore. The production of mining companies which are multiply owned by several steel companies was allocated to the owner companies according to their ownership of shares. Only active mining operations engaged in production in 1974 were included in our inquiry. 1/ Table 2A.1 shows the ownership pattern by summarizing the proportionate interests of the various steel companies in iron ore and taconite.

A crude measure of the degree of vertical integration was estimated as follows. First, it was assumed that 1.35 tons of iron ore was required to make a ton of steel. Multiplying this

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1/ United States Steel Corporation's Orinoco Mining Co. and Bethlehem Steel's Iron Mines Co. of Venezuela, which were expropriated by Venezuela, were included for 1974.

figure by each company's 1974 raw steel production yielded estimates of its raw iron ore requirements. Each company's estimated production of iron ore was divided by its estimated iron ore requirement to calculate an iron ore self-sufficiency ratio. These are given in table 2A.2 for the eight largest U.S. Steel companies. The table shows that the top eight steel companies mine part of their iron ore requirements but only U.S. Steel Corporation mines more than it consumes. As a matter of fact, 32 percent of its iron ore was sold in 1974. 2/

The United States Steel Corporation is not involved in any iron ore venture with any other domestic company. Only in cases such as Brazil, where the government insists on majority domestic ownership in ventures, does United States Steel Corporation have a joint interest in an iron ore operation. Other steel firms purchase ore from non-integrated mines and from foreign sources.

Most of the large coal producers are subsidiaries or affiliates of large oil, metal, utility, and steel corporations. The major coal companies that are subsidiaries of steel companies are shown in table 2A.3.

The large steel firms tend to be integrated vertically into iron ore or coal or both. The partially or non-integrated firms in the industry are in a considerably weaker position with respect to raw material supplies.

2/ United States Steel Corporation, Securities and Exchange Commission Form 10-K, 1974, p. 2.

TABLE 2A.1

Company Ownership of Iron Ore & Taconite Projects: 1974

United States Steel Corp.

Name of operation	Location	Total shipment (long tons)	Ownership (percent)
Amazonia Mineraco, S.A.	Brazil	---	49.0
Quebec Cartier Mining Co.	Port Cartier, Quebec	8,500,516	100.0
Orinoco Minning Co.	Venezuela	21,943,732 a/	
Western Ore Operations:			
Atlantic City	Lander, Wyoming	1,666,942	100.0
Desert Mount	Ceder City, Utah	423,630	100.0
Total Western Ore Operations:		2,090,572	
Minnesota Ore Operations:			
Minntac	Mt. Iron, Minn.	12,395,065	100.0
Sherman	Chisholm, Minn.	2,949,781	100.0
Rouchleau	Virginia, Minn.	2,451,596	100.0
Stephens	Aurora, Minn.	1,842,787	100.0
Plummer	Coleraine, Minn.	1,938,350	100.0
Total Minnesota Ore Operations:		21,577,579	
Grand Total		54,112,399	

a/ Nationalized by the Government of Venezuela, December 31, 1974.

TABLE 2A.1 (Continued)
Company Ownership of Iron & Taconite Projects: 1974

Name of operation	Location	Total shipments (long tons)	Ownership (percent)
	Bethlehem Steel Corp.		
Erie Mining Co.	Hoyt Lakes, Minn.	11,014,701	45.0
Bethlehem Mines Corp.			
Grace Mine	Morgantown, Pa.	1,169,205	100.0
Cornwall	Cornwall, Pa.	a/	100.0
Meramec Mining Co.	Sullivan, Mo.	1,181,690	50.0
Pioneer Pellet Plant	Ishpeming, Mich.	1,482,185	20.0
Marmoraton Mining Co.	Mormora, Ontario	515,635	100.0
Iron Ore Co. of Canada:			
Carol Lake	Labrador City, Nfld.	12,015,326	
Knob Lake	Knob Lake, Quebec	8,453,062	
Total - Iron Ore Company of Canada		20,468,388	
Negaunee Mine Co.	Negaunee, Mich.	38,133	20.0
Somifer	Gabon	b/	20.0
LAMCO Joint Venture	Burhanan, Liberia	12,774,031	25.0
Iron Mines Co. of Venezuela	Venezuela	4,151,296	100.0 c/
Grand Total		52,795,264	

a/ Mining terminated in 1973. Present activities are limited to operation of a pellet plant using concentrates from outside sources.
b/ Exploration only - no production.
c/ Nationalized by the Government of Venezuela, December 31, 1974.

Name of operation	Location	Total shipments (long tons)	Ownership (percent)
	National Steel Corp.		
National Steel Pellet Plant	Keewatin, Minn.	2,527,550	85.0
Pilot Knob Pellet Co.	Ironton, Mo.	683,242	50.0
Moose Mountain	Capreol, Ont.	686,362	100.0
Mesaba-Cliffs Minning Co.	Coleraine City, Minn.	1,037,931	14.0
Iron Ore Co. of Canada:			
Carol Lake	Labrador City, Nfld.	12,015,326	
Knob Lake	Knob City, Quebec	8,453,062	
Total - Iron Ore Company of Canada		20,468,388	
Lauretta Manganiferous Mines	Wolford Twp., Minn.	111,459	60.0
Hanna Ore Mining Co.	Hibbing, Minn.	983,384	85.0
Grand Total		26,498,316	

TABLE 2A.1 (Continued)
Company Ownership of Iron Ore & Taconite Projects: 1974

Inland Steel Company

Name of operation	Location	Total shipments (long tons) a/	Ownership (percent)
Butler Taconite Project	Nashwauk, Minn.	1,284,189	38.0
Empire Mine	Palmer, Mich.	1,520,738	40.0
Jackson County Iron	Black River Falls, Wisc.	899,253	100.0
Caland Ore Co., Ltd.	Atikokan, Ont.	2,163,921 b/	100.0
Wabush Mines	Labrador and Quebec, Canada	525,982	10.2
Sherwood Mine	Iron River, Mich.	479,235	100.0
Minorca Reserve	Virginia, Minn.	c/	100.0
Grand Total		6,873,318	

a/ Where Inland's ownership is less than 100 percent, the amount shown is shipments to Inland only.
b/ Includes 199,384 long tons shipped to another mining company.
c/ Not in production during 1974.

Youngstown Sheet & Tube

Erie Mining Co.	Hoyt Lakes, Minn.	11,014,701	35.0
Iron Ore Co. of Canada:			7.7
Carol Lake	Labrador City, Nfld.	12,015,326	
Knob Lake	Knob Lake, Quebec	8,453,062	
Total Iron Ore Company of Canada		20,468,388	
Wabush Mines	Wabush, Lab-Que.	5,445,474	15.6
Grand Total		36,928,563	

TABLE 2A.1 (Continued)

Company Ownership of Iron Ore & Taconite Projects: 1974

Republic Steel Corp.

Name of operation	Location	Total shipments (long tons)	Ownership (percent)
Pioneer Pellet Plant	Ishpeming, Minn.	1,482,185	32.3
Reserve Mining Co.	Silver Bay, Minn.	10,399,000	50.0
Iron Ore Co. of Canada:			6.1
Carol Lake	Labrador City, Nfld.	12,015,326	
Knob Lake	Knob Lake, Quebec	8,453,062	
Total Iron Ore Company of Canada		20,468,388	
Negaunee Mine Co.	Negaunee, Mich.	38,133	32.3
Liberia Mining Co.	Liberia	2,076,000	59.2
National Iron Ore Co.	Liberia		8.9
Grand Total		34,463,706	

Jones & Laughlin Steel Corp.

Marquette Iron Mining Co.	Ishpeming, Mich.	3,593,260	46.5
Tilden Mining Co.	Ishpeming, Mich.	41,801	27.0
Hilton Mines	Shawville, Quebec	931,579	25.0
Mesabe-Cliffs Mining Co.	Minnesota	1,049,547	32.0
Northwest Ore Division	Minnesota	4,187,857	100.0
New York Ore Division	New York	952,330	100.0
Grand Total		10,756,374	

Armco Steel Corp.

Reserve Mining Co.	Silver Bay, Minn.	10,399,000	50.0
Iron Ore Co. of Canada:			5.9
Carol Lake	Labrador City, Nfld.	12,015,326	
Knob Lake	Knob Lake, Quebec	8,453,062	
Total Iron Ore Company of Canada		20,468,388	
Grand Total		30,867,388	

Note: For a list of operations in North America along with joint venture details see: Skillings Mining Review, June 14, 1975; and Engineering and Mining Journal, November 1974.

TABLE 2A.2
Iron Ore Self-Sufficiency Ratio: 1974

Company rank by production	Raw steel production in 1974 (Net tons) a/	Estimated Required Iron Ore (Net tons) b/	Potential receipts of iron ore from mining ventures (Net tons)	Iron-ore self-sufficiency ratio
United States Steel Corp.	33,924,711	45,798,360	60,605,886	1.3233
Bethlehem Steel Corp.	22,281,000	30,079,350	21,160,130	.7035
Republic Steel Corp.	10,635,385	12,187,800	7,169,113	.5882
National Steel Corp.	10,603,800	14,357,770	9,147,451	.6371
Armco Steel Corp.	9,028,000	14,315,130	8,763,896	.6122
Inland Steel Co.	8,043,000	10,858,050	7,698,116	.7090
Jones & Laughlin Steel Corp.	8,036,000	10,848,600	8,278,020	.7630
Youngstown Sheet & Tube Co.	5,960,000	8,046,000	7,034,390	.8743

a/ Iron Age, "1974 Steel Industry Financial Analysis," April 28, 1975.

b/ Based on a factor of 1.35 tons of ore per ton of raw steel. In practice, the material-input/product-output ratios vary from plant to plant, depending on physicial, technological, and economic factors. Iron ore does vary by Fe content which might cause this ratio to vary from company to company. Iron ore with 50 to 55 percent Fe content would require 1.5 to 1.4 tons of iron ore to make a ton of steel; 55 to 60 percent Fe content would require 1.4 to 1.3 tons iron ore to make a ton of steel; over 60 percent Fe content would require 1.3 to 1.2 tons of iron ore per ton of steel.

TABLE 2A.3

Captive Coal Production by Steel Companies: 1974

Operating company	Parent company	1974 coal production (net tons)
United States Steel Corp.	United States Steel Corp.	16,389,000
Bethlehem Mines Corp. Beth-Elkhorn Corp.	Bethlehem Steel Co.	13,347,625
Republic Steel Corp.	Republic Steel Corp.	2,951,169
Youngstown Mines Corp. Buckeye Coal Co. Olga Coal Corp.	Lykes Resources, Inc.	2,606,800
Inland Steel Co.	Inland Steel Co.	2,469,434
Kaiser Steel Corp.	Kaiser Steel Corp.	2,049,950
Cannelton Coal Co. Divs.	Algoma Steel Co., Ltd.	1,952,220
National Mines Corp.	National Steel Co.	1,934,067
Mathies Coal Co.	(Lykes Resources, Inc.) (Steel Co. of Canada, Ltd.) (National Steel Co.) Consolidation Coal Co.	1,808,534
Jones & Laughlin Steel Corp.	Jones & Laughlin Steel Corp.	1,807,514
Armco Steel Corp.	Armco Steel Corp.	1,494,700
Gateway Coal Co.	Jones & Laughlin Steel Corp.	1,092,311
Beatric Pocahontas Co.	Republic Steel Corp. Island Creek Coal Co.	870,316
U.S. Pipe & Foundry Co.	U.S. Pipe & Foundry Co.	770,416
Mead Coal Co.	Mead Corp.	695,000
Harmar Coal Co.	Consolidation Coal Co.	631,991
CF&I Steel Corp.	CF&I Steel Corp.	625,000
National Coal Mining Co.	National Steel Co. Island Creek Coal Co.	566,055

Source: Keystone News Bulletin, March 1975.

References for Chapter 2

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Chapter 3

INTERNATIONAL COST MOVEMENTS IN STEELMAKING

I. INTRODUCTION

Changes in relative steel production costs among countries may have a strong influence on steel trade flows. Given any initial market situation, relative cost reductions by one country should allow it to expand into areas formerly controlled by the countries whose relative costs have increased.

This chapter examines the cost of steelmaking in the United States over the past 20 years relative to the costs in Japan and in the European Community. For reasons of data availability, different methodologies have been used for the Japanese and the EC comparisons. In the case of Japan, costs are compared with those of the United States on a factor by factor basis for a number of key input factors. In the case of the EC, price and profit data are used to compare European production costs with those of the United States for three particular steel products. The methodology used for Japan allows a much more intensive study of costs, including identification of the source of relative cost changes. The methodology used for the EC is not without advantages, however. It allows a more extensive coverage of aggregate costs and allows inferences about individual products. Both methods allow us to examine the correlation between relative cost changes and the trade position of the United States steel industry.

A number of studies have estimated steelmaking costs for the United States, Japan, or the EC. Some of these studies have done intercountry cost comparisons but, with few exceptions, they have covered only one or a few years. Although they collectively cover many years, their methodologies are so incompatible as to prevent conclusions from them about long-term trends in relative costs.

The only recent study discovered which presents comparative cost estimates over a long period of time was prepared by Pifer, Marshall, and Merrill (PMM) for the American Iron and Steel Institute [27]. The PMM study includes an 11-year time series of comparative costs between the United States and Japan for the same items studied here [27, pp. 29, 33].

Unfortunately, PMM did not construct independent cost estimates for basic input items. PMM have informed the authors that they relied on preliminary estimates made by the FTC staff for this report. The FTC document which PMM used was in draft form and contained errors and omissions. These shortcomings are reflected in the figures reported by PMM and explain most of the differences between their figures and those appearing in this chapter.

II. THE UNITED STATES AND JAPAN

Methodology

The method employed to examine steelmaking costs in this section is quite simple in concept. Data were collected for the United States and Japan on the quantity and average price of selected inputs used in the manufacture of steel during each of the years 1956 through 1976. Weighting each quantity by the appropriate price gives the total cost for each input in each year. Dividing each cost by the steel output in the respective year yields the cost of the input per unit of output. The unit costs for individual inputs are summed across inputs to give the cost of all the selected inputs per unit of output. The movements over time of these summed costs are used to gauge changes in relative costs between the two countries.

Changes in relative costs can be traced to the individual inputs or groups of inputs causing them, and the extent to which shifts were due to changes in the quantity employed or changes in the price of the input can be determined.

The inputs selected for examination are iron ore, scrap iron and steel, labor, and a number of energy inputs--coking coal, other coal, fuel oil, natural gas, and electric power. These inputs accounted for over 70 percent of variable steelmaking costs in the United States in recent years and over 60 percent of total costs. They are believed to have been the inputs most important in causing relative cost changes among countries. Among the excluded inputs are fluxes, alloys, oxygen, water, and other purchased materials. Taxes and the cost of transporting finished products to market were also excluded from consideration. 1/ Capital costs, which are not directly comparable to variable costs, were also excluded. Although it would have been preferable to include all variable inputs and cost factors, the necessary price and quantity data were not available. Underlying the use of the unit cost figures calculated is an implicit assumption that the relative cost between the United States and Japan of excluded inputs has not shifted significantly over time.

Even for the selected variables, price and quantity data which are exactly comparable for the two countries do not exist for some inputs. Attempts were made to adjust the data in some instances to make it more comparable but the possibility of error was not eliminated. There are a few basic comparability problems which will be discussed prior to dealing with individual variables.

First, comparability of input quantities suffers because of differences among countries in the definition of the steel industry. Particularly troublesome are differences in the degree of vertical integration. For example, in the United States, finishing the edges of steel plate is usually done at the steel mill; and, for data collection purposes, the labor and energy inputs required are considered to be employed in the steel industry. Industry sources have said that in Japan

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1/ Appendix 3B discusses recent transportation costs for finished products moving between Japan and the United States.

steel plates are more often finished by the service centers or by the users. If this is true, the labor and energy used are not counted as steel industry inputs in Japan.

A second general problem arises due to the difficulty of defining "the price" of an input. Even in specifying the ideal, one must choose between data which reflect the marginal cost of inputs and those which reflect the average cost. Since many inputs are purchased under long-term contract in the steel industry, there may be significant differences between the average cost and the marginal cost; and it is not clear which would be preferable. Marginal conditions, as reflected by spot market prices, may give an accurate indication of opportunity costs and an immediate signal of changed market conditions not provided by average prices. If average prices include a large contract component, for example they will probably understate opportunity cost during a period of rising input prices. On the other hand, current market prices may be overly responsive to transient changes 2/ and give a poor indication of fundamental conditions.

Real world data present additional problems. In few cases do we have the choice between average and marginal indicators; often there is only one data source available. Average, delivered input costs were available for many inputs for Japan;

2/ This is especially true when a market is very thin due to heavy vertical integration into the supply of the input.

but for the U.S., the available data were generally market prices for some characteristic market or the average transfer value of a particular commodity. Since U.S. companies are heavily integrated into the production of iron ore and coal, many transfers of these commodities are intracompany; and it is unclear whether published information based on these transfer values reflects average or marginal cost.

Perhaps a more serious obstacle to precise cost comparability between the U.S. and Japan involves output data rather than input data. Steel is not a homogeneous product. There are hundreds of steel products which vary in many dimensions--the type of steel used, carbon, stainless, etc.; the shape of the product, plate, wire, pipe, etc.; the dimensions of the product, thick, thin, light, heavy, etc.; and most difficult to measure, the quality of the product which involves such factors as the finish, production tolerances, and even promptness and reliability of delivery. The input requirements vary with the product and unless two countries produce the same product mix, cost comparisons lose their meaning. Failure to adjust for product mix can result in misleading conclusions concerning cost competitiveness. As a simple example, if country A produced only steel strip and country B produced only sheet, it would be inappropriate to conclude that A and B were cost competitive in labor simply because each had an average labor cost of $90 per ton of output. Since strip production is very labor intensive compared to sheet production, country A could be presumed to have a clear labor cost advantage. Country A could undoubtably produce sheet for less than $90 per ton labor cost, and it would undoubtably cost country B more than $90 per ton for labor to produce strip.

Complicating the theoretical problems of adjusting for product mix is the fact that in available data sources product classifications are limited and differ among countries, making comparisons of output mixes difficult. For example, while the U.S. industry classifies stainless and alloy steel as "specialty steels," the Japanese include under that term certain types of carbon steel products.

The variable input affected most by the product mix is labor. The Bureau of Labor Statistics series upon which the labor usages in this report are based do include some corrections for differences in product type and shape [43, pp. 20-25], but these corrections are far from complete and assume no differences in product quality.

Two types of distortions in comparative costs due to data problems can be distinguished. One is distortions which make the two countries' relative costs at any point in time misleading; the other is distortions which make changes in the relative costs over time misleading. An example is distortions which might arise due to an excluded input. Using oxygen as an example, assume that both countries use the same amount of oxygen but that one country's industry purchased its oxygen and the other produced its oxygen. Using this study's measurement method, the purchaser's steelmaking costs would appear to be lower even if actual costs for the two countries were the same. Outlays for oxygen by the purchasers would not be counted while the producer's cost series for electricity and labor would reflect the cost of inputs to produce oxygen. This would give a misleading indication of relative costs at any point in time, but the trend of relative costs over time might still be accurate if oxygen costs remained a constant proportion of total costs. If oxygen processes became an increasingly important part of steelmaking, however, there would be a misleading indication of an increasing relative cost trend in the oxygen producing country even if both countries increased their expenditures for oxygen at the same rate.

Little imagination is needed to identify the likelihood of numerous possible distortions in this study's relative cost measures both at points in time and as indicators of trends over time. The authors believe they have used the best available data, however, and must rest the validity of their results on the assumption that most distortions are insignificant and that even significant distortions are offset by others to yield an insignificant net effect. They do believe that the trends in the relative costs computed are generally correct in direction and approximate the magnitude of the actual changes.

Data Description

Labor. The labor quantity and price series for both the U.S. and Japan are an amalgamation of series constructed by the Bureau of Labor Statistics covering various periods of time. 3/ As pointed out above, the BLS makes some limited corrections in its series to reflect product mix differentials and the series developed here reflects these corrections.

Iron Ore. For the United States, the source of the iron ore quantity series was the total iron ore consumption reported by the American Iron and Steel Institute (AISI) [1]. The price of iron ore used for the United States was a weighted average of prices computed for domestic and imported ore. For domestic ore, the price used was "the average value at the mine of usable iron ore" mined in the U.S. reported by the Department of the Interior, Bureau of Mines [42]. To the value of ore at the mine was added an estimated cost of transportation to the steel mill. The estimate was based on transportation rates published periodically in Skilling's Mining Review. The estimated time series of transportation costs is shown in appendix 3A. For imported ore, the quantity and value were obtained from the Department of the Interior [42]. Since the values given are f.o.b. the exporting country, a transportation cost

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3/ Along with unpublished BLS data covering the period 1964 to 1974, data were used from Jackman [9] and Mark [23]. The data from Mark incorporated changes supplied to us by the Bureau of Labor Statistics through May 1977. The 1976 figures are projections based on data in [1], [11], and [12].

was added, estimated on the basis of data obtained from major U.S. steelmakers through compulsory questionnaires.

For Japan, the quantity of iron ore used was the sum of annual "imported" and "home iron ore consumption in the iron and steel industry" reported by Japan Iron and Steel Federation (JISF) [12]. The price of iron ore used for Japan was the annual average c.i.f. price of imported iron ore from the JISF [15].

Scrap. Only scrap purchased from outside the steel mills (as opposed to that generated internally) was considered in calculating the cost of scrap. 4/ If internally generated scrap had been included, there would be double counting since the cost of materials, energy, and labor used to produce that scrap are included in other cost series.

For the U.S., the quantity of scrap purchased was computed from data reported by the AISI [1] simply by subtracting the quantity of scrap "produced" from that "consumed." The price used for U.S. scrap was the annual average, composite price of #1 heavy melting scrap at Chicago, Philadelphia, and Pittsburgh from Iron Age.

For Japan, the quantity of scrap purchased was obtained from the JISF [12] and [13]. Separate figures were available for the quantity imported and the quantity purchased in Japan.

4/ Data on the total consumption of scrap are shown in appendix 3A.

The price used for domestically purchased scrap was the domestic "market" price and for imported scrap the "average" cost of imports, c.i.f., both as reported by the JISF [15].

Coking Coal. The quantity of coking coal consumed by the U.S. steel industry was obtained from the AISI [1]. The price used was annual "average cost of coking coal at merchant coke ovens" from Department of the Interior data [42]. This value included the cost of transportation to the ovens.

Coking coal consumption by the Japanese steel industry was obtained from the JISF [12]. The price used for Japan was the average cost of imports, c.i.f., from the JISF [15].

Non-Coking Coal. For the U.S. industry, the quantity of non-coking coal was obtained from the AISI [1] by subtracting "coal consumed in production of coke" from "total" coal consumption. The price for non-coking coal was estimated, using data from the Department of the Interior [42]. The average f.o.b. mine value in the U.S., reported in [42] for bituminous and lignite coal, was adjusted downward by taking into account the quantity and value of that coal which was sold as coking coal. To arrive at a delivered price, the authors added to the adjusted f.o.b. value the average railroad freight charge for shipments of coking coal to merchant ovens, which also appears in [42].

For Japan, quantity data for non-coking coal were available from the JISF [12] only through 1970. By that year, non-coking coal consumption had decreased to an insignificant cost component in the Japanese steel industry. Consumption was assumed to be zero in subsequent years. No price data for non-coking coal were available for Japan. It was assumed for this study that the Japanese price bore the same relation to the U.S. price that Japanese coking coal price bore to the U.S. coking coal price.

Fuel Oil. The quantity used to represent steel industry fuel oil consumption for the U.S. was that reported by the AISI [1]. The price used was the arithmetic average of the annual Chicago and Pittsburgh "refinery" and "terminal" prices of #6 fuel oil reported in Platt's Oil Price Handbook [28].

For Japan, the steel industry consumption of heavy fuel oil was taken from the JISF [12]. The price used was the annual average cost of "grade C heavy oil" imported to Japan, as reported also by the JISF [15].

Electric Power. As with the scrap, only purchased electric power was counted as a cost factor. 5/ If electric power generated by the steel mill were included, there would be double counting since the cost of energy and labor used to generate electricity internally are included in other series. 6/

5/ Data on the total consumption of electric power are shown in appendix 3A.

6/ As an illustration of the complex substitution of inputs which can occur, note the following. Blast furnace gas can be used to generate electricity internally--thus reducing the cost of purchased electricity, or it can be used to preheat blast furnace air--thus reducing the need for coking coal or fuel oil fed to the blast furnace. To some extent, therefore, purchased electricity can be substituted for coking coal.

The quantity of electric power purchased by the U.S. steel industry was obtained from the AISI [1]. The price series used for U.S. electric power purchases was constructed in the following manner. For the years 1971 through 1976, the Bureau of Labor Statistics [44] has presented regional price series for industrial electric power. The price for the East North Central region for each of the six available years was used. For earlier years, the 1971 East North Central price was carried back in time using the BLS price index for residential electric power. Electric power rates vary even among industrial users, depending upon the users' requirements and supplier, but no data were available specifically for steel producers.

For Japan, the total electric power consumption by the steel industry was taken from the JISF [12]. The percent purchased for each of the years 1970-76 was obtained from the Steel Newspaper Corporation [32] 7/ and for the years 1959-63, from the JISF [14]. The remaining years were estimated by interpolation and projection of the available figures. The prices used were the "national average" "steel industry electric fees" shown in Tekko Nenkan for 1964-76 and from Tekko Sangyo Kihon Tokei for 1959-63. The price in 1956-58 was assumed to be at the 1959 level.

Natural Gas. Steel industry consumption of natural gas in the U.S. was obtained from the AISI [1]. The price series

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7/ Does not include cooperatively produced power.

used for natural gas was the average value of natural gas sold to industrial consumers in the East North Central region. These data were computed from Department of the Interior data in [42]. 8/ Even more so than in the case of electric power, natural gas rates vary among industrial users, depending upon the timing and nature of their contracts as well as their specific locations. No data specific to the steel industry were available, however.

There were no data discovered indicating usage of natural gas by the Japanese steel industry and no usage was assumed. 9/

Steel Output. Total input quantities and steelmaking costs, with the exception of those for labor, were normalized using the annual physical quantity of output for each country. For the U.S., steel output was obtained by adding changes in inventories to net shipments of steel products. Net shipments of steel products were obtained from AISI [1]. Changes in mill inventories for the years 1962-76 were obtained from U.S. Department of Commerce [35]. Inventory changes for the years prior to 1962 were estimated based on raw steel production. Japanese production of ordinary and special steel products was obtained from JISF [15]. The output figures used in our computations are presented in appendix 3A. Labor costs, as

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8/ Due to the unavailability of information from this source for 1976, a 15 percent price increase was assumed.

9/ It is known that natural gas constituted only 6.8 percent of Japanese energy supply in 1973 as contrasted to 30.6 percent in the United States [10, p. 12].

mentioned above, were normalized by the BLS, using physical output quantities with some adjustment for product mix.

Results

Introduction. In discussing the results the following terminology will be employed.

> Price of input: the price of the input as defined in the section above describing the data used.
>
> Unit purchases of the input: the purchased quantity of the input (as decribed above in the discussion of the data) per metric ton of steel product output.
>
> Unit cost for the input: the price of the input times the unit purchases of the input. In other words, the average cost of the input to the country's steel industry per metric ton of steel product output.

Figures 3.1, 3.2, and 3.3 show, for each of the past 21 years, the U.S. unit costs, unit purchases, and prices of the inputs studied relative to Japan's costs, purchases, and prices. Tables 3.1, 3.2, and 3.3 provide supporting numerical data. Figure 3.4 shows, for the U.S. and Japan, cumulative unit costs for all the inputs studied.

Labor. The primary difference between U.S. and Japanese unit steelmaking costs is the unit cost for labor. The difference in unit labor cost, in turn, is due primarily to the labor wage rate differential.

Between 1956 and 1961, the unit cost for labor in the U.S. generally increased relative to that in Japan. Unit labor costs in the U.S. increased as the price of labor increased and

FIGURE 3.1--Relative Unit Cost for Selected Inputs: U.S./Japan

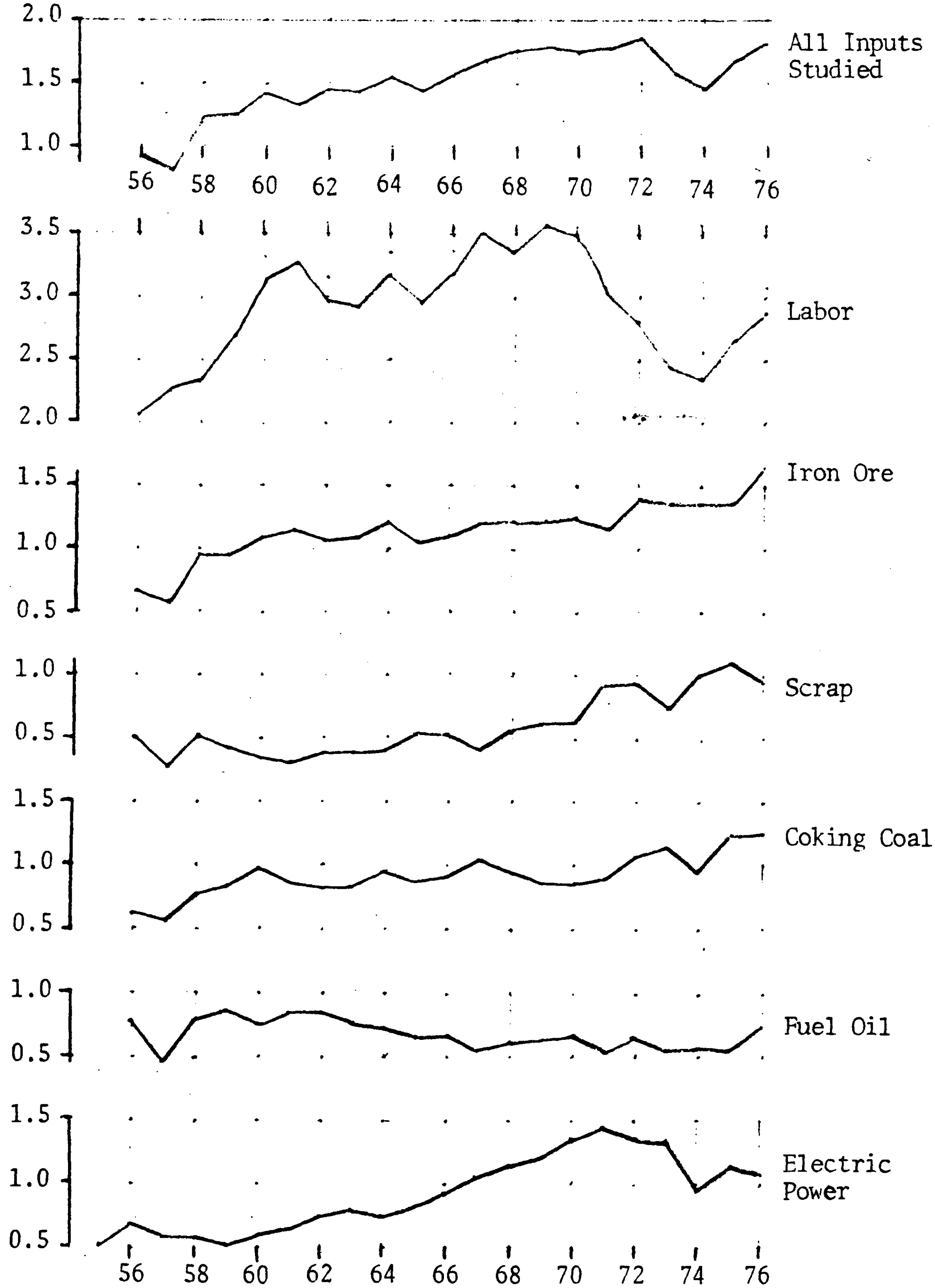


FIGURE 3.2.--Relative Unit Purchases of Selected Inputs: U.S./Japan

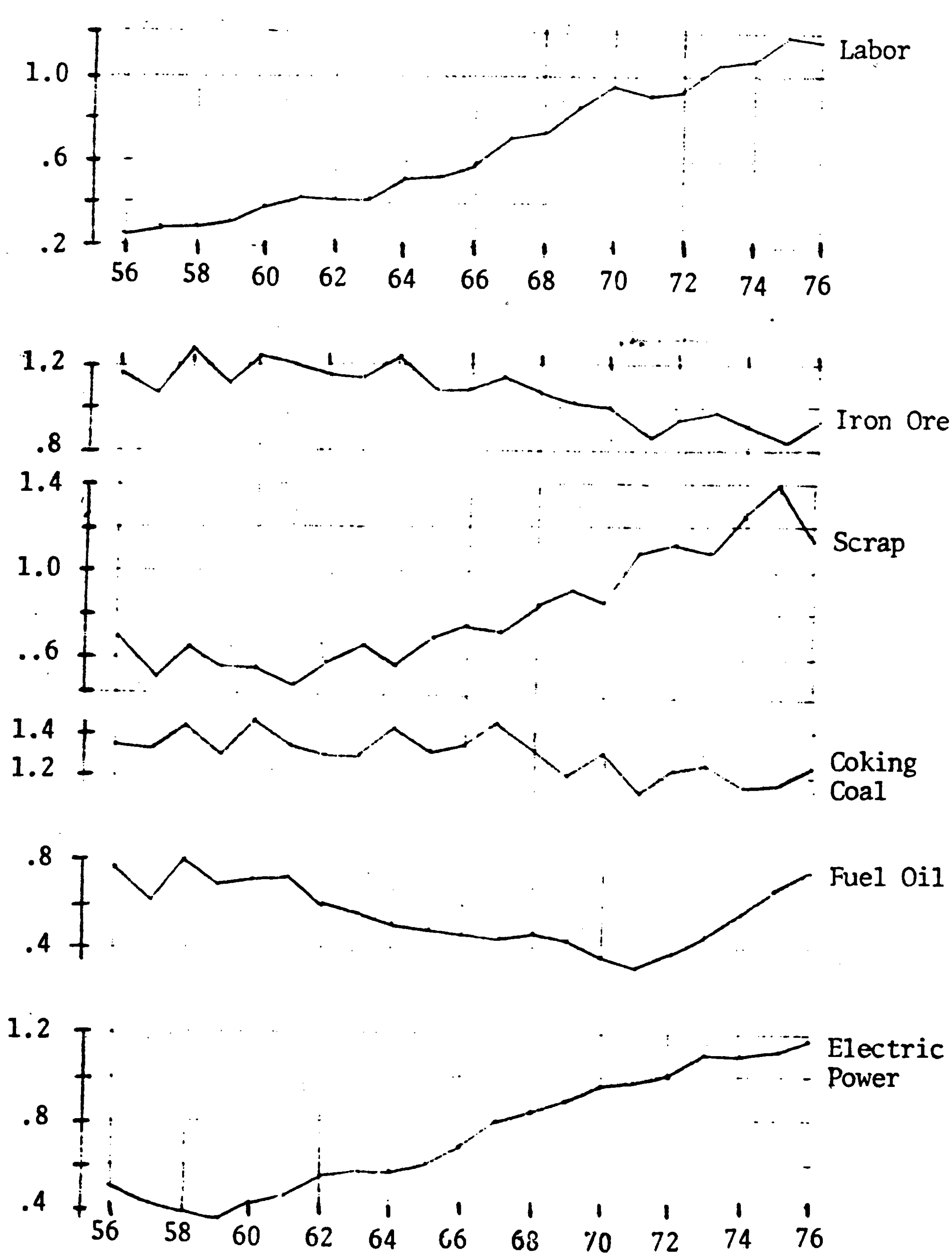


FIGURE 3.3--Relative Prices for Selected Inputs: U.S./Japan

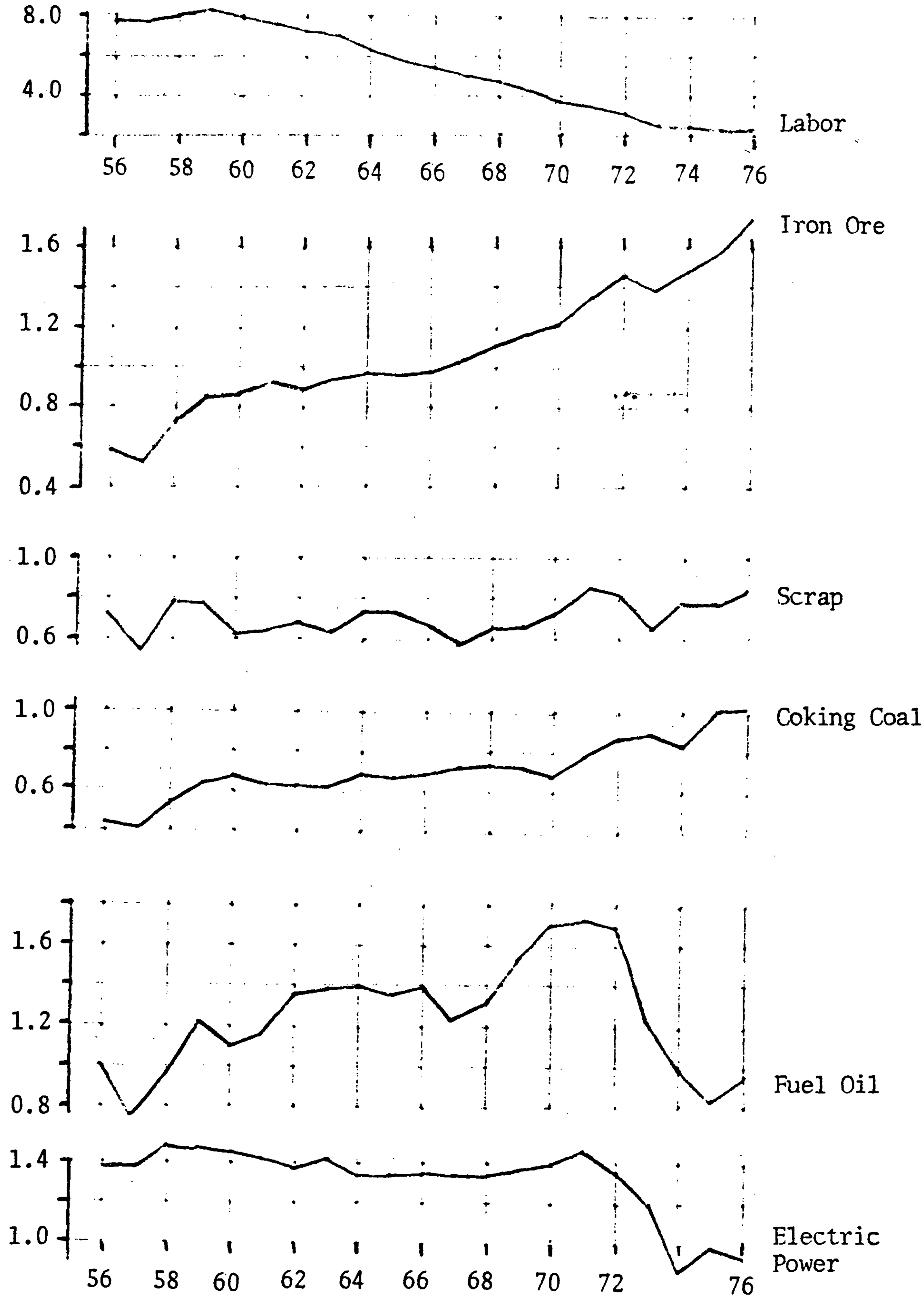
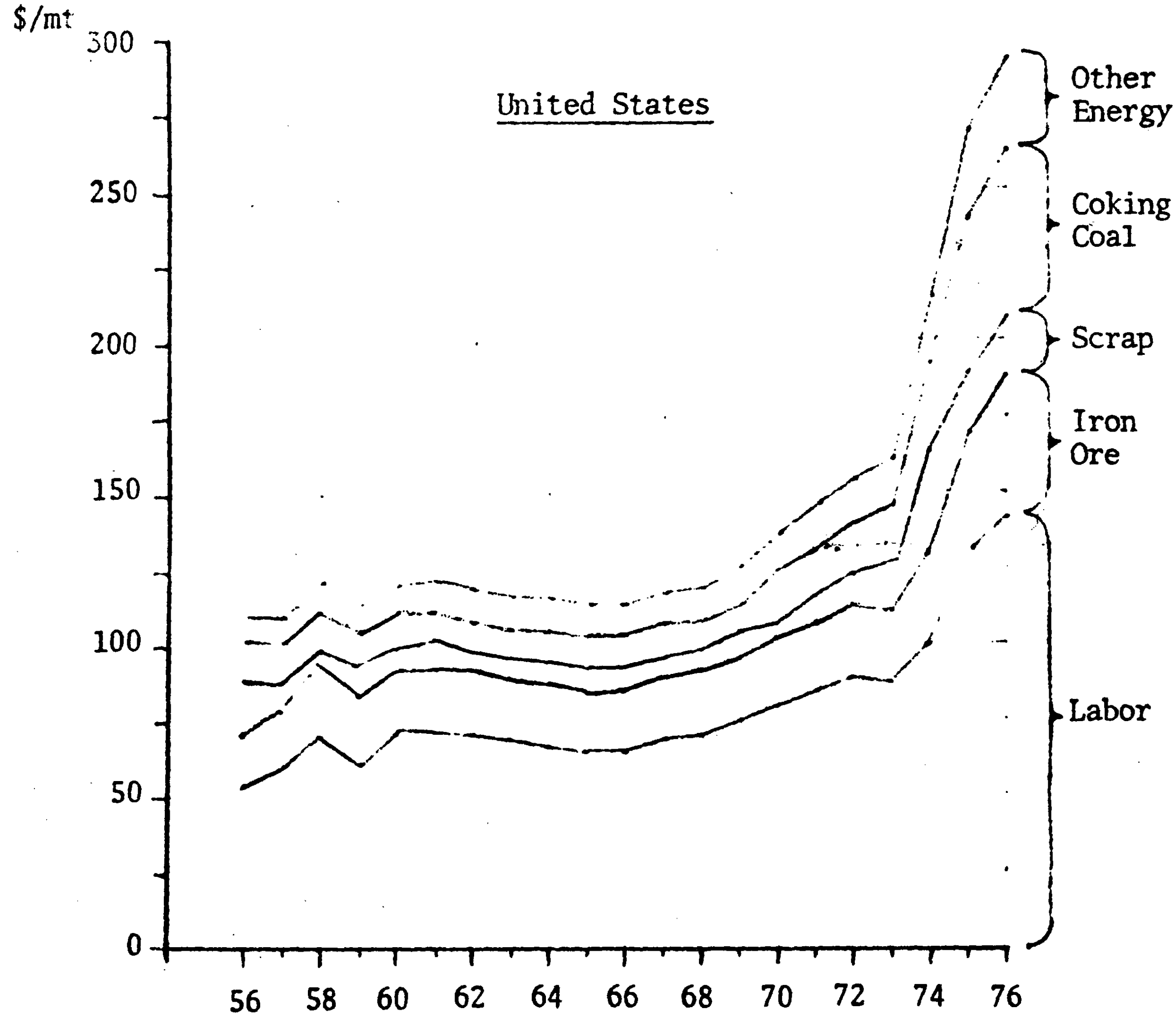


FIGURE 3.4--Cumulative Unit Cost for Selected Inputs: U.S. and Japan



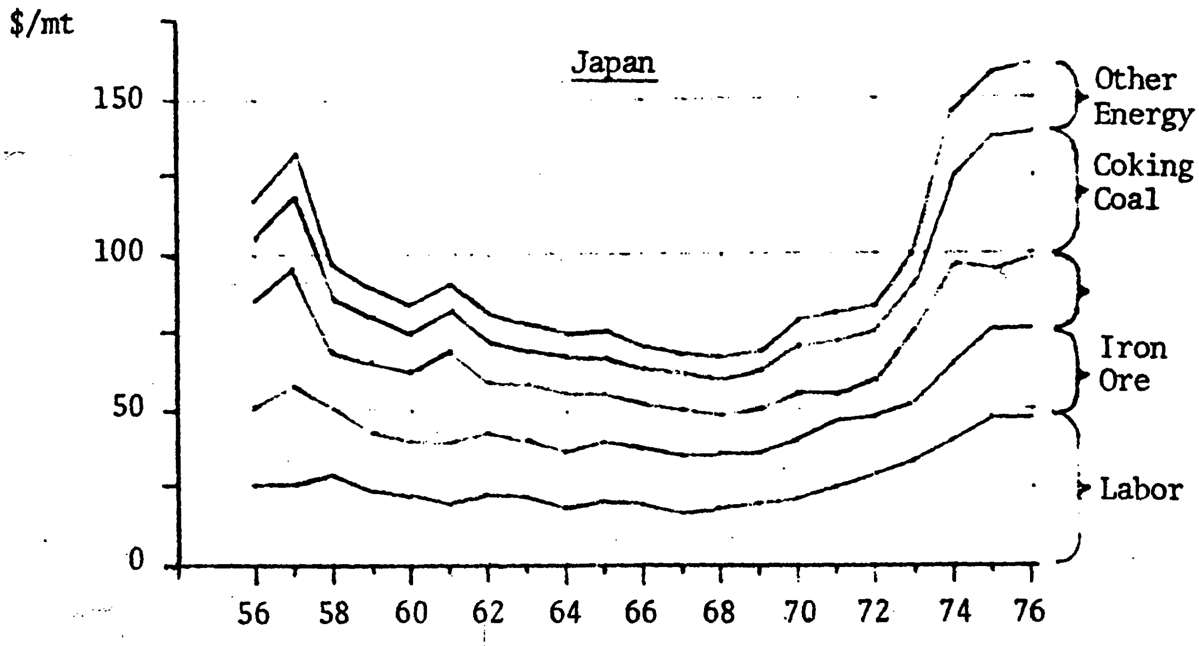


TABLE 3.1

Unit Cost for Inputs: U.S. and Japan
(Dollars per metric ton of steel produced)

Year	Total		Labor		Iron ore		Scrap		Coking coal	
	U.S.	Japan	U.S.	Japan	U.S.	Japan	U.S.	Japan	U.S.	Japan
1976	294.65	161.93	143.55	49.64	44.51	26.87	21.82	22.72	53.73	41.38
1975	270.27	159.26	132.87	49.93	37.58	27.85	18.98	17.23	52.40	43.18
1974	215.55	147.30	100.91	42.60	29.66	21.65	34.10	33.65	29.20	29.84
1973	161.21	100.97	87.31	35.32	24.42	17.62	17.08	23.38	17.44	15.18
1972	155.11	83.56	89.52	31.97	23.84	16.97	11.26	12.04	16.08	14.65
1971	145.98	81.28	85.03	27.98	22.85	19.43	8.53	9.06	15.15	16.76
1970	137.23	78.05	80.81	23.22	21.54	17.47	10.05	16.05	12.80	14.65
1969	125.25	69.93	75.18	21.20	20.34	16.66	8.60	14.00	10.29	11.72
1968	119.40	67.78	70.35	20.83	20.65	16.99	6.71	12.16	10.69	10.91
1967	117.70	69.53	69.88	19.93	20.10	16.68	6.73	15.73	10.83	10.27
1966	113.21	71.86	65.93	20.68	19.95	18.14	7.72	14.88	9.99	10.84
1965	112.99	76.38	65.06	22.11	19.92	18.63	8.56	16.75	9.78	10.94
1964	114.97	75.20	67.00	20.97	20.41	16.73	8.25	19.27	9.74	10.05
1963	116.01	79.03	69.62	23.76	19.60	17.80	7.39	18.12	9.16	10.99
1962	118.74	81.56	71.36	24.10	19.93	18.97	6.83	17.43	10.17	12.33
1961	122.50	91.59	72.36	21.94	20.58	18.54	9.45	30.09	10.21	11.85
1960	120.18	85.08	71.83	23.01	19.47	17.91	8.24	23.16	11.48	11.50
1959	113.98	90.04	66.67	25.02	17.25	18.08	10.87	24.59	10.93	13.03
1958	122.18	98.65	70.09	30.12	19.75	21.20	9.94	19.37	13.09	16.75
1957	110.00	133.21	60.24	26.79	18.17	31.55	10.95	37.98	12.73	23.03
1956	110.84	119.83	54.67	26.66	17.51	25.78	17.78	35.15	12.15	20.01

TABLE 3.1 (Continued)

Unit Cost for Inputs: U.S. and Japan
(Dollars per metric ton of steel produced)

Year	Fuel oil U.S.	Fuel oil Japan	Electric power U.S.	Electric power Japan	Non-coking Coal U.S.	Non-coking Coal Japan	Natural gas U.S.
1976	5.05	6.84	15.84	14.47	0.85	0.00	9.31
1975	4.95	8.66	14.03	12.41	0.85	0.00	8.60
1974	5.02	9.01	10.21	10.54	0.76	0.00	5.67
1973	1.91	3.43	8.09	6.04	0.54	0.00	4.40
1972	1.60	2.47	7.60	5.45	0.54	0.00	4.64
1971	1.54	2.73	7.70	5.31	0.62	0.00	4.55
1970	1.23	1.81	6.49	4.74	0.56	0.11	3.74
1969	0.94	1.44	5.83	4.80	0.51	0.10	3.54
1968	1.09	1.74	5.74	5.02	0.61	0.10	3.56
1967	1.05	1.87	5.30	4.92	0.63	0.13	3.16
1966	1.14	1.75	4.90	5.33	0.63	0.24	2.93
1965	1.28	1.93	4.64	5.70	0.63	0.31	3.09
1964	1.41	1.92	4.48	5.88	0.63	0.37	3.01
1963	1.58	2.04	4.73	5.87	0.73	0.45	3.19
1962	1.59	1.92	4.71	6.28	0.83	0.54	3.29
1961	1.74	2.04	4.27	6.50	0.89	0.63	2.99
1960	1.80	2.30	3.92	6.44	0.85	0.75	2.59
1959	1.78	2.09	3.47	6.61	0.80	0.61	2.19
1958	1.99	2.54	3.96	6.72	1.07	1.94	2.28
1957	1.97	4.27	3.73	6.29	0.75	3.31	1.46
1956	2.26	2.85	4.15	6.07	0.74	3.31	1.58

Source: See text.

TABLE 3.2

Unit Purchases of Inputs: U.S. and Japan
(Units of input per metric ton of steel produced)

Year	Labor (man-hours)		Iron ore (metric ton)		Scrap (metric ton)		Coking coal (metric ton)		Fuel oil (metric ton)	
	U.S.	Japan	U.S.	Japan	U.S.	Japan	U.S.	Japan	U.S.	Japan
1976	11.82	10.04	1.462	1.542	.285	.252	0.869	.700	.073	.096
1975	12.04	10.09	1.421	1.667	.269	.194	0.903	.771	.069	.101
1974	10.78	10.04	1.371	1.481	.319	.252	0.774	.665	.067	.118
1973	10.87	10.30	1.431	1.437	.299	.274	0.800	.637	.060	.131
1972	11.99	12.85	1.438	1.485	.310	.273	0.825	.669	.056	.146
1971	12.73	14.12	1.467	1.678	.254	.232	0.900	.783	.053	.163
1970	13.23	13.68	1.496	1.475	.249	.290	0.946	.726	.053	.133
1969	12.95	15.07	1.486	1.431	.283	.311	0.868	.717	.050	.118
1968	13.08	17.73	1.522	1.389	.263	.311	0.916	.688	.058	.122
1967	13.67	19.15	1.531	1.317	.248	.342	0.950	.655	.057	.126
1966	13.37	22.53	1.541	1.381	.254	.336	0.924	.683	.062	.133
1965	13.76	26.70	1.531	1.388	.253	.364	0.919	.695	.070	.143
1964	14.47	27.97	1.560	1.243	.249	.425	0.897	.632	.076	.145
1963	15.11	35.48	1.524	1.311	.277	.424	0.888	.676	.082	.145
1962	15.79	38.39	1.558	1.326	.246	.421	0.951	.729	.081	.132
1961	16.59	37.75	1.585	1.305	.265	.546	0.942	.693	.089	.122
1960	17.12	43.15	1.583	1.261	.260	.461	0.987	.668	.093	.129
1959	16.07	49.43	1.448	1.292	.270	.477	0.945	.724	.094	.134
1958	18.06	61.70	1.687	1.309	.265	.407	1.134	.787	.107	.133
1957	16.70	56.87	1.581	1.454	.238	.453	1.073	.797	.088	.142
1956	16.31	60.66	1.650	1.401	.336	.483	1.118	.820	.111	.143

TABLE 3.2 (continued)

Unit Purchases of Inputs: U.S. and Japan
(Units of input per metric ton of steel produced)

Year	Electric power (kWh)		Non-coking coal (metric ton)		Natural gas (MCF)
	U.S.	Japan	U.S.	Japan	U.S.
1976	558	472	.034	.000	7.50
1975	532	465	.037	.000	7.60
1974	482	432	.038	.000	7.01
1973	473	423	.045	.000	6.60
1972	465	451	.047	.000	7.51
1971	497	500	.056	.000	8.00
1970	452	462	.055	.007	7.10
1969	417	469	.060	.008	7.22
1968	416	490	.076	.009	7.30
1967	387	480	.079	.012	6.77
1966	355	520	.080	.021	6.16
1965	338	556	.081	.026	6.61
1964	327	574	.080	.030	6.44
1963	341	600	.090	.036	6.69
1962	337	625	.101	.042	6.91
1961	310	672	.105	.047	6.37
1960	287	689	.101	.056	5.50
1959	257	729	.093	.043	4.79
1958	295	741	.120	.112	5.16
1957	295	693	.083	.138	3.50
1956	330	669	.085	.159	3.85

Source: See text.

TABLE 3.3

Price of Inputs: U.S. and Japan
(Dollars)

Year	Labor (man-hour)		Iron ore (metric ton)		Scrap (metric ton)		Coking coal (metric ton)		Fuel oil (metric ton)	
	U.S.	Japan	U.S.	Japan	U.S.	Japan	U.S.	Japan	U.S.	Japan
1976	12.14	5.25	30.45	17.43	76.55	90.19	61.77	59.08	68.88	71.08
1975	11.03	4.94	26.44	16.70	70.58	88.74	58.05	56.02	71.88	85.44
1974	9.35	4.24	21.63	14.62	106.78	133.70	37.72	44.88	74.96	76.36
1973	8.02	3.42	17.06	12.26	57.02	85.19	21.81	23.82	32.06	26.12
1972	7.46	2.48	16.58	11.43	36.30	44.18	19.49	21.90	28.73	16.87
1971	6.67	1.98	15.56	11.58	33.55	39.07	16.83	21.40	29.02	16.70
1970	6.10	1.69	14.39	11.84	40.40	55.40	13.53	20.16	23.18	13.60
1969	5.80	1.40	13.69	11.64	30.38	44.99	11.86	16.34	18.69	12.19
1968	5.37	1.17	13.57	12.23	25.44	39.05	11.67	15.87	18.85	14.41
1967	5.11	1.04	13.13	12.66	27.18	45.99	11.39	15.67	18.36	14.83
1966	4.93	0.91	12.94	13.13	30.38	44.30	10.82	15.88	18.29	13.15
1965	4.72	0.82	13.01	13.42	33.80	46.07	10.64	15.73	18.36	13.52
1964	4.63	0.75	13.09	13.46	33.13	45.37	10.86	15.91	18.59	13.21
1963	4.60	0.66	12.86	13.58	26.68	42.75	10.31	16.25	19.25	14.05
1962	4.51	0.62	12.79	14.30	27.78	41.36	10.69	16.92	19.59	14.47
1961	4.36	0.58	12.99	14.20	35.70	55.08	10.84	17.09	19.55	16.78
1960	4.19	0.53	12.29	14.20	31.70	50.22	11.64	17.23	19.25	17.77
1959	4.14	0.50	11.91	14.00	40.26	51.54	11.57	18.00	18.85	15.52
1958	3.87	0.48	11.70	16.20	37.48	47.57	11.55	21.29	18.59	19.20
1957	3.60	0.47	11.49	21.70	46.00	83.80	11.87	28.90	22.32	29.98
1956	3.35	0.43	10.61	18.40	52.95	72.75	10.86	24.40	20.41	19.95

TABLE 3.3 (continued)

Price of Inputs: U.S. and Japan
(Dollars)

Year	Electric power (M kWh)		Non-coking coal (metric ton)		Natural gas (MCF)
	U.S.	Japan	U.S.	Japan	U.S.
1976	28.36	30.63	24.55	-	1.24
1975	26.39	26.65	23.01	-	1.13
1974	21.21	24.37	20.46	-	0.81
1973	17.11	14.28	12.25	-	0.67
1972	16.36	12.07	11.57	-	0.62
1971	15.50	10.61	11.19	-	0.57
1970	14.34	10.24	10.23	15.33	0.53
1969	13.96	10.24	8.46	12.04	0.49
1968	13.78	10.24	7.97	11.47	0.49
1967	13.69	10.24	7.94	11.26	0.47
1966	13.76	10.24	7.91	11.65	0.48
1965	13.72	10.24	7.85	11.78	0.47
1964	13.72	10.24	7.91	12.30	0.47
1963	13.85	10.24	8.08	12.56	0.48
1962	13.96	10.05	8.26	12.87	0.48
1961	13.78	9.66	8.45	13.39	0.47
1960	13.69	9.35	8.42	13.30	0.47
1959	13.49	9.07	8.62	14.23	0.46
1958	13.43	9.07	8.92	17.40	0.44
1957	12.65	9.07	9.05	23.93	0.42
1956	12.58	9.07	8.78	20.78	0.41

Source: See text.

unit purchases failed to decrease correspondingly. In Japan, the price of labor was increasing somewhat more rapidly than in the U.S. but labor productivity was increasing at roughly the same rate, allowing the Japanese fairly constant unit costs.

From 1961 to 1966, unit labor cost in the U.S. declined somewhat, but there was no clear trend in the relationship between the U.S. and Japan. Decreasing unit purchases of labor continued to keep Japan's unit cost for labor roughly constant or declining slightly in the face of a labor price which continued to rise faster than the price in the U.S.

From 1966 to 1970, the U.S. unit cost for labor again rose relative to Japan's as the U.S. price rose and unit purchases of labor stayed fairly constant.

From 1970 to 1974, the U.S. relative cost for labor declined to near the 1958 level. This reversal of trend occurred because the Japanese labor price continued to increase faster than the U.S. price, as it had since 1959; but the yearly reduction in Japan's unit labor purchases, which had been quite large prior to 1970, became smaller as Japanese labor productivity approached that of the U.S.

In 1975, the U.S. relative labor cost increased as U.S. unit purchases rose above the 1973 level and Japan's price of labor failed to rise appreciably faster than that of the U.S. There was a further increase in the U.S. relative unit cost in 1976 as the Japanese showed a remarkably small increase in the price of labor.

The upturn in 1975 may not have signaled the end of U.S. improvement relative to Japan. It is possible that the upturn was, to some extent, a cyclical phenomenon. The decline in steel demand from 1974 to 1975 resulted in a nearly 21 percent decrease in U.S. steel production. In 1976, production was still less than 83 percent of the 1974 level. Although labor is classified as a variable cost, major changes in plant work forces are not made easily and unit labor cost tends to rise as production is cut back. Japan also suffered a downturn in production from 1974 to 1975; but it was somewhat milder--less than 15 percent. In 1976, the Japanese produced over 91 percent of the 1974 level. In the future, if the Japanese are unable to increase their labor productivity much beyond that of the U.S., and if Japanese labor wage rates resume their earlier tendency to increase more rapidly than those in the U.S., improvements in relative unit labor costs could significantly improve the U.S. competitive position.

Iron Ore. The U.S. steel industry's unit cost for iron ore generally increased relative to Japan's over the entire 20-year period examined. This occurred despite increases in Japan's unit purchases relative to those of the U.S. because of overriding decreases in the relative price of iron ore to Japan. Japan had a generally decreasing price from 1956 through 1970; and even during the past few years when Japan's price increased sharply, it generally increased less sharply than for the U.S. The U.S. price of iron ore rose through most of the period. Japan's unit purchases of iron ore increased relative to those of the U.S. due to generally decreasing unit purchases in the U.S. and generally increasing unit purchases in Japan. Japan's increase has probably been due to both a substitution toward iron ore from scrap and a shift toward lower quality ore. It should be noted that U.S. iron ore receives considerable upgrading at the mine site which is included in the price of the ore.

Scrap. Between 1956 and 1961, the U.S. steel industry's unit cost for scrap declined relative to that of Japan. This was due primarily to increased unit purchases by Japan. Over the next 11 years, Japan's unit costs for scrap generally declined relative to those of the U.S. as Japan's unit purchase of scrap declined. U.S. unit purchases of scrap remained relatively constant over both periods and there was no clear trend in relative prices of scrap. In 1973, the relative unit scrap cost for the U.S. declined sharply due to a relatively sharp rise in the Japanese price. In 1974, however, further decreases in Japan's unit purchases of scrap and an increase in the U.S. relative price carried the U.S. relative unit cost above the 1972 level. A further decline in Japanese unit purchases carried the relative U.S. unit cost even higher in 1975. In 1976, the U.S. relative unit cost declined somewhat in spite of a relatively large increase in the U.S. scrap price because U.S. unit scrap purchases increased relatively less than those of Japan.

Coking Coal. From 1956 through 1960, Japan's unit cost for coking coal decreased relative to that of the U.S. due primarily to improved trading agreements which brought decreases in Japan's price of coking coal. After 1960, the U.S. unit cost of coking coal decreased somewhat relative to Japan's (as the U.S. industry cut its unit purchases) but there was no clear trend, at least through 1971. In 1972, the relative unit cost rose for the U.S. above the 1960 level, and in 1973, it rose further. Japan cut its unit purchases more sharply than the U.S. and, at the same time, the U.S. price rose more rapidly than that facing Japan. In 1974, relative unit costs for coking coal improved for the U.S.; but in 1975, an increase in the U.S. relative price caused the relative U.S. unit costs to exceed the 1973 level. There was little change in 1976.

It might be noted here that during the 1970's the U.S. steel industry's average acquisition cost for coking coal has been considerably lower than the cost indicated in our series. Major U.S. steel companies are heavily integrated into coal production and acquire much of the coal which they purchase under long-term contracts. The OPEC oil cartel engineered a rapid rise in energy prices during the 1970's and this has been reflected in the spot market price of coal (used in this study). The average cost of producing coal in the steel industry's own mines has increased at a much slower rate and long-term contracts have remained in force at the price levels of earlier years. Industry sources indicate that in 1975 the average production cost for captive coal was probably 45 percent less than the market price 10/ and existing long-term contract prices were about 10 percent lower.

Fuel Oil. Between 1956 and 1961, there was no clear trend in the relative unit cost for fuel oil in the U.S. as compared to Japan. Japan was hurt relative to the U.S. in 1957 by the Suez crisis price rises, but, by 1961, its relative position had improved slightly as compared to 1956.

Between 1961 and 1967, the U.S. unit cost generally declined relative to Japan's as decreases in unit purchases in the U.S. relative to those in Japan tended to more than compensate for decreases in Japan's fuel oil price.

Between 1967 and 1970, the U.S. position worsened relative to Japan in spite of the fact that the U.S. was reducing unit purchases of fuel oil more rapidly than Japan. This was because the price of fuel oil was declining in Japan as it rose in the U.S. After 1970, the relative price trend for fuel oil reversed, with Japanese price increases outstripping those in the U.S through 1975. This allowed the U.S. to maintain a constant or slightly decreasing unit cost for fuel oil relative to Japan even though Japan was decreasing and the U.S. increasing unit purchases. In 1976, the Japanese price for fuel oil dropped more rapidly than that of the U.S., causing the U.S. unit cost to rise along with it relative unit purchases.

10/ During the 1960's, the production cost for captive coal was reportedly 10 percent above the market price.

Electric Power. Between 1956 and 1959, the U.S. decreased somewhat its unit cost for electric power relative to Japan; but from 1959 through 1971, the trend was clearly one of Japanese improvement relative to the U.S. The improvement in Japan's position was primarily due to decreased relative purchases by Japan. The relative price trend was mixed over the 1959-71 period. The relative price for the U.S. fell through 1964, was steady until 1968, and rose again until 1971. From 1971 through 1974, the U.S. relative price fell rapidly enough to offset its increasing relative purchases and the U.S. enjoyed declining relative unit cost for electric power. The Japanese position improved somewhat in 1975 as it continued reducing unit purchases relative to the U.S. and its price increased by less than that of the U.S. There was a slight decrease in U.S. relative unit cost in 1976 due to a relatively small rise in the U.S. price.

Other Energy. U.S. unit cost for non-coking coal has been an extremely small part of total unit costs over the entire period. It was a slightly more important component of Japanese costs in the 1950's but had been eliminated as a cost item by the mid-1960's.

We have assumed natural gas usage only for the U.S.

Total Cost. For the costs we have studied, the dominant trend from the beginning of the period through 1972 was an increase in U.S. unit cost relative to that of Japan. There were periods in which this trend was quite weak--1968 through 1971 and 1962 through 1965. There were even years in which the U.S. significantly improved its relative cost position as compared to the previous year--i.e., 1957 and 1961. But the trend of rising relative cost for the U.S. was clear. In 1973 and 1974, there were sharp improvements in the relative cost position of the U.S. The devaluation of the dollar relative to the yen undoubtably contributed to this reversal of trend. These improvements returned the relationship between U.S. and Japanese unit costs very close to that existing from 1962 through 1965. In 1975 and 1976, the U.S. relative cost increased, nearly eliminating the gains of the preceeding two years but staying slightly below the 1972 level.

This historical pattern of relative steel cost is compared to the pattern of Japanese steel import penetration after the following discussion of relative steelmaking costs in Europe.

III. THE UNITED STATES AND THE EUROPEAN COMMUNITY

Methodology

In this section the relative steelmaking costs of the United States and the original six members of the European Community (EC) are examined. The cost of delivering three steel products, cold rolled carbon sheet (CRS), hot rolled carbon sheet (HRS) and wire rod (WR), to the United States were estimated. HRS and CRS were selected because they are representative of flat rolled products generally produced by major steel mills and because together they account for one-third of net industry shipments. WR was chosen because it is representative of the non-flat type product which minimills are capable of producing. The basic methodology used was to compute, for each product, the average revenue per ton realized by United States and EC steel producers in their home areas, and then to subtract from that a factor reflecting the average rate of return on sales for each group of producers. To the value thus obtained for the EC, a figure was added to reflect the cost of transporting steel to the United States, including tariff.

One problem with this method of cost estimation is that profit rates are not available on a product by product basis and over all industry rate of return must be used. 11/ Estimates for some products in some years may not be meaningful due to estimation errors caused by this and other factors. As with the United States/Japanese comparisons, however, the figures should accurately reflect long-run trends.

Data Description

The fundamental set of data used for EC cost estimations was the unit values, in U.S. dollars, on intra-European sales of the selected carbon steel products. These data are a measure of average revenue and were obtained from the Statistical Office of the European Community [31].

11/ Even some non-steel profits will be included to the extent that the steel producers are diversified.

Three series of unit values were available: export values, intra-community trade, and sales of producers within their own nations. The export series has the lowest unit values, while sales within the producers' own nations has the highest. The selected series on intra-European Community trade is most reflective of the mean.

The average revenue data were adjusted by the factor: [1 - the rate of return on sales]. The result is, by accounting definition, average costs. The rate of return on sales data were constructed from data reported, for the years 1961-71, by the International Iron and Steel Institute [7].

For cold rolled sheet, data from [31] were used, which is translated as uncoated sheets less than three millimeters. It is known, from data reported by the European Coal and Steel Community [5], that only a small proportion of uncoated sheets of less than three millimeters is hot rolled.

The calculated import duties are available for the years 1969-74 from the U.S. Census Bureau [35]. The European costs were adjusted upward by the percentage of the tariff.

Since 1974, the Census Bureau [39] has been publishing data from which unit values may be calculated on both a c.i.f. and f.o.b. basis. The difference between the c.i.f. and f.o.b. unit value, was used as the estimate of transportation costs. Transportation costs as a percentage of f.o.b. values were obtained and European costs were adjusted upward by this percentage for all years in the study. The result is an estimate of European delivered costs to the U.S., including tariff.

At the time of this writing, the intra-Community unit value data were unavailable for the years after 1973. F.o.b. unit value data on exports from West Germany into the U.S. on the three product categories were obtained from the U.S. Bureau of the Census [40]. The average difference between this study's estimate and the Census f.o.b. unit values for the years 1968-73 was obtained. That difference was added to the Census unit values for the year 1974 to obtain the estimate for HRS and CRS in that year. 12/

The U.S. average revenue is unit value data obtained from [35]. The average costs were obtained by adjusting the average revenue for the profit rate on revenue.

12/ No estimate for wire rods for 1974 is offered. This is because the EC unit value data are unavailable for 1974 and there are biases in the methodology employed to estimate the costs of wire rods in 1974 which could not be corrected. Specifically, U.S. Government price controls held down steel prices in 1974. Unlike HRS and CRS, wire rods are commonly made by minimills which employ scrap as the primary raw material. Unlike other inputs, a cost passthrough of scrap price increases was allowed by the Cost of Living Council. Thus, according to the Census Bureau [35], wire rod prices rose in relation to HRS and CRS which were more stringently controlled (wire rod prices exceeded CRS prices in 1974). Partly under the umbrella effect of domestic prices, imported wire rods rose in price (relative to HRS and CRS) as well. The 1974 HRS and CRS cost estimates were adjusted by the average difference between the unit values of imports and the cost estimates for the years 1960-73; a similar adjustment for wire rod would leave the wire rod cost estimate biased upward for 1974.

Results

The United States and EC cost estimates for HRS, CRS, and WR are presented in tables 3.4, 3.5, and 3.6. Also shown is the United States cost relative to that of the EC for each year. These results are described in the conclusions.

IV. CONCLUSIONS

The cost estimates comparing the United States with Japan and with the EC for hot and cold rolled sheet show similar trends. Throughout the period from 1956 to 1968 or 1969, both Japan and the EC were generally able to improve their cost positions relative to the United States. During the years from 1969 through 1971, Japan ceased to improve its cost position relative to the United States and the EC's position deteriorated. Both Japan and the EC were able to cut their relative costs in 1972; but in 1973 and 1974, the United States cost position improved dramatically. In two years the Japanese lost all the relative cost advantage they had gained since 1965, and the Europeans appear to have returned to the relative position they held in the late 1950's with a significant cost disadvantage to the United States. The latest available data for the EC series were for 1974. In 1975 and 1976, however, Japan decreased its unit steelmaking cost relative to the United States and nearly regained its 1972 position. If the unit cost estimates were used to infer a 1976 point comparison, the U.S. would appear to have a decided cost disadvantage in its home market (even if appendix 3B's high estimate of the cost of

TABLE 3.4

Hot Rolled Carbon Steel Sheets: European Community Delivered Costs to the United States, Including Tariff, and United States Costs

(U.S. dollars per metric ton)

Year	EC costs	U.S. costs	Relative cost: U.S./EC
1974	269.1	212.7	0.790
1973	168.0	162.0	0.964
1972	138.9	152.1	1.095
1971	134.8	146.9	1.090
1970	138.2	137.2	0.993
1969	116.7	126.3	1.082
1968	110.2	125.3	1.137
1967	114.1	125.9	1.103
1966	116.8	124.5	1.066
1965	117.8	125.6	1.066
1964	121.2	123.2	1.017
1963	124.4	121.0	0.973
1962	127.1	126.5	0.995
1961	136.0	127.9	0.940
1960	138.0	127.8	0.926
1959	132.2	123.8	0.936
1958	148.9	123.0	.826
1957	151.9	113.5	0.747
1956	142.6	103.7	0.727
1955	145.9	101.6	0.696
1954	143.4	103.4	0.721

Source: See text.

TABLE 3.5

Cold Rolled Carbon Steel Sheets: European Community Delivered Costs to the United States, Including Tariff, and United States Costs

(U.S. dollars per metric ton)

Year	EC costs	U.S. costs	Relative cost: U.S./EC
1974	333.2	256.0	0.768
1973	233.1	196.3	0.842
1972	196.9	189.7	0.963
1971	187.2	178.0	0.951
1970	189.5	172.6	0.911
1969	158.4	159.9	1.009
1968	150.7	151.3	1.004
1967	157.8	150.0	0.951
1966	160.8	147.4	0.917
1965	157.7	147.4	0.935
1964	158.4	146.0	0.922
1963	158.8	144.1	0.907
1962	160.0	145.9	0.912
1961	162.8	144.3	0.886
1960	164.3	145.6	0.886
1959	158.5	146.5	0.924
1958	175.5	143.6	0.818
1957	176.7	138.0	0.781
1956	170.0	127.8	0.752
1955	167.9	119.0	0.709
1954	157.6	117.1	0.743

Source: See text

TABLE 3.6

Carbon Steel Wire Rods: European Community Delivered Costs to the United States, Including Tariff, and United States Costs

(U.S. dollars per metric ton)

Year	EC costs	U.S. costs	Relative cost: U.S./EC
1973	188.5	179.7	0.953
1972	152.5	166.8	1.094
1971	144.4	146.3	1.013
1970	147.7	146.0	0.988
1969	113.1	146.1	1.292
1968	105.7	138.9	1.314
1967	106.2	138.9	1.308
1966	108.2	146.0	1.349
1965	111.0	148.6	1.339
1964	106.3	151.4	1.424
1963	107.1	152.5	1.424
1962	111.1	158.6	1.428
1961	116.1	155.7	1.341
1960	120.1	158.2	1.326
1959	110.4	158.8	1.438
1958	115.0	152.7	1.328
1957	120.7	145.7	1.207
1956	116.4	131.0	1.125
1955	109.0	120.4	1.105
1954	94.6	116.1	1.227

Source: See text.

transporting steel from Japan to the U.S. were accepted). For reasons discussed in the body of the chapter, one cannot place confidence in the unit cost estimates as precise indicators of absolute cost levels.

In figure 3.5 is graphed the relative cost series for Japan ("all inputs studies"), labeled UJ, along with Japanese steel imports to the U.S. as a percentage of U.S. consumption, labeled JI. On the same page is graphed the relative cost series for European hot rolled sheet (U.S./EC), labeled UEH, along with European imports to the U.S. as a percentage of U.S. consumption, labeled EI. The parallels are apparent.

A simple linear regression of Japanese steel imports as a percentage of United States consumption on the U.S./Japan relative cost series and a constant yields:

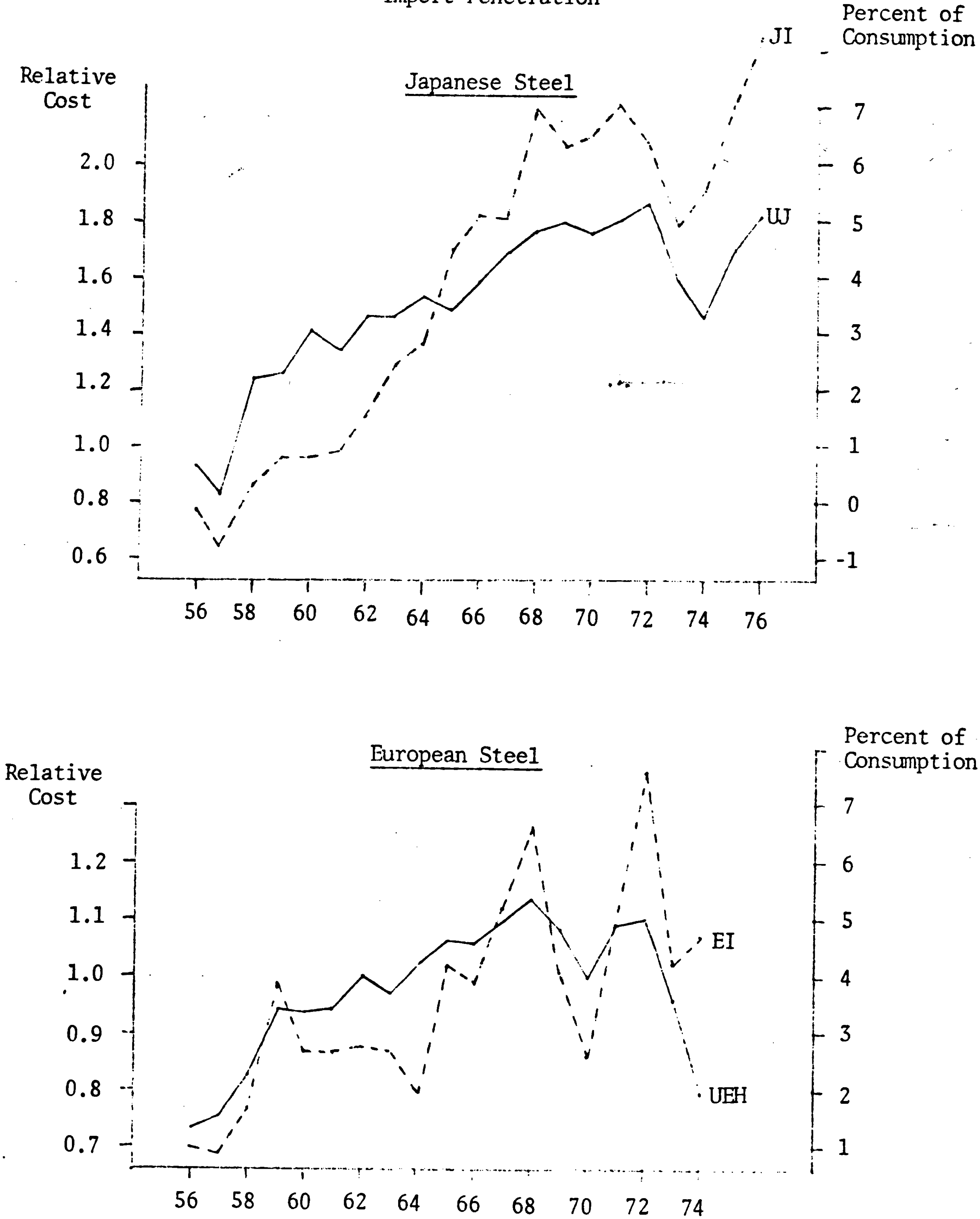
$$(1)\ JI = 9.5 + \underset{(8.62)}{8.8\ UJ} \qquad R^2 = .80 \quad F = 74.4$$

The value in parentheses is the t statistic and the R^2 is adjusted for degrees of freedom.

Regressions of EC imports as a percentage of United States consumption on EC hot rolled sheet relative cost, cold rolled sheet relative cost (UEC), and wire rod relative cost (UEW) yield:

$$(2)\ EI = -7.5 + \underset{(3.87)}{11.6\ UEH} \qquad R^2 = .47 \quad F = 15.0$$

FIGURE 3.5--Relative Unit Cost and Import Penetration



$$(3)\quad EI = -11.2 + \underset{(2.94)}{16.8}\ UEC \qquad R^2 = .34,\ F = 8.7$$

$$(4)\quad EI = 9.0 - \underset{(-1.29)}{4.1}\ UEW \qquad R^2 = .09,\ F = 1.7$$

All of the equations except (4) show the United States level of imports to have a significant positive correlation with the United States relative production cost. The equation for Japan (1) shows the strongest correlation but the correlation is also significant at better than the 99 percent confidence level in equations (2) and (3). The coefficient on relative cost is statistically insignificant in equation (4).

Of course, many factors other than relative costs can be expected to influence trade balances--unsynchronized business cycles, national trade policies, industry behavior, strikes, etc. But the relationship between the broad pattern of the relative cost movements and the U.S. trade balance is such that one cannot reject the hypothesis that costs have been an important factor influencing trade flows.

Appendix 3A,

Table 3A.1

Supplementary Data on U.S. and Japanese Costs

Year	Domestic iron ore shipping cost	Output of steel products (1000 mt)		Input of scrap per output of steel product (weight)		Input of electric power per output of steel product (kWh/mt)	
	U.S.	U.S.	Japan	U.S.	Japan	U.S.	Japan
1976	7.96	79314	90214				
1975	7.66	75876	84469	.747	.405	667	716
1974	6.79	95572	99154	.769	.465	593	660
1973	5.31	97076	100280	.770	.484	592	634
1972	5.18	84714	80401	.786	.493	608	683
1971	5.03	75406	70545	.766	.473	645	734
1970	4.36	83623	74072	.751	.553	592	646
1969	4.19	87867	64854	.791	.569	550	632
1968	4.02	80411	53772	.790	.565	573	649
1967	3.97	78906	48892	.752	.602	538	640
1966	3.92	83983	37828	.757	.596	499	684
1965	3.92	82778	32446	.764	.648	485	712
1964	3.92	79584	31137	.757	.716	488	726
1963	3.95	69344	24959	.766	.720	485	754
1962	3.98	62902	21753	.737	.755	495	763
1961	3.94	62641	21412	.736	.899	486	809
1960	3.90	65605	16844	.720	.786	461	822
1959	3.79	66240	12699	.687	.792	408	877
1958	3.67	54056	9478	.737	.733	489	881
1957	3.55	80264	9891	.655	.793	445	825
1956	3.29	73685	8615	.777	.834	486	796

Source: Text

APPENDIX 3B

JAPANESE PRODUCT TRANSPORTATION COST

A key factor in the ability of U.S. firms to compete with Japanese firms in the U.S. steel market is the cost of delivering steel to the United States from Japan. Estimates of this cost vary.

Kawahito [18, p. 157] reports that conference ship rates are usually about 20 percent of the f.a.s. value of steel products at Japanese ports. Kawahito and others have noted, however, that conference rates are an inappropriate measure of Japanese shipping cost since the bulk of Japanese exports to the U.S. travel in non-conference or chartered ships. It is suspected that substantial discounts are obtained from the conference rates.

Marcus [21, p. 25] estimates that dock to dock freight costs for steel products moving between Japan and the U.S. were 12.3 to 13.7 percent of f.o.b. product values in mid-1974 and 11.4 to 13.6 in Spring 1975. To the freight cost Marcus adds about 2 percent for insurance and brokerage and a 2 percent interest charge. Marcus does not report the source of his estimate.

PMM [27, p. 26] estimate dock to dock freight plus insurance from Japan to be about 17.5 percent of the f.a.s. value of the product. PMM informed the authors that they based this estimate primarily on the difference between f.a.s. and c.i.f. values of imports from Japan. Both of these values have been reported since 1974 in U.S. Census Bureau report FT 135. The c.i.f. value reported in FT 135 for cold rolled sheet was 16.3 percent higher than the f.a.s. value in 1974 and 15.2 percent greater in 1975.

Bradford [3, p. 17-18] presents sample freight rates which, he informed the authors, were obtained from the records of a major Japanese trading company. Using cold rolled sheet as an example, to allow comparison with PMM, he shows a freight cost to the east coast of $40.10/s.t. between January and June 1975. This is about 13 percent of the average f.a.s. value of cold rolled sheet imported from Japan during those months. 1/ This includes loading and unloading but does not include insurance cost which he estimates to be about one percent of the value of the product. This same percentage relationship persisted in March 1977, according to Bradford's narrative. The authors have examined a few rate sheets prepared by Japanese shipping agents, and these confirm the figures presented by Bradford.

There is another indication that shipping costs may be somewhat lower than those estimated by PMM. While the difference between f.a.s. and c.i.f. examined by PMM would seem to reflect the dock to dock cost of transportation, insurance, and brokerage, there are other data reported by the U.S. Census Bureau which give transportation cost directly. In Census

1/ About $311/net ton as reported by the U.S. Census Bureau [39].

Report FT 246, along with the c.i.f. and f.a.s. data, there is another figure labeled "charges." This figures is defined as

> "the aggregate cost of all freight, insurance and other charges, but not including U.S. import duties, incurred in bringing the merchandise from alongside the carrier at the port of exportation in the country of exporation and placing it alongside the carrier at the first port of entry in the United States" [40, 1974, p. VI].

The "charges" for products imported from Japan are consistently lower than the difference between c.i.f. and f.a.s. For example, the average charges for cold rolled sheet were 8.9 percent of the f.a.s. value in 1974 and 9.4 percent in 1975. From the definition, it seems likely that these charges do not include an interest charge and they may exclude some brokerage costs, but it is unlikely that these omitted costs would amount to as much as 4 percentage points.

Census and customs personnel interviewed by the authors were unable to provide an explanation for the difference between "charges" and the c.i.f. less f.a.s. value. For countries other than Japan, there is generally little or no difference.

APPENDIX 3C

POLLUTION CONTROL COSTS

The costs shown in table 3.1 include some pollution control costs in recent years in the labor and electric power inputs. Pollution control requirements, however, will be increased during the next several years, and, consequently, they will have a greater effect upon costs in the future than they have had in the past. This appendix is an inquiry into the relative impact of pollution control upon steel operating costs in the U.S. and Japan.

United States

In the U.S., the greatest impact of pollution control requirements on the steel industry will occur between 1977 and 1983. These standards are based on the Clean Air Act of 1970 and the Federal Water Pollution Control Amendments of 1972. The years since then have been occupied with the design and approval of Federal and State standards, court challenges of the standards, and the development of specific schedules for installation of pollution control equipment. For future years, the program calls for substantially greater expenditures for pollution control by 1983.

According to a survey by the Commerce Department, the U.S. steel industry's capital expenditures for pollution control equipment averaged 13.7 percent of its total capital expenditures from 1973 through 1975. 1/

A survey by the Census Bureau [37] indicates that the operating costs for pollution control in the U.S. steel industry amounted to $241.8 million in 1973, $321.9 million in 1974, and $408.5 million in 1975. In terms of cost per ton of steel products (after adjustment for inventory reductions), these costs amounted to $2.52 in 1973, $3.37 in 1974, and $5.40 in 1975.

Two major studies have been published on the future impact of pollution control regulations on the U.S. steel

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1/ See U.S. Department of Commerce [38, July 1975, p. 15; and July 1976, p. 16]. The first year covered by this survey was 1973. There are other estimates of pollution control equipment costs for earlier years, but they involve definitional problems. The Commerce Department states that for its survey "the types of questions asked and the definitions of what constitutes pollution abatement expenditures . . . were more precise than those used in similar surveys conducted by trade associations and other private organizations" [38, July 1974, p. 58]. In another survey, the Census Bureau [37] reported that the steel industry's capital expenditures for pollution control equipment were $189.0 million in 1973, $321.9 million in 1974, and $418.7 million in 1975. The Census Bureau attributes the differences from the survey conducted by the Bureau of Economic Analysis of the Commerce Department to normal sampling variations and to the use of a company basis for the Bureau of Economic Analysis survey versus an establishment basis for the Census Bureau survey.

The American Iron and Steel Institute also reports steel industry capital expenditures for pollution control: $100.1 million in 1973, $267.2 million in 1974, and $453.1 million in 1975. These figures total $820.4 million, whereas those from the Bureau of Economic Analysis total $871 million for the same 3 years, and those from the Census Bureau total $929.6 million. The AISI reports total steel industry capital expenditures of $2,189.4 million for air and water quality control from 1967 through 1976.

industry. The first of these was conducted by Arthur D. Little, Inc. (ADL) [2], for the American Iron and Steel Institute. It found that compliance with the pollution control regulations for 1983 would increase operating costs by 9.7 percent. This would amount to about $25-30 per net ton of steel shipped [2, pp. VI-8 and I-5]. The second major study was conducted by Temple, Barker, & Sloane, Inc. (TBS) [33], for the Environmental Protection Agency. The TBS study concluded that operating costs would be increased by 2.8 percent beyond the pollution control costs incurred in 1974 [33, p. 5-4 and table 3]. This increase would amount to about $8.72 per net ton of steel shipped. 2/ Thus, the TBS study indicates that pollution control regulations for 1983 would increase operating costs by 3.8 percent, or about $11.66 per net ton of steel shipped.

The major differences between these two estimates are in different assumptions for the control of fugitive emissions and storm runoff, and for the retirement of existing facilities, especially open hearth furnaces. The ADL study was based on more stringent standards, and the TBS study assumed that approximately 65 percent of existing open hearth furnaces would

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2/ Obviously, estimates of pollution control operating costs expressed interms of tons of steel shipped are affected by the forecast made for 1983. The forecast used here is that contained in the TBS report, shipments of 119.2 million net tons. When TBS compared their forecast with other recent forecasts for 1980 shipments, they found that the differences were less than 7 percent. These forecasts were done by AISI, the International Iron and Steel Institute, Arthur D. Little (for AISI), Booz, Allen & Hamilton, Chase Econometrics, Data Resources, Inc., and the Bureau of Labor Statistics. See [33, p. 2-3].

be closed rather than fitted with more emissions control equipment. 3/

The TBS estimates are probably closer to the actual costs of implementing pollution control standards for the steel industry than the ADL estimates. The TBS study is more recent and, therefore, was able to incorporate a development in pollution standards that occurred after the ADL report was completed. This involved a change in the storm runoff standards so that runoffs from the entire plant site need not be contained and treated, as assumed in the ADL study. The revised standard requires containment and treatment of storm runoffs from only the piles of coal, iron ore, and limestone on the plant site [33, p. 3-10]. Another major cause of different cost estimates in the two studies is the different assumptions concerning emissions control for open hearth furnaces [33, p. 4-7]. Since the basic oxygen furnace is lower-cost than the open hearth (in both capital cost and operating cost as well as air pollution control cost), it seems reasonable to assume that some proportion of existing open hearth furnaces will be closed rather than fitted with equipment to comply with more stringent emissions standards. This assumption is based partly on the fact that several open hearth units have been closed in recent years rather than equipped with pollution control hoods. This assumption is also based partly on an interview with an officer of

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3/ Telephone interview with EPA staff member and [33, p. 2-3].

one U.S. steel company. He said that the deciding factor which induced his company to build a new basic oxygen unit and close an open hearth unit was that pollution control equipment for the open hearths would cost $12 million compared to $4 million for this type equipment for the basic oxygen furnaces, even though their steelmaking capacities were comparable.

Japan

Capital expenditures for pollution control equipment in Japan's steel industry were $378 million in fiscal year 1974, $573 million in fiscal year 1975, and $704 in fiscal year 1976 [6]. (Japanese fiscal years end on March 31). These expenditures averaged 18.1 percent of total capital expenditures by Japanese steel producers during these years [6]. Operating costs for pollution control for the Big Five steel producers were $9.97 per metric ton at the end of 1974 [25]. One Japanese consulting firm that studied pollution control costs for steel predicted that operating costs for pollution control in the Japanese steel industry will increase to $19 per metric ton and that this will increase production costs about 8.6 percent [25].

Europe

A recent OECD study [26] provides information on pollution control in the European steel industry. In Germany, steel companies spent about $340 million on pollution control equipment from 1971 through 1974. These expenditures amounted to 3.9 percent of total investment by the industry in 1971, 8.8 percent in 1972, 14.0 percent in 1973, and 13.7 percent in

1974 [26, table 7, p. 133]. In Belgium, the value of pollution control equipment in place in the steel industry at the beginning of 1975 was estimated at $180 million [26, p. 173]. This amounts to about 8.7 percent of total investment by Belgian steel producers from 1965 through 1975 or about 12.2 percent of their total investment from 1970 through 1975. Programs called for expenditures on pollution control equipment by the Belgian steel industry of about $9 million in 1975; if they were carried out, they would have amounted to about 2.8 percent of the total steel investment in Belgium in 1975. Future programs for the steel industry call for pollution control equipment expenditures of about $134 million from 1976 through 1980 [26, p. 173]. European steel officials interviewed for this study in 1975 said that 17 percent of their new investment was scheduled for pollution control equipment.

Conclusions

Recent capital expenditures for pollution control for the U.S., Japanese, and German steel industries are shown in table 3A.2 of this appendix. In the future, pollution control standards will increase. Estimates are that these standards will increase steel production costs by about 3.8 percent in the U.S. and about 8.6 percent in Japan. These increases would amount to about $13 per metric net ton of steel shipped for the U.S. and about $19 per metric ton of steel shipped for Japan (in terms of 1975 dollars).

Such figures are only rough estimates. They are inherently difficult to make, and they are subject to change from such factors as modifications of standards, postponement of their implementation, and future developments in pollution control methods.

For the U.S., one effect of pollution control may be to induce cutbacks and closings of some older and smaller plants. The ADL study found substantial differences among plants in pollution control equipment costs and operating costs. For 13 integrated plants smaller than 3 million tons of annual capacity, ADL estimated that pollution control operating costs will vary from 8.8 to 48.5 percent of the total cost of shipments. In contrast, for 20 integrated plants larger than 3 million tons of annual capacity, the range of operating costs was 8.5 to 19.7 percent of the total cost of shipments [2, pp. VI-26-30].

Table 3A.2

Capital Expenditures for Pollution Control Equipment in the U.S., Japanese, and German Steel Industries

		(Dollars in millions) 1973	1974	1975
Pollution control equipment:	U.S.	$230	$245	$396
	Japan	$378 a/	$573 a/	$704 a/
	Germany	$107	$135	N.A.
Capital expenditures for pollution control as percent of total capital expenditures:	U.S.	16.3%	12.1%	13.5%
	Japan	17.3% a/	18.6% a/	18.4% a/
	Germany	14.0%	13.7%	N.A.

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a/ Japanese figures are for fiscal years ending March 31. The figures are allocated to the year in which the majority of the quarters occurred.

Sources: For U.S., Bureau of Economic Analysis, Commmerce Department, Survey of Current Business, July 1974, p. 60, July 1975, p. 15, and July 1976, p. 14.

For Japan, Industrial Structure Deliberation Council.

For Germany, Organization for Economic Cooperation and Development, Emission Control Costs in the Iron and Steel Industry, 1977, table 7, p. 133.

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Chapter 4

PRICING BEHAVIOR

The pricing hypotheses examined in this chapter include: (1) has the U.S. established a price umbrella under which imports have been free to erode domestic markets; (2) have domestic steel firms "administered" prices and (3) have Japanese or European steel firms dumped steel? These hypotheses are examined in an effort to determine if the pricing policies of the U.S. steel firms and their foreign rivals have contributed to the observed pattern of imported steel over the past 20 years.

The chapter is divided into three sections: (I) the long-run pricing policy of the U.S. steel industry, (II) cyclical pricing practices and (III) international differences in pricing practices.

I. LONGRUN PRICING BEHAVIOR

Conflicting Theories

There are many theories of the pricing behavior of the U.S. steel industry. Adams and Dirlam [1, pp. 638, 639] have argued that:

> Cost movements and target returns--more so than demand--are prime determinants of price policy. . . . Pricing policy of the steel industry, and of its price leaders, includes therefore, not only the achievement of goals set for individual prices, but also maintenance of the proportions, ratios and margins between prices at successive levels of production that seem to be in the best interest of the industry. . . . When a strategic price is threatened, however, the threat must be dealt with at almost any cost, not

simply because of the necessity for re-evaluating the specific price, but because of the danger to the market structure dependent upon it.

They conclude that import erosion of domestic markets, especially wire rods, was directly attributable to the industry pricing policies. The pricing policy is in turn attributable to the oligopolistic and vertically integrated nature of the industry.

The Council on Wage and Price Stability's "A Study of Steel Prices" [5] has presented a model of steel pricing similar to Adams and Dirlam. The report claims [5, pp. 7, 8]:

> Prices are set by industry leaders in an effort to cover full costs and generate a desired rate of return at a level of output less than capacity . . . . The customary situation is price leadership by larger mills, and following by the other major mills.

The report by the Council on Wage and Price Stability, however, qualifies the above theory by stating that limitations such as imports and alternate suppliers, including minimills, might cause the industry to fail to achieve its goals [5, pp. 8, 9].

On the other hand, in analyzing the historical position of the U.S. steel industry (the first quarter of the 20th century and possibly later), Stigler [32] has concluded that the U.S. Steel Corporation was a dominant firm, whereas Parsons and Ray [22, p. 208] have characterized the industry as a "dominant cartel."

However, the Gaskins model of limit pricing [8] implies that even if U.S. Steel were a dominant firm (or the industry a dominant cartel or group of joint profit maximizing oligopolists) it would still price in a manner to slow the import erosion of its markets.

Moreover, there are authors such as Rowley [25] and Mancke [17] who regard the pricing practices of the U.S. steel industry as quasi-competitive; i.e., the observed pricing pattern is similar to that which would occur in a competitive industry.

<u>Structural Change in Pricing Around 1960</u>

There is considerable evidence to suggest that the longrun pricing policy of the U.S. steel industry changed around 1960. In this section some of this evidence is presented, but its explanation is left to following sections.

Employing quarterly data for the period 1952(2) to 1968(2), Rippe [24] estimated the rate of change in steel mill product prices as a function of (i) the rate of change in employment costs per man-hour, ECMH; (ii) the ratio of unfilled orders to shipments, $\frac{UO}{S}$; and (iii) capacity utilization, CU; yielding:

$$\frac{\dot{P}}{P} = \underset{(-4.6)}{-2.84} + \underset{(9.8)}{.59}\,\frac{\dot{ECMH}}{ECMH} + \underset{(2.7)}{.34}\,\frac{UO}{S} + \underset{(2.8)}{.024}\,CU$$

$R^2 = .74$, D.W. = 1.59, t values in parentheses.

He found that a Chow test rejected, at the one percent significance level, the hypothesis that there was no difference between the pre- and post-1959 steel strike periods. Regarding the pre- and post-1959 periods, Rippe concluded that "we have strong evidence that there has been a change in the steel price-setting mechanism."

On the basis of a series of regressions which he ran, Mancke [17] has also found a structural shift in pricing in the pre- and post-1959 periods. He found that capacity utilization rates affected prices after 1959 but not before 1959. Mancke [17, pp. 154, 155] states: "We must conclude that from 1947-58 steel prices tended to rise independently of demand relative to supply but not from 1959-65. Instead its price behavior began to parrot that of a more competitive industry since prices could now be raised only when demand pressed upon capacity."

Finally, the well known studies by Eckstein and Fromm [4] and Bailey [3] calculated the impact of steel price increases and steel value added increases on other products in the Wholesale Price Index. Recently, Ornstein and Eckard [21] have recalculated the impact of steel value added on other sectors. Like Bailey and Eckstein-Fromm, OrsteinEckard used an input-output based method of estimation; they calculated what the Wholesale Price Index (and Implicit Price Deflator) would have been if the change in steel value added were the same as the change in the value added in all other manufacturing. As the earlier authors found, if steel value added had increased at the same rate as non-steel value added, the WPI would have increased by a smaller amount during the 1947-58 period. However, the opposite result is true for the 1958-74 period.

While overstating their case, Ornstein and Eckard [21, p. 15] conclude:

> Steel has had very litle effect on aggregate price increases during the strong inflationary period since 1965. This is in marked contrast to the results of Eckstein and Fromm for the late 1940's and 1950's. Whatever the basis and reliability of their conclusion on the monopolistic pricing power of the steel industry, there is no basis for a similar conclusion for the 1958-1974 period.

The Rippe and Mancke studies mentioned above are efforts to determine the nature of the steel price-setting mechanism. On the other hand, the Eckstein-Fromm, Bailey, and Ornstein-Ecklard studies are efforts at ascertaining the relationship between steel prices and the prices of other sectors. Since this study is concerned with pricing policy, it is the former studies which are most relevant for our purposes. Nonetheless, it is interesting to note, via the latter studies, that the steel sector's impact on inflation in other sectors subsided in the 1959-74 period relative to 1947-58.

Change in the Pricing Behavior of the U.S. Steel Corporation

Data on the market shares of each of the top eight U.S. steel companies are reported in chapter 2, for the years 1938-76. These data as well as some other pivotal concentration ratios are summarized here (table 4.1) to provide background for the pricing behavior discussion which follows.

These data reveal that since 1962, U.S. Steel Corporation's market share has eroded slightly. This is in contrast to the

TABLE 4.1

Concentration of Raw Steel Production Shares

(percent)

Company	1902	1904	1908	1920	1938	1947	1951	1961	1976	1961-1902	1961-1951	1976-1961
U.S. Steel Corporation	65.4	60.8	56.0	45.8	33.1	33.7	32.6	25.7	22.1	-39.7	-6.9	-3.6
Four Largest Firms	78.8	74.2a/	68.2a/	58.5	62.0	63.5	61.7	54.6	52.8	-24.2	-7.1	-1.8
Eight Largest Firms	N.A.	83.5a/	76.3b/	65.7b/	79.0b/	79.9b/	78.3b/	75.5	73.4	-8.0c/	-2.8	-2.1

a/ The shares of firms two through eight for the years 1904 and 1908 were computed from data for estimated capacity.

b/ National Steel Corporation's share of production was estimated from its share of capacity for the years 1920, 1938, 1947, and 1951.

c/ Computed by subtracting the 1904 eight-firm share from the 1961 eight-firm share.

Sources: The American Iron and Steel Institute and the Iron Age Annual Financial Survey for the years 1920 forward; U.S. Department of Commerce, Bureau of the Census, Historical Statistics of the United States, Colonial Times to 1970, Part 2; and D. Parsons, and E. Ray, "The United States Steel Consolidation: The Creation of Market Control," Journal of Law and Economics , April 1975, pp. 209, 210, for the years 1902, 1904, and 1908.

1951-61 period, in which U.S. Steel's share declined 6.9 percentage points from 32.6 percent to 25.7 percent. Simultaneously, the four-firm concentration ratio declined 7.1 percentage points, while the eight-firm concentration ratio declined just 2.8 percentage points.

Thus, in the decade preceding 1962, virtually the entire erosion of four-firm concentration ratios came at the expense of U.S. Steel. Moreover, during this period, the share of firms two through eight increased by 4.1 percentage points, the principal gainer being Armco Steel. On the other hand, U. S. Steel's share has been eroding at a slower rate since 1961, while the four- and eight-firm shares were buttressed by the National-Granite City merger.

The 1961-76 period is also in contrast with the longer 1902-61 period in the table. There U.S. Steel's share declined 39.7 percentage points from 65.4 percent to 25.7 percent. The longrun trend was arrested before, during, and after the World War II years. Simultaneously, the four- and eight-firm concentration ratios declined only 24.2 percentage points and 8.0 percentage points. Thus, the share of the second through fourth largest firms increased by 15.5 percentage points, and the share of the second through eighth largest firms increased by 31.8 percentage points while U.S. Steel experienced its secular decline. The four- and eight-firm concentration ratios were buttressed by mergers, especially the acquisitions by Bethlehem and Republic.

Compared to earlier periods, the decline of U.S. Steel's market share has slowed. On the basis of these data, one should suspect a change in the pricing policy of the U. S. Steel Corporation following 1961.

The suspicions raised by the market share data are strongly supported by accounts in the trade press. On the basis of these accounts, Scherer [26, pp. 160-169] has found that, by 1962, U.S. Steel had abandoned its strong price leadership role. He states that "When U.S. did exercise leadership, it announced cuts mixed with increases, displaying a new diplomacy which contrasted vividly with the 'bludgeon' approach employed up to 1962 . . . [and by 1968] . . . U. S. Steel abandoned its traditional policy of holding list prices inviolate and joined the 'chiselers' offering substantial secret concessions to a number of buyers. The once rigid steel price structure began to crumble." This chapter will present extensive data from the trade press which support these conclusions by Scherer.

A new development since 1968 is that Bethlehem Steel Corporation has on occasion been the industry price disciplinarian. When steel companies, including U. S. Steel, have offered price cuts off list prices, Bethlehem has cut the list price to stop "chiseling." The well-known 1968 confrontation with U. S. Steel is detailed in section II, below. In addition, there were a number of other incidents in the early 1970's, where Bethlehem cut or refused to raise list prices because of clandestine discounts.

On August 2, 1971, U.S. Steel announced an eight percent price hike on practically all mill products to take effect on a staggered schedule from August 5 to December 1, 1971; within hours the move was followed by Bethlehem, Armco, Republic, and Youngstown. On August 11, Bethlehem postponed its price hike on cold rolled sheets, until February 1, 1972. Because of softness in the economy, the growth of steel imports, and increasing resistance of purchasing agents, analysts questioned whether the industry could actually realize these higher prices or would be forced to continue making the discounts prevalent on some product categories for the last 18 months. On April 13, 1972, Bethlehem announced it would raise prices on virtually none of its steel mill products before January 1, 1973. Similarly, in February 1970, Bethlehem guaranteed it would not raise prices more than once a year. The 1972 action was apparently motivated by the fact that some small companies, notably Alan Wood Company and Phoenix Steel Corporation, had been offering price discounts. Moreover, foreign steel producers were seeking fall orders by offering buyers current prices. Bethlehem's senior vice-president for sales, Edward D. Bickford, stated, "We absolutely do not make deals. We say, 'This is our price to everybody. If a competitor wants to make it lower, then that will be our price to everybody.'" 1/

The analysis of Gaskins [8, p. 312] has shown that in the static demand case when a dominant firm (or dominant cartel or group of joint profit maximizers) enjoys no cost advantage over rivals:

> . . . in response to optimal pricing by the dominant firm the output of the competitive fringe will asymptotically approach . . . the total industry output. The dominant firm in this case prices itself out of the market in the long run. While it is acknowledged that our model will lose its validity at some point as the dominant firm's market share declines, the conclusion remains that dominant firms with little or no cost advantage decline if they strive to maximize their present value. [Emphasis added.]

The relevant point is (as the Gaskins analysis has shown in the case quoted above) that, if the dominant firm continues to price lead, absent a cost advantage, above competitive levels, it prices itself out of the market. It appears United States Steel recognized that it had virtually lost its ability to maintain prices at monopolistic levels, ceased doing so, and thereby slowed its market share decline.

1/ For accounts of these episodes see: "Top Steelmakers Lift Prices 8 Percent on Most Items," Wall Street Journal, Aug. 3, 1971, p. 3; "Bethlehem Steel Postponed Its Price Boost," Wall Street Journal, Aug. 12, 1971, p. 2; "Bethlehem Plans No '72 Price Rises on Milled Steel's," Wall Street Journal, April 14, 1972, p. 3; "Bethlehem Builds a Price Ceiling," Business Week, Feb. 14, 1970; "Slump in Orders May Prompt Steelmakers to Follow Bethlehem's Price Rise Delay," Wall Street Journal, Aug. 16, 1971, p. 4.

The Role of Imports

Table 2.24 contains data on world and United States steel trade. It is apparent that the United States has moved from a net exporter of steel mill products to a significant net importer. In an effort to determine if the longrun pricing policy has been responsible for this change, three selected steel mill products are examined: hot rolled carbon sheet (HRS), cold rolled carbon sheet (CRS), and wire rod (WR).

HRS and CRS were selected because they are representative of flat rolled products, generally produced by major steel mills and because together they account for one-third of net industry shipments. WR was chosen because it is representative of the non-flat type product which the minimills are capable of producing. Tables 4.2, 4.3, and 4.4 present import and export data relevant to these three products during the years 1950-76.

Clearly, comparative cost considerations are crucial in determining if pricing policy contributed to the observed erosion of domestic markets. The pricing policy hypothesis of import erosion argues that domestic producers maintained prices above competitive levels, thereby forming a price umbrella under which competitively priced imports were free to erode domestic markets. However, if costs for foreign producers fell relative to domestic producers during the 1955-71 period, that would significantly contribute to the observed pattern of import erosion.

TABLE 4.2

Hot Rolled Sheet Steel: Shipments, Imports, Exports, and Apparent Consumption, 1950-76 a/

Year	Net industry shipments thousands of tons b/	Imports	Exports	Apparent consumption thousands of tons	Ratio of imports to apparent consumption	Ratio of exports to net industry shipments
		thousands of tons			(percent)	
1976	15,090	1,639	151	16,578	9.9	1.0
1975	11,222	1,511	129	12,604	12.0	1.1
1974	15,774	1,653	858	16,569	10.0	5.4
1973	16,885	1,788	308	18,365	9.7	1.8
1972	14,036	2,233	306	15,963	14.0	2.2
1971	11,760	2,664	317	14,107	18.9	2.7
1970	12,319	2,000	1,190	13,129	15.2	9.7
1969	12,471	1,938	985	13,424	14.4	7.9
1968	10,782	3,468	158	14,092	24.6	1.5
1967	9,312	2,265	100	11,477	19.7	1.1
1966	10,137	1,948	90	11,995	16.2	.9
1965	10,630	1,799	152	12,277	14.7	1.4
1964	9,948	524	516	9,956	5.3	5.2
1963	8,826	332 c/	189	8,969	3.7	2.1
1962	7,753	121	122	7,752	1.6	1.6
1961	7,024	53	89	6,988	.8	1.3
1960	7,991	209	239	7,961	2.6	3.0
1959	7,844	180	63	7,961	2.3	.8
1958	6,291	24	168	6,147	.4	2.7
1957	7,830	23	393	7,460	.3	5.0
1956	8,791	29	299	8,521	.3	3.4
1955	9,431	[39]	300			
1954	6,094	[26]	150			
1953	7,743	[328]	217			
1952	6,099	[41]	259			
1951	8,171	[109]	[539]			
1950	7,805	[60]	[520]			

Note: Apparent consumption equals domestic shipments plus imports less exports.

a/ All grades including carbon, alloy, and stainless steel.
b/ All tons in the table are short tons.
c/ Estimate

Brackets - Sheet and strip - hot and cold rolled combined.

Source: American Iron and Steel Institute, Annual Statistical Report, various years.

TABLE 4.3

Cold Rolled Sheet Steel: Shipments, Imports, Exports, and Apparent Consumption, 1950-76 a/

Year	Net industry shipments thousands of tons b/	Imports (thousands of tons)	Exports (thousands of tons)	Apparent consumption thousands of tons	Ratio of imports to apparent consumption (percent)	Ratio of exports to net industry shipments (percent)
1976	18,265	2,454	159	20,560	11.9	.9
1975	12,841	2,161	59	14,943	14.5	.5
1974	18,275	2,638	270	20,643	12.8	1.5
1973	20,377	2,774	365	22,786	12.2	1.8
1972	16,123	3,343	159	19,307	17.3	1.0
1971	14,898	3,690	146	18,442	20.0	1.0
1970	14,250	2,291	369	16,172	14.2	2.6
1969	16,427	2,007	433	18,001	11.1	2.6
1968	16,336	2,918	138	19,116	15.3	.8
1967	14,709	1,425	77	16,057	8.9	.5
1966	15,972	1,170	87	17,055	6.9	.5
1965	16,571	1,257	143	17,685	7.1	.9
1964	15,699	409	203	15,905	2.6	1.3
1963	14,510	195	181	14,524	1.3	1.2
1962	13,510	52	205	13,357	.4	1.5
1961	12,153	5	267	11,891	.0	2.2
1960	14,466	70	874	13,662	.5	6.0
1959	12,751	30	212	12,569	.2	1.7
1958	10,326	1	318	10,009	.0	3.1
1957	11,879	2	389	11,492	.0	3.3
1956	13,317	5	420	12,902	.0	3.2
1955	15,168	[39]	536			
1954	9,606	[26]	280			
1953	11,274	[328]	163			
1952	8,009	[41]	210			
1951	9,641	[109]	[539]			
1950	9,338	[60]	[520]			

Note: Apparent consumption equals domestic shipments plus imports less exports.

a/ All grades including carbon, alloy, and stainless steel.
b/ All tons in the table are short tons.

Brackets - sheet and strip - hot and cold rolled combined.

Source: American Iron & Steel Institute. Annual Statistical Report, various years.

TABLE 4.4

Wire Rod: Shipments, Imports, Exports, and Apparent Consumption, 1950-76 a/

Year	Net industry shipments	Imports	Exports	Apparent consumption	Ratio of imports to apparent consumption	Ratio of exports to net industry shipments
	thousands of tons	(thousands of tons)		thousands of tons	(percent)	
1976	1,901	1,121	100	2,922	38.4	5.3
1975	1,298	1,113	41	2,370	47.0	3.2
1974	1,861	1,951	66	3,746	52.1	3.5
1973	2,040	1,416	90	3,366	42.1	4.4
1972	1,919	1,403	123	3,199	43.9	6.4
1971	1,587	1,544	63	3,068	50.3	4.0
1970	1,681	1,056	164	2,573	41.0	9.8
1969	1,623	1,261	95	2,789	45.2	5.9
1968	1,339	1,600	12	2,927	54.7	.9
1967	1,266	1,076	7	2,335	46.1	.6
1966	1,366	1,150	12	2,504	45.9	.9
1965	1,338	1,284	19	2,603	49.3	1.4
1964	1,195	953	34	2,114	45.1	2.8
1963	1,100	801	24	1,877	42.7	2.2
1962	1,017	645	17	1,645	39.2	1.7
1961	935	451	5	1,381	32.7	.5
1960	918	408	10	1,316	31.0	1.1
1959	980	448	4	1,424	31.5	.4
1958	895	181	17	1,059	17.1	1.9
1957	962	54	14	1,002	5.4	1.5
1956	1,132	64	18	1,178	5.4	1.6
1955	1,204	48	31	1,221	3.9	2.6
1954	761	40	9	792	5.1	1.2
1953	801	65	9	857	7.6	1.1
1952	742	44	30	756	5.8	4.0
1951	847	122	4	965	12.6	.5
1950	816	112	6	922	12.1	.7

Note: Apparent consumption equals domestic shipments plus imports less exports.

a/ All grades including carbon, alloy, and stainless steel.

b/ All tons in the table are short tons.

Source: American Iron & Steel Institute, Annual Statistical Report, various years.

As mentioned above, the Gaskins [8] model implies that even if the U.S. steel industry were characterized by dominant firm or joint profit maximizing pricing, it would be optimal to price to retard entry by imports. That is, a price less than the shortrun profit maximizing price (but above the price at which no imports enter) is optimal in view of the threat of market erosion by imports. A qualification to the preceding conclusion is that the dominant firm will price below the level at which no imports enter (i.e., price to drive out imports and other competitors) if its market share is less than its longrun equilibrium share. In view of the secular decline of the U.S. Steel Corporation and the rise of imports in the late 1950's and the 1960's, this qualification is evidently irrelevant to the steel industry. Thus, with respect to the domestic steel industry, the Gaskins model implies that (1) prices are lower than they would be without imports but (2) some import erosion is permitted.

However, it is fundamental to the limit pricing model that the dominant firm does not suffer a cost disadvantage. As Gaskins states: "While there may be examples of dominant firms with cost disadvantage, their fate is obvious with or without optimal pricing." They will decline.

In both the HRS and CRS markets, the longrun trend of the ratio of imports to apparent consumption rose as the relative costs of the U.S. rose. (See the preceding chapter for cost estimates.) However, as the U.S. enjoyed a favorable cost advantage in the years 1973 and 1974, the import share of HRS declined to the lowest level since 1964; and in CRS the import share experienced a significant drop from 1971.

Corresponding to the trend in costs is the trend in profits, which was presented in table 2.23. The longrun trend in profits as a percentage of revenues declined from 1955 through 1971 but was reversed during 1972-74. Thus, with respect to the basic flat rolled products, it appears that imports have been eroding the domestic share and squeezing profit margins in accordance with longrun trends in relative costs. As relative costs began to shift in favor of the U. S. in the past few years, the domestic industry saw its market share of these products and its profit margins improve. These results are systematically supported through regressions (1), (2), and (3) of the previous chapter.

In the wire rod market, the European producers enjoyed a significant cost advantage for all years from 1957 to 1969, inclusive. Thus, it is not surprising to find the import share increasing during these years. We do not attribute the longrun market erosion to the longrun pricing policy but, rather, to cost differences. However, the regression for wire rod yielded a statistically insignificant coefficient for the relative cost explanation of trade flows.

Summary and Conclusions

The theories of pricing behavior which have been offered to explain long run domestic steel pricing and the data which have been presented relevant to those theories can now be summarized.

Summary of Theories of Domestic Steel Pricing:

(i) Costs and target rates of return, more so than demand, are prime determinants of prices.

(ii) Subject to limitations imposed by imports and minimills, the major domestic mills price to cover full costs plus target rates of return.

(iii) Prices are set by the United States Steel Corporation acting as a dominant firm facing a competitive fringe of other domestic suppliers and imports.

(iv) The large integrated domestic producers set prices acting as a dominant cartel facing a competitive fringe of smaller domestic suppliers and imports.

(v) The pricing of the United States steel industry is characterized by "barometric price leadership"; i.e., even though structurally different from a competitive industry, prices are not sustained above competitive levels and they change in a pattern which mimics a competitive industry. 2/

2/ See Scherer [26, pp. 170-173] for a more detailed description of barometric price leadership.

Evidence Relevant to Steel Pricing:

1. The United States Steel Corporation's market share has fallen from 65.4 percent in 1902 to 22.1 percent in 1976. However, the decline slowed after 1961.

2. Since 1960, actual steel prices have risen and fallen with demand; this was the conclusion of the Rippe and Mancke studies and in the following section further and detailed documentation of this fact is provided.

3. Since 1960, the United States Steel Corporation has joined the "chiselers" in offering clandestine discounts off the list prices of steel.

4. Beginning in 1968, the Bethlehem Steel Corporation has made a number of efforts to eradicate price cutting by lowering list prices to the erstwhile secret levels.

5. Imports of steel mill products have risen (1.2 percent of apparent steel consumption in 1955; 17.9 percent, in 1971; and 14.1 percent, in 1976), so that they represent a check on the pricing practices of the domestic industry.

6. The rate of return on equity for primary iron and steel was less than the average for all manufacturing for all years from 1958 to 1973, inclusive (from chapter 2).

Conclusions. The long run pricing behavior of the United States' steel industry changed after 1959. While theories of dominant firm (iii) or dominant cartel (iv) pricing had some validity prior to 1960, these theories are inconsistent with the evidence just summarized for the post-1960 period. In particular, points 1, 3, 4, and 5 of the evidence summary argue against dominant firm pricing while 3, 4, 5, and 6 are evidence against dominant cartel pricing. Similarly, theories of steel pricing for the post-1960 period which argue that demand is unimportant (i), or not very important (ii), do not appear to be consistent with points 3, 4, and especially 2 of the evidence summary.

Since 1960, the identity of the industry price leader has varied, with Armco Steel and Bethlehem Steel occasionally sharing the leadership role with U.S. Steel. Price leaders' efforts to raise prices have occasionally been rebuffed as price hikes tended to be followed only when they reflected basic supply and demand conditions. The price leadership that exists in the industry does not appear to have facilitated the sustained attainment of monopolistic prices. It appears the industry's pricing practices are best characterized by the term "barometric price leadership." That is, they reflect underlying demand and supply conditions.

II. CYCLICAL PRICING PRACTICES

Many authors have argued that the U.S. steel industry is one of the major industries which "administers prices." While the concept of an administered price varies somewhat, depending on the author, a consensus has developed. Administered prices have come to mean those, characteristic of highly concentrated industries, that do not fall much during general business contractions and will not rise much in ensuing expansions.

Moreover, it is argued that output, inventories, and order backlogs will fall by a greater amount in administered price industries during contractions [26, ch. 12].

The evidence on whether the U.S. steel industry has been characterized by this concept of administered pricing will be examined. Administered pricing would make the U.S. industry more susceptible to import erosion during the trough of the business cycle. Additional questions studied are whether the steel industries in the other major producing nations have been characterized by administered pricing and whether the loss of the U.S. markets to imports is due, in fact, to differences in pricing policies across nations.

United States Pricing

The Bureau of Labor Statistics and Stigler-Kindahl Data. Our examination of the Bureau of Labor Statistics (BLS) price series for steel mill products, finished steel products, and semi-finished steel products reveals an almost steadily non-decreasing trend. As the BLS obtains its data from list rather than from transactions prices, it is natural to ask whether the true prices would manifest a cyclical trend even if the BLS series does not; i.e., might nonreported discounts off list be more frequent during the trough of the business cycle.

Stigler and Kindahl [33] published what they regard as transactions price indexes in major industries on a monthly basis for the years 1957-66. These indexes were computed from confidential data supplied by purchasers of the products reported.

With respect to steel, they compared their aggregate index of the nine steel products in their study with the BLS index of finished steel products and found:

> The BLS and NB prices of steel products move together so closely that a description of one is a description of the other. The upward trends in price are essentially the same: .05 percent monthly (BLS) vs. .03 percent monthly (NB). Neither index displays a noticeable cyclical movement in either expansion or contraction. Nor are the short-run fluctuations of appreciable size.

Figure I is a graph of the data discussed in the above quotation. There were two recessions in the time period covered by the Stigler-Kindahl data: July 1957 to April 1958 and May 1960 to February 1961. The absence of noticeable cyclical movement in the steel industry surprised Stigler and Kindahl. It stood in contrast to the other industries they studied; for each of the other industries, their index of transactions prices showed more cyclical behavior in prices than were exhibited by the BLS indexes.

Generally, BLS indexes of steel prices move in the manner predicted by the administered pricing hypothesis. Critics of the hypothesis allege that actual or transactions prices differ markedly from the published or list prices that the BLS reports. Thus, if the Stigler-Kindahl data, which purport to measure actual prices and move closely and noncyclically with BLS prices, are relevant to current steel pricing, then administered pricing may be a fair characterization of industry pricing policy. There is considerable evidence, however, that this is incorrect.

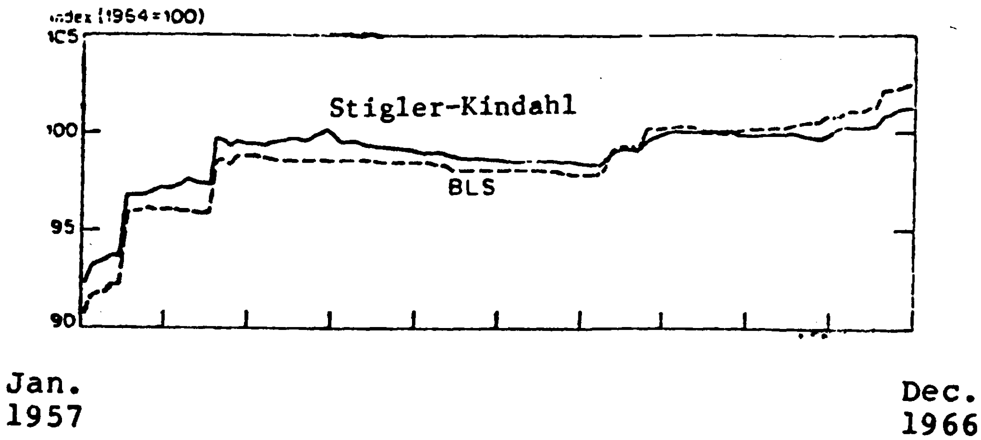
The Stigler-Kindahl data cover the decade beginning in January 1957. In section I of this chapter, it was suggested that a change in pricing policies occurred in the steel industry around 1960. This implies that conclusions based on that part of the Stigler-Kindahl data which is pre-1960 might not apply to current pricing practices. There were two contractions in the period covered by the Stigler-Kindahl data. The data in table 4.5 reflect a slight decline in prices in the post-1960 contraction while the counter-cyclical pricing was for the pre-1960 contraction.

The Steel Trade Press Data. An examination of the steel trade literature of the past 10 years reveals considerable evidence that contradicts the impression of "administered pricing" obtained from the BLS and Stigler-Kindahl data.

In early 1968, steel buyers began accumulating inventories in anticipation of the expiration of the contract between the United Steelworkers and the major steel companies. Despite the hedge buying, certain areas, such as Florida and the Great Lakes region, were experiencing heavy import competition. United States Steel secretly offered to meet the low prices of foreign mills to certain customers on some important products including gas and water pipe, galvanized sheet, and hot

FIGURE 4.1

The Stigler-Kindahl and Bureau of Labor Statistics Price Indexes for Finished Steel Products



Source: George Stigler, and James Kindahl, The Behavior of Industrial Prices, New York: National Bureau of Economic Research, 1970, p. 73.

TABLE 4.5

Percentage Change in Steel Prices During Two Business Contractions a/

Steel product	Aug. 1958 - July 1957	Feb. 1961 - May 1960
Sheet and Strip, Cold Rolled Carbon	.96	-.49
Sheet and Strip, Hot Rolled Carbon	.08	-.04
Tinplate	.27	-.78
Plates, Carbon	.12	0
Bars and Rods, Carbon	.60	-.01
Plain Pipe, Carbon	2.79	-.90
Wire, Carbon	4.60	-.81
Sheets and Strip, Stainless	0	-.49
Alloy Steel Bars, Hot and Cold Rolled	0	-.10

a/ All numbers are percentages calculated by subtracting the index of prices at the beginning of the contraction from the index of prices at the end of the contraction.

Source: George Stigler and James Kindahl, The Behavior of Industrial Prices, New York: National Bureau of Economic Research, 1970, appendix C.

rolled sheet and strip. 3/ Armco Steel, Inland Steel, and Jones and Laughlin Steel officially denied making selective price cuts to meet foreign competition; however, some purchasers said that "Jones and Laughlin salesmen are offering to meet U.S. Steel's prices which are down to the import level." 4/

Moreover, U.S. Steel began offering some steel distributors discounts of as much as 20 percent on certain grades of stainless steel sheet. "The discounts are reported concentrated in the 10 percent to 15 percent range and are in return for bulk orders of at least 100 tons." 5/

The National Association of Purchasing Management (N.A.P.M.) has a "Steel Market Committee," composed of some 30 purchasing managers who buy steel. The steel committee surveys its members, meets from four to six times per year and issues reports. The July 1968 report states:

3/ "Unlikely Rebel: U.S. Steel Cuts Prices to Fight Import Boom," Wall Street Journal, May 9, 1968, p. 1.

4/ "Armco Steel, Inland Steel and J&L Say They Won't Follow Cuts to Meet Import Prices," Wall Street Journal, May 13, 1968, p. 6. See also: "Steel Pricing Shows Some Flexibility," Business Week, July 27, 1968.

5/ "U.S. Steel Said to Slash Prices of Some Stainless," Wall Street Journal, June 12, 1968, p. 3. See also Business Week, July 27, 1968, p. 5.

> Though it is doubtful if there are as many deals going on as there are stories, some of our members have reported instances in which mills have negotiated prices in order to meet a competitive situation. While these instances are not rare they are apparently on a selective basis and are being restricted to particular mill products. 6/

When the United Steelworkers' contract was settled in 1968 without a strike, buyers began drawing down accumulated inventories. 7/ This fact, along with import competition, led to the inability of the industry to make its announced price increase (on approximately two-thirds of the industry's products) stick for all products. Some warehousemen were said to have received 20 percent discounts. 8/

By early October 1968, many steel companies where slashing prices as much as 20 percent on a number of high volume items. At that time the price cuts included big steel customers such as auto and appliance manufacturers but did not cover all products. 9/

In response to these developments, Bethlehem Steel Corporation announced a 22 percent reduction in the list price

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6/ "The Steel Market," Bulletin of the National Association of Purchasing Management, July 17, 1968, p. 5.

7/ "The Steel Market" Bulletin of the National Association of Purchasing Management, Sept. 18, 1968, p. 8.

8/ "Steel Prices Weaken Despite Announced Price Increase," Wall Street Journal, Sept. 5, 1968, p. 1.

9/ "Bargain Steel," Wall Street Journal, Oct. 7, 1968, p. 1.

of hot rolled sheet to $88.50 per ton, "to meet domestic competition." The move by Bethlehem was an effort to restore industry pricing discipline. U.S. Steel and most other major mills followed Bethlehem in initially lowering their list prices of hot rolled sheet to the Bethlehem quote. Significant price shaving also existed in products such as cold rolled sheet and galvanized sheet, but the list price cuts did not extend to these products. However, a $25 per ton price cut in hot rolled carbon strip was announced. 10/

On November 20, 1968, the Steel Market report of the N.A.P.M. announced:

> An additional influence on steel pricing is the reporting by a significant number of members that they are able to obtain steel at less than published domestic mill prices either through special mill offers or the purchase of imported steel.

By February 1969, the selected list price cuts were restored to precut levels. Moreover, the industry experienced a production turnaround that greatly lessened the price discounting. 11/

The August 1968 to January 1969 period represented a time of deep discounts for steel mill products. Despite this,

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10/ "Price Cuts Make Steel Purchasing Picture Uncertain," Wall Street Journal, Nov. 11, 1968, p. 2; "Steel Industry Hit By Major Price Cut," Business Week, Nov. 9, 1968, p. 35; "Revolution in Steel Pricing," Business Week, Dec. 14, 1968, p. 41; "Steel Mill Price Cuts Improve Competitive Position," Iron Age, Nov. 14, 1968, p. 57.

11/ "Contrary Steel," Wall Street Journal, April 2, 1969, p. 1; and see [26, pp. 169] for an account of this episode.

the BLS data on steel mill products show an increase during this period. BLS recorded the price decreases in hot rolled sheet and strip, since these were list price decreases. However, cold rolled and galvanized sheet prices, which were also heavily discounted, were reported by the BLS to have risen. Clearly, the BLS data are inadequate with respect to the recording of actual price discounts during this period.

The year 1969 represented an international boom year for steel and prices firmed throughout the industry. Domestic customers found foreign steel available only at prices relatively higher than in 1968. 12/

TABLE 4.6

BLS Steel Price Indexes from August 1968 to January 1969

Product	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
;teel Mill Products	102.1	104.3	104.4	103.1	103.0	104.2
ot Rolled Sheet	101.2	104.2	104.2	85.2	85.2	96.2
ot Rolled Strip	100.7	103.6	103.6	102.7	96.9	93.5
old Rolled Sheet	103.4	107.2	107.2	107.2	107.2	107.2
alvanized Sheet	102.7	102.7	102.7	102.7	102.7	102.7

Source: U.S. Department of Labor, Bureau of Labor Statistics.

12/ "Foreign Steel Shortages, Higher Prices, Turn U.S. Customers to Domestic Mills," Wall Street Journal, June 12, 1969, p. 1; "Worldwide Steel Demand Allows Higher Prices to Stick," Business Week, Aug. 9, 1969, p. 21.

Some stainless steel producers chose an interesting manner to raise prices in April 1969: An official announcement was made that most discounts on stainless steel sheet would be eliminated. 13/

On July 30, 1969, a fascinating series of events began. U.S. Steel announced a list price increase. General Motors' Fisher Body division, which was using 10.4 percent of total industry shipments, advised U.S. Steel to hold back on shipments "pending a re-evaluation of the competitive situation with respect to steel prices." General Motors' move was considered uncharacteristic and appears to have been an effort to get bids from other suppliers who would refuse to follow U.S. Steel's lead. However, the market demand was sufficient to make the price increases stick; the price hike was followed by other steel producers and even Fisher Body had to resume steel purchases at the new prices. 14/

These events lend further support to the position that U.S. Steel's price leadership is "barometric" rather than "dominant" or "collusive." If the price hike had been to a level at which industry prices were above industry marginal costs, then faced with the "countervailing power" of General

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13/ "Washington Steel Boosts Stainless Price by Ending Most Discounts on Sheet Items," Wall Street Journal, April 11, 1969; "Allegheny Ludlum Steel, Eastern Stainless Follow Discount Withdrawals," Wall Street Journal, April 17, 1969.

14/ "To U.S. Steel, General Motors Speaks for the Little Man," Wall Street Journal, Aug. 5, 1969; "G.M.'s Fisher Body Unit Resumes Buying of Steel After Resisting Prices," Wall Street Journal, Aug. 7, 1969, p. 15.

Motors, it is likely other producers would have sought General Motors' business at the lower quotes. However, General Motors' effort to halt the price hike failed and additional support is gained for the view that the price hike was "barometric"; i.e., it merely reflected basic supply and demand conditions.

The price developments of 1969 were summarized by the Steel Market Committee of the N.A.P.M.:

> The fact that most of the announced price increases stuck is probably not too surprising in view of the world demand for steel during the past year. . . . It would appear that the law of supply and demand was at work. 15/

The boom in steel demand eased by June 1970. Exports were at record levels for the first six months of 1970, and remained strong in the third quarter due to orders placed during the second quarter. However, the strong demand for exports subsided by June 1970. 16/ The strong export demand was partly responsible for the continued firmness of prices through June 1970. 17/

The first steel products on which unannounced price cutting appeared were stainless steel bar, rod, wire, and forging billet. These price cuts began in mid-April 1970

15/ "The Steel Market," Bulletin of the National Association of Purchasing Management, Jan. 21, 1970, p. 6.

16/ "Boom in U.S. Steel Exports Is Diminishing, Mills Say, and Prices are Also Declining," Wall Street Journal, June 29, 1970, p. 8.

17/ "World Actions Dominate Steel Price Movement," Journal of Commerce, May 4, 1970, p. 1.

and were in the two to three percent range. They ran counter to the overall steel price trends. 18/

By mid-June 1970, the general easing of demand led to selective price shading, most notably in big volume steel sheet. The industry announced a five percent increase in sheet steel prices, effective June 1, 1970. However, steel shipments were running significantly below the 1969 pace, and discounts to big tonnage sheet users appeared. Widespread price discounts were not manifest, but the price spiral of the previous 18 months was halted. 19/

On September 13, 1970, Bethlehem Steel responded to secret price shading on some galvanized steel products by eliminating the extra charges on certain extra smooth or temper-rolled galvanized steels. Bethlehem said the move "is directly responsive to a competitive situation in the market place." 20/

The report of the Steel Market Committee of the N.A.P.M. on November 18, 1970, stated:

> In answer to our question as to whether the buyers were finding steel prices being discounted, the "ayes" outweighed the "nays" three to two.

18/ "Stainless Steel Makers Confirm Price Trimming," Wall Street Journal, April 17, 1970, p. 4.

19/ "Easing Demand Causes Steel Prices to Slip After an 18 Month Rise," Wall Street Journal, June 19, 1970, p. 1.

20/ "Bethlehem Again Acts Against Discounting, Openly Cuts Some Galvanized Steel Prices," Wall Street Journal, Sept. 14, 1970, p. 5.

The activity seems to be taking place on a broad front but with no specific pattern. 21/

In the first quarter of 1971, demand improved slightly over the fourth quarter of 1970; buyers began hedge buying against a potential steel strike on August 1, 1971.

Nonetheless, some limited and selective price shaving continued through to March of 1971. After the imposition of the voluntary quotas on steel imports in 1969 (which were on a tonnage basis), foreign steel mills began shipping a larger share of the higher priced specialty steels. Stainless steel producers felt the pressure of imports longer than the carbon steel producers and two efforts to raise stainless steel prices fell flat. 22/

Joslyn Manufacturing Company failed in its effort to lower stainless steel discounts from the reported 15 percent to 20 percent level to "more normal" levels. 23/ Universal Cyclops Specialty Steel Division of Cyclops Corporation was forced to rescind its 5 percent to 7.5 percent price increase on stainless steels with the exclaimer:

21/ "The Steel Market," Bulletin of the National Association of Purchasing Management, Nov. 18, 1970, p. 3.

22/ "Steel Summary: Mini-Price War in Midst of Boom," Iron Age, March 4, 1971, p. 79; "Price Shaving Continues for Many Basic Steel Products," Metalworking News, March 29, 1971, p. 17.

23/ "Joslyn Manufacturing and Supply Co. Withdraw 5% to 6% Price Increase on Stainless Steel Bars, Wire and Billets," Wall Street Journal, Feb. 5, 1971, p. 16.

> Competitive action in the marketplace, already evident, not only drastically minimized the effect of the increase, but would also serve to create further competitive chaos in an already chaotic market. 24/

From April through July of 1971, demand surged in anticipation of a steel strike. Price discounts vanished and the industry put through a 6.25 percent price increase in sheet and strip products.

After the steel labor negotiations were settled without a strike, the industry announced, on August 2, 1971, an eight percent across-the-board price increase to take effect on a staggered schedule from August 5 to December 1, 1971. However, demand was very weak and within two weeks Bethlehem deferred its increase on cold rolled sheet until February 1, 1972. 25/

Demand remained weak through November 1971, and secret price concessions were available. One steelmaker was quoted as saying that because of weak demand the:

> quoted price situation is very weak and almost mythical. It is so spotty it jumps all over the place and depends on whether you're competing against foreign mill deliveries or whatever. 26/

24/ "Cyclops Division Rescinds Boosts in Steel Prices," Wall Street Journal, April 21, 1971, p. 3.

25/ "Slump in Orders May Prompt Steelmakers to Follow Bethlehem's Price Rise Delay," Wall Street Journal, Aug. 16, 1971, p. 4.

26/ "Steel Prices are Soft, Some Concessions Available in Absence of Ordering Surge," Wall Street Journal, Nov. 8, 1971, p. 2.

Apparently steel distributors were doing the bulk of the outright price discounting. The products most seriously affected were hot and cold rolled sheets since demand from the auto industry was low. Steel mills were also involved in discounting during this time, but the discounts of the major mills took the form of selling prime steel at secondary prices, and the dropping of some extra charges. 27/

The Steel Committee of the N.A.P.M. stated in their December 1971 Bulletin:

> The committee splits evenly on the question of whether or not the latest price levels by major mills are holding firm. The softness seems to be in the form of concessions on quality or extras rather the direct concessions. About half of the committee members are finding that prices by the smaller mills have not followed the lead of the major producers. As would be expected, this condition is found most often in the South, where most of the smaller mills are located.

In referring to prices of steel distributors the Steel Committee went on to say:

> Competition has made the increases more theoretical than actual. The committee is unanimous in the opinion that prices are soft and that concessions are available to the man who looks for them. 28/

27/ "Order Battle Triggers Price Shading in Steel," Industry Week, Sept. 27, 1971, p. 50; "Buyers Press on Prices; Uncertainty Plagues Mills," American Metal Market, Nov. 8, 1971, p. 5.

28/ "The Steel Market," Bulletin of the National Association of Purchasing Management, Dec. 1971, p. 3.

Despite these discounts, the BLS index for steel mill products showed no change from August 1971 to December 1971. While discounting on hot rolled and cold rolled sheet was reported to be especially prevalent, the BLS indexes on these items also showed no change from August to December of 1971.

In early January of 1972, Inland Steel privately informed its users that it would offer quantity discounts on flat rolled products. U.S. Steel responded by cutting prices by $5 to $8 per ton on sheet, eliminating the quantity discount. U. S. Steel's move was followed, either publicly or privately, by the other major steel producers in the U.S. 29/

In addition to the cuts in sheet prices, U.S. Steel also cut a number of non-flat items: $25 per ton on merchant quality bar, $25 per ton on bar shapes, $15.50 per ton on light wall electric weld linepipe, $9 per ton on rebar, and $15 per ton on structural fabric made of heavy wire or light rod. Most of these cuts remained in effect until mid-November 1972. They represented an effort by U.S. Steel, with the other major producers following, to regain some business lost to imports and minimills. 30/

29/ "Quantity Discounts Stir Steel Industry," Industry Week, Jan. 17, 1972, p. 11; "Major Steel Concerns Cut Prices Diluting Recently Won Increases," Wall Street Journal, Jan. 6, 1972, p. 3; "Steel Price Cuts Laid to One Mill's Drive to Lift Market Share, Not Less Demand," Wall Street Journal, Jan. 10, 1972, p. 2.

30/ "Uneasy Truce on Prices; Buyers Pleased with Cuts," American Metal Market, Jan. 10, 1972, p. 4; "Ground work Laid for New Look in Steel Pricing," Metalworking News, Jan. 10, 1972, p. 1; "Behind the Disorder in the Prices of Steel," Business Week, Dec. 23, 1972, p. 17.

Despite these deep discounts on bars, the BLS index of hot rolled carbon bars showed no change from August 1971 through December 1972.

On February 23, 1972, U.S. Steel Corporation reduced the list price of its most popular grade of stainless steel plate by 20 percent. It indicated it was moving to put a floor under prevailing price discounting in the marketplace. 31/

In response to rising demand, specialty steelmakers raised prices in late March 1972 by reducing private discounts to their distributors by five percent. 32/

On April 13, 1972, Bethlehem Steel Corporation announced it would not raise prices on virtually its entire line of steel products before January 1, 1973. The action, which was followed by most major mills, was an effort to stop discounting by domestic mills, notably Alan Wood and Phoenix, and to meet import competition. A spokesman for Phoenix Steel indicated that if a purchasing agent had a bona fide lower offer, Phoenix Steel would meet the competition. However, Phoenix thought its company was sufficiently small so that "we couldn't possibly hinder anyone." 33/

31/ "U.S. Steel Reduces Quote 20 Percent on Some Stainless Plate," Wall Street Journal, Feb. 24, 1972, p. 4.

32/ "Steelmakers Cutting Discounts Five Points for Stainless Sheet," Wall Street Journal, March 31, 1972, p. 2.

33/ "Bethlehem Plans No '72 Price Rises on Milled Sheets," Wall Street Journal, April 14, 1972, p. 3.

In late November 1972, U. S. Steel announced a round of price increases, averaging 2.7 percent on items other than sheet and strip, to be effective January 1, 1973. The increases were in anticipation of increased demand. 34/ The Steel Committee of the N.A.P.M. commented in February 1973 that:

> Some of the other producers announced the same increases, some different increases and some no increases at all. This creates the unusual situation of several different price levels within some product lines and will require careful study on the part of buyers. The general opinion in the Committee seems to be that these increases were expected and will stick. There is also a feeling that competitive adjustments will be made where warranted . . . . Many buyers are beginning to feel that under the current arrangement, foreign prices do not, in fact, hold down domestic prices since they are tied to them. They are also beginning to feel that what is today's ever smaller spread may be tomorrow's premium as consumption surpasses capacity in this country. 35/

Probably even the Steel Market Committee did not anticipate the extent to which their prediction would be verified. A sustained boom in steel demand prevailed--beginning in November of 1972 and extending to October 1974.

Spurred by especially strong automotive demand, the boom first hit the flat rolled market. By April 1973, partly as a result of price controls, a shortage of steel appeared. Thus, mills began to allocate the available steel on non-price

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34/ "Price Moves Point to Strong, Improving Steel Market," American Metal Market, Nov. 27, 1972, p. 22.

35/ "The Steel Market," Bulletin of the National Association of Purchasing Management, Feb. 1973, p. 8.

criteria, rewarding regular customers with larger shares of the short steel. Moreover, the dropping of marginally profitable product lines was accelerated. 36/

In May of 1973, the Steel Market Committee reported:

> Equitably distributed, it (output) is probably not too far out of balance with the actual needs of the economy. However, it is not sufficient to take care of a tremendously inflated automotive demand and the booming demand for other products on top of attempts to build inventory. . . . According to most reports, foreign suppliers are not very interested in quoting. Those who are quoting are frequently at levels above domestic. The domestic mills, understandably, have to divvy up the available supplies among those who have been buying from them during the lean times. . . .37/

By May 1973, the boom spread to the remainder of the steel market with heavy steels such as heavy plates, structural shapes, oil country goods and pipe in short supply. 38/ The domestic boom coincided with a worldwide boom, so that foreign steel was generally available only at higher prices.

The across-the-board boom continued throughout 1973. In the face of Cost of Living Council price controls, a significant shortage of steel developed. Many products, such as rebar, were being sold by steel brokers at prices well above the

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36/ "Steel Summary," Iron Age, April 26, 1973, p. 101; "Sheet Steel Price Boost Seen Soon to Ease What Industry Contends is a Profit Squeeze," Wall Street Journal, May 7, 1973, p. 36.

37/ "The Steel Market," Bulletin of the National Association of Purchasing Management, May 1973, p. 3.

38/ "Steel Summary," Iron Age, June 7, 1973, p. 81.

mill price. 39/ Discounts off list virtually vanished and charges for "extras" were revised upward.

Commenting on these developments the Steel Market Committee in August 1973 stated:

> The industry is trying to improve its net by the elimination of "deals," revisions in extras, elimination of unprofitable products and customers. . . . [T]he once lowly rebar is so scarce that a form of black market seems to be developing as some brokers ask double the going mill price. . . . Foreign steel is still being delivered here but generally under long term contracts and only to very important customers. Prices generally seem to be above domestic for the material available. 40/

The Steel Market Committee's November 1973 report stated:

> The premiums now being paid for imports by the same people who were the low dollar buyers in the past should demonstrate that opportunism has two edges. . . . Apparently users are paying up to a third more for foreign because its all they can get and are being very quiet about it. . . .
>
> It is interesting that only one Committee member lists price as a major consideration. All others consider availability as their first concern. All say that price increases will cause no change at all in buying policy. 41/

In the first quarter of 1974, automotive demand dipped. Nonetheless, the full-blown boom continued. The demand for heavy steels was as strong as ever, and the demand for flat

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39/ "Mersick and Co. Chairman Asks: 'Where Is the Steel Going?'" American Metal Market, Oct. 19, 1973, p. 1.

40/ "The Steel Market" Bulletin of the National Association of Purchasing Management, Aug. 1973, p. 7.

41/ Ibid. Nov. 1973, p. 7.

rolled products from other industries was sufficient to consume mill production. Moreover, there were reports that the automobile industry was taking its allocation of sheet and reselling it at a premium. 42/ Automotive demand returned in the second quarter of 1974 and demand remained at a peak until October 1974. 43/

Many mills, including U. S. Steel, dropped their policy of freight absorption and the schedule for extras was revised upward so that it corresponded more closely with costs. 44/ Due to the strength of demand, steel mills were able to sell products of lower quality. This was a major factor in increasing the industry's yield of shipped to raw steel from 68.9 percent in 1972 to 75.2 percent in 1974 (see table 4.8). 45/

In their May 1974 Bulletin, the Steel Market Committee reported:

42/ "Steel Summary," *Iron Age*, April 22, 1974, p. 65; "Months Steel Output Sold in One Week," *Industry Week*, March 4, 1974, p. 56.

43/ "Steel Summary," *Iron Age*, April 22, 1974, p. 65; "Steel Summary," *Iron Age*, July 15, 1974, p. 81; "Steel Summary," *Iron Age*, Oct. 20, 1974, p. 85.

44/ "Price Increases Force Shifts in Steel Buying," *Industry Week*, June 3, 1974; p. 59; "Steel Price Boosts are Likely as U.S. Lets Firms Pass Along Soaring Costs of Scrap," *Wall Street Journal*, March 18, 1974, p. 7.

45/ "Steel Makers Raise Sights on Shipments," *Industry Week*, May 27, 1974, p. 52.

> Everyone expected the 30 percent to 40 percent auto slowdown in [f]irst quarter 1974 [to] make more sheets available for the general sheet using market. This has not happened. Automotive has continued to take the sheet allocated to them. They have shipped it to their overseas plants, sold some of it to brokers, and passed some of it along to their own subcontractors. . . . Little if any additional tonnage is being offered to the market. . . .
>
> (Foreign) Prices for long standing good accounts are apparently 30 percent to 50 percent above domestic with a rising trend. Steel for new accounts or sold by brokers might be double the domestic price or more. 46/

By August of 1974, with price controls lifted, the steel mills raised list prices by 30 percent to 40 percent. The Steel Committee reported in August 1974 that these price increases stuck. 47/

By the fourth quarter of 1974, demand began to weaken. It did not weaken uniformly, however, and modest price increases were announced in December 1974 for the two products in strongest demand: plates and shapes. 48/

Due to the differential impact of the scrap passthrough permitted by the Cost of Living Council, a multi-tiered list pricing schedule had developed in January 1974. 49/ However,

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46/ "The Steel Market," Bulletin of the National Association of Purchasing Management, May 1974, p. 6.

47/ Ibid. Aug. 1974, p. 7.

48/ "After Two Years Buyers are Back in the Drivers Seat," Iron Age, Dec. 9, 1974, p. 44.

49/ "Steel Summary," Iron Age, Jan. 14, 1974, p. 57; "Six More Steelmakers Lift Some Prices, Causing Rare Pricing Chaos in the Industry," Wall Street Journal, Dec. 31, 1973, p. 5

in the first quarter of 1975, firms, under demand pressures, were shaving prices to meet the lowest quotes of competitors. 50/ Price shaving by minimills was reported through the second and third quarters, while discounting appeared in the specialty steel markets. 51/

In testimony before the International Trade Commission, R. Simmons, president of Allegheny Ludlum, presented data on his company's delivered transactions prices of stainless cold rolled sheet in Chicago. These data show a cyclical trend: rising during the 1973-74 boom and falling during the 1975 contraction.

On the basis of reports from American Metal Market and the Wall Street Journal, Jondrow et al. [12] constructed an index of percentage discounts from list during the 1973-75 period. Jondrow et al. report the appearance of price discounts during 1975 on a composite index of steel prices constructed according to the source of steel. These data are reproduced below as table 4.7.

50/ "Softening of Steel Prices is Appearing on Some Steel Items Due to Easing in Demand," Wall Street Journal, Feb. 10, 1975, p. 2.

51/ "Some Small Steel Firms Offer Discounts to Cut Stocks, Boost Sales to Auto Market," Wall Street Journal, June 6, 1975, p. 3; "Price Cutting in Steel Develops; Demand Low," Journal of Commerce, July 3, 1975, p. 1; "Buyer Aware: How Lloyd Konrad, A Purchasing Agent, Wheels for Good Deals," Wall Street Journal, Oct. 7, 1975, p. 1.

TABLE 4.7

Estimated Percentage Discount or Premium on
Aggregate Steel Prices from Major Mill Price List

Quarter		Type of Steel Supplier				
		Major mill	Small mill	Import	Warehouse	Broker
		(Discount designated by minus sign)				
1974	I	0	24	42	30	102
	II	0	14	44	38	89
	III	0	16	18	37	65
	IV	0	12	3	40	8
1975	I	0	-8	-17	13	-4
	II	-12	-16	-15	-8	-38
	III	-13	-11	-11	-10	-33
	IV	-5	-17	-17	-8	-24

Source: Jondrow, Chase, and Gamble, "Forms of Competition in the Steel Industry," paper presented at the Meetings of the Econometric Society, Atlantic City, Sept. 16, 1976, pp. 7, 8. Their sources for 1975 discounts were reports in American Metal Market and The Wall Street Journal.

In addition, non-price concessions began to reappear. Steel companies began warehousing steel that buyers ordered but did not want delivered immediately. Delivery times for orders were cut where desired by buyers. Mills, which had dropped freight absorption, returned to the earlier policy and buyers received higher quality products.

After the experience of the previous boom, when the major mills allocated steel to their regular customers, buyers became very wary of accepting deals on steel from firms other than their regular suppliers. Thus, in order to establish good relations for the next boom, many buyers continued to purchase from their regular suppliers even when steel was available from others at a discount.

The reports of the Steel Market Committee summarized some of these 1975 developments.

February 1975:

> Since the November report, the steel market has changed from one of limited availability, to one in which most products are, or will soon be, readily available, and from a period when price was relatively unimportant to one in which price competition is beginning to work again. . . . Our prices are still the lowest in the world.

May 1975:

> Steel buyers have good memories. With few exceptions they are continuing to buy their reduced requirements on a proportionate basis from those suppliers who took care of their needs during the past several years. . . .
>
> There is a very strong feeling in the committee that we have turned the corner to a buyers' market and free competitive pricing is

directly and indirectly affecting the multi-tier pricing structure. Multi-tier pricing accommodations under competitive pressures have now spread to a wide variety of products [,] with the degree of adjustment contingent on demand and availability. . . .

Steel buyers. . .will no longer accept some of the poor quality and high handed treatment they have had to accept in the past two years.

August 1975:

Our members report only a minor interest in foreign steel this year as compared to 60 percent last year. It is felt that to generate a genuine interest for imports, the pricing advantage would have to be in the range of 15 percent under domestic prices.

November 1975:

We have a dramatic change in the market from premium prices (of foreign steel) early in the year to discounts in the fourth quarter . . . . [P]rices vary all over the ball park depending on product and location. 52/

In addition to sub rosa price cutting, another favorite method of responding to fluctuating demand is to offer items without charge during a contraction, and charge for them during a boom. These items include: absorbing freight systematically (i.e., establishing the f.o.b. mill price as the delivered price); charging less than actual costs for "extras;" warehousing or holding inventories without charge; raising the

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52/ "The Steel Market," Bulletin of the National Association of Purchasing Management," Feb. 1975, p. 5; May 1975, p. 7; Aug. 1975, p. 6; Nov. 1975, p. 7.

quality of the product (e.g., selling Class A sheet for Class B prices); and giving discounts for cash payments. 53/

The above, mentioned by the trade press, provide examples of these non-price adjustments to demand. Moreover, the investigation by the Council on Wage and Price Stability supports this study's conclusions regarding the cyclical response of steel mills to freight absorption, warehousing, varying product quality and the pricing of "extras" and surcharges [5, p. 42]. The Council's report [5] estimated the price equivalence of some of these non-price discounts during the 1974 boom. The elimination of freight absorption was estimated at 2.5 percent; cash discounts were reduced from 2 percent to 0.5 percent; increased storage and interest charges due to the reduction of warehousing were valued at 2 percent to 2.5 percent.

In addition, table 4.8 shows data on steel industry yields. Lower product quality was a factor contributing to the high industry yields during the boom years of 1973 and 1974. Industry yield decreased in 1975 and 1976.

Thus, list prices, as reflected by the Bureau of Labor Statistics data, move in a steady non-decreasing manner. The Stigler-Kindahl data reveal that prior to 1960 transactions prices moved in a manner similar to the BLS prices.

53/ For a report of developments on the pricing of "extras," see: "Why Steel is Pricing More for Extras," Business Week, July 12, 1976, p. 24.

TABLE 4.8

Yield of Finished Steel Products Per Net Ton of Raw Steel: United States

Year	Yield
1976	.699
1975	.685
1974	.752
1973	.739
1972	.689
1971	.723
1970	.690
1969	.665

Source: American Iron and Steel Institute, Annual Statistical Report, 1976.

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This study shows, however, that the Bureau of Labor Statistics data are not reflective of post-1967 actual prices on a cyclical basis. It concludes that actual post-1967 prices (after adjusting for such items as freight and extras) have risen and fallen with demand. Thus, it agrees with the report of the Council on Wage and Price Stability which concluded:

> The Council staff is concerned that the information on steel prices in the WPI fails to reflect actual price movements accurately. When steel is scarce, many transactions prices exceed significantly those reported by the BLS. In addition, recession causes a greater drop in prices than one would be led to believe from an examination of the WPI [5, p. 6].

International Synchronization of Steel Cycles

Before proceeding further in the anaylsis of cyclical steel pricing, it is necessary to obtain a firm idea of how demand varied in the major producing nations. Table 4.9 shows apparent consumption by area from 1955 to 1973.

From the data in this table it appears that the years 1955, 1960, 1964, 1969, 1973, and 1974 were international boom years, whereas 1958, 1962, 1971, and 1975 were international recession years. 54/ The business cycles in steel during the years 1954, 1961, 1968, and 1970 showed little international synchronization. The year 1970 is interesting regarding the U.S. There a domestic recession coupled with an expansion in the rest of the world resulted in a record year for U.S. exports.

European Pricing

The historical list (base) prices of steel products of the countries in the original European Community, and recent list price data of the countries in the enlarged community were examined. 55/ These data reveal a remarkable degree of list price stability. The overall tendency is for prices not to decline, and occasionally to increase.

54/ Friden's study [7] is a more detailed analysis of the synchronization of steel cycles for the years 1954-68.

55/ These prices are published in various issues of the Annual Yearbook on Iron and Steel by the Statistical Office of the European Community. A more complete set of list base prices is available in the European Economic Community's publication, Basis Prices.

TABLE 4.9

Apparent Crude Steel Consumption by Area: 1938-75

(Millions of metric tons)

Year	U.S.	Canada	Japan	EC a/	U.K.	Other b/ Western Europe
	Country or region					
1938	40.45	1.44	5.93	22.86	10.92	4.55
1955	102.36	5.04	7.18	42.65	18.80	11.55
1956	100.95	7.26	9.92	44.91	19.56	11.46
1957	97.18	6.79	12.67	47.32	19.21	12.33
1958	75.70	5.41	10.25	44.83	16.81	11.77
1959	87.37	6.20	15.06	48.23	17.35	13.90
1960	89.78	5.50	19.46	57.90	22.41	16.40
1961	89.90	5.88	25.77	58.64	18.83	17.65
1962	91.36	6.41	22.92	60.42	17.54	18.35
1963	102.40	7.12	24.68	62.10	19.79	19.08
1964	118.45	8.71	31.34	69.95	23.45	25.10
1965	128.39	10.51	28.81	66.82	23.25	22.15
1966	131.64	9.85	35.50	68.81	21.23	24.89
1967	126.30	9.24	51.22	71.17	21.26	25.54
1968	136.34	10.09	50.39	79.13	23.35	26.51
1969	137.18	10.72	62.17	92.09	24.58	32.25
1970	126.50	11.07	70.57	96.71	25.52	35.79
1971	127.66	11.99	57.70	85.02	20.20	31.64
1972	138.41	12.85	68.89	93.74	22.65	35.42
1973	149.60	14.15	87.18	98.94	24.72	38.33
1974	144.12	15.46	75.75	100.87	23.24	41.90
1975	116.82	13.18	64.74	74.30	21.54	35.67

a/ We use EC to denote the original six member nations.

b/ Other Western Europe denotes: Austria, Denmark, Finland, Greece, Ireland, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, and Yugoslavia.

Source: International Iron and Steel Institute, Projection 85; Metal Bulletin Handbook, 1975; and United Nations, Economic Commission for Europe, The Steel Market in 1975.

This pattern is exhibited to an extreme degree by the Luxembourg producers. The data reveal absolutely no price change on many steel products for a 10-year period between 1958 and 1968, after which list prices tended to increase, never to decline.

Although not as marked, the non-decreasing pattern of list prices is also true of the German and French producers. During the worldwide recession of 1958, the major producers of West Germany and France raised their list prices for virtually all products. The next most serious recession for the EC was in 1965; again, the major producers of West Germany and France held their list prices unchanged. The years 1961-63 are years of below average growth in apparent steel consumption for the EC. Yet the West German producers held their list prices fixed, while the French producers raised their list prices on Thomas quality steel. Again, in the 1971 recession, German list prices rose, while the French remained constant. During the 1975 recession, list prices did not decline. However, most producers listed "temporary rebates" on carbon steel products.

Unlike the major producers of the EC, the smaller Belgian steel producers exhibited aggressive list price cutting during recessions. Stegemann [30] concluded that during the years of depressed growth in steel demand in the EC--1963, 1965, 1966, and 1967:

> ... aggressive price cutting (by the Belgians) which reduced the price floor did take place. . . Whereas in the case of the other countries the VDMA data for each product generally reflect the pricing behavior of one major national producer or a coherent group of national producers, the lowest Belgian list prices for certain products are the result of considerably diverse pricing policies of individual firms or subgroups.

During the 1963-68 period, the Belgian list prices became the lowest in the EC for wire rod, merchant bars and heavy plate. 56/

Although not to the same extent as the Belgians, the producers of The Netherlands and Italy have also exhibited some list price flexibility. For example, list prices were lowered in both Italy and The Netherlands during the 1958 recession. During the recent recession of 1975, "temporary rebates" off list prices were granted by both Dutch and Italian producers on products such as hot rolled hoop and strip, merchant bars, and concrete reinforcing bars.

However, one must look beyond the monotonic non-decreasing list prices in the EC to transactions prices if one is to discern the pattern of EC pricing. Legally, no EC steel firm may sell steel at a given place for a price lower than the lowest delivered list price that has been quoted by any firm for that place. For example, if a French firm has quoted the

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56/ The data on Belgian relative list prices were calculated by Klaus Stegemann from data supplied by the Association of German Machinery Manfacturers (VDMA). See [30, ch. 3] for more detail on this subject.

lowest delivered price for Paris, a German firm may legally sell at a price below its own published delivered price, provided it is not below the French firm's quotation. Such sales are termed "alignment" sales. An EC steel firm may sell below its own quoted price by aligning on another EC firm's quoted price or on the delivered price of a firm from outside the EC. Selling at prices lower than the lowest quoted delivered price is illegal under the terms of the Treaty of Paris. 57/

During the 1963 recession in the European Coal and Steel Community (ECSC), steel producers made significant use of their alignment rights. The weighted average of the price reductions for all alignment sales by Community producers in 1963 is estimated at 30 to 35 percent [25, p. 227].

Since June of 1967, the EC High Authority has been collecting confidential data from steel producers on the modes of pricing certain important steel products. These data are compiled into summary statistics and are occasionally released. Table 4.10 shows data for the first quarter of 1970 (a boom), the second quarter of 1972 (contraction), and the second quarter of 1973 (a boom). For the three quarters in the table, sales moved cyclically: Sales at list rise during the boom quarters,

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57/ The "Treaty of Paris" is a name for the treaty that established the European Coal and Steel Community. The High Authority requires that alignment sales on the prices of a foreign supplier may be made only on the basis of an actual offer to an EC steel buyer. This latter point is explained in detail by Hans Mueller [19].

TABLE 4.10

Percent of Member Countries' Deliveries to the ECSC Market at Producers' Own List Prices

Quarter	Germany	France	Italy	The Netherlands	Belgium	Luxembourg	ECSC
1st Quarter 1970	63.2	31.5	62.7	32.7	26.8	34.3	54.7
2nd Quarter 1972	35.8	33.6	42.9	11.8	5.2	3.0	28.9
2nd Quarter 1973	52.7	31.7	53.7	16.8	8.0	1.4	37.7

Source: Klaus Stegemann, "Price Competition and Output Adjustment in the European Steel Market, 1954-75," table III-21, in press.

and sales at below list increase in the trough quarter. It is interesting to note that the country with the most inflexible list prices, Luxembourg, sells the least amount of its steel at its own list prices.

Moreover, price cutting below legal EC levels has occurred. The major German steel producers aligned themselves into joint sales agencies in 1966-67, after which the share of imports into the German market rose from the 15 to 20 percent level to over 30 percent in 1968. There were widespread reports of illegal price cutting in the German market; especially accused of price cutting were the Belgian and Italian producers. 58/ These illegal price cuts led to the issuance of a series of "temporary rebates" by the German joint sales agencies.

During the recession of 1975, deep and significant price cutting developed. Alignments on imports from Japan, Spain, and Eastern Europe permitted significant legal price reductions, and the price competition was depicted by some as severe. 59/ The French steel leader, Jacques Ferry, led a move to have the European Community declare a "manifest crisis" and establish minimum prices along with production cuts and import controls. However, the Germans maintained

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58/ See Stegeman [30, ch. 3] for a detailed account of this period.

59/ "On the Brink," Metal Bulletin, Nov. 18, 1975, p. 19; "Korf Calls for Price Discipline," Metal Bulletin, Oct. 10, 1975, p. 36.

strong opposition to Ferry's proposal and finally the market began to improve in 1976. 60/

In table 4.11, unit value data for selected steel products are presented. Similar data are published by the Statistical Office of the European Community (SOEC) for nine additional steel products. While the series suffers some limitations as a price index, it is the best publicly available indication of steel transactions prices within the European Community. To date these data are unavailable after 1973; however, the data in table 4.12 roughly indicate the trend in prices in recent years.

Table 4.12 presents data which depict internal and export prices on three steel products of the EC. As the OECD report stated, realized prices obtained by EC producers fell significantly after the 1974 boom, even though official list prices were not marked down to any extent.

List prices of many of the major EC producers have been sticky over the course of the business cycle. Through alignment sales, however, and sometimes illegal price cutting, transactions prices have fluctuated with demand over the cycle.

60/ "EC Steel Floor Price is Possible, Ferry Says," American Metal Market, Oct. 28, 1975, p. 1; "Iron and Steel in 1975: The Year of Recession," Metal Bulletin Monthly, March 1976, p. 29.

However, the EC did negotiate a "voluntary" export limitation from Japan. See "Steelmakers Obtain Approval to Organize Cartel for EEC," Japan Economic Journal, Dec. 30, 1975, p. 12.

TABLE 4.11

Average Prices of Steel Products Sold Within the European Community: 1954-73 (Dollars per metric ton)

Year	Product (carbon steel)				
	Wire rods	Bars	Hot rolled sheets	Cold rolled sheets	Plates
1973	158.9	168.5	138.9	193.3	173.5
1972	130.2	133.6	115.2	163.3	147.4
1971	126.4	138.5	115.5	157.1	147.3
1970	131.6	147.7	116.3	161.9	155.5
1969	100.1	118.0	97.6	134.4	123.2
1968	92.6	100.0	91.2	126.6	105.4
1967	93.1	103.3	94.4	132.6	109.7
1966	94.7	104.2	96.6	134.9	108.3
1965	98.2	106.6	98.6	134.0	111.8
1964	94.5	106.5	101.8	134.9	112.1
1963	94.5	101.8	103.8	134.4	113.3
1962	98.7	102.9	106.7	136.3	119.4
1961	104.7	104.9	115.8	140.6	122.1
1960	106.5	103.8	119.9	139.5	118.6
1959	97.9	95.2	115.2	134.5	112.4
1958	102.0	102.6	124.7	149.0	131.3
1957	107.0	110.8	126.0	150.0	139.8
1956	103.2	105.9	118.5	144.3	124.7
1955	96.7	96.8	120.4	142.5	112.1
1954	83.9	86.0	118.3	133.8	101.9

Source: Statistical Office of the European Community, Yearbook of Iron and Steel, 1974 and 1966.

TABLE 4.12

Indexes of EC Transactions Prices for Three Steel Products: 1974-77

	Indices			
	Nov. 1974	Nov. 1975	Nov. 1976	Feb. 1977
1. Joists				
Average ECSC market price	100.0	77.7	87.4	82.5
Export price	100.0	65.0	75.2	68.4
2. Reinforcing rounds				
Average ECSC market price	100.0	55.3	61.0	56.1
Export price	100.0	53.8	54.6	53.1
3. Plates				
Average ECSC market price	100.0	54.8	58.1	53.2
Export price	100.0	47.1	47.1	44.1

Source: Organization for Economic Cooperation and Development, "The Situation in the Iron and Steel Industry," June, 1977, which obtained the data via EC submissions.

Japan

In Japan, as in Europe and the United States, there is a significant difference between list prices and transactions prices of steel products. However, unlike the situation in the other countries, list prices until recently were arrived at jointly by 43 steel producers under the guidance of the Japanese Ministry of International Trade and Industry (MITI). These companies met monthly with their trading companies and, except for slight variations, announced uniform prices [14, pp. 5, 6] and [9, pp. 36-39]. This system, known as the "kokai hanbai seido" or "kohan" system, for short, was first established in June 1958 in an effort to reduce price cutting during recessions [13, p. 103] and [9, pp. 36, 37]. These prices are termed "joint open sales prices" (JOSP). Prices for large users such as the automobile industry are given separately. In addition, the industry quotes "joint open sales standard prices" (JOSSP). The JOSSP are intended to represent the prices steelmakers consider necessary for longrun industry growth. <u>However, these JOSP and JOSSP have shown extreme inflexibility and are above transactions prices except during periods of strong demand</u>.

It should be understood that the Japanese distribution system differs markedly from that of the U.S. In the U.S., approximately 80 percent of the steel is sold directly by the steel company to the end user. 61/ Japanese steel companies sell approximately 90 percent of their steel products indirectly through middlemen. 62/

61/ According to the American Iron and Steel Institute's <u>Annual Statistical Report</u> in 1975, 80.5 percent of the steel was sold by steel mills to end users and 19.5 percent was sold to steel service centers and distributors.

62/ See the estimate of Kawahito [13, p. 98], or Japan Iron and Steel Federation, <u>Tekko Tokei Yoran</u>, 1976, pp. 107-109 (in Japanese), for the raw data from which this ratio is computed.

Virtually all of these indirect sales are made through intermediary companies known as trading companies. Trading companies market almost all Japanese steel exports and the bulk of domestic sales. The trading companies actually take possession and reship to the end user about 20 to 25 percent of the steel which they purchase. 63/ In addition, there are small steel service centers for local demand who usually purchase their steel from the trading companies. The f.o.b. prices at which the steel service centers purchase their steel from the trading companies are called "market prices." It is estimated that about 5 percent of total transactions occur at these "market prices," with such transactions rising as a percentage of the market during contractions. Sales not made through trading companies are generally those of the Big Five steel producers to a large buyer of steel; e.g., sales to a Japanese automobile manufacturer like Nissan.

The major functions of the trading company, as intermediary between steel producer and domestic end user, are threefold: finance, delivery, and product finishing. 64/ Generally speaking, trading companies are involved most frequently in transactions between steel producer and end user

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63/ Kawahito [13, p. 99]; and Japan Iron and Steel Federation, Tekko Tokei Yoran, 1976.

64/ In addition to the information from public sources cited in this section, considerable information has been obtained from our interviews of steel industry and government steel specialists in Japan.

when the consuming firm has a high debt-equity ratio. These consuming firms find the credit extended by the trading companies attractive. 65/

Most contracts between steel producers and trading companies involve the use of the so-called "uchikosen" system, by which the price of the steel is first determined through direct negotiation, and then the commission of the trading company follows as a predetermined proportion of the sales price. Trading companies claim that competition among them prevents the commission from exceeding competitive rates 66/; the commission is currently about three percent. The nature of contracts between trading companies and steel consuming companies change substantially with cyclical fluctuations in the economy. During recessions, particularly in times of tight credit, trading companies frequently extend the financing period under which end users may pay for the

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65/ For example, Japanese Fair Trade Commission statistics reveal that about 100 percent of Mitsubishi Heavy Industries' steel purchases are handled by trading companies, compared to about 50 percent of Nissan's transactions. Nissan has a relatively high proportion of internal finance. As an exception to the pattern, Matsushita Electric has 100 percent of its steel transactions handled by trading companies, despite its relatively low debt-equity ratio. Matsushita uses trading companies, not because of the financing they provide, but because of the services they render in cutting producer steel to sizes meeting Matsushita's distinctive requirements.

66/ For a good analysis of this subject, which concludes that the commission fees are not excessive, see Krause and Sekiguchi [15, pp. 394-397].

steel. Trading companies usually pay steel producers cash for products received and sell them on credit to end users. 67/

Thus, Japanese steel producers are selling steel either to large end users or to trading companies (who are even larger buyers); one would surmise, then, that the kohan system of prices does not generally characterize the transactions prices at which the Japanese steel producers sell their products. In fact, it is known that the prices at which steelmakers sold their steel to the trading companies were arrived at privately outside the large monthly meetings [14, p. 6].

Some indication of the extent to which steelmakers discount the list prices to their trading companies is given in table 4.13. The year 1968 was a recession year for steel demand, and 1969 and early 1970 was a boom period. Yawata Steel offered discounts of approximately 20 percent off its list price (JOSP) in 1968, but the discounts narrowed in 1969 and were virtually eliminated on plate and hot rolled sheet in early 1970.

In the first three to four years after the formation of the kohan system, the direction of MITI helped to preserve its meaningfulnes. In the recession years of 1962 and 1965, however, transactions prices were so significantly below list prices that the list price system virtually collapsed.

67/ For additional details on this subject see, Krause and Sekiguchi [15, pp. 389-397]; [13, pp. 97-101]; and Schneider [27, pp. 1-12].

TABLE 4.13

List and Transactions Prices of Steel Products, Between Manufacturers and Their Distributors

(1,000 Yen per metric ton)

Month	Plates			Hot rolled sheet			Cold rolled sheet		
	JOSSP	JOSP	YAWATA	JOSSP	JOSP	YAWATA	JOSSP	JOSP	YAWATA
1968									
June	46.0	44.0	32.5	52.0	47.0	33.0	56.0	55.0	
July			33.0			34.5			
Aug.									43.5
Sept.			35.0			36.5			44.5
Oct.			37.0			38.5			46.0
Nov.									46.5
1969									
May						40.0			47.5
June			38.0			41.0			48.0
Aug.			40.0			43.0			49.0
1970									
Feb.						46.0			51.0
March			43.0						

Source: Kiyoshi Kawahito, "The Japanese Steel Industry: Prices and Costs," August, 1974, where it was reprinted from Tekko Shimbum Sha, Tekko Nenkan, various issues.

As a result of the low level of steel prices during the 1962 and 1965 recessions, MITI intervened. "Administrative guidance" and production-cut agreements on raw steel production were adopted through open discussion. 68/

As indicated in table 4.14, MITI called for production cutbacks during the 1975 recession. The eight integrated companies were called upon, and they submitted quarterly production plans to MITI. The move by MITI was intended to reduce inventories and help maintain prices. In the case of merchant bars, a formal "recession cartel" was implemented.

68/ See Kawahito [13, p. 109]. During the 1962 recession executives of MITI and the Japanese Iron and Steel Federation administered a monitoring committee. Monitoring staff were stationed at 53 plants of 28 companies. During the 1965 recession a monitoring committee was formed in August. However, the well-known "Sumitomo Incident" in 1965 represents an example of the difficulties in enforcing such agreements: According to Imai [9, p. 39]:

> When Yawata tried to exercise its leadership by cutting crude steel production and raising steel prices, Sumitomo Metal Industries resolutely opposed it because of its discontent with the assigned quota. The MITI intervened in the dispute, [a conference between the Minister of MITI and the president of Sumitomo was held on December 27, 1965] threatening Sumitomo by hinting at a cut in its coal quota.

Moreover, contracts between large end users and large steel producers were also negotiated separately. These big producer-big user relationships were characterized by long-term contracts, establishing relatively stable prices.

TABLE 4.14

MITI Guideposts for Steel Production and Shipments: 4th Quarter 1975

Rolled ordinary steel mill products	Revised 4th Quarter Guidepost (1,000 metric tons)	Percentage Change from	
		3d Qtr '75	4th Qtr '74
Total shipments	18,020	-8.7	-16.4
Domestic shipments	12,820	-5.2	- .8
Exports	5,200	-16.8	-39.7
Production	17,270	-13.3	-20.3
Stocks, end of period	7,568	- 7.9	+ 2.8
Crude steel production	23,340	-11.2	-18.5

Source: Ministry of International Trade and Industry; obtained through U.S. State Department, Embassy Tokyo, unclassified document number A-551, December 5, 1975.

According to MITI, the cartel's production cut stipulations succeeded in reducing inventories of merchant bars. 69/

Under production "guideposts," quotas are not allocated among companies. MITI's "guidepost" is essentially its quarterly demand forecast. Since August 1966, companies, voluntarily submit their own quarterly production plans to MITI on the basis of the guidepost. MITI then publishes these reports.

On the other hand, the steel industry must file an application with the Japanese Fair Trade Commission (JFTC) to obtain a "recession cartel." This obligation is based on the Antimonopoly Act. JFTC regulations, with respect to the application and hearing procedure under the application, stipulate that supporting cost and price data must be turned over to the JFTC at the time of application for a recession cartel. 70/

Summarizing these developments with respect to the openly quoted joint list price system, Imai [9, p. 39] has stated:

69/ "Lower Japan Final Quarter," Metal Bulletin, Oct. 10, 1975, p. 39; "Output Down and Costs Up," Metal Bulletin, Dec. 5, 1975, p. 40; see, also, the metals section in various issues of the Japan Economic Journal during this period.

70/ If a recession cartel is approved, the participants set up a conference which establishes quota allocations among members and monitors the agreement. Quotas are generally allocated on the basis of past manufacturing and sales volume. The participants must submit to the conference actual monthly manufacturing and sales data along with supporting documents; the conference is empowered to impose penalties on firms which violate the quota.

> From 1960 on, when major steelmakers began lowering actual prices by offering rebates and nonmembers of the cartel continued to increase their market shares, the kohan prices gradually became unenforceable. . . . [T]he system gradually lost its force and turned into a price reporting system.

Recently, partly as a result of the antimonopoly laws, the kohan system has ceased functioning even as a price reporting system.

For a systematic treatment of cyclical pricing in Japan, table 4.17 presents data obtained from Metal Bulletin on steel prices in Japan. These prices are Metal Bulletin's assessment of small merchants' buying prices. One observes that compared with the associated trough, prices rose during the booms of 1973-74, 1969 and early 1970, and 1967. Metal Bulletin began publishing its assessment of Japanese small merchants' prices in 1965; the data in table 4.15 for 1961-64 are "market prices" in Tokyo reflecting exchanges between trading companies and service centers.

Table 4.16 presents the Bank of Japan indexes of iron and steel prices and all prices of wholesale commodities. The Bank of Japan index reflects both the JOSP and the market prices. Thus it exhibits less price flexibility than actual prices.

Table 4.17 presents domestic unit value data of five steel products. Both the Bank of Japan index and the unit value data reveal a slight decline in steel prices within Japan from 1961 to 1972.

TABLE 4.15

Japanese Domestic Prices for Selected Steel Products

(1,000 Yen per metric ton with dollars per metric ton in parentheses)

Date	Product							
	Reinforcing Rounds		Medium Angles		Heavy Plates		Cold Rolled Sheet	
8/25/77	51	(193)	50	(189)	68.5	(259)	79	(298)
8/25/76	57.5	(198)	66	(228)	69	(238)	69	(238)
3/24/76	55	(190)	63	(217)	65	(224)	77	(266)
11/27/75	41.5	(143)	50	(172)	49.5	(170)	64	(221)
6/25/75	52	(179)	55	(188)	51.5	(176)	62	(212)
6/25/74	86	(294)	91	(312)	80	(274)	76	(260)
7/11/73	57	(210)	62	(229)	62	(229)	64	(236)
7/12/72	33.5	(111)	36.5	(120)	45.3	(150)	51	(168)
7/09/71	32.8	(95)	34.5	(99)	37	(107)	32	(92)
7/14/70	47.5	(133)	43	(120)	39.5	(110)	49	(137)
1/13/70	56	(156)	59	(165)	54	(151)	54	(151)
7/08/69	34	(95)	41	(115)	41.3	(115)	50	(140)
6/22/68	28.3	(79)	32	(89)	33.5	(93)	43	(119)
6/24/67	39	(108)	40	(110)	38	(105)	46	(127)
7/05/66	31.5	(87)	32.5	(90)	43.5	(120)	53	(146)
8/20/65	31.5	(87)	33.5	(93)	35.5	(98)	45.5	(126)
1964	33	(91)					50	(138)
1963	31	(86)					48.5	(134)
1962	30	(83)					46	(127)
1961	37	(102)					50	(138)

Source: Metal Bulletin for the years 1965-77; Bureau of Statistics, Office of the Prime Minister, Monthly Statistics of Japan, for the years 1961-64 (data for 1961-64 not strictly comparable with the data for later years); Federal Reserve Bulletin for exchange rates.

TABLE 4.16

Wholesale Price Indexes in Japan, All Commodities and Iron and Steel: 1952-75

(1970 = 100)

Year	All Commodities	Iron and Steel
1952	87.3	103
1953	87.9	95
1954	87.3	84.2
1955	85.7	90.5
1956	89.5	117.9
1957	92.2	124.9
1958	86.2	98.1
1959	87.0	100.8
1960	88.0	98.8
1961	88.9	97.8
1962	87.4	90.1
1963	89.0	89.4
1964	89.2	90.1
1965	89.8	88.8
1966	92.0	90.4
1967	93.7	92.8
1968	94.5	86.7
1969	96.5	91.9
1970	100.0	100.0
1971	99.2	93.6
1972	100.0	95.9
1973	115.9	110.5
1974	152.2	146.0
1975	156.8	141.0
1976 March	162.6	150.8
June	164.9	155.4
Sept.	168.0	163.6

Source: Bureau of Statistics, Office of the Prime Minister of Japan, <u>Monthly Statistics of Japan</u>, November 1976; and Bank of Japan, <u>Hundred Year Indexes</u>.

TABLE 4.17

Average Domestic Prices of Selected Steel Products in Japan: 1961-72

(1,000 Yen per metric ton)

Year	Product				
	Shapes	Bars	Wire Rods	Plates	Cold Rolled Sheets
1972	41.7	31.7	38.5	36.5	40.3
1971	39.1	39.0	39.2	35.1	40.1
1970	44.7	44.1	40.0	35.8	40.4
1969	38.3	34.7	37.0	33.4	39.5
1968	36.3	31.8	35.1	31.9	39.5
1967	39.3	36.5	36.5	36.2	41.1
1966	37.6	33.9	35.6	36.5	43.4
1965	36.7	33.8	35.4	36.6	44.5
1964	39.5	33.1	36.7	36.9	47.2
1963	37.1	31.5	35.5	38.4	46.7
1962	36.7	33.7	37.6	37.7	44.6
1961	44.2	38.3	41.8	45.0	51.0

Source: Kiyoshi Kawahito, "The Japanese Steel Industry: Prices and Costs," August, 1974, Kawahito's sources were the Ministry of International Trade and Industry, Kogyo Tokei Hyo; and the Japanese Iron and Steel Federation, Tekko Tokei Jiho.

It appears that list prices in Japan, as measured by the JOSP, are extremely inflexible. However, the evidence reveals that transactions prices vary cyclically.

III. INTERNATIONAL DIFFERENCES IN THE PRICING POLICIES OF THE MAJOR PRODUCING NATIONS

Cyclical Pricing

This study has concluded that with respect to domestic prices all the major producing nations have list prices that could be characterized as "administered." However, the domestic transactions prices have moved in a cyclical manner in all of the nations studied. Thus, with respect to domestic cyclical pricing, one finds that the pricing policies of the steel industries in the major producing nations are similar: actual prices are responsive to demand while list prices are not. 71/

Comparisons of Domestic Prices

Table 4.18 presents data on the domestic prices of bars, plates, and cold rolled sheets in the U.S., EC, and Japan. 72/ Throughout the 1960's the prices were highest in the United States. From 1968 until 1972, the Japanese prices were the

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71/ It should be emphasized that cyclically flexible pricing does not necessarily imply competitive pricing, since profit maximizing pricing by monopolists and oligopolists will generally lead to flexible pricing. For theoretical and empirical discussions of this matter see, respectively, [26, p. 305] and P. David Qualls, "Market Structure and Price-Cost Margin Flexibility in American Manufacturing, 1958-70," Bureau of Economics Working Paper Number 1, Washington, D.C.: Federal Trade Commission, 1977.

72/ All of these prices, except the Japanese for the 1970's, are unit values; i.e., they are the average values of all actual transactions in the product line for the years.

TABLE 4.18

Comparison of Domestic Steel
Prices in U. S., EC, and Japan: 1956-77
(U. S. dollars per metric ton)

Year	Bars			Cold Rolled Sheet			Plates		
	U.S.	EC	Japan	U.S.	EC	Japan	U.S.	EC	Japan
March 1977	239		178	347		272	350		229
May 1976	234		181	307		272	322		227
1975	259		179	295		212	312		176
1974	262		294	273		260	268		274
1973	160	169	210	204	193	236	214	174	228
1972	141	134	111	195	163	168	202	147	150
1971	140	139	95	183	157	92	187	147	107
1970	134	148	124	176	162	113	177	156	100
1969	127	118	97	162	134	111	160	123	94
1968	127	100	89	162	127	111	160	105	89
1967	127	103	102	158	133	115	153	110	101
1966	146	104	95	157	135	122	150	108	103
1965	140	107	95	156	134	125	148	112	103
1964	115	107	93	156	135	132	148	112	103
1963	117	102	88	155	134	131	144	113	108
1962	128	103	94	152	136	125	145	119	106
1961	135	105	107	152	141	143	146	122	126
1960	142	104		154	140		146	119	
1959	143	95		155	135		139	112	
1958	144	103		153	149		142	131	
1957	138	111		148	150		137	140	
1956	133	106		138	144		125	125	

Sources: U.S.A.: Unit values obtained from the U.S. Department of Commerce, Bureau of the Census, Current Industrial Reports, 1956-75. The data for 1976 (and the 1975 bar price) are the 1975 (1974) numbers adjusted according to the BLS indexes for the respective products. EEC: Statistical Office of the European Community, Yearbook of Iron and Steel, 1974 and 1966. Japan: Metal Bulletin for 1971-77, Kiyoshi Kawahito, "The Japanese Steel Industry: Prices and Costs," August 1974 for earlier years. Kawahito's sources were the Ministry of International Trade and Industry, Kogyo Tokei Hyo and the Japanese Iron and Steel Federation, Tokko Tokei Jiho.

lowest. Since the beginning of 1972, no producing area dominates or is dominated by another with respect to having the lowest domestic prices. All areas have had the lowest domestic prices on some of the products in some years after 1971.

Comparisons of Export Pricing

Explanation of the Data Sources. Table 4.19 contains the relative prices of steel exports in terms of domestic steel prices. The "relative export price" of a steel commodity is defined as its export price divided by its domestic price. The data used for domestic prices are those in table 4.18. The sources we employed for export prices were as follows:

For the United States unit values were used; they were obtained from the U.S. Department of Commerce, Bureau of the Census, publication FT 410 U.S. Exports: Commodity by Country. 73/ The bar product selected was concrete reinforcing bars, while uncoated plates was the plate choice. In all cases for all countries domestic and export, carbon steel products were selected.

For the EC, the unit values used were for steel exports published in the Statistical Office of the European Community's (SOEC) biannual Yearbook of Iron and Steel. This was the same source employed for domestic prices in the EC.

73/ The unit value (or average value) of a commodity means the total value of its sales divided by the total quantity of its sales.

TABLE 4.19

Relative Price of Steel Exports by Product and Country
Export Unit Value Divided by Domestic Unit Value (or Price)

Year	Bars			Cold Rolled Sheet			Plates		
	U.S.	EC	Japan	U.S.	EC	Japan	U.S.	EC	Japan
3 Quarters 1976	.94		1.06	.99		1.08	1.07		.98
Year: 1975	1.12		1.21	1.31		1.17	1.08		1.46
1974	1.13		1.04	1.12		1.11	1.14		1.03
1973	1.35	.94	.90	1.04	.87	.83	.97	.91	.70
1972	1.11	.88	1.13	.81	.85	.89	1.02	.90	.83
1971	1.17	.86	1.19	.96	.90	1.46	1.27	.94	1.07
1970	1.13	.87	1.03	.96	.98	1.28	1.10	1.02	1.21
1969	1.16	.82	1.15	.96	.97	1.10	.96	1.00	1.05
1968	1.30	.89	1.20	.94	.91	1.05	1.34	.99	1.02
1967	1.17	.87	1.13	1.03	.89	1.05	1.53	.99	.99
1966	1.06	.87	1.06	1.06	.88	.97	1.52	.97	.93
1965	.99	.88	1.07	1.10	.91	.98	1.33	1.01	1.02
1964	1.24	.87	1.05	1.10	.97	.98	1.25	1.01	1.00
1963	1.23	.86	1.08	1.12	.96	.97	1.21	.93	.85
1962	1.13	.91	.99	1.11	.98	1.03	1.34	.95	.94
1961	1.10	.96	1.02	1.13	1.03	1.03	1.25	.98	.92
1960	1.12	1.03		1.12	1.25		1.32	1.04	
1959	1.15	.95		1.14	1.13		1.43	.99	
1958	1.12	.94		1.15	1.09		1.15	1.06	
1957	1.06	1.09		1.17	1.10		1.18	1.24	
Average for column	1.14	.91	1.08	1.07	.98	1.06	1.22	1.00	1.00

Source: See text.

For Japanese export prices we used the data available in the publication The Summary Report: Trade of Japan. This is a Ministry of Finance document published by the Japan Tariff Association.

Thus, virtually all the data are in unit values. 74/ The selection of unit values was made for two fundamental reasons: First, in general, unit values are the best approximation available for steel prices. On the theoretical level, products such as concrete reinforcing bars or cold rolled carbon sheets are standardized products compared with most finished products. They should, therefore, be subject to fewer product mix difficulties than other unit value indexes of finished products.

On the empirical level, the index of steel export prices of continental European producers published in Metal Bulletin (and reprinted in a number of statistical publications) is widely regarded as an excellent source of price data. The data are obtained confidentially by Metal Bulletin correspondents on the basis of actual prices and transactions. 75/ However, the Wage and Price Stability Council's A Study of Steel Prices [5, pp. 44, 45] has shown that unit values taken from

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74/ The exception is recent Japanese domestic prices, for which unit value data are unavailable.

75/ For example, see the assessment of these data in the annual statistical publication of the Organization for Economic Cooperation and Development entitled The Iron and Steel Industry, and in Kravis and Lipsey [16, p. 214].

U. S. Customs data follow the Metal Bulletin price series with a lag of several months. Thus the Council's comparison leads to the conclusion that unit values of steel exports reflect actual steel export prices fairly well, provided that one adjusts for the several months' lag in unit value indexes.

A second reason for selecting unit values throughout was to maintain comparability. Generally speaking, no better source was available. However, the Metal Bulletin index of European export prices is a better source for actual prices than the SOEC index of unit export prices. No source comparable to Metal Bulletin is available, however, for domestic European prices. Therefore, had the Metal Bulletin data been chosen, the relative export prices of the EC would have contained biased fluctuations because the export index is more responsive to actual prices than the SOEC domestic index. Consequently, SOEC unit value indexes were used for both EC export prices and domestic prices. In the case of Japan, this difficulty could not be avoided for recent years. The unit value data are unavailable, so Metal Bulletin's assessment of Japanese domestic prices for the 1970's were used.

Tests and Analysis of Export Pricing Data: Dumping. Recently, a number of authors have alleged that foreign producers "dump" steel. It is argued that during recessions, Japanese and European producers export steel at low prices compared with their home markets, but during booms steel is exported at high prices compared with their home markets. For the 1955-67 period, Lennart Friden [7] computed relative export prices for selected steel products in a manner analogous to that used in table 4.19. He found that the United States was the only country whose steel industry did not price its exports below its domestic prices at any time. Friden concluded that other countries have a dual pricing structure with exports priced both above and below domestic prices, depending on the time period. Thus, the Friden data appear to support the contention of the American Iron and Steel Institute:

> The Japanese labor system, like that in Europe, has the effect of making a large part of labor costs fixed costs. In the past, this has resulted in continuing pressure on the Japanese steel industry to maintain operations by exporting at low prices during periods of weakening domestic steel consumption [2, p. 19].

The view that import prices fluctuate in a cyclical pattern is also stated in Paul Marshall's summary of the steel pricing symposium held by the Council on Wage and Price Stability:

> The costs of relying on imports for a significant portion of domestic supply are most obvious during a period of worldwide shortages. Import prices move above domestic prices [6, p. II-8].

Moreover the recently released study for the American Iron and Steel Institute by Pifer, Marshall, and Merrill (PMM) [23, p. 21], claims to have found evidence that:

> . . . the Japanese have aggessively manipulated export prices in order to sell steel in the U.S. market. In times of shortage, very sharp premiums have been extracted from U.S. customers; in times of surplus capacity, prices have been reduced precipitously to increase export volume.

The PMM study made a fundamental error in its cost estimation procedure that invalidates its results. The authors inappropriately compare their estimated costs of making carbon steel products, with the prices of all steel products. This leads to an overstatement of Japanese costs in relation to prices by an amount which may dominate any of the "dumping" effects they allege. 76/ Nonetheless, the PMM study is another one that expresses concern about the cyclical pricing of Japanese and European exports.

The essence of these arguments is that the Japanese and Europeans rely on exports, by cyclically varying their export prices more than their domestic prices, to smooth out cyclical fluctuations in demand. Thus, it is alleged that these countries have a dual pricing structure with exports priced higher or lower than domestic products, depending on whether there is a domestic boom or recession; i.e., there is a cyclical pattern to the dumping.

The Friden study [7], cited above, purports to have found evidence of a dual pricing structure. However, there are a number of limitations with respect to using the Friden data for the hypothesis that is being examined here: (1) Friden's data terminate in 1967; (2) no statistical analysis or tests on the data were preformed; and, most

76/ For the details of this argument, see the appendix to this chapter.

importantly, (3) Friden did not separate the time periods into boom and recession periods so that relative export prices might be examined in relation to their hypothesized values. Thus, while Friden found limited evidence of dual pricing structures in countries other than the United States, he did not find evidence of a *cyclical* pattern in the dual pricing structure.

To elaborate on point (3), this study designates the export price of a steel commodity divided by its domestic price as the relative export price. The *cyclical dual pricing structure* hypothesis asserts that relative export prices rise in booms and fall in contractions. Consider as an example the years 1974 and 1975. Since 1974 was an international boom year in steel demand, and 1975 was an international recession year, the *cyclical* dual pricing structure hypothesis asserts that relative export prices would be higher than average for 1974, and lower than average for 1975. If in a contraction year, such as 1975, we found relative export prices *above* average, that would be evidence tending to disconfirm the *cyclical* dual pricing structure hypothesis. It is, therefore, necessary to examine first whether a country is experiencing above or below average steel demand in a given year. If steel demand is above (below) average, then the cyclical dual pricing structure hypothesis asserts that relative export prices will be above (below) average.

For the purpose of analyzing the cyclical dual pricing hypothesis, a new variable for each country and each product was developed. For a boom year, this variable is defined as the relative export price for that year minus the sample average for all years. For a contraction year, it is defined as the average for all years minus the relative export price for that year. The cyclical dual pricing hypothesis alleges that these numbers are positive for boom years and contraction years. Take Japanese carbon steel bars as an example.

The procedure calls for the following definitions:

J_t^B = Japanese relative export prices of bars in the year t

$\bar{J}^B$ = the average of Japanese relative export bar prices of the years in the sample, i.e.,

$$\bar{J}^B = \frac{1}{16} \sum_{t=1961}^{1976} J_t^B$$

and

$$\overset{*}{J}{}_t^B = J_t^B - \bar{J}^B \qquad t \in B$$

$$\overset{*}{J}{}_t^B = -[J_t^B - \bar{J}^B] \qquad t \in R$$

where B = the set of all years in the sample which are above average years of steel demand and R = the set of all years in the sample which are below average years of steel demand. The cyclical dual pricing hypothesis predicts that $\overset{*}{J}{}_t^B$ is positive in boom years and contraction years.

Assume that ($\overset{*}{J}{}^{B}_{1961}, \ldots, \overset{*}{J}{}^{B}_{1976}$) is a random sample from an underlying population that is normally distributed with unknown variance. The cyclical dual pricing hypothesis predicts that the mean of this population is greater than zero.

A generalized likelihood ratio test for this hypothesis was employed. This test may be reduced to a t- statistic. 77/ Nine separate tests were performed: one for each of the three carbon steel products for each of the three regions.

The results are presented in table 4.20. The numbers in the table represent the estimated values of the t-statistic appropriate for the particular test. A high and positive value of the t-statistic tends to confirm the hypothesis that the mean is positive; i.e., that there is cyclical dual pricing. Conversely, negative values tend to disconfirm the cyclical dual pricing hypothesis.

At significance levels of .10 or lower the data call for rejection of the hypothesis of cyclical dual pricing--in all nine cases. 78/ Significance levels higher than .10 are considered poor tests because of an unacceptably high probability of accepting the alternative hypothesis when the null hypothesis is true. Nonetheless, at the significance level of .25, one

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77/ For a more detailed discussion of the procedure see: Hogg and Craig [8, ch. 10, section 1], and especially Mood, Graybill, and Boes [18, pp. 428-429].

78/ The significance level of this test is the probability of accepting the hypothesis that there is cyclical dual pricing if in fact there is none.

would accept the cyclical dual pricing hypothesis for EC bars and plate, and U.S. bars. This study concludes that the data do not support the hypothesis that Japan, the European Community, or the United States prices its steel products in a cyclical dual pricing manner. 79/

Explanation of the Results. The hypothesis of greater relative export price variability for the Japanese and Europeans emanated from the assumption that they have a larger share of fixed costs. This in turn assumed their labor costs were fixed and that the Japanese debt-equity ratios imposed significant fixed costs on the Japanese.

TABLE 4.20

Result of Likelihood Ratio Tests
for Cyclical Dual Pricing Hypothesis

Estimated values of the *t*-statistic

Product (carbon steel)	Country		
	Japan	E.C.	U.S.
Bars	-1.72	.742	1.206
Cold Rolled Sheet	- .174	.254	- .339
Plates	- .309	.977	.110

Source: See text.

79/ In fact, the negative t-values for Japan (as displayed in table 4.20) indicate that, if anything, the cyclical effect goes the other way for Japan--higher relative export prices in contractions and lower relative export prices in expansions. Again, however, except for bars, this effect is not statistically significant at conventional levels.

However, the proportion of Japanese employees who are "contract" employees has been rising in the past ten years. There is now more than one contract employee for every two regular Japanese steelworkers. 80/ These "contract" employees are not considered regular employees of the steel firm as they are employed by a subcontractor. Thus, the steel firms can, and in fact do, lay off these workers in recessions.

In addition to the variability in labor costs provided by contract labor, a new element of Japanese labor cost variability has appeared since July, 1975. A special form of unemployment compensation is now available to depressed industries on an economywide basis since the passage of the Employment Adjustment Assistance Law. These unemployment compensation funds, known as "Koyo Chosei Kyufukin," pay one-half the salary of the worker for layoff days in the case of large firms and two-thirds the

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80/ The most detailed data available on this subject is compiled by the Tekkororen Steel Workers Federation in their publication Rodo Handbook (annual in Japanese). Data for the proportion of workers who are subcontracted on a plant by plant basis for the major Japanese steel firms are published there. On the basis of these data it appears that contract labor has significantly increased in recent years reaching 57 percent of regular employees (or 36 percent of total employees) by December 1973.

The estimates of the Bureau of Labor Statistics, Office of Productivity and Technology, have also shown a rise in the proportion of Japanese contract employees. Their unpublished estimates are that contract workers represented between 43 and 65 percent of regular employees in 1976 compared with 24 to 36 percent in 1964. (Their analogous numbers for contract workers as a percentage of total employees are 28 to 37 percent in 1976 and 18 to 25 percent in 1964.)

The authors' interviews with the major Japanese firms have also supported these estimates.

salary in the case of small firms. The firm pays the balance of the worker's salary. The government limits the number of days for which these unemployment compensation funds are available to 75 days per six months; moreover, these funds are available only in those industries designated as depressed by the Labor minister. In fact, the open hearth sector of the steel industry has been continuously designated as depressed since the law's inception in July, 1975 and other steel sectors have generally been included on the list of depressed industries. Thus, as a result of this unemployment compensation, Japanese steel firms can assume that a portion of their regular employees' salaries are not fixed during recessions.

On the United States side, the industry has recently moved into a position of quasi-permanent employment for approximately forty percent of its employees. These forty percent (generally those with the most seniority) are effectively protected against layoffs until the age of 62. The steelworkers' union promises to increase coverage in future negotiations until all workers are similarly protected. Specifically, the contract provides that:

> Effective January 1, 1978, an employee with 20 or more years of service as of his last day worked becomes eligible for a Rule of 65 pension if (1) he is off work because of a shutdown, extended layoff or disability, (2) his age plus service equals 65 or more, and (3) his company fails to provide him with suitable long term employment. Because he

> accrues age and service during layoff or sickness (commonly called "creeping"), a twenty-year employee who meets all of the requirements need be only 41 years old when first laid off, or when his Sickness and Accident Benefits begin, to become eligible for a Rule of 65 pension.
>
> The amount of pension is calculated as it is for other pensions. However, in addition to the pension amount, a Rule of 65 pensioner also draws the pension supplement which has been raised by the 1977 Settlement to $300 per month. This supplement is suspended should the retiree obtain suitable long term employment, but it is resumed if employment ends. Otherwise, the supplement continues until age 62 or such earlier time as the retiree becomes eligible for Social Security. 81/

Thus, United States' steel labor costs cannot be viewed as completely variable.

It appears that, when one compares the Japanese contract labor and Japan's recession type unemployment compensation with the new permanent employment contract of the United States' steel industry, the labor costs for the Japanese

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81/ Quoted from Steel Labor: The Voice of the United Steelworkers of America, May, 1977, p. 15. It is stated there on page 14 that:

> Similarly, we have laid the foundation in this 1977 contract on which to build a lifetime security program for all steelworkers. This foundation consists of a series of greatly expanded benefits for 40 percent of the employees of the ten major steel companies--those with 20 or more years of service. In future negotiations we must increase the group of employees covered by the plan until all are protected. At the same time, we must work to increase the benefits provided by the plan until it fully meets the goal of lifetime job security.

are as variable as those in the United States. Moreover, the trend is for greater labor cost variability in Japan: usage of contract labor has been increasing during the past decade, especially in the modern plants which export to the U. S. and the newly available recession unemployment compensation lowers the portion of fixed costs cyclically. Meanwhile, American steelworkers are moving in the direction of permanent employment. 82/

The major U.S. producers tend to be integrated backward into coal and iron ore mining. Thus, when demand falls, producers in the United States cannot reduce raw materials costs proportionately due to the fixed costs of operating iron ore and coal mines.

Generally, Japanese steel producers are not as integrated backwards into coal or iron ore production as the U.S. producers. In fact, Japan relies on raw material supplies which are heavily under foreign control. 83/ Japanese steel producers

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82/ It should also be noted that labor costs amount to less than 15 percent of Japanese revenues, compared with over 35 percent for the United States. See Kawahito [13, p. 169] for estimates for the 1960's. Kawahito's source was Tekko Shinbun Sha, Tekko Nenkan, 1968. According to the Japan Iron and Steel Federation in 1973, wages as a percentage of total sales were as follows:

Top five Japanese steel firms	12.3 percent
Four top steel firms in West Germany	21.7 percent
Eight top U.S. steel firms	36.6 percent.

83/ For detailed data on comparative self sufficiency in iron ore see [11, p. 52], and chapter 2 for coal self-sufficiency.

purchase about 80 percent of their iron ore and coal through Japanese trading companies. The trading companies purchase their raw materials primarily through long-term contracts, although short-term contracts and spot purchases are utilized as well [27, p. 2]. Trading companies purchase iron ore on 12 to 15 year contracts. Yearly shipments can vary plus or minus 10 percent provided that a total quantity is taken over the life of a contract [27, p. 1, 2]. Thus, recession deliveries can be 20 percent less than boom deliveries under the contract. These contracts are staggered such that a roughly proportionate number expire each year. The expiring contracts represent costs which can be varied. Moreover, the raw materials costs of the steel producers are somewhat more variable than for the trading companies since steel producers do not necessarily purchase stocks of raw materials owned by trading companies. 84/ The Japanese steel producers, who are less integrated back to raw materials, may adjust their raw materials costs at least as readily as the U.S. producers. 85/

84/ However, the greater variability obtained through utilizing trading companies should not be overemphasized. Long-term relationships between steel companies and trading companies imply that, one way or another, steel companies will have to pay for storage costs of raw materials. These costs represent a deterrent to having the trading company hold the raw materials.

85/ Raw materials costs amount to approximately two-thirds and four-tenths of total revenues for Japan and the United States, respectively; see [13, p. 169].

It is true that most major foreign producers are financed by a greater percentage of debt, for which interest obligations are fixed. 86/ However, even Japan, which has the highest debt-equity ratio, has interest payments accounting for less than six percent of its revenues. Moreover there is a quasi-fixed element to dividend payments as U.S. companies are loathe to suspend dividends. Thus, the difference in the share of fixed costs resulting from the financial structure seems to be negligible and insufficient to be the driving force behind dumping.

The evidence does not support the proposition that foreign producers have a higher percentage of fixed costs and are, as a result, more motivated than U.S. producers to price exports low during a recession. Table 4.21 shows data on rates of capacity utilization in the U.S., Japan, and EC. These data reveal, especially in recent years, that U.S. operating rates are as high as those of the Japanese. These recent operating rates support our conclusion that the Japanese do not have a higher percentage of fixed costs which compels them to maintain high operating rates during recessions.

IV. CONCLUSIONS

During the 1960's, steel prices were lower in the European Community and Japan than they were in the United States. From 1968 through 1971, the Japanese had the lowest steel prices.

86/ See, for example, [34, p. 147]. The performance aspects of this question are analyzed in chapter 7.

TABLE 4.21

Steel Production, Capacity, and Capacity Utilization: Japan, ECSC, and United States
(Millions of tons)

	Japan			EC (6)			United States		
Year	Raw steel production a/ MT	Usable capacity b/ MT	Capacity utilization(%)	Raw steel production MT	Usable capacity c/ MT	Capacity utilization(%)	Raw steel production NT	Rated capacity d/ NT	Capacity utilization(%
1956	11.1	12.4	89.5	57.0	59.1	96.4	115.22	130.91	88.0
1957	12.6	14.8	85.1	59.8	63.5	94.2	112.72	137.10	82.2
1958	12.1	17.6	68.7	57.9	67.7	85.5	85.26	144.24	59.1
1959	16.6	21.15	78.5	63.2	70.5	89.6	93.45	148.12	63.1
1960	22.1	25.15	87.9	73.1	76.5	95.6	99.28	149.00	66.6
1961	28.3	30.0	94.3	73.5	80.2	91.6	98.01	149.8	65.4
1962	27.5	34.3	80.2	73.0	83.4	87.5	98.33	150.4	65.4
1963	31.5	38.1	82.7	73.2	87.9	83.3	109.26	151.1	72.3
1964	39.8	43.2	92.1	82.9	92.1	90.0	127.08	151.9	83.7
1965	41.2	49.3	83.6	86.0	102.1	84.2	131.46	152.7	86.1
1966	47.8	56.6	84.4	85.1	108.3	78.6	134.10	153.5	87.4
1967	62.2	67.2	92.6	89.9	112.3	80.1	127.21	154.2	82.5
1968	66.9	77.5	86.3	98.6	115.1	85.7	131.46	155.0	84.8
1969	82.2	89.6	91.7	107.3	120.6	89.0	141.26	155.5	90.8
1970	93.3	103.65	90.0	109.2	126.6	86.2	131.51	155.5	84.6
1971	88.6	110.15	80.4	103.4	135.1	76.5	120.44	156.2	77.1
1972	96.9	118.8	81.6	113.1	138.8	81.5	133.10	154.6	86.1
1973	119.3	129.1	92.4	122.9	144.4	85.1	150.80	155.0	97.3
1974	117.1	140.15	83.6	132.6	150.4	88.2	145.72	155.57	93.7
1975	102.3	150.0	68.2	104.8	162.3	64.6	116.64	156.5	74.5
1976	107.4	151.0	71.1	110.8	169.4	65.4	127.3	159.0	80.1

a/ Japan Iron and Steel Federation, Monthly Report of the Iron and Steel Statistics, various issues.
b/ Calculated by interpolating between peak monthly production points assuming constant compound growth between peaks. Calculated by Professor Donald Barnett, University of Windsor, Windsor, Ontario, Canada, and Institute for Iron and Steel Studies, Steel Industry in Brief: Japan 1977.
c/ EC, Investment in the Community Coal Mining, Iron and Steel Industries, EC includes only West Germany, France, Belgium, Netherlands, Luxembourg, and Italy.
d/ From Barry Bosworth, "Capacity Creation in Basic Materials Industries," Brookings Papers in Economic Activity, No. 2, 1976, table 1, p. 304.

Source: Council on Wage and Price Stability, "Prices and Costs in the United States Steel Industry," Oct. 1977, p. 145.

The lower prices in the domestic markets of foreign producers resulted from the foreign producers' enjoying lower costs of production prior to the dollar devaluations. With their lower costs and prices, foreign producers were able to make significant inroads into the United States steel market. Imports as a percentage of apparent United States steel consumption reached a high of 17.9 percent in 1971. It was found that the penetration into the United States steel market was not due to foreign steel producers pricing their exports relatively lower during recessions; i.e., cyclical dumping.

Since 1971, the prices of United States steel producers have become competitive. In some years, the prices of some products were lowest in the United States. Lower domestic prices reflect an improvement in the relative cost position of the United States and were exaggerated in 1973 and 1974 due to domestic price controls. Corresponding to the cost and price trends, imports as a percentage of domestic apparent steel consumption declined from 17.9 percent in 1971 to 13.3 percent and 13.5 percent in 1974 and 1975, respectively.

During the 1973-74 boom, as a result of the changed cost picture and domestic price controls, foreign steel sold at a premium over domestic steel and domestic mills supplied their regular customers on an allocation system. During the 1975 contraction, many domestic buyers chose to purchase domestic steel at slightly higher prices because of their belief that they could purchase steel more cheaply, on average, from domestic suppliers. Domestic steel purchasing managers are currently more concerned with establishing a long-term buying relationship with domestic suppliers.

This study indicates that pricing in the domestic steel industry may be characterized as barometric price leadership. However, an important element in the industry structure which contributed to this conclusion is the role of imports. Edgar B. Speer, chairman of the United States Steel Corporation and also the current chairman of the AISI, has stated that U.S. steelmakers plan a campaign to get the Carter administration to negotiate a worldwide steel agreement that would force foreign producers to sell in the United States at "unsubsidized prices." 87/ In an apparent response to the U.S. industry's accelerated campaign against imports, Hiroshi Saito, president of Nippon Steel, U.S.A., Inc., the American affiliate of Japan's largest steelmaker, stated that his company intends voluntarily to pursue "orderly marketing" practices. 88/ This could limit exports to the U.S. 89/

87/ "U.S. Steel Producers Hit 'Predatory Pricing' of Imports," The Washington Post, May 26, 1977, pp. C1, C3.

88/ "Steel Study Hits Foreign Makers' Export Tactics," The Wall Street Journal, May 26, 1977, p. 3.

89/ As was mentioned, the European Community and MITI of Japan negotiated an agreement, during 1976, which limited the exports of Japanese steel products into the EC. Regarding this agreement the American Iron and Steel Institute, on October 6, 1976, filed a complaint with the Office of the Special Representative for Trade Negotiations under section 301 of the Trade Act of 1974. In the complaint, the AISI objected to the fact that (Continued)

Recently, officials of the U.S. Government and the European Community negotiated reference (or minimum) prices for steel imports. 90/ Reference prices would prohibit imports below the minimum prices via the immediate imposition of tariffs.

Either an orderly marketing agreement or reference prices would in effect periodically implement import restrictions, and an important competitive element in the industry structure would be reduced. In the event such agreements were implemented, there would be a serious adverse effect on competition and the domestic steel industry's pricing policy would not remain as competitive as was characterized herein. The costs to consumers and to the economy of such agreements are estimated in the final chapter of this study.

89/ (Continued)

similar limitations on Japanese steel exports were not granted to the United States.

The position of the AISI appears to be that, while it opposes such agreements which exclude the United States, it favors similar multilateral agreements which include the United States. See the testimony of R. Heath Lary (vice-chairman of the U.S. Steel Corporation and former chairman of the International Trade Committee of the AISI) before the U.S. Senate, Committee on Finance, on February 4, 1976.

90/ See "U.S., Europeans Hopeful of Steel Settlement Soon," The Washington Post, Nov. 10, 1977, pp. B1, B2; and "Program to Aid U.S. Steel Makers Unveiled," The Washington Post, Dec. 7, 1977, pp. D8, D11.

APPENDIX 4

Analysis of the Evidence on Pricing Below Costs Presented by The Pifer, Marshall, and Merrill Study

The recent study by Pifer, Marshall, and Merrill (PMM) [23] has attempted to verify empirically that the Japanese have sold their steel in the United States at prices below their average total cost of production during at least two periods, 1975-76 and 1968. 1/ Although our research has not addressed the question of pricing below cost, a brief comment on the evidence presented in the PMM study is required.

PMM used a different methodology for each period to support their argument. For the 1975-76 period, they first estimated the average price per ton each month for Japanese carbon steel products. This was based on exit prices (f.a.s., from Japan) for various carbon steel products arriving in the United States that month, and the total production of these products in Japan during that month. They compared these monthly prices with annual estimates of the per ton total cost of producing steel in Japan. The cost estimates were based on the financial statements of major Japanese steel companies. The PMM price series falls below their cost

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1/ The PMM study also alleges, with a much less extensive empirical verification, that the EC has sold below average total cost and perhaps below average variable costs in recent years.

series in August 1975 and stays below it through November 1977. 2/

This study has not attempted to verify either the PMM price or cost estimates in any detail. The cost estimates used by PMM are due to Schneider [27] of I.V.M. Detailed criticism of the Schneider study has been presented in a submission to the U.S. Treasury Department by Steptoe and Johnson [31], counsel to Nippon Steel Corporation. Schneider [28] has presented a detailed reply to the Steptoe and Johnson critique. The methods used certainly leave room for error, but there is no apparent reason to believe that they are biased.

It appears, however, that there is a very fundamental error in the price/cost comparison. The price series is for carbon steel products; but the cost series is, as Schneider emphasizes, "for <u>all steel products</u>" [27, p. 17] (emphasis his). Alloy and stainless steel sells for a much higher price than carbon steel. In April 1976, for example, the month in which PMM figures show cost to exceed price by the greatest amount, the average of the monthly f.a.s. price estimated by PMM is $206.25 per net ton (PMM accept Schneiders' $254 as the average cost of production). The average f.a.s. value of Japanese stainless and alloy steel arriving in the United States, however, was

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2/ A simple arithmetic average of the monthly prices in Japanese fiscal year 1975 is about two percent below the estimated cost for that year and, for the first eight months of fiscal 1976, about 13 percent below. For individual months the PMM series shows price below cost by as much as 15 percent in fiscal 1975 and 18 percent in fiscal 1976.

about $886 per net ton. 3/ If PMM had included stainless and alloy steel when computing their price series, stainless and alloy steel would have had to make up only 7.1 percent of total Japanese production to cause the average price level, as computed, to exceed the estimated average cost. 4/ In fact, "special" steel production in Japan averaged over 9 percent of total production in 1975 and 1976. 5/

Thus, PMM have estimated the costs of making all steel and compared these costs with the price of carbon steel alone. Ignoring special steels in the price series results in a serious bias in favor of finding below cost pricing. Since PMM have not removed this bias from their data and estimates, one cannot conclude from their estimates that below cost pricing has occurred.

The PMM study presents somewhat different evidence that the Japanese priced below cost in 1968. The essence of their argument can be presented as follows: PMM estimated the average

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3/ Computed from U.S. Department of Commerce, Bureau of the Census, Report FT 135, which is the same source used by PMM for carbon steel prices.

4/ (.071)($886) + (.929)(206.25) = $254.51. Steptoe and Johnson detail errors in Schneider's cost estimate which indicate that it overstates Japanese costs by $23 per net ton during this period. If $231 is accepted as the correct cost, stainless and alloy could have been only 3.7 percent of Japanese production and the average price would have exceeded cost. (.037)($886) + (.963)($206.25) = $231.40.

5/ Computed from Japanese Iron and Steel Federation output figures. "Special" steel is primarily stainless and alloy but does include some carbon structural steel which is not separately quantified.

TABLE 4A.1
Estimation of Identified and Apparent Unidentified Costs: 1968
(dollars per net ton)

	U.S.	Japan
Average Selling Price	$158.76	$104.20
Employment Cost	63.73	20.07
Capital Cost	21.89	18.23
Basic Raw Material Costs	38.18	50.02
Depreciation	9.46	7.54
Total Identified Costs	$133.26	$ 95.86
Apparent Unidentified Costs	$ 25.50	$ 8.34

SOURCE: Pifer, Marshall and Merrill, Economics of International Steel Trade, Exhibit III-14, p. 35 of first edition.

TABLE 4A.2
Recalculated Estimation of Identified and
Apparent Unidentified Costs: 1968
(dollars per net ton)

	U.S.	Japan
Average Selling Price	$170.73	$112.06
Employment Cost	63.73	20.07
Capital Cost	21.89	18.23
Basic Raw Material Cost	43.82	42.56
Depreciation	9.46	7.54
Total Identified Costs	$138.90	$ 88.40
Apparent Unidentified Costs	$ 31.83	$ 23.66

SOURCE: See text.

exit price per ton of carbon steel products leaving Japan in 1968, bound for the United States. They estimated the average price of the same mix of steel products in the United States. They use these figures along with their unit cost estimates for a number of input components to construct table 4A.1. The basic raw material costs are those for iron ore, scrap, and energy, discussed in chapter 3.

PMM maintain that there are only two possible explanations for the difference between "apparent unidentified costs" of the United States and Japan derived in table 4A.1. Either the Japanese enjoy that much cost advantage on input items whose costs were not estimated, or the Japanese have sold below cost. 6/

There are, however, more possible explanations for the difference between "apparent unidentified costs" than the two suggested by PMM. The PMM cost estimates for the United States may be too low, or those for Japan too high; or the estimated average price of steel in the United States may be too high or that for Japan too low. The estimates of basic materials costs which we developed in chapter 3 would make the PMM results look considerably weaker. Additionally, PMM have again used carbon steel prices to compare with cost estimates for all steel products. In 1968, about 2.6 percent of Japanese exports to the U.S. were alloy or stainless and these

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6/ The PMM capital cost estimate includes realized profit as the opportunity cost of stockholders' equity contribution.

products sold on average for about 3.9 times PMM's estimated price of carbon steel products. 7/ Including alloy and stainless, one would get an "average selling price" of $170.73 for the United States and $112.06 for Japan. Accepting PMM capital and labor 8/ cost estimates as correct, we could construct table 4A.2 which is equivalent to table 4A.1, except that it incorporates this study's materials costs estimate and an estimated price for all steel products. Whereas PMM had Japan's unidentified costs as only 33 percent of the United States' and deemed this impossible, the revised calculation has them at over 74 percent, a figure which is much less improbable.

7/ Computed from U.S. Dept. of Commerce, Bureau of the Census, U.S. Imports for Consumption and General Imports, Report FT210, 1968 Annual.

8/ The PMM labor cost estimates are based on the same BLS information as this study's.

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Chapter 5

THE EFFECT OF JAWBONING AND PRICE CONTROLS ON THE U.S. STEEL INDUSTRY

The U.S. Government has directed more of its price control effort at the steel industry during the last quarter-century than at any other industry. Even Administrations that did not have a systematic price control program have exerted pressure against steel price increases. The Government used moral suasion to deter or reduce steel price increases throughout the 1960's, and applied the formal wage-price control mechanisms of 1971 through 1974 to the steel industry with particular emphasis.

What have been the effects upon the steel industry of these price control efforts? Since the industry is cyclical, and, as indicated in the previous chapter, realized steel prices fluctuate over the cycle, it may be that price controls have reduced the long-term vitality of the steel industry by interfering with its profit opportunities during boom times. If so, the argument would run that steel is an industry that has to make above-average profits during booms in order to overcome low profits during downturns and, thereby, earn longrun profits adequate to attract funds for expansion and modernization. If Government price control policies reduce the industry's profits during booms, these policies could reduce the industry's cash flow in the long run. A sustained record of low profits may induce the financial community to project continued low-profit performance in the future, with the consequence that the industry becomes unable to rely upon the capital market for meaningful amounts of expansion capital. 1/ The longer-run consequences of this could be that the U.S. steel industry would become unable to expand sufficiently as the domestic demand for steel grows, and the economy would become increasingly dependent upon imported steel. At this point price controls could have a second negative effect upon the steel industry. In the long run, as demand exceeds domestic capacity during booms, the domestic steel industry would lose sales and profit opportunities during booms. Over time the greater the gap becomes between capacity and boom-time demand, the greater would be the profits foregone by the domestic industry.

This issue is explored by analyzing the impact of price controls upon the steel industry.

The Character of Controls

Both jawboning and controls followed a pattern of a strong beginning followed by declining efforts to thwart steel price

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1/ Some recent reports by brokerage houses say that Government price control policies have damaged the steel industry. See, Merrill Lynch, Pierce, Fenner & Smith, Institutional Report, Japanese Steel Industry, A Comparison with its United States Counterpart, by Charles A. Bradford (June 24, 1977), p. 1; and Faulkner, Dawkins & Sullivan, The Steel Industry: An American Tragedy? by Joseph C. Wyman (February 22, 1977), pp. 12, 13.

increases. 2/ Jawboning was begun as part of the wage-price guideposts, and the rationale of the guideposts indicated when jawboning should be utilized. After the guideposts were discontinued, jawboning of steel price increases became more sporadic and less related to well-understood criteria. Consequently, a greater proportion of announced steel price increases remained unmodified by jawboning.

Some of this appears to have been a function of time: It became more difficult to maintain the guideposts and jawboning as years went by. Some of this also appears to have been a desire on the part of both the Administration and the steel companies to avoid a confrontation; both sides wanted to avoid the appearance of having lost stature. Even in the clearest confrontation--the Kennedy-Blough clash in 1962--the Administration believed that its victory had cost it too much support, and it did not want to repeat such an experience. Thus, the Kennedy-Blough confrontation resulted in no price increase, but almost all subsequent jawboning incidents ended in some increases.

Over time, jawboning came to be practiced in various ways. In some instances the President made a speech for the sole purpose of criticizing a steel price increase. In others, the President made his point in press conferences

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2/ The history of jawboning and price controls in the U.S. steel industry is given in appendix 5A.

that included statements on other subjects. In still others, the President made his remarks in response to questions at press conferences. Sometimes jawboning was done by others in the Administration without the obvious participation of the President. For example, in 1966 and 1967, most jawboning messages concerning steel were given by the chairman of the Council of Economic Advisers or by the President's press secretary. None of the jawboning efforts conducted without any Presidential involvement achieved any reductions from the announced price increases. In fact, one could argue a priori, that these various methods of jawboning (listed above) should be expected to have different degrees of effectiveness.

Frequency, as well as form, affected the strength of the jawboning efforts, and, after a few years the Administration usually spoke against only large price increases or increases on large-volume products. Also, by this time the Administration frequently avoided confrontation by giving up early if the steel companies did not alter their original price increase announcements. (For example, in 1966, a 2.1 percent increase in sheet and strip prices was criticized by the Chairman of the Council of Economic Advisers and by the President's press secretary. Nevertheless, virtually all producers followed this increase, and the Chairman of the Council deplored this as a "defeat" for the guideposts.)

In addition, steel producers adjusted to jawboning by changing from their custom of increasing prices on all their products at one time to making selective price increases. They also developed a practice of sometimes including price reductions on one or two products in their announcements of price increases. Furthermore, Government officials jawboned only announced increases in list prices, not changes in discounts, extra charges, freight absorption, warehousing charges, or credit terms.

As was the case with jawboning, the Wage-Price Controls of 1971-74 began on a strong note. President Nixon established the controls with a previously unannounced 90-day freeze on wages and prices. This freeze interfered with an 8 percent price increase, which had been announced but not implemented, for nearly all steel products. The Price Commission at first postponed much of this increase and later allowed a 2.5 percent increase instead of the 8 percent producers had announced.

In general, however, price control standards became milder as time passed. Primarily for administrative reasons, the Price Commission adopted a procedure that allowed companies to increase prices for some products more than the overall increase allowed by the Commission. This system could be expected to have less of a negative effect upon profits than would controls that did not allow for such flexibility. Another indication that price controls at times were not very stringent was contained in one producer's statement that market conditions had forced it to roll back prices on a wide range of products, including some it had raised with Price Commission approval less than a month before. (This statement was made about five months after the onset of controls.) Also, the Price Commission adopted a scrap surcharge method of allowing steel price increases, in order to compensate for large increases occurring in scrap prices. Approval of a scrap surcharge price increase was essentially automatic under Price Commission procedures, and such increases were often substantial.

In addition, the last nine months of the control program (known as Phase IV) was a period of gradual withdrawal of controls, and price increase applications during this phase were automatically approved after 30 days unless denied or modified by the Cost of Living Council. During this period, the Cost of Living Council allowed seven steel price increases to take effect without modification and postponed or modified only two.

Some price control actions, however, clearly had a negative effect upon steel prices. The 60-day price freeze imposed in June, 1973, postponed a 4.8 percent increase in the prices of sheet and strip. At the end of this freeze, producers applied for a 5 percent increase for sheet and strip, but a Cost of Living Council ruling allowed only 2.5 percent effective October 1, and another 2.5 percent, effective January 1, 1974. Also, some of the other price increases granted by the Cost of Living Council were so much less than those requested by the companies that it seems reasonable to conclude that price increases were substantially less than they would have been without controls. For example, a request by one company to raise its tin mill prices an average of 8 percent and its galvanized sheet prices an average of 4.25 percent was held to 0.5 percent by the Council. Furthermore, the rash of steel price increases soon after the end of controls provides a tentative indication that controls had some impact upon the industry.

The Model

It is possible to make a more definite analysis of the effect of jawboning and price controls. As indicated earlier, a crucial test of the impact of these Government actions on the steel industry is whether they reduced steel profits. Therefore, a measure of the determinants of profits in the U.S. steel industry can be used to conduct a statistical test of whether jawboning or price controls, or both, adversely affected the industry.

The time period used for this test was 1961 through 1975, beginning with the third quarter of 1961 when the Kennedy Administration made its first attempt to prevent a steel price increase. All variables were measured on a quarterly basis. The dependent variable, steel industry net profits after taxes, was deflated by the Bureau of Labor Statistics wholesale price index for all commodities in order to measure steel profits more nearly in terms of purchasing power than would be the case without such adjustment. The source of the profit data was the Quarterly Financial Report for Manufacturing Corporations issued by the Federal Trade Commission.

The independent variables selected were raw steel production, steel imports, and unfilled orders in the steel industry, and to these were added dummy variables for jawboning and price controls. (The source for production and for steel imports was the Annual Statistical Report of the American Iron and Steel Institute, and the source for unfilled orders was the Commerce Department's Survey of Current Business.) Unfilled orders was used as an indicator of price changes not reported in the BLS price indexes for steel, such as discounts, changes in extra charges, freight absorption, warehouse charges, and credit terms. (Since the Commerce Department reports unfilled orders in dollars but not in tons, this series was deflated by the ratio of steel shipments in dollars to steel shipments in tons.)

The dummy variable for the price controls of 1971-74 was a value of one assigned to each quarter in which the controls were in effect and a value of zero assigned to all other quarters.

A single-stage ordinary least squares model was first used to test these hypotheses. Eight different dummy variable systems were tried, but none indicated a significant relationship between steel profits and jawboning. However, all these results yielded a positive relationship between jawboning and steel profits. Since there is no justification for a hypothesis that jawboning increases steel profits, there was reason to believe that the linear model used for the first set of tests was biased. Such bias can be caused by a correlation between the explanatory variables and the error term which is normally present in a simultaneous equation model. In this case, it seems reasonable to assume that the profit equation is part of a larger simultaneous system. This simultaneous system also describes the process which determines the decision concerning when to jawbone steel price increases. And if some of the same variables affect both steel profits and the jawboning decision process, a bias would be expected in the ordinary least squares estimates. This source of bias can be overcome by a procedure that explains the systematic part of the jawboning decision which is not explained by the variables included in the error term of the profit equation. 3/ This procedure took the form of a two-step analysis: One equation was used to estimate the probability of jawboning during each three-month period, and the estimated probability of jawboning was used as an instrumental variable in a second equation to estimate the relationship between steel profits and jawboning.

The hypothesis underlying the first equation was that Government officials would be more likely to jawbone steel price increases when: (1) steel prices were increasing more

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3/ The rationale of probit analysis is explained more fully in appendix 5B.

rapidly than prices in general, (2) steel producers announced price increases, and (3) some Administrations held office rather than others. A variation of this hypothesis was also tested by substituting the rate of change in National Income for the first factor. This was done to test for a relationship between changes in general economic conditions and jawboning of the steel industry.

For this analysis, the measure of steel price increases was the Bureau of Labor Statistics price index for steel, because the history of jawboning indicated that Government officials reacted to increases in list prices rather than to changes in discounts, extra charges, or freight absorption. (The BLS steel price index is based on list prices). This index was divided by the implicit price deflator for the gross national product in order to measure steel price changes relative to general price changes. A dummy variable was used to distinguish between quarters in which steel companies announced price increases and those in which they did not. Dummy variables were also used to distinguish between the Kennedy, Johnson, Nixon, and Ford Administrations. The equation involving the rate of change of national income used the quarterly change in national income divided by the national income in the more recent quarter (i.e., $\frac{NI_t - NI_{t-1}}{NI_t}$). This measure was lagged one quarter.

The equation describing the probability of jawboning is then:

$$\hat{JB} = \int_{-\infty}^{V} o(u)du \qquad \text{where}$$

$$V = \frac{\Delta SPI}{\Delta GNPD} + K,J,N, + ANNC + \text{constant.}$$

$\hat{JB}$ is the estimated probability of jawboning during each quarter.

$\frac{\Delta SPI}{\Delta GNPD}$ is the change in the Bureau of Labor Statistics steel price index relative to the change in the implicit price deflator for the gross national product.

K,J,N are dummy variables to distinguish between the Kennedy, Johnson, Nixon, and Ford Administrations.

ANNC is a dummy variable to distinguish between quarters in which steel price increases were announced and those in which they were not.

ΔNI is the rate of change in national income, lagged one quarter. (For one test, this was used instead of $\frac{\Delta SPI}{\Delta GNPD}$).

The profit equation is:

$$DNP = PROD + DUO + M + J + PC + \text{constant.}$$

DNP is net profits after taxes for the steel industry, deflated by the Bureau of Labor Statistics wholesale price index for all commodities.

PROD is production of raw steel in net tons.

DUO is unfilled orders for steel products in dollars deflated by the ratio of steel shipments in dollars to steel shipments in tons.

M is imports of steel in net tons, lagged one quarter.

JB is a dummy variable for jawboning in the single-equation model. ($\hat{JB}$ is the estimated probability of jawboning in the two-equation model).

PC is a dummy variable for the price controls of 1971-74.

The Results of Regression Analysis

The results of these tests are shown in table 5.1.

TABLE 5.1

Regression Analysis of Steel Profits in Relation to Jawboning and Price Controls

$$DNP = -166.993 + \underset{\substack{(3.70)\\ *}}{.011PROD} + \underset{\substack{(4.66)\\ *}}{.004DUO} - \underset{(-1.21)}{.00001M} + \underset{(0.59)}{2.750JB} - \underset{\substack{(-3.50)\\ *}}{105.783PC}.$$

Unadjusted $R^2 = .587$

For the instrumental variables estimates using $\hat{JB}$ based on $\frac{\Delta SPI}{\Delta GNPD}$, K, J, N, ANNC:

$$DNP = -210.724 + \underset{\substack{(2.95)\\ *}}{.010PROD} + \underset{\substack{(3.76)\\ *}}{.004DUO} - \underset{(-.99)}{.00001M} + \underset{\substack{(2.16)\\ **}}{141.588\hat{JB}} - \underset{\substack{(-1.71)\\ **}}{72.337PC}.$$

Unadjusted $R^2 = .297$

For the instrumental variables estimates using $\hat{JB}$ based on ΔNI, K, J, N, ANNC:

$$DNP = -212.729 + \underset{\substack{(2.91)\\ *}}{.010PROD} + \underset{\substack{(3.72)\\ *}}{.004DUO} - \underset{(-.97)}{.00001M} + \underset{\substack{(2.17)\\ **}}{145.690\hat{JB}} - \underset{\substack{(-1.66)\\ ***}}{71.269PC}.$$

Unadjusted $R^2 = .278$

The numbers in parentheses are t statistics. A single asterisk means the coefficient is significantly different from zero for at least the one percent level; a double asterisk means the coefficient is significant for at least the five percent level; and a triple asterisk means the coefficient is significant for at least the ten percent level.

All three equations indicate a significant relationship between the Nixon wage-price control program and steel profits, but no meaningful significant relationship is indicated between jawboning and steel profits. Although the instrumental variable estimates yielded a statistically significant relationship between jawboning and steel profits, they failed to produce the negative sign necessary for an inverse relationship between these variables. The positive relationship between these two variables would indicate that jawboning increases steel profits; however, there is no a priori reason to believe this is the case.

Thus, the conclusion on the basis of these tests is that jawboning did not reduce profits in the steel industry, 4/ but the price control program of 1971-74 did. These three years included the greatest steel boom in history, and steel profits increased markedly for the first time during the years

4/ This conclusion is consistent with a separate analysis of the effects of the Wage-Price Guideposts on steel prices from 1962 through 1965. (See, Richard Mancke, "The Determinants of Steel Prices in the U.S.: 1947-1965," Journal of Industrial Economics, April, 1968, pp. 147-160).

used for this test. Consequently, this price control program prevented steel profits from increasing as much as could have been expected under such boom conditions.

The equations in table 5.1 indicate that the price control program of 1971-74 reduced deflated, after-tax profits in the steel industry by approximately $71 million to $106 million during each quarter the control program existed. 5/ Over the 12-quarter life of this control program, its effect on deflated steel profits amounted to about $855 million to $1.3 billion. When the deflation adjustment is removed in order to express steel profits in more current terms, the reduction in after-tax steel profits amounts to about $1.1 billion to $1.7 billion. If all of this were invested in a new steel plant (at the 1975-76 cost of steel plant construction), it could have bought

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5/ The low end of this estimate is consistent with a statement made by John T. Dunlop when he was director of the Cost of Living Council. In 1973, in rebutting a comment that the Cost of Living Council treated the steel industry too generously, he estimated that the price freeze of June 13 and the Council's decision of September 10 on steel prices would reduce steel industry profits $177 million in 1973. Since the September 10 decision limited future steel price increases until the end of the year, Dunlop's statement applied to essentially two quarters (i.e., from June 13 to the end of 1973). The effect of price controls on steel profits, as estimated by the econometric methods described in this chapter, are $96 million to $142 million per quarter when adjusted for the price level of 1973. Although the models used in this chapter are not directly comparable with Dunlop's statement (because they cover the entire price-control period as distinct from the last two quarters of 1973), these estimates do not appear to be inconsistent. (For Dunlop's statement, see The New York Times, September 20, 1973, p. 27).

from 1.1 million to 2.2 million annual tons of shipped steel capacity, depending on the estimates used. 6/ The larger estimate is about two-thirds the size of the Fairless Works or the Burns Harbor Plant, the two greenfield steel plants built in this country since World War II. However, it is more likely that expansion would take the form of additions to existing plants, and here capital costs per ton of new capacity are markedly lower. Consequently, if the estimated $1.1 billion to $1.7 billion were invested in expanding existing steel plants, U.S. steel capacity could have been increased from 2.1 million to 4.6 million annual tons of shipped steel capacity. 7/ This would be an increase of about 2.0 to 4.3 percent in total U.S. shipped steel capacity.

6/ There are two ranges of estimates involved in this calculation. One is the range in the estimated reduction in steel profits attributed to the price-control program ($1.1 billion to $1.7 billion). The other is the range in the estimated cost of greenfield steel capacity. The highest generally-accepted cost estimate of greenfield steel capacity is $1,014 per ton of shipped steel capacity, and the lowest generally-accepted estimate is $760 per ton. (See, The American Iron and Steel Institute, Steel Industry Economics and Federal Income Tax Policy, (Washington, D.C.: AISI, June 1975); Peter F. Marcus, World Steel Supply Dynamics: 1975-1981 (New York: Mitchell, Hutchins, Inc., 1976); and Council on Wage and Price Stability, A Study of Steel Prices, (Washington, D.C.: Government Printing Office, July 1975).

7/ Again, two ranges of estimates are involved in the calculation, one in the estimated reduction in steel profits attributed to price controls, and the other in the cost of rounding out steel plants. The highest generally-accepted estimated cost of rounding out is $526 per ton of capacity on a shipped basis, and the lowest generally-accepted estimate is $360 per ton.

However, it is not certain that the industry would have invested in expansion all the estimated additional profits it would have had had there been no price controls. This is only one of several possibilities. Steel companies might have elected to pay out part of these greater profits in dividends. (From 1970 through 1976, the industry paid 43 percent of its after-tax profits in dividends, and 15 percent of its profit increases in dividend increases [1, p. 9]. Or, the companies could have used these additional profits to retire debt, invest in non-steel activities, or invest in steel facilities that reduce operating costs without increasing capacity.

APPENDIX 5A

HISTORY OF JAWBONING AND PRICE CONTROLS IN THE U.S. STEEL INDUSTRY

The fundamental rationale for the Kennedy Administration's involvement with the steel industry was provided by the anti-inflation program formulated during 1961. This program was the wage-price guideposts, first announced in the January 1962 Annual Report of the Council of Economic Advisers. 1/ The guideposts were founded upon the concept of relating wage and price changes to changes in productivity. That is, "the general guide for noninflationary price behavior calls for price reduction if the industry's rate of productivity increase exceeds the over-all rate--for this would mean declining unit labor costs; it calls for an appropriate increase in price if the opposite relationship prevails; and it calls for stable prices if the two rates of productivity are equal" [3, p. 189]. The guideposts were general enough that they did not provide definite recommendations for changes in wages and prices in specific cases, but they did provide a more specific set of principles than had been used before. In a sense they were not fundamentally different from the appeals of officials of

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1/ The concept of restricting the rate of wage increases to the rate of productivity increases was explained as Administration policy in October 1961. This was in the form of a speech by a member of the Council of Economic Advisers, James Tobin, to officials of the AFL-CIO. They gave it a cool reception. (See The New York Times, October 7, 1961, p. 1).

the Eisenhower Administration for responsible behavior by businessmen and labor unions, but they were different in that they were designed for application to specific situations. Thus, the guideposts were not new in concept, but they were new in presenting a more specific set of principles and in indicating a more active Government participation in the formation of prices and wages [7, pp. 16, 17].

However, the Kennedy administration became involved in opposing steel price increases even before the wage-price guideposts were formulated. The involvement was prompted by an increase in labor costs scheduled to take effect on October 1, 1961, under the terms of the three-year union contract that had been signed in January 1960. The Administration enlisted sympathetic Senators to speak in a debate on the Senate floor on the importance of stable steel prices and on the problems of concentration and price fixing in the steel industry. This debate occurred on August 22 [4, p. 157]. (Other Senators spoke in rejoinder on September 7; their general theme opposed Government intrusion into pricing decisions in private industry). The Council of Economic Advisers and the Secretary of Labor collaborated on preparing a Presidential response to a prearranged press conference question on steel prices. The answer was that the steel companies could absorb a wage increase without increasing prices and expressed a concern that an increase in steel prices would create another inflationary spiral [4, p. 158]. President Kennedy sent a letter to the chief executive officers of 12 steel companies on September 6, 1961, in which he noted that steel wages and other employment costs would increase at the end of the month [2, pp. 121, 122]. He wrote that these cost increases appear "almost certain to be outweighed by the advance in productivity . . ." from both increased output per man-hour and increased operating rates. He emphasized the desirability of price stability in the steel industry on the grounds that steel is both a bellwether of the economy and a major element in industrial costs. He stated that, if the industry were to forego a price increase now, in the next collective bargaining session "it would clearly be the turn of the labor representatives to limit wage demands to a level consistent with continued price stability."

The result was that no price increase was made until April 1962. It is not clear how much influence the President's letter and some private pressure by the Administration had, but newspaper stories had contained statements by executives of several steel companies to the effect that a price increase was needed. On the other hand, within the Administration there was some question whether the results would have been much different if there had been no Administration opposition to a price increase. Some sources close to the industry reported that soft demand had meant that steel leaders were disinclined to raise prices at the time [4, p. 160].

The next time the Administration became involved in steel price increases was in April 1962, when United States Steel announced an across-the-board price increase of about 3.5 percent. This was its first price increase in more than three years, and it was followed by similar announcements by Bethlehem, Republic, Jones & Laughlin, Youngstown, and Wheeling. Other major producers considered price increases but did not announce them before the Administration reacted. The Government used every method it could muster to oppose the increase. President Kennedy denounced the increase in a press conference. He asked Senator Kefauver, the chairman of the Senate Subcommittee on Antitrust, if he would publicly express concern over the price increase and consider an investigation. The Senator agreed to do this. Other congressional leaders criticized the increase. Within a three-day period, FBI agents questioned newsmen about their stories that the president of Bethlehem had said that a price increase is not appropriate; two congressional committees and two Federal agencies undertook four antitrust investigations of the steel industry; the Solicitor General drafted legislation that would impose price and wage controls on the steel industry; the Defense Department began to divert steel purchases to companies that had not raised prices; and various Government officials telephoned friends and acquaintances in steel companies and in steel-consuming companies in an effort to prevent the increase from becoming industrywide. The Government pressure was intense, and was directed through as many channels as the President and his advisers could design. The issue was resolved on the third day when Bethlehem rescinded its price increase, followed later in the afternoon by United States Steel's announcement canceling its increase. 2/

More important than the drama of this confrontation was the sustained attention the Administration gave the steel industry in its anti-inflation program. The Administration had tried to induce the industry not to raise its prices when steel wages were increased in the fall of 1961. After that, the Administration worked toward early agreement on a new three-year union contract in 1962 that it deemed noninflationary. Government spokesmen tried to impress both sides that the national interest was at stake, that either a steel price increase or an inflationary wage settlement would start a new wage-price spiral that would impair economic growth, keep unemployment high, reduce export sales, weaken the dollar, and increase the outflow of gold. 3/ During the negotiations over the union contract, the Administration pressed for a wage increase that did not exceed the increase in labor productivity in the industry. The settlement called for no wage increase during the first year but for a considerable increase in fringe benefits estimated to raise employment costs in the first year

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2/ A detailed account of the Government's actions is given in The New York Times, April 23, 1962, p. 1.

3/ The New York Times, April 23, 1962, p. 1.

about 2.5 percent. The Administration calculated the productivity increase in the industry at 3.5 percent, and therefore viewed the agreement as consistent with price stability during the first year [5, p. 2083]. Thus, the Administration had selected steel as a key industry in its anti-inflation program and had made a substantial investment in trying to influence its labor costs and its prices.

The next Government involvement in labor negotiations in the steel industry occurred in 1965, in the final months of the three-year labor contract. Again, the Government's objective was a noninflationary settlement. In January 1965, President Johnson ordered the Council of Economic Advisers to study recent steel price increases. Their report, released on May 3, said that the industry did not need to increase its prices at the present time. President Johnson intervened in the negotiations in order to postpone a strike deadline, and negotiations thereafter were held in the Executive Office Building next to the White House. The Secretaries of Labor and of Commerce participated in the discussions. President Johnson repeatedly emphasized the need for a noninflatinary settlement and remained in close contact with both sides during the negotiations. A settlement was made without a strike. The increase was exactly on the 3.2 percent guidepost figure, according to the Chairman of the Council of Economic Advisers, and was too large according to several steel executives. R.C. Cooper, the chief negotiator for the companies, said the new pact cost "somewhere above"

3.5 percent and challenged the Administration claim that it did not exceed the guideposts. The leadership of the steelworkers union said it was dissatified with industrywide bargaining and that it was seeking a new approach for the future. 4/

The pattern of price increases from 1962 until the expiration of the labor contract in 1965 was selective rather than across-the-board. Government opposition was rather mild, certainly relative to its opposition in April 1962. Selective price increases were made in April and September 1963. In August 1964, United States Steel officials said that they foresaw a general price increase for steel, and in October President Johnson, in a news conference, issued a thinly-vailed threat against a steel price increase. No general increase occurred. In December 1964, galvanized sheet and coil prices were increased. Sometimes decreases in list prices were included with the increases, and the wholesale price index for the steel sector rose by only 1.8 percent during the four years ending December 1965.

However, a price confrontation began on the last day of the year, when Bethlehem announced an increase of $5 per ton on structural steel. This product line accounts for about 7 percent of total industry deliveries, but is more important for Bethlehem. The increase was announced without prior consultation

4/ New York Times, September 10, p. 1; October 15, p. 73; October 16, p. 9; and October 31, 1965, p. 50.

with the Government and without a decrease for any other products. Within hours, the Chairman of the Council of Economic Advisers issued an analysis and a statement denouncing the increase, and President Johnson issued a statement calling the increase "unwarranted." The point of the Council's analysis was that labor costs per ton had fallen during the last five years, and, therefore, there was no justification under the wage-price guideposts for a price increase. President Johnson requested that Bethlehem officials meet with the Council. At the meeting, they rejected a proposal that the increase be delayed until the reasons for it could be studied thoroughly. 5/ By this time Inland and Colorado Fuel and Iron had matched the increase. The Government warned of possible controls if the increase spread, and Federal agencies were ordered to buy structural steel at the lowest possible price. Then Colorado Fuel and Iron deferred its increase. The conflict was resolved on the fifth day by United States Steel's announcement of an increase of $2.75 a ton on structural steel and a reduction of $9 a ton on cold rolled sheet on the west coast. President Johnson was quoted as pleased with the outcome. 1/

Later in 1966, U.S. Steel consulted with the Council of Economic Advisers concerning its desire to increase extra

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5/ New York Times, January 1, p. 1; and January 2, 1966, p. 1.

6/ Ibid., January 3, p. 1; January 4, p. 1; January 5, p. 19; and January 6, 1966, p. 1.

charges for some types of steel plate and to reduce list prices for nails and some types of wire rod subject to intense import competition. The Council had requested repeatedly that companies considering price increases on important products notify the Council in advance and discuss the issues when the case seemed doubtful. U.S. Steel was the first company to accept this suggestion, according to public announcements. The price changes received a statement of approval from the Council. 7/

In August 1966, Inland announced a 2.1 percent increase in the price of sheet and strip. This was the broadest increase since 1963, and it was made without consulting the Government in advance. The Council wired requests to the other major producers to delay action until they discussed the issues with the Council. Some replied and some did not. All followed the increase, and the Chairman of the Council issued a critical statement saying that this was a "defeat" for the guideposts. President Johnson's press secretary also criticized the increase. However, the Government took no further action, and the increase took effect. 8/

The record of Government opposition during 1966 to steel price increases indicates a weakened determination or ability to resist price increases. This year marked the first time a

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7/ New York Times, March 1, 1966, p. 47.

8/ Ibid., August 3, p. 1; August 4, p. 1; August 5, p. 1; August 6, p. 1; and August 7, 1966, p. 24.

steel company implemented a Government-opposed price increase without some modification of its original announcement. This condition became more pronounced in subsequent years. In 1967, the Administration urged the steel industry on three occasions not to adopt price increases announced by one of its members, but without success. In January, Jones & Laughlin raised its price for tubular steel by 2.7 percent, and Wheeling Steel, Colorado Fuel & Iron, and two smaller producers followed. In spite of urging by the Chairman of the Council of Economic Advisers, several other producers raised their prices for tubular steel 2.5 to 3 percent. At the end of August, Republic increased its price for reinforcing bars 1.8 percent. The Chairman of the Council of Economic Advisers criticized the increase and wired all other steel producers urging them to hold the line. In a news conference, President Johnson expressed regret over the increase but indicated that no Government action was planned. Five other companies raised their prices on reinforcing bars. The Administration later called industry leaders to Washington for a general discussion of steel prices. The Chairman of the Council of Economic Advisers and the Secretary of Commerce urged the industry to hold the price line. This was the first meeting with industry leaders that the Administration had held. At a press conference afterwards, the Secretary of Commerce said that the Administration had neither requested nor received a formal pledge of price stability from the industry. 9/ The third price increase implemented in 1967, despite Government opposition, occurred in early December when United States Steel raised its prices for some light, flat rolled products 3.4 percent, effective December 15. Mr. Ackley criticized the increase as "another turn in the price-wage spiral," and he urged other steel companies to consider the national interest and the industry's own interest. He said that steel prices were already too high, and he noted the loss of steel markets to foreign producers and to substitute materials. However, no indications of active Administration opposition were given. 10/ When Bethlehem also raised its price, President Johnson said, in a news conference, that the Government would take steps to stem the increases, and a few days later, in addressing the Business Council, he urged business and labor to restrain prices and wages. The chairman of United States Steel issued a statement defending the increase, saying that steel prices had not kept up with increases in the cost of living. A widespread interpretation of the Administration's statements was that stronger action was not contemplated. 11/ President Johnson's remarks before the Business Council concerning steel apparently were prompted also by Armco's announced increase on galvanized sheet and hot rolled sheet. Although

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9/ New York Times, September 13, 1967, p. 63.

10/ Ibid., December 3, 1967, p. 1.

11/ Ibid., December 5, 1967, p. 67.

the Administration did not comment specifically on this increase, Senator Hart, chairman of the Senate antitrust subcommittee, asked the Justice Department to study it. He said he reflected the concern of the White House. Armco rescinded its increase on hot rolled sheet after only two other producers followed it, but did maintain its increase on galvanized sheet.

The next year Bethlehem announced the first across-the-board increase since April 1962 and drew strong Administration opposition. Bethlehem's announcement came immediately after an agreement between the industry and the union on a new three-year contract that called for a wage increase of at least 44 cents an hour and increased fringe benefits. The price increase was 5 percent on all products, and Bethlehem said the purpose was to offset the immediate cost increase of the contract settlement and to meet other cost increases expected in the next few months. President Johnson deplored the increase in a news conference. He said that if it were followed by the rest of the industry, it would have "dire economic consequences for the nation," 12/ and he urged other steel companies not to follow it. He asserted that the price rise far exceeded any reasonable calculation of the cost of the contract settlement. He also asked Cabinet officers to explain the Administration's position to other companies. Bethlehem's chairman defended

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12/ New York Times, August 1, 1968, p. 1.

the increase. The Defense Department limited its steel purchases to companies that had not announced across-the-board increases.

Four other producers announced such increases: Republic, Inland, Armco, and Pittsburgh. United States Steel announced a selective increase of $7 a ton on plate and structural steel. President Johnson called 20 leaders of Congress to the White House to explain the Administration's position to them. Administration officials said that they believed that the costs of the new contract could be offset by selective increases that raised the average price for steel by 2 percent.

Despite these pressures, four of the five companies that had announced across-the-board increases refused to rescind them. Only Armco modified its position; it stopped just short of an across-the-board increase. However, some producers that had not announced price increases now made selective ones. National raised its tin mill items; Youngstown raised hot rolled and cold rolled sheet, galvanized sheet, and plate; and Jones & Laughlin made selective increases. Two days after the Defense Department announcement concerning its steel procurement policy, President Johnson extended to all Federal agencies the ban on steel purchases from companies that had announced across-the-board increases. Bethlehem officials met with the Defense Department.

Republic now said it would not raise its price for ammunition steel. However, Armco refused to follow this move. In an effort to exploit Republic's change from an across-the-board position, the Administration asked for bids for a year's supply of ammunition steel. Two days later, United States Steel announced increases averaging 2.5 percent on a wide range of products covering about 70 percent of the industry's production. The other companies reduced their increases to correspond with U.S. Steel's, and the Administration praised this development. About six weeks later, Presidential assistant Joseph Califano said that the President had saved consumers $550 million by winning this price rescission. 13/

The remainder of 1968 was marked by a 22 percent cut in the list price for hot rolled sheet and subsequent recovery in list prices for this product and related flat products. These price changes did not increase list prices above the level before the cut and, therefore, were not challenged by the Government. However, there were also three other announcements of price increases during the last part of 1968 that were not opposed by the Government. On October 18, U.S. Steel increased large-diameter pipe prices by almost 4 percent, effective November 1. Bethlehem announced that it would not follow this increase, and U.S. Steel postponed its increase until February 1. On December 18, U.S. Steel announced an increase in semi-finished carbon steel of $5 a ton, effective January 2, and Jones & Laughlin followed. On December 30, Inland raised its price for hot rolled strip, and three other producers followed.

13/ New York Times, September 24, 1968, p. 30.

None of the price increases made during 1969 and 1970 drew opposition from the Nixon administration, which took office in 1969. In all, there were 15 reported price increases in 1969 and 11 in 1970. None of them were across-the-board, and only a few involved more than one product at a time.

The first opposition to steel price increases by the Nixon administration occurred in January 1971, when Bethlehem announced a 12 percent increase in the price of construction and shipbuilding products. President Nixon condemned the action in a statement issued by his press secretary, and he hinted that he might allow an increase in the steel import quotas if other producers followed Bethlehem's move. He said he was deeply concerned about the increase, calling it enormous and likely to have an inflationary effect upon the construction industry and upon the economy in general. His press secretary said he had ordered the Cabinet Committee on Economic Policy to review the increase and to report promptly with suggested actions. The Government cancelled a negotiating session with other countries concerning continuation of the steel import quotas. 14/ The press viewed President Nixon's reaction as much milder than the jawboning techniques used by Presidents Kennedy and Johnson. 15/ Most steel executives were reported as believing that President Nixon had not been briefed well on

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14/ New York Times, January 13, p. 1; and January 18, 1971, p. 1.

15/ Ibid., January 13, 1971, p. 1.

the reasons for the increase and the industry's need for it. 16/ Four other firms followed the increase, and two of them announced that they would not rescind their increases. Bethlehem's president said his company had no plans to rescind or modify its increase. He said he had discussed it prior to announcment with the chairman of the Council of Economic Advisers, and that he had received no indication that the President would react so sharply. Bethlehem issued its annual report two weeks early, a move apparently intended to strengthen its case for a price increase. 17/ The report showed an earnings decline of about 40 percent from the previous year. Two more steel companies followed Bethlehem's increase. Five days after Bethlehem's initial announcement, United States Steel announced an increase of 6.8 percent on major structural steel products. The announcement also said that this increase would not cover inflationary cost increases incurred during the previous year and would not compensate for possible future cost increases. U.S. Steel had met with Administration officials before making this announcement, and reportedly was told that "massive" increases in steel prices would intensify pressures for wage and price controls. 18/ Kaiser followed U.S. Steel's

16/ *New York Times*, p. 61.

17/ *Ibid.*, January 15, 1971, p. 1.

18/ *Ibid.*, January 17, 1971, p. 76.

increase the next day, and the following day Bethlehem cut its increase to 6.8 percent. The White House press secretary said that the Administration was gratified that the increase was not as large as originally proposed, but it was not "sanguine" about the new level of steel prices. He said that the Cabinet Committee on Economic Policy would continue to review steel prices. Other producers that had followed Bethlehem's original increase followed Bethlehem's modification to a 6.8 percent increase.

About two months later, Hendrik Houthakker, the member of the Council of Economic Advisers in charge of the steel study ordered by President Nixon, said that the price behavior of the industry would determine in large part whether the Government would seek an extension of steel import quotas. 19/ A week later Mr. Houthakker expressed sympathy toward the steel industry's financial condition, but said that he was not convinced that the solution lay in the industry's freedom to raise prices. 20/

Five other steel price increases were made between late February and late April in 1971 without causing opposition from the Administration. Each of these increases was on specific products that constituted a small proportion of the industry's production. Then in May, U.S. Steel raised prices 6.25 percent for hot rolled and cold rolled sheet and strip,

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19/ New York Times, March 22, 1971, p. 49.

20/ Ibid., March 29, 1971, p. 49.

products that amount to about one-third of the industry's shipments. Company spokesmen said that there were no prior consultations with the Administration. President Nixon's press secretary said that the President was "disappointed," but denied that the President would seek a price rollback. The Council of Economic Advisers said it was following a "long-standing policy of refraining from comment on specific price increases." 21/ Three other companies followed the increase, and the Secretary of the Treasury expressed regret. The increase soon became widespread.

A three-year union contract was scheduled to expire in August 1971, and a considerable amount of activity during the first half of the year revolved around this fact. Hedge buying against a possible strike was reported as early as January. The United Steelworkers' president expressed determination to win a sizable wage increase for the first year of the new contract and restoration of the cost-of-living clause the union had given up in 1957. Later he referred to the 31 percent wage increase (spread over three years) that his union had won from the can industry in March, and he said that the union would not accept a steel contract that followed the wage guidelines set by President Nixon for the construction industry. The president of National Steel said in March that the industry expected to make a second round of price increases after the new labor contract was negotiated.

21/ New York Times, May 6, 1971, p. 1.

In this climate, the Council of Economic Advisers issued an "Inflation Alert," cautioning management and labor that a big wage increase, such as that agreed upon in the can industry, would increase the industry's problems and would induce higher unemployment. This was the first Government message of its kind to comment on a major wage negotiation before the actual bargaining had begun. 22/ The president of the United Steelworkers rejected the warning, saying that his union deeply resented the Administration's intrusion into the forthcoming negotiations.

Preliminary talks began on May 20. On June 1, the White House press secretary cautioned the steelworkers union not to seek a settlement as large as the one they had signed that day with the aluminum industry. This also called for a 31 percent wage increase over three years. On July 6, the first day of formal negotiations, President Nixon called company and union negotiators to confer with him at the White House. He made available the report on the steel industry by the Cabinet Committee on Economic Policy. The report said that the U.S. steel industry had steadily lost sales in the world market and had had sharp losses in productivity and that the real income of steel workers had declined relative to other U.S. industries. The Administration also reported that it planned to negotiate an extension of the voluntary quotas on steel

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22/ New York Times, April 14, 1971, p. 1.

imports. Some of those present at the White House conference felt that this implied a threat that efforts to extend the quotas would not be pressed if the contract settlement were viewed by the Government as inflationary. 23/

This notwithstanding, a new settlement was agreed upon on August 1, calling for a total wage package reported to be more than a 30 percent increase over three years. The immediate statement from company officials was that the size of the increase made a price increase virtually certain.

Five of the eight major producers announced an 8 percent price increase on nearly all products that would take effect on a staggered schedule from August 5 to December 1. The Administration reaction was a statement warning that this increase would have an adverse effect on jobs. Later, in a press conference, President Nixon said he regretted that the settlement included wage increases that called for price increases, and he stated that the settlement was not in the best interest of the country, the industry, or labor. However, he ruled out an attempt to roll back steel wages or prices. 24/ White House spokesmen indicated that the Administration was not notified in advance about the price increases. By August 4, the other three major steel announced companies similar increases.

23/ New York Times, July 7, 1971, p. 1.

24/ Ibid., August 5, 1971, p. 16.

On August 11, Bethlehem announced that it would defer its 8 percent increase for cold rolled sheet until February 1, 1972. This increase had been scheduled to take effect on December 1, 1971. 25/

The Wage-Price Freeze

On August 15, 1971, President Nixon imposed a 90-day freeze on wages and prices throughout the economy. At first steel producers were uncertain whether they could charge the higher prices they had announced on August 2. United States Steel said it would not rescind the 8 percent increase that took effect on August 5, but that it would hold back the price increases it had scheduled for October and December. 26/ Bethlehem said that it regarded the announced increases as frozen, and would continue to bill at the higher prices that became effective on August 5. 27/ Some other producers rescinded announced price increases that would have taken effect during the 90 days following August 15. 28/ The Cost of Living Council decided that it would allow steel companies to continue the 8 percent price increase announced on August 2 if a substantial number of transactions during a 30-day base period, beginning August 5, occurred at the higher price.

25/ New York Times, August 12, 1971, p. 1.

26/ Ibid., August 18, 1971, p. 20.

27/ Ibid., August 19, 1971, p. 21.

28/ Ibid., August 20, 1971, p. 49.

The first decision under the control program that involved the steel industry concerned the 8 percent price increase the companies had announced shortly before the price freeze. On November 18, the Wage and Price Commission decided to limit the increase to 2.5 percent. In the next decisions involving steel, the Price Commission approved applications by two companies: a 7.6 percent increase in tin mill prices requested by Bethlehem and a 7.2 percent increase by National. 29/

The Price Commission granted U.S. Steel an average price increase of 3.6 percent on all its products on December 7. The Commission did not consider the application on a product-by-product basis but instead announced that U.S. Steel could increase specific products by different amounts so long as the weighted average increase did not exceed 3.6 percent. 30/ Under this decision, U.S. Steel raised its prices for sheet and strip and for tin mill products 7.7 percent, effective on various dates between December 20 and February 1.

Also in December, Republic was allowed to implement on January 1 the price increase for sheet and strip that it had

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29/ New York Times, November 24, 1971, p. 15.

30/ The Price Commission developed a Weighted Average Price Increase procedure and a Term Limit Pricing procedure for large firms. Both methods offered administrative advantages both to corporations and to the Price Commission: one application could cover more than one product. They also offered corporations greater price flexibility in that they could increase the price of some products more than the allowed weighted average increase. See [6, pp. 276, 277].

announced on August 2. Price increases for cold rolled sheet were deferred until February 2. 31/ The Price Commission also approved an 8 percent increase for sheet products requested by National, a 4.8 percent increase in tin mill prices requested by Kaiser, and a 2.7 percent increase on all steel products requested by Bethlehem. Jones & Laughlin raised its tin mill prices 7.2 percent; and Armco raised various products 6.5 percent, effective in January, and announced it would increase its cold rolled sheet prices on February 1. National announced it would raise its price for sheet about 8 percent, and Wheeling-Pittsburgh announced it had received permission from the Price Commission to increase its prices for certain flat rolled products about 8 percent. 32/

In early January, 1972, U.S. Steel announced that market conditions had forced it to roll back prices on a wide range of products, including some it had raised with Price Commission approval less than a month before. The cuts ranged from $5 to $25 a ton. 33/ Other producers matched the price cuts on sheet. 34/ However, later in the month the chairman of U.S. Steel stated that his company would not postpone the price

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31/ New York Times, December 16, 1971, p. 93.

32/ Ibid., December 17, p. 20; December 18, p. 43; and December 21, 1971, p. 30.

33/ Ibid., January 6, 1972, p. 1.

34/ Ibid., January 8, 1972, p. 41.

increase for cold rolled sheet scheduled for February 1. 35/ In early February the major producers raised cold rolled sheet by $10.50 a ton. 36/

In April, Bethlehem announced it would not increase its prices for rolled steel products before the end of the year. 37/ Other major producers made similar announcements within a few days.

In June, U.S. Steel announced a reduction in the prices of certain galvanized steel sheet with light commercial coating. This grade is used in autos and appliances. Some other steel companies said that this was more of change in specifications than in price, but they added that they were studying the situation. 38/

In October, Bethlehem announced it was advising its customers that it would not increase its prices for sheet until at least April 1, 1973. 39/ In November, U.S. Steel said it would increase its prices for a variety of products by an average of 2.7 percent. 40/ Other producers announced similar increases during the following two weeks.

35/ New York Times, January 21, 1972, p. 33.

36/ Ibid., February 7, 1972, p. 46.

37/ Ibid., April 14, 1972, p. 1.

38/ Ibid., June 29, 1972, p. 55.

39/ Ibid., October 31, 1972, p. 63.

40/ Ibid., November 18, 1972, p. 51.

In May 1973, the Cost of Living Council indicated a concern about the rising prices for scrap iron and steel, and announced it would conduct a fact-finding survey of the largest scrap producers and brokers to determine the reasons for their recent price increases. 41/

Also in May, U.S. Steel announced it would increase its prices for sheet and strip by an average of 4.8 percent effective June 15. The company pointed out that this increase would raise the average price for all its products by approximately 1.3 percent, well within the permissible limitations of the price control program. 42/ Other major producers made similar price increases. On June 11, President Nixon was reported to be preparing a package of anti-inflation measures that would include a request to the steel industry to delay its price increase scheduled to take effect in a few days. 43/ On the same day, Lukens Steel announced it would raise its base prices for carbon plate $5 a ton and for alloy plate $10, effective August 6. 44/

Two days later, President Nixon instituted a 60-day freeze on wages and prices, and an Administration spokesman explained that the steel price increases that had not gone

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41/ New York Times, May 11, 1973, p. 51.

42/ Ibid., May 11, 1973, p. 51.

43/ Ibid., June 12, 1973, p. 30.

44/ Ibid., June 12, 1973, p. 61.

into effect by June 8 would not be allowed to take effect during the freeze. 45/

At the end of the 60-day freeze period, Armco requested permission to increase its sheet and strip prices by an average of about 5 percent. Armco acted under the regulations for Phase IV of the price control program. This phase began at the end of the freeze, and the regulations stated that a requested price increase would take effect automatically if not challenged by the Government within 30 days. Other major steel producers made requests similar to Armco's. 46/ On August 20, the Cost of Living Council announced that it would hold public hearings in August on the price increase requests made by the steel and auto industries. The steel hearings were held on August 30 and 31, and on September 10 the Cost of Living Council allowed a price increase for sheet and strip in two stages of about 2.5 percent each on October 1 and again on January 1. The decision also deferred price increases on any products other than sheet and strip until January 1. 47/

In November, the CF & I Steel Corporation (the new name for Colorado Fuel & Iron) announced it would discontinue production of welded wire fabric in its

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45/ *New York Times*, June 14, 1973, p. 36.

46/ *Ibid.*, August 14, p. 1; August 15, p. 1; and August 18, 1973, p. 31.

47/ *Ibid.*, September 11, 1973, p. 1.

Roebling, New Jersey, plant because it could not obtain price relief from the Cost of Living Council in the face of rising scrap prices. 48/

Six steel companies applied in late November for permission to raise prices about 6.5 percent on about half of their product line effective January 1. Their applications covered a variety of products other than sheet and strip, since in September the Cost of Living Council had approved a price increase for sheet and strip to take effect January 1. 49/ Six other companies made similar applications a few days later. The Cost of Living Council held hearings on these requests on December 19, and on December 21 ordered a postponement of price increases as such, but allowed immediate price increases to reflect higher scrap costs. 50/ Producers applied scrap surcharges on products using large amounts of scrap. For example, Bethlehem's scrap surcharge on reinforcing bars was $11.50 a ton for shipments from the east coast and $14 for shipments from the west coast. 51/

On January 7, 1974, U.S. Steel told the Cost of Living Council that it would raise its tin mill prices an average of 8 percent and its galvanized sheet prices an average of 4.25

48/ New York Times, November 21, 1973, p. 41.

49/ Ibid., November 28, 1973, p. 1.

50/ Ibid., December 22, 1973, p. 35.

51/ Ibid., January 1, 1974, p. 28.

percent, effective February 16. 52/ However, the Council ruled that these price increases should be less than 0.5 percent. At the same time, the Council gave steel companies exemptions from certain price restrictions. It removed the 10 percent maximum price increase for any one product, and removed altogether controls on products with annual sales of less than $50 million. These two actions removed price controls from about 18 percent of all steel production. The products affected were largely wire, pipe and tubes, electro-metallurgical products, and certain cold-finished products. The Council said that smaller producers would benefit more than larger ones from these exemptions. The Director of the Council said that these actions would give steel firms greater incentive to increase production of products currently in short supply, such as those used in oil drilling and in coal mining. 53/

Industry spokesmen were critical of the Council's decision. The chairman of U.S. Steel charged that the decision to grant less than a 0.5 percent price increase and to lift price controls on only certain classes of products was unfair and had a discriminatory effect upon the various steel companies. He said that he would seek a change in the decision. 54/ A spokesman for the American Iron and Steel Institute said that the

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52/ New York Times, January 8, 1974, p. 45.

53/ Ibid., January 26, 1974, p. 41.

54/ Ibid.

tight controls on steel would soon cause shortages of drill pipe and roof-line bolts. 55/ Bethlehem announced it would sue the Council on its latest price increase decision. The chairman of Bethlehem said the decision would discourage badly-needed expansion in the steel industry. 56/

Four companies announced price increases about this time. Wheeling-Pittsburgh said it would raise its tin mill prices by an average of 7.6 percent on February 16. 57/ On February 8, Inland and Jones & Laughlin said they would raise prices on selected products. 58/ Youngstown raised its prices for casing and drill pipe about 6 percent and for tubing about 12 percent, and rescinded its scrap surcharge in effect since January 1. Youngstown also announced price increases for its standard pipe and line pipe that would vary according to the finish and the method of manufacture. 59/

On February 15, the Cost of Living Council exempted all ferrous and ferro-alloy scrap from price controls. 60/ Five days later, the Council exempted iron and steel foundries from wage and price controls. 61/

55/ New York Times, January 27, 1974, Section III, p. 13.

56/ Ibid., January 30, 1974, p. 43.

57/ Ibid., January 31, 1974, p. 49.

58/ Ibid., February 9, 1974, p. 44.

59/ Ibid., February 16, 1974, p. 39.

60/ Ibid., p. 43.

61/ Ibid., February 21, 1974, p. 47.

Youngstown announced it would increase its prices for bar products by an average of 9 percent. 62/

On February 28, the Cost of Living Council granted price increases averaging 5 percent on all steel products and authorized additional increases to cover higher scrap prices. 63/

During Phase IV, the Council was preparing for the end of controls. A sector-by-sector decontrol program was undertaken over several months to exempt industries on an individual basis. The first industry to be exempted was fertilizer, on October 25, 1973. Two more industries were exempted on December 6, cement and certain nonferrous metals (zinc, antimony, bismuth, and cadmium, and most nonferrous scrap). The auto industry was exempted on December 10. After January 1974, the pace of industry exemption increased and about 15 other industries were exempted [6, pp. 870, 888, and 932-938]. However, the steel industry was not among them because the Council expected that exemption of steel would create inflationary pressures [6, p. 943].

On April 2, Youngstown announced it would raise its prices for tubing an average of 7 to 8 percent. 64/ National said it

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62/ New York Times, February 28, 1974, p. 54.

63/ Ibid., March 1, 1974, p. 35.

64/ Ibid., April 3, 1974, p. 68.

was adding a scrap charge of $7 a ton on all rolled products, in line with the Cost of Living Council's regulation. 65/

The industry agreed on a new three-year contract with the United Steelworkers on April 12, over three months before the expiration of the existing contract. The new agreement called for a wage increase of over 10 percent, and increases in cost-of-living allowances, pensions, and other benefits. 66/ The industry's chief negotiator refused to comment on the effect of this agreement on steel prices. 67/ Since the new contract would not take effect until August, no company at this time announced related price increases.

After Wage-Price Controls. Wage-price controls expired on April 30, 1974, and on May 1, National increased its tin mill products 9.5 percent and Youngstown raised prices 10 to 25 percent on all its tubular products. 68/ The next day, U.S. Steel raised prices on all its product line by an average of 5.7 percent. The company raised cold rolled sheet 9.7 percent and hot rolled sheet 10 percent. Wheeling-Pittsburgh raised its prices an average of 6 percent, and raised tin mill products 9.5 percent. 69/ Bethlehem increased prices on its cold rolled products

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65/ New York Times, April 5, 1974, p. 51.

66/ Ibid., April 13, 1974, p. 1.

67/ Ibid., April 21, 1974, Section III, p. 1.

68/ Ibid., May 2, 1974, p. 75.

69/ Ibid., May 3, 1974, p. 1.

an average of 9 percent and said it was revising its extra charges. Armco raised its prices in accord with other companies. National raised its prices an average of 6.7 percent, and Republic raised its prices an average of 8.1 percent. Inland increased its prices an average of 6.1 percent and Youngstown raised its prices by an average of 5.8 percent. 70/ Kaiser raised its prices an average of 9 percent. 71/

On June 11, U.S. Steel increased its prices an average of 8 percent on bars, semi-finished steels, rod, wire, and plate. Bethlehem and Kaiser increased their prices an average of 9 percent. 72/ On June 24, Bethlehem raised prices on some of its rolled products 5 to 15 percent. 73/

On June 26, U.S. Steel announced it would raise prices on about half its shipments about 5.5 percent, effective July 1. The company gave examples of the increases it would make: 14 percent for plate, 10 percent for structural shapes, and 15 percent for rail. 74/ Similar increases were announced during the next few days by many other producers. 75/

70/ New York Times, May 4, 1974, p. 51.

71/ Ibid., May 21, 1974, p. 66.

72/ Ibid., June 12, 1974, p. 61.

73/ Ibid., June 25, 1974, p. 49.

74/ Ibid., June 27, 1974, p. 1.

75/ Ibid., June 29, p. 35; July 2, p. 49; and July 3, 1974, p. 46.

Bethlehem said it was reducing prices on structural shapes and on plate from June 24 through August 31. The reductions were $20 a ton on structural shapes from three of its plants (Bethlehem and Johnstown, Pa., and Lackawanna, N.Y.) and $10 a ton on carbon plate from all its plants. 76/

Two weeks later, the chairman of U.S. Steel noted that his company had raised its prices by an average of 23 percent since controls were ended, and he stated that his company did not intend to increase prices significantly on any major steel products for the rest of the year. 77/

The next round of price increases came in September. Kaiser announced it would increase its prices. 78/ Bethlehem said it had increased its prices for structural shapes 10 percent and carbon plates 4.4 percent. Inland raised its prices for structural shapes $9 a ton, for reinforcing bars $13, and for merchant quality bars $25. 79/ National increased its prices for tin mill products an average 2.25 percent. 80/

The Council on Wage and Price Stability

In December, U.S. Steel announced increases averaging 8 to 10 percent on products that were in heavy demand. These

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76/ New York Times, July 2, 1974, p. 49.

77/ Ibid., July 16, 1974, p. 1.

78/ Ibid., September 7, 1974, p. 36.

79/ Ibid., September 10, 1974, p. 58.

80/ Ibid., September 19, 1974, p. 72.

products amounted to about two-thirds of the company's product line. 81/ The following day, President Ford directed the Council on Wage and Price Stability to obtain immediately written justification for the price increase from U.S. Steel. A U.S. Steel spokesman said these increases were justified because big companies had been subjected to more stringent price controls than smaller ones. 82/ CF & I Steel announced price increases similar to those for U.S. Steel, and the Council on Wage and Price Stability asked CF & I to justify its increases. 83/ The chairman of U.S. Steel met with the director of the Council on Wage Price Stability. He argued that 60 percent of the price increase merely brought U.S. Steel's prices up to those of other steel companies, and that U.S. Steel had increased its prices less than its costs had increased. 84/ Three days after this meeting, U.S. Steel announced a reduction in its price increases to 7 to 8 percent and a pledge not to increase the average level of its steel prices during the next six months unless forced to do so by unforeseen major economic events. The company said that this change in its price increase would give it an increase of about 4 percent on its total product line.

81/ New York Times, December 17, 1974, p. 51.

82/ Ibid., December 18, 1974, p. 1.

83/ Ibid., December 20, 1974, p. 9.

84/ Ibid., December 21, 1974, p. 35.

U.S. Steel's chairman said the company took this action because of a desire to help the fight against double-digit inflation. 85/

Albert Rees, the Director of the Council on Wage and Price Stability, was quoted as being pleased with U.S. Steel's reduction in its price increase, and he expressed hope that other companies would reconsider their announced increases. 86/ It was reported that observers did not regard this modification as a great victory for the Administration, since it still left U.S. Steel with substantial price increases. There was speculation that the company had raised prices in anticipation of a return of price controls. 87/

Bethlehem and Wheeling-Pittsburgh announced increases averaging 5 to 6 percent. The Council asked Bethlehem to explain its increase. 88/ After meeting with the Council, Bethlehem made a partial reduction of its price increases for rails and tin plate but not for its other increases scheduled to take effect on December 30. Bethlehem explained that it had learned of U.S. Steel's price increase modifications only hours after it had announced its own increases. 89/

85/ New York Times, December 24, 1974, p. 1.

86/ Ibid.

87/ Ibid.

88/ Ibid.

89/ Ibid., December 29, 1974, p. 32.

Two days after U.S. Steel announced a reduction in its price increase, CF & I Steel stated it had submitted a statement to the Council supporting its price increase, which it now described as averaging less than 5 percent. 90/

Kaiser raised its prices for some products and lowered others, so that its net average increase was 1.5 percent. 91/ Armco raised prices 2.2 percent on products constituting about one-third of its product line. National raised its prices for plate $10 a ton, and for structural shapes $5 a ton and reduced its extra charge for cold rolled sheet about $9 a ton. CF & I reduced its price increases for rail $10 a ton and for structural shapes $5 a ton from the amounts it had announced on December 17. 92/

In early January, 1975, Republic increased its prices by an average of 1.4 percent, but also cut its prices for reinforcing bars and galvanized pipe. Its increases were primarily in plate, tubular products, wire, and alloy bars. 93/

Other announced price changes in 1975 did not occur until early August, when Bethlehem reduced its prices for plate $5 a ton, and for specialty bars $4. 94/ This amounted to about

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90/ *New York Times*, December 26, 1974, p. 66.

91/ *Ibid.*, December 28, 1974, p. 35.

92/ *Ibid.*, December 31, 1974, p. 27.

93/ *Ibid.*, January 4, 1975, p. 33.

94/ *Ibid.*, August 5, 1975, p. 49.

2 percent. Armco raised its prices for flat rolled products, including sheet, by an average of 9 percent. 95/ Wheeling-Pittsburgh announced a price increase on all flat rolled products. 96/ U.S. Steel said it would increase its prices an average of 3.8 percent by October 1. The company also said it was delaying a planned price increase of 5.7 percent in an effort to encourage the economic recovery it believed had begun. 97/ A few days later, Republic said it would alter its prices in line with the price changes announced by U.S. Steel. 98/ Two days later, Bethlehem and National announced price changes that would increase their prices by almost 4 percent when averaged over all their products. 99/ Youngstown said it would increase its prices for flat rolled products and for hot rolled bars. 100/ Inland increased prices on a number of products, including sheet, bars, and structural shapes, and cut prices on several other products, including reinforcing bars. 101/ Armco announced it would revise its prices both

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95/ New York Times, August 6, 1974, p. 1.

96/ Ibid., August 7, 1975, p. 41.

97/ Ibid., August 9, 1975, p. 1.

98/ Ibid., August 12, 1975, p. 37.

99/ Ibid., August 14, 1975, p. 43.

100/ Ibid., August 15, 1975, p. 49.

101/ Ibid., August 19, 1975, p. 47.

upward and downward consistent with price changes recently announced by other steel companies. 102/ Jones & Laughlin said it would increase its prices to the levels of its competitors on September 1 for pipe and tubing and on October 1 for sheet and bars. 103/ Kaiser raised its price for plate $10 a ton and reduced special quality bars $14 and alloy bars $7, effective October 1. Kaiser said the net effect of its price changes would be an average increase of about 3.1 percent. 104/

In November, National announced an increase in its tin plate prices estimated at 7 percent, effective January 15. The Council on Wage and Price Stability requested data from National so that it could review the increase. 105/ Bethlehem and Wheeling-Pittsburgh announced increases in tin plate prices of 7 to 9 percent, effective February 1. 106/ U.S. Steel announced that it would increase its tin plate prices. Jones & Laughlin said it would increase its tin mill prices

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102/ New York Times, August 21, 1975, p. 55.

102/ Ibid., August 22, 1975, p. 42.

104/ Ibid., August 30, 1975, p. 28.

105/ Ibid., November 19, 1975, p. 61.

106/ Ibid., November 21, 1975, p. 67.

more than 7 percent. 107/ The Council on Wage and Price Stability did not comment on these price increases for tin plate. On December 12, National said it would defer its price increase for tin plate until February 1. 108/ This was the last steel price announcement made in 1975.

107/ New York Times, December 3, 1975, p. 73.

108/ Ibid., December 13, 1975, p. 43.

APPENDIX 5B

A general principle of econometrics is that the least squares estimates of the parameters in a linear model are biased when the explanatory variables are correlated with the error term. When this is perceived to be the case, techniques such as two-stage least squares or instrumental variables estimation is the appropriate estimating procedure. The first step in this procedure is, of course, the recognition of the correlation between the explanatory variables and the error term. This recognition presupposes some knowledge of the components of the error term and some knowledge of the mechanism which generates the explanatory variables; hopefully, this knowledge can be exploited in the subsequent estimation process.

In estimating the impact of jawboning on steel profits, the error term in the profit equation is all of the other economic and political forces which normally affect profits but are not already included as explanatory variables. The mechanism which determines when jawboning will be utilized is probably not very well understood, but it is fair to say that the jawboning variable is correlated with the error term of the profit equation and that the least squares estimates are inappropriate. This correlation will exist if any of the "left out" variables which make up the error term are also part of the input to the jawboning decision. This seems to be a reasonable assumption. What one would like to do then in the estimation procedure is to systematically explain that part of the jawboning decision which is not influenced by the variables included in the error term of the profit equation and to use this predicted variable in an instrumental variables estimation of the parameters of the profit equation.

Since jawboning is a dummy or binary variable, and binary variables are not included in the usual textbook description of instrumental variables estimation, a more formal treatment of the estimating technique is presented below:

Consider the equation

(1) $Y_t = X_t\beta + d_t\alpha + U_{1t}$

where d_t is the dummy variable but is also a dichotomization of a random variable U_{2t} which is correlated with U_{1t}. This correlation represents the common influence, or the variables which affect both y_t and d_t. If the joint distribution of U_{1t} and U_{2t} is normal with mean zero and correlation ρ, the dichotomization of U_{2t} (the mechanism which determines when $d_t = 1$ and when $d_t=0$) is given by the probability distribution

(2a) $P(d_t = 1) = \int_{-\infty}^{Z_t'\delta} \phi\ (U_2)\ dU_2 = p\ (Z_t'\ \delta)$

(2b) $P\ (d_t = 0) = q(Z_t'\delta) \quad = 1-p(Z_t'\ \delta\ )$

where $\phi\ (U_2)$ is the standard normal density function. Z_t is the vector of exogenous variables with the same meaning as exogenous variables in a quantal response model. Since U_{1t} and U_{2t} are correlated, d_t and U_{1t} are also correlated, with the correlation coefficient given by

$$(3)\quad \rho \frac{\phi(Z_t' \delta)}{\sqrt{p(Z_t' \delta) q(Z_t' \delta)}}$$

It is now apparent in this model that least squares estimates will be biased and inconsistent estimates of α and β. However, given the structure described in equation (2), we can obtain consistent estimates of $p(Z_t \delta)$ using probit analysis which can be used as instruments for d_t in an instrumental variables estimation of the parameters α and β. It then follows from Amemiya's article in the Journal of Econometrics (July, 1974, pp. 105-110) at the estimator

$$(4)\quad \begin{vmatrix} \hat{\beta} \\ \hat{\alpha} \end{vmatrix} = [(X\ \hat{P})'\ (X\ D)]^{-1}\ (X\ \hat{P})\ y$$

is a consistent estimator of α and β with an asymptotic covariance matrix which can be consistently estimated by

$$(5)\quad \hat{\sigma}^2\ [(X\ \hat{P})\ \ (X\ D)]^{-1} \quad \text{where}$$

$$(6)\quad \hat{\sigma}^2 = \frac{\Sigma(Y_t - X_t \hat{\beta} - d_t \hat{\alpha})^2}{T}.$$

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Chapter 6

SUBSIDIES

Public financial aids that amount to subsidies may lead to alterations in the flow of steel in international trade. This chapter discusses possible sources of public subsidies to the steel industries of the United States, Japan, and the nations of the European Community. Quantitative estimates of their impact on costs are rendered.

At the outset, it should be recognized that not all forms of public financial assistance will lead to significant alterations in future trade flows. There are several reasons for this. First, it is conceivable that, in some cases, public assistance may be granted on the basis of "equity" considerations with "no strings attached," primarily or solely for the purpose of improving the income positions of owners and workers. Without significant effect on the unit economic costs of production in the industry, such aid should not be expected to affect the level or pattern of production and output in the industry, either in total or as broken down between exports and domestic use. As an extreme example of this, consider a one-time outright gift from a government to workers and/or owners in the steel industry. Economic theory suggests that such aid, although it would improve the income and wealth levels of recipients, would not affect costs of production and marketing and should not, therefore, have any effect on production and marketing decisions. 1/

Second, but somewhat related to the first point in principle, is the fact that some public assistance programs, although they might affect costs in the short run, are clearly temporary in nature. An example of this might be a direct wage subsidy program. While it was in effect, it would reduce the cost of production in the industry and thereby affect production and marketing decisions. Economic theory suggests, however, that once the program was stopped, production levels and patterns should assume a configuration approximately equal to that which would have occurred had the subsidy program never been undertaken. This clearly follows if long-range planning and investment decisions during the interim were predicated on foreknowledge that the subsidy program was going to end.

Subsidization of capital costs (rather than labor costs), perhaps by the provision of low-interest loans, is a similar but less clear-cut phenomenon. If low-interest loans are provided for a limited period of time by the public authority, and particularly if the reception of the public loan is predicated upon a requirement to install new plant or other

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1/ A permanent program to supplement incomes in a particular industry might have some indirect effect. If, for example, steelworkers received income supplements conditioned on their employment in the industry, they might be willing to accept lower wages than otherwise. In this case, steel producing firms would have lower costs than otherwise, and a subsidy effect would be established.

capital facilities, one would expect new capital investment to accelerate during the period of the loan program. Once the loan program was stopped, however, and the new capital facilities were in place, economic decisions concerning how they should be operated would be independent of their method of original finance. The only thing that would matter would be the fact that they were there.

The very fact, however, that the capital stock in the industry at that point in time was larger than it would have been (absent the interim subsidy program) suggests that for some time after the termination of the program, relevant production costs would be lower and production (including net exports) would be higher than would have been the case had the subsidy program never been in force. The length of time during which enhanced production would occur should depend on the length of life of capital goods and the rate of technological change in the industry. Nevertheless, the effect of a short-term subsidy program should dissipate eventually, and the industry should move to an equilibrium state that it would have achieved absent the subsidy program. It must be admitted, however, that the effect of the interim subsidy program might be to get the industry into its longrun equilibrium state more or less quickly than it would have moved there on its own.

A capital goods subsidy program (reduced-interest loans) that is <u>permanent</u> in nature, however, will have longrun equilibrium effects on the industry. A permanent program of granting reduced-interest public loans, assuming that the volume of loans is not restricted below a level that firms would voluntarily want to borrow, should have the following effects: (1) Insofar as substitution of capital for labor is possible in production, the industry would tend to become more capital intensive; (2) longrun average and marginal costs of production would be reduced; and (3) production in the industry should be greater, in a permanent equilibrium sense, for both domestic consumption and net exports.

Similarly, a permanent subsidization of any other factor of production should have a permanent impact.

In summary of these first two points, economic theory suggests the following propositions: (1) A financial aid program which affects the income of workers and/or owners in the industry, but which does so without affecting input prices (and therefore, costs of production), should not affect industry production levels. It is irrelevant for our purposes. (2) A subsidy program that is clearly temporary in nature should have only temporary effects on industry production levels; and (3) a subsidy program that is permanent in nature should be expected to have permanent longrun equilibrium effects on production levels in the industry, and hence on the longrun equilibrium volume of net exports.

A third point that must be noted is that, in some cases, cost-reducing subsidies (such as low-interest loans) may be intended to offset, wholly or partially, cost-increasing conditions forced on the industry by public authority. Possible examples of this are numerous. Firms may be required to locate new plants (or keep old ones open) in depressed areas as part of redevelopment plans. Or they may be forced to continue employing workers that they would otherwise lay off. Government planners may require firms to maintain or expand certain product lines that yield returns that are inadequate from a private industry viewpoint. Or firms may be required to invest in unprofitable "social overhead" capital.

In cases such as these, it is the net cost effect (the effect of the subsidy minus the effect of the associated requirement) that is important for our purposes. Adjustments must be made accordingly.

A final but very important point is that measures affecting a large segment of a national economy leave the international competitiveness of a given industry within that segment largely unchanged. 2/ Economic theory suggests that in this case, the general effects on production costs will be compensated either by exchange rate adjustments or differential international changes in general price levels, leaving the particular industry in question no better off compared to

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2/ This point was advanced by the Tinbergen Committee, formed in 1953 to analyze the trade-distorting effects of different national tax systems within the European Coal and Steel Community. See [31, p. 41]. For a comprehensive discussion, see [7, pp. 46-48, and chapters 4 and 5].

its international rivals. Thus, generally applied rules allowing rebates of value added taxes to exporters, or those permitting accelerated depreciation of assets, should not improve the international competitiveness of a particular industry such as steel.

In the calculations of the cost-reducing effects of various subsidy programs in various steel producing countries, these considerations were taken into account. In general, the approach was to search the historical record of each country for evidence of public programs that might have had cost-reducing impacts on that country's steel industry. Our study then attempted to quantify, with the best estimates possible, the reductions in unit cost of production attributable to the various programs. This yielded what was dubbed a "crude" subsidy value. To this "crude" value either or both of two adjustments were sometimes made. One was to subtract an estimate of the cost-increasing impact of any possible condition tied to the aid (a "compensatory" adjustment). A second was to apply a percentage adjustment to allow for the extent to which the aid program was targeted at the steel industry per se, rather than a large segment of the economy (this was called a "proportionality" adjustment).

Unfortunately, information was not available for all countries for the same historical time period. This makes country by country comparisons less meaningful than they would otherwise be. A somewhat related question is: Since the subsidy programs examined occurred in the past and may not continue into the future, what impact do they have on current and future international trade flows? One view of this whole matter might be that, for each individual country, the historical information obtained can be used as a "time" sample to predict the country's likely future policy toward its steel industry. One might assume, in effect, that future policy will be similar to past policy as observed. The meaningfulness of intercountry comparisons, and predicted impacts on current and future trade flows, must rest on some such assumption.

One final caveat must be added. Although a thorough search involving at least one full workyear of effort was conducted, it is not absolutely certain that all the subsidy programs that might have existed were, in fact, uncovered. An inability to find a needle doesn't necessarily prove that there isn't one in the haystack. This doesn't mean, however, that all the estimates should be regarded as being on the low side. Errors may have been made in the other direction as well. Something may have been called a subsidy when, in fact, it wasn't. Or cost-increasing conditions tied to particular subsidy grants may have gone undiscovered. Nevertheless, the calculated values should be taken for what they are: best informed estimates.

I. GENERAL COMMENTS ON SUBSIDY CALCULATIONS

For grants and aids regarded as direct cost reducing subsidies, an estimated reduction in unit costs was calculated by dividing the total amount of the aid by the crude steel output over the relevant time period.

Most of the aid that was uncovered, however, involved the granting of public loans and guarantees for private loans. The true subsidy value involved here is not the amount of the loan; it is the interest savings compared to the interest that would have to be paid for similar loans obtained on the private capital market. Annual cost savings can be calculated as the outstanding balance of such loans, multiplied by the difference in interest rates between public (or guaranteed) and private loans.

Precise information concerning such interest rate differentials for particular loan programs was generally not available. Wherever there _was_ information, however, that public loans _were_ made at "reduced" rates of interest, a rate differential of three percent was assumed (with one exception) unless there was evidence available concerning the actual rate differential. 3/ In situations in which there was no reason to infer that public loans _were_ made at

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3/ Three percent was the average rate differential specified for such loans by the European Coal and Steel Community (ECSC) and by the lending agency of the French Government. See the appendix, pp. 398 - 400 and p. 434.

reduced rates of interest, a rate differential of one percent was typically assumed, on the theory that public loans must have had some net beneficial impact, even if it had to do more with capital availability rather than with rate differentials. For loans guaranteed by the public authority, an an interest rate differential of one-half of one percent was assumed, on the assumption that potential risk reduction associated with such guarantee must be worth something.

Annual subsidy values were divided by average annual physical outputs over the relevant time periods. 4/ This put the subsidies on a "per unit of output" basis. In addition, since information was not available for the same time period for all countries, the subsidy values were adjusted by the U.S. Bureau of Labor Statistics wholesale price index and stated in terms of 1975 dollars. (If future subsidies are to be predicted by past subsidies, the prediction should be in "real" terms rather than "nominal" terms. This also calls for price level adjustments.) All this enables one to make international comparisons.

The discussion in this chapter will be limited to the United States, Japan, and the European Community. In the

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4/ In order to avoid errors caused by divergent definitions of "finished" steel, production data prepared by the German Iron and Steel Federation were used. In its Statistical Yearbook, the Federation supplies output data, according to the product definition of the ECSC, for all major steel producers.

appendix, comments are made concerning ownership and assistance in other, less developed, steel industries.

A discussion of the calculation of subsidy values for the individual countries follows. In the main body of the chapter, only the amount of information required to understand the calculations is presented. Much more extensive and detailed information concerning the individual countries' subsidy programs (with the exception of that for the U.S.) is discussed in the appendix to the chapter. The meticulous reader who is interested in details should search for them there.

The overall findings are summarized at the end of the chapter.

II. THE UNITED STATES, 1957-75

As a general matter, the U.S. steel industry has not received direct subsidies, loans, or loan guarantees, except for minor loans extended to some small companies under various special assistance programs. In some cases, individual States have also made minor loans to companies in order to promote regional development, and for pollution control. 5/

There are various ways, however, in which Government actions may have affected U.S. steel industry profitability. These are as follows: (1) the work done by the Army Corps of Engineers on waterway and harbor projects that benefit

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5/ For examples of these, see Metal Bulletin (a British trade journal), August 13, 1976, p. 30, and January 11, 1977, p. 38.

some steelworks, (2) tying clauses in the U.S. foreign aid programs that have enhanced steel exports, (3) the negotiation, in 1968 by the U.S. State Department, of Japanese and European Voluntary Restraint Agreements that presumably benefited the U.S. industry, and (4) the imposition of price controls from 1971 to 1974. 6/

The conclusion here is that, on balance, the net subsidy effect of these measures was approximately zero. The reasoning is as follows:

First, only (1) and (4) bear much resemblence at all to the concept of "subsidy" as it is used in this chapter. The other two are international trade policies that occurred in the past; as an end result of the present study, one is interested in what current and future U.S. trade policy should be. The effect of past policies, at least in the context of the issues raised in this chapter, is not relevant to this discussion of subsidies.

Beyond this, the true "subsidy" impact of waterway and harbor construction and maintenance on the international trade flow of steel is probably very minimal. There is a true "public good" element in such activities; other industries probably

6/ For a discussion and econometric analysis of this, see chapter 5 above. In short, "jawboning" does not appear to have had an adverse effect on profitability. Estimated coefficients for the price-control variables in chapter 5 suggest that the negative profitability effect of the 1971-1974 price controls may have been in the neighborhood of $1.1 to $1.7 billion after taxes.

benefit as well. And even if the steel industry did benefit differentially, it would probably be true that foreign steel industries benefit differentially from similar activities on the part of their governments. The net impact on trade flows must be in the neighborhood of zero.

The analysis of price controls on costs and thereby on trade flows is somewhat complicated. As indicated above, econometric results in chapter 5 indicate that the 1971-74 price controls did have a negative impact on industry profitability. But, in what sense can this be regarded as having a cost-raising impact (the nature of a negative subsidy)? There is one way in which it conceivably might occur.

Presumably, there is an optimal mix between debt capital and equity capital in investment financing. Perhaps price controls twist the financial structure in the direction of less equity capital and more debt capital by reducing the internal flow of funds. Assuming that an optimal debt-equity ratio would have existed in the absence of controls, it follows that the true "cost of capital" in the industry might be increased. This would give rise to an increase in longrun marginal and average costs in the industry. The amount of the increase in unit costs would be approximately equal to the total dollar quantity by which debt capital has increased, multiplied by the difference in true interest cost between debt capital and equity capital (equity capital is not "free" in an opportunity cost sense), with the product of these two figures divided by the average annual volume of steel production.

There is no good and easy way to estimate this; one does not know how much equity capital was reduced and debt capital increased as a result of the estimated $1.1 to $1.7 billion reduction in profitability over 1971-74. One can compute, however, a gross upper-bound estimate. Assuming that the total $1.7 billion represented a reduction in equity capital and an increase in debt capital, and that the related difference in "economic" cost between debt and equity capital was 1 percent (a generous assumption), the increase in annual total costs in the industry would amount to $17 million. Divided by an annual average production figure of 80 million metric tons, it would amount to 20 cents per ton.

It should be re-emphasized that this is a gross upper-bound figure. No doubt, the effected difference between equity and debt capital was not as large as $1.7 billion. And 1 percent seems large for any related difference in the involved costs of capital.

Moreover, it should be kept in mind that this is a temporary effect. An argument that this is a permanent effect must be predicated on an argument that the price controls program (or something like it) and its effect on profitability, and hence on the structure of new investment finance, will continue into the future. In point of fact, the price controls program is over. And our econometric estimates in chapter 5 indicate that "jawboning" appears to have no detrimental effect on steel industry profitability.

Another overriding factor is that the price controls program was not unique to the steel industry. Attaching any importance whatsoever to the effect of price controls on steel industry costs, and subsequently on the flow of steel in international trade, must be predicated on an assumption that the program, if not unique to steel, had a much greater relative effect on steel than on the rest of the manufacturing economy. Overall, it seems that the impact on steel costs must be reckoned as being in the neighborhood of a very few cents per ton, at most. 7/

There is perhaps an additional consideration as well. If the price control program was effective in holding down the "relative" price of steel, it no doubt had some shortrun effect of increasing exports and decreasing imports (as long as the price of steel was not held below marginal cost so that production might have actually declined).

7/ There may be a somewhat different process whereby price controls might affect the size of the domestic industry and, thereby, the flow of steel in international trade. The economic theory of "competitive" markets suggests that if price controls are typically applied in cyclical upswings to hold prices below competitive levels, the "expected" rate of return on capital in the industry will be depressed below normal, competitive levels. The market reaction to this would be to reduce the size and capacity of the domestic industry in an attempt to restore the "expected" rate of return to a normal level. With a smaller domestic industry, imports should rise and exports should fall.

Overall, it seems reasonable to assume that the effect of Government action on U.S. steelmaking costs is approximately zero.

III. JAPAN, 1951-75

The Japanese steel industry appears to receive little public financial assistance at the present time. Government loans played a relatively important role before 1955. In later years, the Japanese Government's declaration that the steel industry was a "priority sector" probably meant that steel firms could obtain loans from private lending institutions with greater ease than could non-priority businesses. Until the beginning of the present decade, the industry also benefited from other investment aids, as well as from several export promotion measures.

Crude Subsidies

Three types of assistance will be discussed: (1) loans from Government-controlled lending institutions, (2) the priority status assigned to the industry, and (3) other types of preferential treatment (certain aids to stimulate investments and exports). Like most Japanese industries, steel has suffered and benefited from interferences by the Bank of Japan, the Ministry of Finance (MOF), and the Ministry for International Trade and Industry (MITI). However, only those interferences which affected the steel industry more than other sectors of the economy and, especially, other industries comprising the export sector, will be discussed. It is held that generally applied policies (such as Japanese monetary policy promoting low interest rates and highly leveraged business financing) led to balance of payments surpluses before 1971, and subsequently to increased inflationary pressures and exchange rate adjustments. Such policies do not significantly affect the competitiveness of a given firm or industry.

Government Loans. This assistance was of some importance in the early reconstruction period after World War II and during the first modernization program (1951-55). The figures for the remainder of that decade are inconsistent. In the 1960's, the aid fell to a low level but then rose again beginning in 1971 (mainly for environmental protection expenditures).

Until 1961, these loans were made at interest rates that were typically 1.3 percentage points lower than the prime rates charged by private long-term credit banks. In subsequent years, the rates were the same [2, p. 141]. In order to simplify the calculations, a uniform difference of one percent was applied for the entire period.

Even though the rates were the same after 1961, allowance must be made for the fact that, in Japan, loans are allocated not so much on the basis of interest rate differentials, but through an informal rationing system applied by the Bank of Japan and the large city banks [1, pp. 203-205].

Unfortunately, no analysis is available concerning the precise working of this rationing system. It is difficult, therefore, to assign a subsidy equivalent to Government loans which measures their scarcity value. A one percent interest differential was assumed to reflect the marginal benefit from obtaining a Government loan. This is approximately equivalent to the differential between public and private loan rates prior to 1961.

The Priority Status of the Japanese Steel Industry. Steel, shipbuilding, electric power, coal, and fertilizer were designated key industries in the reconstruction program conceived during the occupation years. In the 1950's and part of the 1960's, MITI (established in 1949) attempted to influence the structural formation of heavy industries (among them steel) by exercising control over raw material allocations, mediating access to public and private loans, and through informal administrative guidance via trade associations and other industry groups. 8/ The purpose was to bring the scale of plants up to world standards and thus to improve the international competitiveness of Japanese firms. The Bank of Japan and the Ministry of Finance also exerted some influence over the expansion policies of large firms.

This does not mean, however, that Government institutions were in control of the investment programs carried out by

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8/ See [16, pp. 487-489], and [63, pp. 34, 145].

steel companies. On the contrary, the planning and construction of new steel plants were marked by private initiative, and carried out in an environment of fierce competition for market shares. In 1949, for example, Kawasaki went ahead with the construction of Japan's first new integrated steel plant against the advice of the Bank of Japan. In 1965, Sumitomo continued to expand capacity despite opposition and, ultimately, sanctions applied by MITI (reduction of imported coal allocations). 9/

Nevertheless, official designation as a key industry was equivalent to a priority status in the Government's economic program; this reduced the risk attached to private loans extended to members of the industry. It was a signal to private lending institutions that, in a crisis, they could count on the Bank of Japan to back these loans.

The effect of this status on costs in the Japanese steel industry is difficult to assess. In the first place, official support of the steel industry began to wane in the 1960's as MITI shifted its attention to newly emerging growth industries. Second, the large steel firms have close ties with a few very powerful city banks. 10/ Without Government support there

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9/ See [64, pp. 124, 166], and [63, pp. 141, 146-148].

10/ See [11, pp. 210-227]. It does not appear that large enterprises linked to Keiretsus (industry and financial groups) receive loans at favorable rates from the "house banks" associated with these groups. See [76, p. 297, including footnote no. 39, and p. 503].

might have been some delays in the reconstruction of steelmaking capacity in the early postwar period. But the Korean War, the demand for large ships caused by crises in the Middle East, and the Vietnam War, as well as actual or expected shutdowns of the United States steel industry because of strikes, would very probably have provoked a rapid development of the Japanese steel industry anyhow. Once the industry had built to a strong position in the national economy, it is doubtful that the Bank of Japan would have tolerated the collapse of a major firm, or of its supporting bank, during a severe recession.

The crude value of the steel industry's priority status was assumed to be the equivalent of one-half of one percent applied to all non-Government loans received by the industry from 1951 through 1975. It should be noted that the actual value of this status declined seriously in the latter part of this period as priority status was transferred to other industries such as petrochemicals, automobiles, and computers [76, p. 45]. In view of this, the one-half of one percent seems generous.

Other Preferential Treatment.

a. Subsidies to the construction of port facilities: Data about public financial contributions to dredging of harbors and the construction of piers were available only for the year 1968 [64, p. 39]. The subsidy ($5.6 million) amounted to .48 percent of total investment outlays in the industry during 1968.

b. Tariff, tax, and export promotion measures: A description of various measures adopted by the Japanese Government to encourage the expansion of steelmaking capacity and exports of steel products is found in the appendix to this chapter. Because of the complexity of the task, no effort was made to estimate, and then to quantify, the subsidy content of each of these measures individually (only some of which benefited the steel industry disproportionately over other sectors of manufacturing).

<u>Calculation of Subsidy Values</u>

<u>Government Loans</u>. A dollar figure for the average annual balance over 1951-75 (in 1975 U.S. dollars, adjustment by the U.S. wholesale price index) was calculated from public loan flow data as contained in table 6A.2 in the appendix. (This is the average balance from loan flows generated during this period.) This average balance estimate was $111 million dollars. Assuming an interest rate differential of one percent, it follows that the average annual total cost of steel production was reduced by approximately $1.11 million dollars. Dividing by average annual output over the period, 38.2 million metric tons, yields a unit cost reduction figure of 2.9 cents per ton, in 1975 dollars.

In addition, as indicated in Table 6A.2, the industry benefited during part of the period from loans by the World Bank. As with the public loans discussed above, an average balance (in 1975 dollars) for the whole period was calculated and was multiplied by an assumed one percent interest differential. This figure was divided by average annual production yielding a unit cost reduction figure of .3 cents per ton.

Thus, the calculated cost reducing value of Japanese Government and World Bank loans amounted to 3.2 cents per ton.

Priority Status, Private Loans. As indicated above, the value of priority status was assumed to be equivalent to a one-half percent interest reduction in the cost of private loan capital. The actual calculation procedure here was exactly analogous to that followed with regard to public loans. An average balance for private loans (in 1975 dollars) generated during 1951-75 was calculated (from data contained in appendix table 6A.2) to be $3.33 billion. Applying a one-half of one percent interest differential yields an annual figure of $16.7 million. Dividing by average annual production, 38.2 million metric tons, yields a per ton cost reduction figure of 44 cents per metric ton.

Other Preferential Treatment.

a. Subsidies to the construction of port facilities: Assuming that the ratio of harbor construction cost subsidies to total industry investment outlays, equal to .48 percent for 1968, held true for the whole period 1951-75, would yield an average annual subsidy of $3.4 million. Treating this as a direct and current cost element rather than capitalizing it, and therefore dividing by average annual production, yields a unit cost reduction estimate of 8.9 cents per metric ton.

One should note that in the case of the U.S., such activities on the part of the U.S. Corps of Engineers were excluded. Doing so in the case of Japan appears to admit that such activities in Japan were more beneficial than such activities in the U.S. In point of fact, it is not totally clear that this was the case. This may slightly bias the subsidy figure upward for Japan relative to the U.S.

b. Tariff, tax, and export measures: The cumulative total crude subsidy equivalent of all these measures is taken to be equal to $200 million in 1975 dollars. This seems rather generous; the figure is, of course, subject to some reservations. (For further discussion, see the appendix.)

As with the port facilities contributions, this is treated as a reduction in direct current expenses rather than a capitalization. The figure per metric ton of steel amounts to 21 cents.

<u>Totals and Corrections</u>

Adding all the crude subsidy figures calculated above yields a total figure of $.77 per metric ton. One might want to correct for proportionality to take into account the fact that other industries benefited to some extent from similar aids. This is especially true of Government loans to key industries. Information in this respect is sparse but it appears that public loans to the steel industry from 1956 to 1975 were approximately equal to the volume of public loans made to all key industries in a single year (1969) [8, table 15]. In addition, tax incentives for investment and export promotion did not benefit the steel industry alone [78, pp. 352-361].

Finally, the benefits attributed to the designation of key industry must be compared to pressures and other "administrative guidance" by MITI, MOF, and the Bank of Japan which had the effect of reducing the potential profitability of Japanese steel companies. For example, during the boom and inflation period of 1973-74, MITI sought to restrain aggregate demand by controlling the investment expenditures of 1,700 firms in 12 major industries, including steel. Price controls were effected through administrative guidance [1, pp. 237, 238].

If, in order to compensate for these effects, the estimated crude subsidy equivalent were corrected downward by 40 percent, the resulting figure would be 46 cents per metric ton, in 1975 U.S. dollars.

IV. THE EUROPEAN COMMUNITY

Supranational Activities

The European Coal and Steel Community (ECSC) conducts a program of lending, guaranteeing loans, and awarding research grants. This is financed by an ECSC levy on its members. 11/

The loans made by the ECSC will be left out of the subsidy calculations; no financial resources were transferred from other industries or from general taxes to the steel industry of the Community. The steel industries, which contributed three-quarters of the ECSC levy (or assessment) from 1954 to 1975, received only two-thirds of all the loans and 40 percent of the research grants made by the ECSC. A considerable portion of the levy fund (30 percent) and of the total loan volume (17 percent) was distributed for the benefit of coal and steel workers and for the creation of new employment opportunities in areas where structural change caused coal and steel workers to be permanently laid off. This kind of social assistance did little to improve the profitability of steel companies. Consequently, it is doubtful that the steel sector of the ECSC gained a net advantage.

However, the loans made by the European Investment Bank (EIB) will be dealt with in the same manner as loans made by national governments. This is because the steel companies

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11/ For more discussion of this, see the appendix to this chapter.

in England and Italy benefited to a far greater extent from EIB loans than they contributed to the maintenance of the institution of the European Community.

The calculated subsidy values of the more important loans made by the European Investment Bank are listed in the sections of the text concerning the recipient national industries.

Activities of the Member Governments

Both the ECSC and its successor, the Commission of the European Community, made efforts to eliminate the distoring effects on the intra-Community trade of the public assistance measures applied by the member governments. It was recognized at an early date that the integration of national markets could be counteracted, or even vitiated, by national government policies. 12/ For steel, economic integration remained largely restricted to trade interpenetration of the national markets. Although historic ownership links between firms in

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12/ Realization of the extent to which different national tax systems could impede progress toward the goal of market integration led to the establishment in 1953 of a study group, under the direction of Professor Ian Tinbergen, to analyze these matters in depth. The initiative of the ECSC to "harmonize" national laws and policy measures (i.e., eliminate conflicts between them and the objective of unobstructed trade among member countries) was soon applied to a broader range of problems, including subsidies of all forms, regional development programs, rate setting for common carriers, social assistance measures, and anti-cyclical measures. See [31].

The analysis will be limited to member countries with steel industries of substantial size; Denmark and Ireland will be omitted.

different member nations were reinforced, the traditional nationalistic rivalries seem to have dominated the formation of expansion plans. Government assistance to national industries was, as a rule, motivated by the same sentiment. It is necessary, therefore, to discuss the extent of public financial assistance separately for each of the member countries.

V. GERMANY, 1960-70

Available information about public financial assistance in Germany was somewhat inconsistent. An official source [29] mentions loan guarantees as the only aid to the steel industry. Most of these were made before 1960. 13/

In the 1960's, the loan guarantees received by the steel industry relative to the entire manufacturing sector had fallen below the ratio of steel to total manufacturing sales. According to the proportionality rule, it is therefore doubtful that public financial assistance (as reported by official sources) had a distorting effect on the German steel industry's competitive position.

An academic source [62] provides more detailed information, but only for the years 1960 through 1970. Unfortunately, no comparable information about other German industries was

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13/ Price controls to which the industry was subjected in the mid-1950's may have offset a good part of the subsidy value of this assistance.

furnished, so no conclusions can be drawn about the proportionality of the various types of assistance. On the other hand, from a description of the individual aids to the steel industry, it seems that many of them were made in the context of regional and manpower development programs of a general character. For example, 22 percent of the subsidies came from the regional development funds of German provincial (state) governments, while another 44 percent took the form of tax write-offs for generating employment in the economically declining coal mining regions. Most of the loan guarantees (76 percent) were provided by the provincial governments for similar objectives. Loans at reduced interest rates, which involved much smaller amounts than the other two aids, were contributed almost entirely by the Federal Government of Germany from remaining funds of the European Recovery (Marshall Plan) Program.

Total financial aids to the German steel industry from 1960 through 1970 were stated as follows: \$204 million in subsidies (\$2 million as interest subsidies, \$45 million as investment subsidies, \$125 million in the form of reduced tax obligations, and \$32 million converted from a loan guarantee into a subsidy), \$287 million worth of guaranteed loans, and \$57 million in loans at reduced interest rates.

Even if it is assumed that assistance to the steel industry (weighted by sales or value added) exceeded that to other industries, it is doubtful that the excess could have been more than 50 percent. The net subsidy would, therefore, be, at most, equal to one-half the estimated crude subsidy value. An additional reduction, perhaps on the order of 20 to 30 percent, should be calculated to compensate for any financial burden assumed by steel companies in complying with the conditions tied to those aids which had the objective to promote the development of regions and manpower.

Against the remaining subsidy value, the large negative effect of the German Government's embargo on imported coal should be balanced. As a result of this interference on behalf of the German coal mining industry, steel procedures incurred something like $600 million to $700 million in higher costs during the 1960-70 period. 14/

For the 11 year period considered, therefore, it is concluded that on balance the various aids and interferences had a negative effect on the international cost competitiveness of the German steel industry.

Calculation of Subsidy Values

Per ton subsidy values from the various sources indicated above were calculated in the following fashions:

Direct subsidies. The $204 million mentioned above was treated as a subsidy to direct operating costs rather than as a capitalization. It is not completely clear that it all should be treated this way. Therefore, our estimate should be viewed as an upper bound.

14/ For more discussion of this, see the appendix to this chapter.

In order to make price level adjustments by the U.S. wholesale price index, it was assumed that the total was equally distributed, in real terms, over the period 1960-70. In 1975 dollars, the total amounted to $369.4 million (or $33.6 million per annum, on average). Total steel production over the period amounted to 276.5 million metric tons. The reduction in costs per metric ton, therefore, amounted to $1.34 (in 1975 dollars).

Loan guarantees. Over the whole period 1960-70, the net float of guaranteed loans was $287 million. In order to make price level adjustments and to calculate the average outstanding balance, it was assumed that loan balances grew linearly over the period. On this basis, the average balance was calculated to be $259.8 million in 1975 dollars. Assuming that the value of the "guarantee" was worth approximately an interest rate reduction of one-half of one percent, the calculated average balance was multiplied by .005, yielding an estimated figure for the reduction in annual steel producing costs equal to $1.3 million. Dividing this by average annual production over the period yielded a unit cost reduction of 5 cents per metric ton.

Loans at Reduced Interest Rates. In the case of the $57 million in loans at reduced interest rates, an average balance was calculated by a procedure similar to that adopted with regard to the guaranteed loans. This yielded an average balance estimate of $51.6 million in 1975 dollars.

There was no firm information as to the magnitude of the interest rate reduction. A rate differential of three percent, therefore, was assumed. Multiplying $51.6 million by three percent yields an estimated reduction in annual costs of $1.55 million, and an average unit cost reduction of 6 cents per metric ton.

Total Subsidy Value and Corrections

Summing over the subsidy values estimated above yields a per ton figure of $1.46 in terms of a crude subsidy value. As indicated above, one can argue that this should be reduced by at least 50 percent as a result of similar aids being granted to other German industries (a proportionality adjustment), and by 20 to 30 percent to account for tied conditions (a compensatory adjustment).

Reducing the estimated crude subsidy per ton by 70 percent leaves a net value of 44 cents per metric ton, in 1975 U.S. dollars.

As also indicated above, and as discussed in the appendix to this chapter, the total dollar cost to the German industry during the 1960's as a result of the trade prohibition on foreign coking coal is estimated to be on the order of $600 million. In terms of 1975 U.S. dollars, this amounts to $1,086 million, or, approximately $3.93 per metric ton.

Subtracting this from the adjusted subsidy makes for a net increase in German steel costs of $3.49 per metric ton.

VI. ITALY, 1968-75

Only Finsider, the diversified Government-controlled steel company will be discussed. Finsider accounts for about 60 percent of Italy's steelmaking capacity. The firm is controlled by the Government through the Institute per la Reconstruzione Industriale (IRI), a public enterprise created in 1933 to take over failing companies. IRI is now comprised of several major banks and about 130 manufacturing and service companies. The various divisions of Finsider include the large carbon steel producer Italsider, the specialty steel producer Terni, and the steel pipe producer Dalmine, as well as subsidiaries concerned with the selling of steel products, the transportation of raw materials, and the utilization of byproducts from steelmaking [51].

The capacity of Finsider's steelmaking divisions more than doubled from 1965 to 1975, but with very little support from public funds. Heavy reliance was placed on long- and medium-term loans as the vehicle for expansion, and in 1975 debts were twice as large as equity. Interest payments in 1975 reached 16 percent of sales revenue [47, p. 33], a much higher level than even that of the Japanese steel industry. Since the average interest rate on total debts is very high (almost 12 percent), a subsidy element of only two percent was assumed for reduced-interest loans, and one-half of one percent for the other loans.

Finsider's ownership link with the Italian Government is probably the reason for its continued ability to borrow heavily from private sources. Private lenders evidently view a loan to Finsider as little more risky than Government bonds, no matter how great the indebtedness of the firm. It appears doubtful, though, that Finsider can continue to cover large losses by more borrowing, and large injections of public funds into its capital structure may be imminent. In the past, however, the transfer of funds from the Italian Government did not seem to provide the company with a competitive edge over its rivals.

Data could be obtained for only the years 1968 through 1975. During this period, medium- and long-term loans financed 65 percent of all investment outlays. (The remaining one-third came largely from depreciation.) About two-thirds of these loans benefited from interest reductions. Finsider, which accounts for about 40 percent of all IRI sales, received more than 70 percent of all reduced-interest loans. 15/ Information regarding the volume of such loans to other Italian busineses was not available. It appears, however, that Finsider received a larger share of these loans than the ratio of its sales to total sales of either all IRI firms, or of the entire Italian manufacturing sector. Therefore, only a slight correction was made for proportionality.

15/ Calculated from data contained in IRI, Annual Reports.

Another correction was made by applying the criterion of compensatory burden. Finsider had to comply with certain Government regional development objectives and tolerate some political interferences with its operations. Its costs were increased to some degree by these interventions.

Loans by the European Investment Bank to the Italian steel industry, for the most part to Finsider, were substantial. Precise data were available for only EIB loans to the entire Italian steel industry, but EIB press releases indicate that the largest portion of these loans was received by Finsider. 16/ The volume of loans made by EIB to Finsider was estimated to have been about $150 million, out of a total of $200 million to the entire Italian steel industry.

Calculation of Subsidy Values

Ordinary Loans, Medium- and Long-Term. From the net increase in balances data in table 6A.6 in the appendix, an average balance (in 1975 dollars) of $633.6 million was calculated for Finsider over the period 1968-75. As rationalized above, a one-half of one percent interest rate reduction was attributed to Finsider's Government affiliation. This yields a total cost reduction of $3.2 million per annum; dividing by average annual steel output of 8.75 million metric tons yields a unit cost reduction of 37 cents per metric ton.

16/ European Investment Bank, Annual Report, 1975, p. 27; EIB, Press Releases covering several years; Letter of May 5, 1977, from EIB to the authors.

Reduced Interest Rate Loans, Medium- and Long-Term. In a similar fashion, an average balance for reduced-interest loans was calculated from the data in table 6A.6 in the appendix. In 1975 dollars, this amounted to $1,217.3 million. Applying the two percent interest rate reduction discussed above yielded an estimate of annual cost savings equal to $24.3 million, or $2.78 per metric ton of steel.

Corrections and Net Subsidy. Summing the two estimates yields a total crude subsidy of $3.15 per ton in 1975 dollars. Applying a correction for proportionality and compensatory burden, equal to 25 percent, leaves a net subsidy figure of $2.36 per metric ton.

European Investment Bank Loans. To the net subsidy value of $2.36 per ton, we should add some subsidy value for loans from the European Investment Bank. The total value of these loans from 1968 to 1975 was estimated above as approximately equal to $150 million. In order to make price level adjustments and calculate an average balance, it was assumed that the net floating of these loans was distributed equally (in real terms) over 1968-75. On these assumptions, an average annual balance of $106.2 million, in 1975 dollars, was calculated. Applying a one-half of one percent interest reduction yields a total annual cost saving of $.5 million, and a per ton figure of 6 cents.

Adding this to the net subsidy of $2.36 calculated above, yields a total subsidy of $2.42 per metric ton, in 1975 dollars.

VII. FRANCE, 1948-75

The French brand of "indicative planning" has exerted considerable influence over the postwar development of the French steel industry. Under pressure from the French Government, the steel industry undertook several major efforts to reorganize its structure. 17/ Although the Government supported these efforts with financial asistance, it also imposed price controls on the industry from 1949 to 1962. As a consequence, the prices and profits of the French steel industry were among the lowest (and indebtedness the highest) of the European Coal and Steel Community until the mid-1960's. 18/ In return for pricing restraints, the industry was reported to have been promised low-interest loans for expansion by the Government [68, p. 229]. This assistance came forth on a massive scale in 1966, after a trade association study revealed that the French steel industry lagged behind its foreign rivals in productivity and in plant size. The assistance program ended in 1971. Afterwards, the Government made available a considerable amount of loans for the construction of a greenfield plant on the Mediterrannean coast. This was done in the context of a program to foster economic development in the south of France.

The Government lending agency, the Fonds de Developpement Economique et Social, has granted financial assistance to many

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17/ See [81, pp. 248-250] and [68, pp. 131-136].

18/ See [68, pp. 468-469], [33, table 44], and [86, p. 448].

sectors of the French economy, especially for transportation, communications, and urban development. The "industry and services" sector received only a small fraction of the total but, within this sector, the steel industry's share was by far the largest (over 40 percent after 1967) [22, 23, 24]. Thus, although the assistance was "nondiscriminatory" 19/ (i.e., it was made available to other industries as well as steel), it was not utilized by all industries on a proportional basis.

Nevertheless, in the process of estimating the net effect which various Government measures had on the competitive position of the French steel industry, the negative effects of Government intervention must be taken into account. For example, large revenue losses have been attributed to intervention with the pricing and employment policy of management.

Regarding the first item, it has been stated that the price controls imposed by the Government from 1949 to 1962 caused French steel producers a loss of $700 million in potential revenues. This is additional revenue the industry would have earned if, during the 1950's, it had been permitted

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19/ This was the conclusion of the Court of Justice of the European Community in a 1968 case brought by the Dutch Government. The court also held that the public financial assistance received by the French steel industry was granted in compensation for social burdens accepted by the industry. See the appendix to this chapter, under France.

to adjust its prices to the level prevailing elsewhere in the Community. 20/

Employment costs allegedly were raised by Government restraints on labor force reductions, in connection with the rationalization (or restructuring) of the steel works in Lorraine. 21/ Indeed, there has been a persistent gap between the labor productivity of the French steel industry and the Community average, and this gap has been widening. It went from 14 percent in 1956 to 25 percent in 1975 (blue-collar workers only). The blue-collar payroll for the industry ($274 million in 1956, and $1.2 billion in 1975) thus could have been reduced by $38 million in 1956, and by $300 million in 1975, 22/ if the French steel industry had been able to raise its labor productivity to the Community average. 23/

20/ Interview with an official of the French steel federation on June 6, 1977. The actual figure was 3.5 billion Belgian francs (1966 value). It was stressed that this estimate had not been disputed by the French Government.

21/ *Ibid*.

22/ See [39, pp. 172-173]. Calculation data were taken from: Eurostat, *Iron and Steel*, 1964 Yearbook, tables 3, 47, and II-72, 1976 Yearbook, tables 3, 50, and II-88 (hours worked for the Dutch steel industry were estimated).

23/ Concerning white-collar employee productivity, the showing of the French steel industry is considerably worse. With 21 percent of the 1976 crude steel output of the original six-member Community, the industry employs 40 percent of all white-collar employees.

Calculation of Subsidy Values

In the case of the French steel industry, data for public financial assistance could be obtained for the 28-year period from 1948 to 1975. Because financial assistance from 1948 to 1965 was relatively small compared with that from 1966 to 1975, the results for the two periods were calculated separately. They will be discussed separately. As a general matter, the later period should be more relevant as a predictor of current and future government policy.

Government Loans: 1948-65. As indicated in table 6A.9 in the appendix to this chapter, the net balance of French Government loans to the steel industry grew by $375 million over the period 1948-65. The calculation procedure adopted to estimate the cost-reducing impact of this was analogous to that adopted for the other countries above. It was assumed that the balance grew linearly (in real terms) over the period, and the figures were adjusted to 1975 dollars by the U.S. wholesale price index. An average annual balance, over the period, of $346.7 million (in 1975 dollars) was calculated on these assumptions.

There was no apparent evidence that public loans during this period were provided at below market rates of interest. Nevertheless, in order to attribute some incremental value to these loans, an interest rate reduction of one percent was assumed.

Multiplying the average annual balance by one percent yields an estimated total cost saving of $3.47 million per annum. Dividing this figure by average annual production over the period (10.6 million metric tons), yielded an estimated reduction in unit cost of 33 cents per metric ton, in 1975 dollars.

Government loans: 1966-75. As indicated in appendix table 6A.9, net public loan balances grew by $563 million over 1966-70, and by $464 million over 1971-75. For each of these periods, it was assumed, for purposes of calculation, that loan balances grew linearly (in real terms) between the benchmark years. Adjusting by the U.S. wholesale price index, an average balance for loans generated during 1966-75 was calculated to be $949.1 million, in 1975 dollars.

There is evidence that during this period, loans were provided at reduced interest rates. The average balance for this period, therefore, was multiplied by an assumed interest rate differential of three percent to yield an estimated reduction in average annual total cost of $28.5 million. Dividing this by average annual production (17.1 million metric tons) during the period, yielded an estimated unit cost reduction of $1.67 per metric ton, in 1975 dollars.

Corrections and Net Subsidies

Compensation and Proportionality. As indicated above, much of the aid to the French industry was granted to foster economic development in the south of France. Although the aid was available to other industries as well as steel, steel appeared to benefit somewhat disproportionately. Nevertheless, one can argue that, in this context, an adjustment should be made for both locational factors (compensatory) and the non-specificity of the aid (proportionality).

Reducing the value in these two periods by a 30 percent correction would leave net subsidy values of 23 cents and \$1.17 per metric ton in the 1948-65 and 1966-75 periods, respectively.

Alternatively, one might adjust for the compensatory phenomenon by calculating the cost differential due to lagging French labor productivity. By using the figures indicated above for 1956 and 1975, adjusting for price level changes (1975 dollars), and interpolating linearly between 1956 and 1975, total blue-collar payroll costs were estimated to have been \$246.6 million per year (on average) higher, during the period 1966 to 1975, than they would have been if French labor productivity in steel had been equal to the average for the European Community. (The average annual figure for 1956-1965 is \$127.6 million.)

Dividing this annual cost differential by average annual steel output yields a per ton figure of \$14.42.

Not all of this labor cost differential, to be sure, should be attributed to the Government's interference with employment policy in the industry. But if only 12 percent of the labor productivity differential was the result of Government interference, it would be sufficient to offset completely the crude subsidy estimate given above for the 1966 to 1975 period.

Price controls. The price control program, 1949-62, is alleged to have had a detrimental impact on steel industry profitability. Nevertheless, since this program occurred so far in the past, and since there is no evidence that such a program will be implemented in the future, no adjustment allowance for its negative profitability effects was calculated.

VIII. THE UNITED KINGDOM, 1968-76

This section will discuss public financial assistance to only the British Steel Corporation, which accounts for about 86 percent of steelmaking capacity in the United Kingdom. No information concerning assistance to the remainder of the British steel industry (consisting of nonintegrated producers) could be obtained.

Because the British Steel Corporation (BSC) is a publicly-owned enterprise, it is extremely difficult to screen out allocations of public funds to BSC in excess of the amounts needed for the expansion of capacity and for increases in working capital. The funds received by BSC were not earmarked according to purpose or application. Furthermore, aid may also be granted indirectly in the form of nonpayment of dividends, or reduction of public loan interest rates to below market levels.

The criterion of proportionality has relatively little relevance to the evaluation of aid to public enterprises, unless a certain identifiable aid was also available to other firms under a general assistance program. A case in point is the regional development grants received by BSC from 1968 to 1976.

On the other hand, the compensatory burden criterion assumes a special significance. With few exceptions, public corporations suffer more than private businesses from government interference. In the case of the British steel industry, the history of Government interference goes back as far as the 1930's, long before BSC was formed [68, pp. 201, 202]. The reasons for the poor profit performance, and thus the need for extensive public funding, are closely related to this development. It is appropriate, therefore, to describe briefly the events preceding the formation of BSC in 1967.

A History of Government Interference

In 1950, the British Labor government fulfilled its campaign pledge and nationalized the country's 14 integrated steel producers. In the following year, however, a Conservative government enacted legislation that returned 13 of the companies to private ownership. Because of its impact on the stock market, this transformation took until 1955. The remaining company was so unprofitable that it did not attract private capital, and was therefore retained by the Government [17, pp. 51-54].

During the early postwar period, however, whether under private or public control, the prices of most steel products and the planning of expansion projects were subject to approval by the Iron and Steel Board. British prices for non-flat products only caught up with those prevailing on the European Continent by about 1958, while the prices for non-flat products were still below those on the Continent (as well as those in the United States) in 1964, when the Iron and Steel Board abandoned its control over prices. 24/ An example of adverse consequences resulting from the control over capacity additions is a government decision in 1958, ruling, for political reasons, in favor of two suboptimally sized hot strip mills rather than one larger installation [17, p. 54].

Together with the uncertainty created by the prospect of nationalization, and the subsequent denationalization, price and investment controls hampered the efforts of steel producers to generate and attract funds for the modernization of an industry already weakened from undermaintenance during

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24/ See [68, pp. 231-232] and [32, Statistical Appendix, Tables 44 and 45].

the war years. The long debate preceding the renationalization in 1967 caused further deterioration of the investment climate. Finally, after BSC was established, the Government interfered almost continually with the decisions taken by management. Interference occurred primarily in three ways: (1) renewed price controls, (2) delayed approval of investment decisions, and (3) delaying or preventing the closure of high-cost mills. 25/ BSC also suffered negative impacts on its profitability from an overly lenient (or timid) attitude of the Government toward an almost unending series of unauthorized strikes by steelworkers (i.e., strikes not approved by labor union leadership).

Financing of British Steel Corporation

When BSC was established, it was obliged to assume an interest-bearing debt totaling over $3 billion. This debt was composed of the cost of compensating the shareholders of the 13 acquired firms, the outstanding debts of these firms, and public loans to the firm already controlled by the Government. When the service of this huge debt put the new company under severe financial strain, $1.7 billion of the total was converted into "public dividend capital" (PDC), on which the company did not have to pay interest but was

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25/ See [48, p. 93], and Steel News (a British Steel Corporation publication), August 5, 1976, Supplement p. III; BSC, Annual Report 1974-1975, p. 17; Annual Report 1975-1976, p. 7.

expected to pay dividends (equal to at least eight percent) to the Government out of profits. But the 1971 recession, in conjunction with price controls and other Government interference, precluded an easing of BSC's financial problems. In 1972, the PDC was therefore reduced (written-off) by $500 million, and the interest-bearing debt by $375 million. 26/

New allocations of public funds to BSC were as follows over the entire period from 1968 to March, 1976: about $2 billion gross in loans (March, 1976 balance: $1.2 billion), $871 in public dividend capital, and $540 in regional development grants, or a total of $3.4 billion. During the same period, investments not financed out of depreciation funds amounted to $2.4 billion, and additions to working capital were approximately $1.4 billion. In addition, $859 million was spent on items not included in the profit and loss statement. 27/

It may be assumed that, as the owner of BSC, the British Government will be eventually compensated for its contributions to fixed and working capital by the company's rising net worth. However, both types of capital were financed not only by the Government but also with considerable outside help. Recent additions of fixed capital relied heavily on foreign long-term

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26/ See [48, pp. viii, 88, 89, and 261); and British Steel Corporation, Annual Reports.

27/ British Steel Corporation, Annual Reports.

loans, especially from the European Community. From 1973 to March 1976, these loans amounted to about $1.2 billion. The balance of outstanding short-term loans, which helped finance working capital, stood at $500 million in March 1976. 28/

To summarize, financial data for BSC over 1968-76 indicate the following sources and applications for funds: sources, $5.1 billion ($3.4 billion Government + $1.2 billion foreign loans + $0.5 billion short-term loans), and applications, $4.66 billion ($2.4 billion investments + $1.4 billion working capital + $0.86 billion special items). 29/ The difference between total sources and applications of funds from 1968 to March 1976 amounts to $440 million. In comparison, total losses incurred by BSC over the same period were $527 million. The discrepancy between these two figures may be attributed to imprecise estimates of some of the data, as well as to distortions caused by exchange rate adjustments.

In summary, six sources of funds to be considered as possible subsidies were uncovered. These are (1) possible

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28/ Estimated from British Steel Corporation Annual Reports.

29/ British Steel Corporation, Annual Report 1974-1975, and Annual Report, 1975-1976, p. 31. The special items were (1) losses on medium-term contracts with British shipbuilders at prices which were "insufficient to cover cost increases", (2) relining of blast furnaces, and (3) cost of work closures and "redundancy payments" to workers.

interest reduction on public loans, (2) interest reductions on European Investment Bank loans, (3) nonpayment of dividends on Public Dividend Capital, (4) interest and dividend savings associated with the write-off of public debt and Public Dividend Capital, (5) regional development grants, and (6) losses covered by Government ownership.

Reductions in profitability associated with Government price control will also be considered.

These will now be discussed in turn, and the calculations of the subsidy values associated with each of them will be explained.

Calculations of Subsidy Values

Public Loans. Interest rates paid by BSC on Government loans have been considerably higher than the rates charged by the European Coal and Steel Community. During the boom year 1974, they were reported to be as high as 14 percent. 30/ Although it is impossible to estimate the rates BSC would have been charged in the capital market as a privately-owned company, it appears doubtful that public loans to BSC were made at reduced rates. Even so, a subsidy value of one-half of one percent interest rate reduction was attributed and applied to average public loan balances over the period 1968 to 1975.

30/ See [48, pp. 289]; Metal Bulletin, December 9, 1975, p. 37 and February 20, 1976, p. 36; Steel News, July 24, 1975, Supplement, p. IV. In view of these high rates, a one-half of one percent rate reduction was assumed, rather than the one percent assumed for other countries.

From the data in table 6A.10 in the appendix, an average public loan balance for BSC over 1968 to 1975 (balance adjusted to 1975 U.S. dollars by the wholesale price index) equal to $994.3 million was calculated. Multiplying this by .005 yielded an estimated annual cost saving of $5 million. Dividing by average steel output over the period (22.8 million metric tons) yielded a subsidy value of 22 cents per metric ton, in 1975 dollars.

European Investment Bank Loans. Some interest rate reductions may have been involved in the case of European Investment Bank loans received after 1974. Considering, however, that the rates charged by EIB were relatively high (9.5 percent in 1975) the subsidy value of these reductions must have been small.

As indicated on page 403 of the appendix, EIB loans to the British steel industry totaled $250 million by May 1977. Since most of this appeared to occur subsequent to 1973, no price level adjustment was made. Instead, the $250 million figure was taken as a balance against which to apply a .5 percent interest rate reduction. This estimates an annual cost savings of $1.25 million. Dividing this by average annual output over 1972-75 (21.45 million metric tons) yields a cost savings of 6 cents per metric ton.

Non-Payment of Dividends on Public Dividend Capital. As indicated above, BSC, at the time of the establishment of its Public Dividend Capital account, was expected to pay dividends to the Government at a rate of at least eight percent per annum. (Eight percent is also roughly equivalent to the rate of return on equity for the U.S. steel industry over the same period.) It has not done so. In fact, dividends paid by BSC to the government from 1968 to 1976 have totaled only $55 million. 31/

In context here, the nonpayment of these dividends should be considered as a subsidy. Had the PDC account not been established, BSC would have had a larger fixed indebtedness with associated fixed interest charges (although one could argue that the past accounts were grossly overvalued). Therefore, an annual subsidy value was calculated by multiplying eight percent times the balance in the Public Dividend Captial account, and subtracting the dividends actually paid.

In calculating the annual subsidy values, two adjustments were made. One was to make price level adjustments (using the U.S. Wholesale Price Index) to 1975 dollars. (This was analogous to our procedure for other capital accounts for BSC and other steel industries.) In addition, a balance was calculated for each year on the basis of what it would have been had the $500 write-off in 1972 for the PDC account not occurred. The dividend (interest) savings associated with the write-off should be regarded as a subsidy. The procedures of adjusting the balances automatically accounted for this.

31/ British Steel Corporation, Annual Reports, 1974-1975 and 1975-1976.

On this basis, the average annual dividend payment (stated in 1975 dollars) that would have been required to pay PDC dividends equal to eight percent was calculated to be $202.4 million. Subtracting $9.7 million, the annual average price-adjusted equivalent for what was actually paid, leaves a net annual underpayment of $192.7 million. Dividing this by average output (22.8 million metric tons) yields a subsidy estimate of $8.45 per metric ton (1975 dollars).

Interest Savings Associated With Public Debt Write-Off. In 1972, interest-bearing public debt was also reduced (written-off) to the extent of $375 million. The write-off, in effect, gives rise to an annual cost savings equal to the annual interest charges that would have been required to service the debt, had it not been forgiven.

As stated on page 441 of the appendix, loans made by the Government before 1972 carried interest rates varying from 6-3/8 to 9-3/8 percent. The $375 million in 1972 was the equivalent of $550.7 million in 1975 dollars (adjustment by the U.S. wholesale price index). This $550.7 was multiplied by 9-3/8 percent, the highest rate quoted above, to estimate an annual savings of $51.6 million. Dividing this by average annual output (21.45 million metric tons) over 1972 to 1975, yields a net subsidy figure of $2.41 per metric ton (in 1975 dollars).

Regional Development Grants. Between 1968 and 1976, BSC received $540 million from the Government in the form of regional development grants. One approach for dealing with this would be to argue that it amounts to financial capital that the company would otherwise have had to raise by borrowing, and that there is, therefore, an associated interest savings.

On the other hand, one can argue that such aid was also available to other industries (proportionality), and that it was also probably contingent upon cost-increasing burdens being accepted by the aid recipients (compensatory burden). Therefore, it should not be taken as a subsidy or subsidy equivalent.

Although there is no firm evidence as to what extent other industries received gross benefits from such grants, or as to precisely what associated requirements were imposed, it would seem that, by their very nature, "regional development grants" are open to very heavy discounting on the basis of the "proportionality" and "compensatory burden" criteria. Therefore, no net subsidy value was attributed to these grants.

This is the only potential subsidy source for BSC that was subjected to these criteria; they should apply, therefore, with special weight here.

Coverage of Losses. Total losses incurred by BSC over the period 1968 to March 1976 amounted to $527 million. The relevant question, then, is: Are "covered" losses for a nationalized (public) enterprise the analogue of cost reducing subsidies for a privately-owned enterprise? Economic theory suggests that the answer is no.

Assuming that the managers of the public enterprise are basically motivated to behave in a manner designed to maximize the firm's profits (or minimize its losses), as are, presumably, managers of privately-owned enterprise, they should make its production and marketing decisions on a consideration of potential revenues (demand) and costs. If profits are sometimes made, it is a result of demand being sufficiently strong so that prices are higher than full unit costs. If losses are incurred, it is the result of demand being sufficiently weak so that prices are less than full unit costs.

Under an assumption of profit motivation, factors which affect the level of costs in the enterprise will affect its production decisions. Those that reduce costs (subsidies) will lead to increased production. Those that increase costs (in effect, negative subsidies) will lead to reduced production. The question of who receives any profits or losses is essentially irrelevant. On this score, "covered" losses accruing to owners (taxpayers) of the public enterprise is the analogue of "uncovered" losses accruing to owners (stockholders) of the private enterprise; i.e., they affect pricing and production decisions in the same way.

The crucial question seems to be whether management decision makers in the enterprise are basically motivated to operate in a profit-maximizing fashion. If they are, there is clearly no reason to regard covered losses as the equivalent of a subsidy.

If they are not, there is no need at all to be concerned with the calculation of subsidy values. The only important question then is strictly an empirical one: How does the enterprise behave? Economic theory, and the calculation of "subsidy" values, would provide little insight.

In light of this reasoning, and in view of casual evidence which suggests that the British Government is indeed concerned about BSC's profit prospects, no subsidy value is attributed to covered losses for BSC.

Reductions in Profitability Due to Price Controls. There is evidence that price controls interfered with British Steel's profitability. Year-by-year calculations showing the "amounts by which BSC's revenue has fallen short of what the ECSC price level would have produced," yield a total of $1.7 billion from September 1967 to March 1975. 32/ Based upon a methodology equivalent to that discussed above in connection with U.S. price controls, a negative subsidy value equal to 75 cents per metric ton could be calculated. On the basis of the same arguments applied in the U.S. case, however, this is disregarded here.

Total Subsidy Values.

In summary, the following subsidy values have been calculated for the British Steel Corporation: (1) assumed interest reduction on public loans, 22 cents per metric ton; (2) assumed interest reduction on European Investment Bank loans, 6 cents

32/ Select Committee on Nationalized Industry, Subcommittee B, Minutes of Evidence, April 7, 1976, pp. 18, 19.

per metric ton; (3) nonpayment of dividends on public dividend capital, $8.45 per metric ton; (4) interest savings associated with public debt write-off, $2.41 per metric ton; (5) regional development grants, zero; (6) coverage of losses, zero.

Summing over the per ton values listed above, the total subsidy value for the British Steel Corporation is calculated to be $11.14 per metric ton.

IX. BELGIUM, 1969-75

A general aid program to stimulate the creation of employment opportunities in stagnant or declining areas was introduced in Belgium in 1959. A new law passed in 1970 emphasized the longrun improvement in infrastructure in order to attract investments to such regions.

Under this program, the Belgian Government granted rebates on the interest cost of enterprises qualifying for the aid. Under the 1959 law, the reduction was from two to four percentage points, but under the new law it may reach six percentage points. 33/ The precise calculation of the refunds is not clear, however, because interest rebates are reported with respect to the total value of a given investment project and not, as might be expected, for only the amounts borrowed on the investment. Furthermore, Belgian publications describing the working of the program use an industry classification in which the steel industry is lumped together with

33/ See [10, pp. 402-410] and [73, pp. 3-8].

the scrap industry under the title "siderurgie," or with non-ferrous industries into a "metallurgy" sector [71, p. 180].

After making allowance for these classification problems, it seems that the steel investments which benefited from interest rebates comprised from 25 to 27 percent of all industrial investments aided in the same manner from 1959 to 1968. Because the steel industry contributed only 10 to 15 percent of total manufacturing value, the aid received by the steel industry during this period appears to be disproportionate to its weight in the manufacturing sector. 34/

For the years 1969-75, estimates of the actual cost of the subsidies to the Belgian Government were either available or they could be derived from published data concerning the metallurgical sector. The steel industry received approximately 10 percent of all regional development subsidies, whereas the industry's manufacturing percentage weight during this period ranged from 11 to 17 percent. 35/ In this period, aid to the steel industry was less than proportional to the industry's weight in the entire industrial sector.

In comparing the two periods it should be noted, however, that from 1969 to 1975, investments made by the Belgian steel industry were 35 percent higher than investments made from 1959

34/ For the years 1959 to 1968, see [70, p. 101] and [10, p. 410]; for later years, see [71].

35/ Calculated from data in [36, various issues].

to 1968. Over the entire 1959-75 period, therefore, the disproportionality of the aid in favor of and against the steel industry should nearly balance out.

Because the objective of both the 1959 and the 1970 laws was to stimulate regional development, the firms receiving aid under this program probably had to comply with some conditions which resulted in higher investment or operating costs. In view of the near proportionality of the aid with respect to steel (over the entire 1959-75 period), even a minor correction for compensatory burden should be sufficient to clear the aid of trade-distorting effects.

However, the strong market in the early part of the 1970's affected the production costs, especially employment costs, of Belgian steel firms more severely than those of other steel producers in the EC. Particularly hard hit by this development were the steel plants in the Charleroi and Liege regions which are of suboptimal size, poorly laid out, or not well located. 36/ In 1975 and 1976, some of the firms incurred such great losses that their survival without some financial assistance from the Belgian Government was in question. The Government meanwhile exerted pressure on the firms to reorganize their operations in order to raise their efficiency. A provisional aid program involving $250 million in loans was initiated in 1977, but it

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36/ Metal Bulletin, May 4, 1976, p. 38; October 26, 1976, p. 37; January 25, 1977, p. 36; February 11, 1977, p. 38; See also [35, pp. LXVI, LXVII, and LXXV].

is not clear yet how much authority the Government will assume concerning the reorganization of a major portion of the Belgian steel industry.

Intervention by the Government will be of great importance to steel producers in other member countries of the EC and in the United States, because the Belgian steel industry has been a major exporter to those areas. Belgian steel, more than any other, has been confronted directly with the expansion of Japanese steel in nearly all segments of the international market. 37/ But problems of adaption to the changing requirements of lowest-cost steel production prevented the Belgian steel industry from maintaining the position it had gained in the 1960's.

Calculation of Subsidy Values

Data concerning public financial assistance to the Belgian steel industry are more comprehensive, at least for the years 1969 to 1975, than those for the other steel industries discussed here. They include the Government's cost of providing subsidies to the steel industry as well as information about the assistance received by other Belgian industries. Although no information was available regarding the method of calculating this cost, the data will be accepted as the crude subsidy equivalent. They are given in rows 2 and 3 of appendix table 6A.12. The crude subsidy figure is $1.22

37/ See [50, pp. 3-16], and the appendix to this chapter.

per metric ton over 1969-75. In 1975 dollars, this amounts to approximately $1.64 per metric ton.

As already stated above, the net subsidy value of public financial aid to the Belgian steel industry is probably zero over the entire period as a result of applying the proportionality and compensation criteria. But new developments in 1977 may change this situation.

X. THE NETHERLANDS AND LUXEMBOURG

No evidence of public financial assistance to these two steel industries of the European Community could be uncovered.

XI. SUMMARY OF FINANCIAL AIDS TO STEEL INDUSTRIES

Table 6.1 indicates that the two Government-controlled steel companies, British Steel Corporation and Finsider, received the largest net benefits from Government financial assistance. A very small positive amount was registered for the Japanese steel industry, amounting to less than one-fifth of one percent of the average price of steel sold in the United States. For the United States and Belgium, the results are negligible or zero. The German steel industry seems to have suffered negative subsidy effects from Government intervention. The French industry has been subsidized approximately two and one-half times as heavily as the Japanese industry.

It is difficult to assess just how a country's export performance has been related to the level of its subsidization. Since about 1960, the Japanese steel industry has been the most successful in increasing its share of both world steel trade and of total steel exports to the United States. The EC industries were collectively the world leader until the end of the 1960's; then they held a position of parity with the Japanese steel industry until 1974. Subsequently, they lost considerable ground to the Japanese. The composition of all EC steel exports to the United States also changed after 1974. France, Italy, and to a smaller extent, the United Kingdom improved their share of these exports, while the share of the traditionally strong countries in this respect (Germany, Belgium, and Luxembourg) declined. 38/

It would be difficult to attribute the success of the Japanese steel industry to Government support, given the relatively small amounts of public assistance received by the industry. The impact of public aid on the export performance of some of the EC steel industries is less clear. But steel exports of the EC have generally been in a fluid state following the setback suffered in 1975 and 1976. Steel exports from Italy in particular have fluctuated sharply from 1973 to 1976.

In any event, none of the subsidies appears to be really large. With the single exception of the estimate for British Steel, none amounts to as much as one percent of the selling price of steel in the U.S.

38/ AISI, Annual Statistical Report, various years, table 24.

TABLE 6.1

Estimated Subsidies to
Some Major Steel Industries
(1975 U.S. dollars)

Country	Years covered	Average value per metric ton of steel: Uncorrected	Corrected a/
United States	1957-75	approximately zero	
Japan	1951-75	$ .77	$ .46
Germany	1960-70	1.46	-3.49
France	1948-65	.33	.23
	1966-75	1.67	1.17
Italy (Finsider only)	1968-75	3.21	2.42
United Kingdom (British Steel Corp. only)	1968-March 1976	11.14	11.14
Belgium	1969-75	1.64	zero

a/ The "correction" is for proportionality and compensatory burden. For an explanation, see the text.

Source: Text.

APPENDIX 6

DETAILED INFORMATION ON SUBSIDIES

This appendix presents detailed information concerning subsidies and other government involvement in various foreign steel industries.

I. JAPAN

Industrial organization and, in particular, the relationship between business and Government have evolved along a somewhat different path in Japan than in the United States. Although some parallels may be observed with the development in Western Europe as regards emphasis on reconstruction and the promotion of export industries, even there the differences appear to outweigh the similarities. This is in part due to the traditional Japanese approach to economic growth. In order to accelerate the pace of industrialization during the first decades following the Meiji restoration, the Government often took the lead in developing new industries, if only to stimulate imitation by as yet undeveloped private enterpreneurship.

Another reason for the differences is the temporary retardation of the economy, and its isolation from its traditional supply and marketing centers following World War II. According to a Brookings study [76, p. 11], "per capita GNP in 1952 was only $188, below that of Brazil, Malaysia and Chile among other less developed countries.... the war thus cost Japan some seventeen to eighteen years of lost growth and decline in output."

Possessing virtually no natural resources, and its only asset being a large, well-educated, and industrious labor force, the country had little choice but to gear its future economic growth to a policy of creating a large capacity to export. In some areas of the world, imports from Japan increased at such a rapid rate that, by the second half of the 1950's, they became the target of accusations of unfair competition and dumping. 1/

A general policy of export promotion, if it leads to perennial export surpluses, should normally affect the position of steel exports in proportion to their share in total exports. The size of the trade surplus is an important consideration also. 2/

1/ The Brookings study [76, p. 13] elaborates this point as follows: "American textile and steel producers took the lead in this and were soon followed by a host of others. This situation was exacerbated by what was widely viewed as an under-valued yen and by Japan's own protected domestic market. The storm clouds were not confined to the United States; they became especially black in those parts of Asia where Japan made its economic presence felt most in the exploitation of raw materials, direct investments, and selling of products."

2/ In the absence of a surplus, it would be difficult to make a case for unfair competition no matter how favorable to exports some of the general measures might be. Some Latin American countries, for example, grant tax exemptions which only amount to a compensation for the disadvantage exporters suffer from an overvalued domestic currency. As a consequence, these countries have exposed themselves to the imposition of penalties on their exports to the United States. That the combined effects of tariffs and export subsidies are tantamount to those of currency devaluation has been argued by Baldwin [7, pp. 21, 22, 105, 106]. The validity of this argument was demonstrated in 1957 when the French substituted a host of of pro-export measures for a simple adjustment in the exchange rate without suffering adverse consequences in their trade balance. With flexible exchange rates, the likelihood of recurring surpluses or deficits is, in normal circumstances (e.g., in the absence of abnormally large foreign indebtedness), very small.

The absence of a surplus with fixed exchange rates, or, alternatively, frequent adjustment of exchange rates does not entirely eliminate the possible occurrence of unfavorable effects on individual industries in importing countries. Such consequences may still arise whenever a country applies export-promoting measures from which certain industries or sectors benefit out of proportion to their share in total exports.

In the case of Japan, the following observations hold. First, the country kept its currency undervalued until 1972. This favored all Japanese exports in the same way as if they had all received a general (nondiscriminatory) subsidy. It thus had a negative impact on the ability of the corresponding industries in the importing nations to compete with the Japanese industries. Second, from the very start of the Japanese reconstruction and expansion program, the steel industry was elected as one of the key sectors and received a larger than proportionate amount of financial assistance, Government aid, and tax favors. 3/ Although virtually all of these favors were discontinued by the early 1970's, to a large extent as a result of pressures brought by the importing countries, especially the United States [65], they improved the competitive chances of the Japanese steel industry during its formative years.

3/ See [64, pp. 9-11] and [63, pp. 140-142].

In the text of this chapter, the emphasis of the discussion was placed on Government ownership of steel mills and public financial aids to national steel industries. Other aspects of public policy, such as taxation and depreciation rules, were treated in a summary manner since there was little reason to believe that steel producers benefited more from these than other sectors of manufacturing. With respect to Japan, the situation is somewhat different, however. The steel industry was one of the first to be assigned priority status in the postwar reconstruction program. Not only did it receive a relatively large amount of loans from public financial institutions during its initial period of rebuilding and expansion, but also some tax legislation was explicitly designed to increase the cash flow of this industry [63, pp. 46, 47]. Moreover, steel exports comprise a larger share of total exports in the case of Japan than other major steel producing areas (table 6A.1). It is therefore appropriate to analyze in a more comprehensive manner the role played by the Japanese Government in helping create the financial conditions which enabled steel producers to carry out greenfield projects of unprecedented size and, by outdistancing their foreign rivals in both capital and labor productivity, to underbid them in international competition.

TABLE 6A.1

Iron and Steel Exports as a Percent of
Total Industrial Exports, Various Geographical Areas
1955-73

Year	European Community	North America	Japan	Remaining Western Europe	Eastern Europe	World	Developing Countries	Industrial Countries
1955	15.4	6.4	15.0	6.2	12.1	9.6	1.3	10.0
1960	15.1	5.2	10.8	8.0	11.8	10.1	2.3	10.4
1965	11.0	4.0	16.6	6.7	12.4	8.8	3.2	8.7
1969	9.3	3.5	14.4	6.0	11.3	7.8	3.1	7.7
1971	9.1	3.0	15.6	5.8				
1973	9.4	3.1	15.2	5.2				

Source: EC Commission, General Objectives Steel 1980-1985 (Preliminary German Edition) Brussels, December 10, 1975. p. 93.

The Influence of Government on Company Policies

Although the Japanese Government does not have any ownership interest in steelworks, it has traditionally exercised a great deal of control over the expansion policies of steel firms. The Government established the country's first modern steelworks (Yawata) at the turn of the century, assumed authority to organize production and allocate markets in 1931, and in 1934, created the Japan Steel Company by merging Yawata with the six largest private steel companies [63, p. 139]. The Japan Steel Company was dissolved after World War II by the Allied Powers, but two of its largest components, Yawata and Fuji, were reunited in 1970.

After the war, a close working relationship was established between the largest steel firms and the Ministry of Finance (MOF) and the Ministry of International Trade and Industry (MITI). The former ministry saw to it that the industry obtained adequate amounts of loan capital, at least during the initial expansion period until 1961; it also regularly assessed the industry's expansion plans against national growth objectives and balance-of-payments considerations. MITI was primarily concerned with the international competitiveness of Japanese industries. It therefore used its influence to prevent excessive duplication of installations and to set standards for minimum efficient plant size. Furthermore, it played a decisive role in bringing about the Yawata-Fuji merger.

The ministries do not merely provide companies with administrative guidance. Government-business relations in Japan are not characterized by supervision and compliance but by cooperation and consent. Many steel company executives are former MITI officials; company officials are also represented on many of the Government-industry committees which pave the way for reaching a consesus among all the different parties (public and private, small and large firms, buyers and sellers) concerning major policies and projects. "Business makes few major decisions without consulting the appropriate governmental authority; the same is true in reverse." 4/

Financial Assistance

The Early Post-War Period. The reconstruction of the Japanese steel industry began in 1947, after the punish-and-reform attitude of the Occupation Administration ceded to an industrial rehabilitation program. In that year, the Government-owned Reconstruction Finance Bank provided two-thirds of the fixed and working capital requirements of the steel industry. Additional large amounts were made available in 1949 and 1950 from counterpart funds. In absolute terms the counterpart funds were larger than those provided earlier by the Reconstruction Finance Bank, \$61 million compared to \$44 million, but owing to an enormous increase in investment activity they amounted

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4/ William Lockwood, quoted in [77, p. 488].

to only six percent of total funds used by the industry in 1949 and 1950. Nevertheless, the loans made by this bank in 1947 were essential to get steel production started again; they have been properly described as a sparkplug for the recovery of the industry [64, Ch. 1].

Of great importance to the steel industry were two kinds of subsidy provided from 1947 to 1950. One served to lower the prices paid by steel firms for domestic and imported raw materials, especially coking coal; the other lowered the prices of iron and steel products. The latter was very large because, due to inefficiency, production costs were still exorbitant. In 1948, the price subsidy amounted to 76.4 percent of the producers' net receipts for steel bars. Over the entire four-year period this subsidy came to a quarter of a billion dollars and absorbed 30 percent of all price subsidies granted to priority industries. 5/ The steel price subsidy affected production efficiency indirectly since the ensuing stimulation of demand permitted firms to increase their capacity utilization rates and rationalize their facilities. Nevertheless, when the program expired in 1950, Japanese steel was still not competitive in the world market. The turning point came as a result of the Korean War boom which made it possible for

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5/ Priority had been given to the reconstruction of the coal, steel, shipbuilding, electric power, and fertilizer industries. See [64, p. 11] and [63, p. 140].

the industry to surpass prewar production and to generate funds for modernizing its plants. 6/

The First Modernization Program, 1951-55. Total investment outlays of the industry during the five-year period amounted to $356 million (88 percent of this by the largest six companies). Funds from the Government-controlled Development Bank provided 5.8 percent of this. 7/ Another 7.4 percent came from the Government, but through private banks in the form of foreign exchange loans. During this period production costs fell significantly and Japanese prices for most steel products approached those charged by American and European producers. In 1950, construction began on the country's first modern large-scale steelworks, the Chiba mill of the Kawasaki company.

The Second Modernization Progam, 1956-60. While investment outlays by the industry more than tripled under this program, the share of the total which came from the Government bank actually became negative, on net balance. In contrast, internal sources and the sale of stock provided 52 percent of the funding, compared to only 39 percent under the first program. According to Kawahito, this increase was, in part, the result

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6/ See [64, pp. 12-21] and [11, pp. 35-37].

7/ According to Kawahito [64, p. 27] the Development Bank furnished 8.2 percent; the Industrial Bank, 17.8 percent; and the Long-Term Credit Bank, 6.4 percent. Only 9.3 percent came from new equity capital, while the sale of corporate bonds raised 15.4 percent and internal funds 24.3 percent. Commercial banks provided 11.2 percent.

of a demand by the World Bank for a higher equity-debt ratio as a condition for granting loans to the industry. 8/ In addition, the internal cash flow was enhanced by a number of tax measures to be discussed later in this section. From 1955 until the end of 1961, construction began on several new steelworks, pig iron output doubled, and steel output nearly tripled. Domestic steel prices in Japan fell below those prevailing in the United States and in Western Europe.

After 1961. From 1961 to 1976, Japanese steelmaking capacity increased nearly fivefold. It is now almost identical to that of the United States, and not far below steel capacity in the original (six-member) European Coal and Steel Community.

Direct loans by Government-controlled institutions dwindled to a small fraction of capital requirements during the 1960's, but then rose again beginning with 1970, in part as the result of public financial assistance with regard to outlays for environmental control measures [75, p. 54]. But the continuing priority status of the industry served as an encouragement to the commercial banks, especially the so-called

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8/ World Bank participation amounted to 8.6 percent of total funding under this program. See [64. pp. 41-42].

city banks, to make a large volume of loans to steel firms. 9/ This assurance on the part of large banks and big business that the Bank of Japan will stand behind them probably explains the deterioration of the current ratio (current assets divided by current liabilities) in the 1960's [64, pp. 126, 127]. It enabled the large steel companies to pursue a policy of "grow now, profit later". 10/ Since they knew how to link this policy to longterm investment planning, especially as regards the phasing in of large-scale capacity additions, they achieved greater improvement in factor productivity than their American and European rivals. This in turn permitted them to underbid the latter in their domestic and export markets. To be sure,

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9/ See [77, p. 488]. Kaplan [63, p. 38] expresses the idea in this form: "Lending by government banks can often be considered indicative lending in that it provides guide-posts (if not guidance) to the private sector as to the government's economic priorities. In the early days of the postwar period, city banks were eager to lend money to firms favored by MITI because they appeared a safe and promising means to increased business. More important now, however, is the fact that the central bank is more likely to stand behind loans made to targeted growth industries than those with a lower priority. This is not a minor consideration for the city banks since they are generally overextended and borrow heavily form the Bank of Japan." This development must, however, be considered against the background of the overall situation of Japanese financial institutions. The captial market is poorly developed, in particular the stock exchange and the ability of firms to float new stock issues. Enterprises therefore prefer to obtain captial by selling bonds. In addition, the Dodge Plan, which was accepted by the Japanese in 1949, stressed fiscal conservatism with the result that monetary policy became very expansionary. The city banks could freely lend to their corporate clients because the Bank of Japan covered them with ample interbank loans. See [11, pp, 107-111, 144-145, 168-169, and 174-175].

10/ Kaplan's expression, [63, p. 34].

the Bank of Japan on occasion tightened the reigns of monetary expansion in order to prevent overheating of the economy. In 1949, it opposed the construction of a large steel plant by Kawasaki, pointing to the existence of excess capacity in the steel industry and the inflationary effects of the enormous outlays required by the project. 11/ In the mid-sixties, a credit squeeze, begun by the Bank in the preceding years, caused stock market prices to collapse. The reason for the tightening was the worsening inflation and balance of payments disequilibrium that occurred after the plan to double the national income got underway. But following a series of monetary and fiscal maneuvers and some influx of foreign capital, the upward trend of economic indicators resumed in 1966 [11, pp. 175-184].

The support which the Bank of Japan lent to the expansionary boom of the manufacturing sector (and, within this sector, the steel industry) cannot be identified with financial assistance, in the strict meaning of this expression. But it helped provide a foundation on which the growth and efficiency psychology of Japanese business could build. It contributed in significant degree to the strength of the Japanese steel industry which has managed to withstand the impact of yen revaluation 12/ and dramatic rises in the cost of imported materials.

11/ Nevertheless, "Kawasaki did build its plant. The Bank of Japan continued to advise against it but did not attempt to impose its position on Kawasaki's banks...." [63, p. 141].

12/ The impact of this event was softened by a subsequent rise in export prices and by the fact that the long-term contracts for the importation of raw materials had, for the most part, been concluded in terms of U.S. dollars (ensuing in an 18 percent price drop, in yen, after the revaluation).

TABLE 6A.2

Financing of the Japanese Steel Industry, 1951-75 [a/]
(in millions of U.S. dollars, exchange rates of the periods stated)

Sources of Funds	1951-55	1956-60	1961-65	1966-70	1971-75
Increases in Capital Stock	48.8	350.9	757.5	249.2	792.6
Bonds	64.4	205.0	219.6	361.3	1,453.1
Loans, Japan	99.7	411.7	853.3	2,429.7	3,632.8
Public	20.7	-6.9	14.1	56.1	264.2
Private	79.0	418.6	839.2	2,373.6	3,368.6
Loans, Foreign (World Bank)	16.7	213.7 (149.4)	50.7 (-33.8)	186.9	1,123.0
Self-Financing	126.4	554.1	934.9	3,002.9	6,208.7
Total Amounts Invested	356.0	1,737.0	2,816.0	6,230.0	13,210.0

a/ Net increases in balances over the periods indicated.

Sources: International Iron and Steel Institute, Release ECON/47/4, citing Ministry of International Trade and Industry as a source for the data 1951 through 1971; Organization for Economic Cooperation and Development, Investment in the Iron and Steel Industry, Problems and Prospects, Paris, October 30, 1974; Japan Iron & Steel Exporters' Association, The Overseas Public Relations Committee, U.S.-Japan Steel Trade: Basic Views on Current Issues, Tokyo, July 18, 1977, Tables 3, 4, and 5.

Other Assistance Programs

Subsidies to the Construction of Port Facilities. One of the greatest advantages of the Japanese steel industry is the location of its integrated plants at deepwater ports. Both the central and local Governments have assumed some of the financial burden connected with the construction of piers and the dredging of ship channels. It has been estimated that, in 1968, expenditures on port facilities for steelworks amounted to $13.6 million. Government agencies contributed $5.6 million, or about two-fifths of these costs. 13/ Relative to total investment outlays made by the Japanese steel industry in 1968, this subsidy came to somewhat less than one-half of one percent. In the absence of data for other years, it may be assumed that this ratio held throughout the 1960's when most of the new Japanese steel plants were constructed.

Tariff, Tax, and Export-Promotion Measures. In the section dealing with the European Community, the point is made that general fiscal and trade measures taken by a national government will not affect the competitive position of an individual industry in the international market. The effect of such measures will eventually be offset by adjustments in exchange rates and the balance of payments. To be sure, it may take several years for the appropriate adjustments to take place. In the interim, sales by the export sector of the country which adopted the

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13/ The central Government and the local governments each contributed $2.8 million. See [64, p. 93].

measures will expand as a result of a temporary undervaluation of exchange rates. 14/ Even then, a given industry in the country will only gain a significant competitive edge over its foreign rivals (during the period of adjustment) if the public measures were tailored for its benefit 15/ or if the products of this industry were heavily represented among the country's exports. The former case applied to various tax and tariff rules adopted by the Japanese Government in the 1950's, whereas the latter characterized the situation in the 1960's 16/ and 1970's. It is therefore appropriate to devote further attention to various tax and trade policies introduced by the Japanese Government in the postwar period.

14/ This may apply to the case of Japan which, from 1968 until 1973, registered large balance of payments surpluses [9, p. 220]. Nevertheless, there is a good chance that events other than export promotion or tax rules brought about this result, such as, for example, the Vietnam War and an investment boom in many developing countries.

15/ In this case the measures would, of course, not possess the previously assumed feature of general applicability.

16/ The 15.0 percent share of steel exports in relation to total industrial exports for 1955 was unusually high for that period. It fell in subsequent years and was less than 10.0 percent in 1959 [9, pp. 205-208]. Attempts to promote steel exports were undertaken also in member countries of the European Community, but they were generally either short-lived or of small quantitative significance. Steel exports by the Community in proportion to total industrial exports fell in the early 1960's (when they became important in the steel market of the United States) to a level not much above the world average. For this reason, tax and depreciation rules of member countries should not have affected the steel industry in particular.

Tariff, Tax, and Depreciation Rules. A series of measures were enacted in 1951 and 1952 which were either partially or wholly aimed at the steel industry. Their effect was to increase the cash flow of firms and to favor growing companies over stagnant ones. The following concessions were made: exemption from duties on about 60 percent of imported steel-making equipment, tax-free contingency reserves for price changes of inventories and for bad debts, a 50 percent increase in the depreciation base allowed on designated equipment, and an additional increase of this base by permitting a revaluation of assets [63, pp. 46, 47].

Export Incentives. 17/ From 1953 to 1964, the chief fiscal device to encourage exports was the exemption of export earnings from the income tax. Having become the target of criticism from GATT and the International Monetary Fund, it was finally abandoned and replaced in part by new devices and the alteration of existing measures.

a. Increased depreciation. This program was in force until March 1972. It permitted companies involved in exporting to increase normal depreciation charges on plant and equipment by the following factor: (export revenue divided by total revenue) x 80%. Thus, a company which obtained half of its sales revenues from exports was entitled to increase its depreciation

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17/ The following sections are based largely on the unpublished paper by Dr. Kiyoshi Kawahito [65].

by 40 percent. In 1966, the multiplier of the formula was raised to 100 percent so that the same company could then depreciate its plant and equipment at a 50 percent higher rate than a nonexporting company.

Additional depreciation was allowed under a program begun in 1968 but discontinued three years later. The purpose was to reward companies which had won recognition by MITI for having made an outstanding contribution to exports. Recognition was based on a formula which took into account the amount and growth of revenue from sales abroad, and the ratio of export sales to total sales. Companies were classified in two groups according to a rather complex formula, with those in the more deserving group qualifiying for an additional depreciation allowance of 60 percent, and the others for a 30 percent increase over the normal allowance.

b. Reserve for overseas market development. This program was introduced in 1964 and is still in effect today. Exporters are allowed to set aside a portion of their export income as a reserve for developing overseas markets. Before 1971, small manufacturers could subtract up to 2.3 percent from their export earnings for this purpose, and larger firms (whose capital exceeded a quarter of a million dollars) could set aside up to 1.5 percent. After 1971, the latter ceiling was applied to all manufacturers while for trading companies (except for very small establishments 18/), it was 0.5 percent.

In addition, beginning in 1968, companies recognized by MITI for having made an outstanding contribution to exports could apply rates that were 30 percent or 60 percent higher than those stated above, depending on the merit points they had earned.

The amounts set aside under this program must be repaid, in the form of higher taxes, over a period of five years after the deduction was made. The measure therefore amounts to a tax deferment, and its nature as a subsidy derives only from its effect on present cash flow. 19/

c. Tax exemptions of earnings from service export. Under this program, companies selling or leasing technical know-how and certain other intangible property to foreign customers may reduce their income tax liability on the earnings from these activities by the following rates: for the transfer of industrial property (e.g., patents and know-how), 70 percent; transfer of copyrights,

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18/ For trading firms with capital of less than approximately a quarter of a million dollars (100 million yen or $278,000 in 1971) the limit was 1.1 percent of income from exports.

19/ Kawahito points out [65, p. 7] that Japanese government and industry spokesmen interviewed by him stressed that the American rules for setting up a Domestic International Sales Corporation (DISC), introduced in 1971, provide exporters with stronger tax incentives than the Japanese arrangement. "In particular, they argue that while the reserve for overseas market development in Japan is a tax deferral, the one created by the DISC program in the United States is a tax exemption in substance."

30 percent; and technical consulting and related services, 20 percent. 20/ These provisions have been gaining importance in in the last ten years or so as Japanese steel companies have been increasing their role as exporters of technology.

d. Financial assistance to exporters. The American Export-Import Bank served as a model for a Japanese institution of the same title and function. Both provide long-term credit to exporters at lower rates than those charged by private lenders for loans of similar risk and duration. However, Japanese steel producers began to benefit from those services only in recent years with the increase in external sales of plant and equipment, which these firms also produce.

Until a few years ago, the Bank of Japan discounted trade bills and provided short-term loans to exporters at lower rates of interest than it applied to equivalent domestic transactions. The differentials amounted to two and one-half percentage points before 1970. They were gradually reduced and finally eliminated in August 1971 "because of pressures from abroad" [65, p. 8].

20/ Before March 1972, a 30 percent reduction was allowed for earnings from movies and a three percent reduction for income from "contracting of repairs, processing, and construction; mediation in the primary-products trade; transportation and tourist services; and exports of primary products" [65, p. 5].

II. THE EUROPEAN COMMUNITY

The steel industry of the European Community is subject to the rules of the Paris Treaty which established the European Coal and Steel Community (ECSC) in 1951. The ECSC was integrated with the European Community and the European Atomic Community in 1965. The functions of the ECSC High Authority were assumed by the Commission of the European Community, but few changes were made in the rules governing the conduct of coal and steel firms. (In official publications, reference continues to be made to the "ECSC" when coal and steel matters are discussed).

Public assistance to the steel firms of the Community may come from several sources. In the following sections, two main categories will be distinguished, supranational and national aid programs. Various rules in the ECSC treaty provide for a rather comprehensive system of financial assistance for promoting certain types of investment and various social welfare objectives. The European Investment Bank (established in 1958), the leading arm of the European Economic Community, has also extended loans to steel companies. The criteria for the selection of loan applicants were primarily the development of less advanced regions and the preservation of jobs.

The national programs are for the most part administered by the central governments of the various member countries. They have, on occasion, come into conflict with the basic principle of the Community that member governments must not adopt trade-distorting measures [40, pp. 144, 145]. Despite the proclamation of guidelines by the EC Commission [40, pp. 112-123], the problem is likely to persist, given the federative character of the organization.

Supranational Assistance: Activities of the European Coal and Steel Community

The Paris Treaty gave the ECSC the right to require annual contributions from all member enterprises. The income from this levy is used for administrative expenses, assistance to employees of the coal and steel industries, and subsidies to research. With the exception of a loan guarantee fund and interest subsidies on certain loans, this income is not intended to be made available to enterprises in the form of investment loans. The ECSC does, however, lend large quantities to firms for investment purposes from funds which it borrows in European and North American capital markets. These loans are generally granted at a slightly higher rate of interest than the ECSC itself incurred in order to allow for administrative fees and other costs. Enterprises may borrow at reduced rates of interest when they invest in an area where rationalization or a decline in output caused unemployment among coal and steel workers. This subsidy is not limited to ECSC firms. Low-interest loans are also made for speeding up the attainment of certain particularly important objectives (as defined by the EC Commission). At the present time, investment in coking plants, vocational training centers, and environmental improvement meet this criterion.

Contributions by Member Companies to the ECSC Fund. As mentioned above, the ECSC is entitled to levy assessments on all member companies (up to one percent of their sales). In practice, the rates at which companies are assessed vary with the type of product and over time. Whereas initially almost equal amounts were contributed by the coal and steel sectors, the decline of coal mining in the Community has shifted the burden of the contributions to the steel industry which now acounts for 80 percent of the total. The ceiling of one percent of sales was approached in the second half of 1953, but the assessment rate then declined and, after 1961, stabilized at around 0.3 percent [37, pp. 58, 59]. In 1972, the yield was $56 million, but with the inclusion of Great Britain in the Common Market in 1973, it rose to more than $74 million. By the end of 1975, the amount raised in this fashion was about $1.028 billion, of which the steel industry had contributed $752 million, or about three-fourths of the total. 21/

A portion of this income (11 percent) was immediately set aside for a loan guarantee fund; the rest was absorbed by administrative expenses (40 percent), assistance to workers (28 percent), and research (18 percent). The interest rate

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21/ The original figures are stated in terms of units of account (UA), the monetary unit adopted by the Community since 1973. A uniform exchange rate of US $1.186333=1 UA was applied.

subsidy for conversion loans (granted since 1967) and industrial loans (since 1970), and a coking coal subsidy (since 1970), absorbed about three percent of the total. 22/

Borrowing Activities. A loan of $100 million, contracted in the United States in 1954, was the first raised by the ECSC. For a while, the geographical emphasis of borrowing by the ECSC was placed on European capital markets, but in 1974 and 1975, it shifted back to the United States.

The interest rate at which these amounts were borrowed increased from 3-7/8 percent, in the case of the first American loan in 1954, to 10 percent in 1974. In 1975 and 1976, it fell to under 9 percent. 23/ It has become increasingly difficult in recent years to market notes with a long redemption period. Whereas up to 1973, the maturity period was usually from 15 to 25 years, it subsequently fell to much shorter periods; namely, between 5 and 10 years in most cases [43, pp. 12, 18, and 19].

22/ The interest subsidy for conversion loans granted until the end of 1974 amounted to $6 million [38, pp. 55-56]. The ECSC subsidy for coking coal is received by only two countries, Germany and Belgium, which export this product to other Community countries. Until the end of 1975, it amounted to about $20 million. See [37, pp. 39, 44] for the years 1970-73, and [37, p. 154] for a forecast for 1974 and 1975. Also see [38, pp. 67, 68].

23/ A $125 million issue of ECSC bonds was floated on the American capital market in December 1975 at an interest rate of 8 7/8 percent [EC, Press Release, Dec. 18, 1975] and a public issue of 50 million Canadian dollars in March 1976, priced at 100.5 percent, and an interest of nine percent [EC, Press Release, March 3, 1976].

TABLE 6A.3
Borrowing by the ECSC, by Currency,
1954 to 1975
(in millions of U.S. Dollars)

Currencies borrowed	Total amounts borrowed a/ (end of 1975)	Amounts outstanding a/ (end of 1974)
U. S. Dollar	$1,355	$773
German DM	777	467
Swiss Francs	317	151
Italian Lire	211	151
French Francs	166	130
Luxembourg Francs	160	134
Belgian Francs	128	81
Dutch Florins	102	31
European Monetary Units	67	67
Units of Account	24	19
	3,307	2,004

a/ Most of the data were available in the currencies borrowed and in EC units of account. With the exception of the loans contracted in terms of U.S. dollars, unit-of-account figures were chosen for the purposes of this table and converted into U.S. dollars at the rate of 1 unit of account = 1.18633 U.S. $.

Source: Calculated from EC Commission, Report on the Loan Policy of the European Communities, Brussels, March 17, 1976, pp. 11, 18, and 19.

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The total loan volume contracted by the ECSC rarely exceeded the level of $100 million per year from 1954 to 1971. It then began to rise abruptly and in 1975 reached $780 million.

There is little doubt that the ECSC was able to raise money more cheaply than individual member companies. On the capital market of the United States, for example, the ECSC enjoys an AAA rating, whereas American steel companies have an AA or A rating. 24/

Lending Activities. Except for the initial guarantee fund, none of the amounts obtained from the annual assessments on coal and steel firms may be used for the lending program of the ECSC. The interest charged on the loans extended to enterprises must therefore be sufficiently high to cover the costs of obtaining the funds.

The total amount lent to enterprises from funds borrowed by the ECSC was $2.9 billion by the end of 1975. Almost two-thirds, or $1.8 billion, was granted to the steel industry for

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24/ For the ECSC, see [43, pp. 3, 4, and 12] and Euromoney, January 1976, p. 67. According to the EC Commission, this high rating is based on the ECSC's power to require member firms to contribute one percent of their sales, a potential income of $350 million annually (four times as much as is collected at the present time) and the existence of a loan guarantee fund of about $135 million.

According to the U.S. Department of Commerce (Business Statistics, 1973 Edition), the interest costs of A-rated and AA-rated bonds were higher than that of AAA-rated bonds. For example, from 1969 to 1972 the average annual interest rates on the three types of bonds were as follows:

	AAA	AA	A
1969	7.03	7.20	7.40
1970	8.04	8.31	8.56
1971	7.39	7.78	8.03
1972	7.21	7.48	7.66

Nevertheless, it appears that the European agencies are compelled to pay a considerable premium, compared to a domestic AAA-rated organization, in order to find American buyers for their securities. [Business Week, January 17, 1977, p. 69.]

the purpose of expanding capacity or replacing equipment. Of the remainder, the coal industry received $500 million (17 percent); power generation, $132 million (5 percent); iron ore mining, 30.5 million (1 percent); and enterprises from various industries investing in areas affected by a decline in coal or steel output, $388 million (14 percent). 25/

Total investments by ECSC steel firms from 1954 to the end of 1975 were $32.5 billion. 26/ Loans provided by the Community authorities therefore accounted for 5.5 percent of all expenditures on fixed investment made by the ECSC steel industry.

Until 1969, the interest on loans differed according to the cost incurred for raising the funds for a particular loan, the lending rate usually being slightly above the borrowing rate. After 1969, a single rate was set for all comparable loans; this rate was periodically adapted to changes in the cost of borrowing. Even though the program is self-sustaining as regards the bulk of industrial loans, the interest rates charged to enterprises appear to be slightly lower than the industrial

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25/ At the end of 1974, ECSC steel firms had received 17 percent of allocations under this provision. If this share was maintained in 1975, the total amount of loans received by the steel industry would be raised by $66 million and the industry's share of all ECSC loans would increase to 66.9 percent (compared to 63.8 percent without this correction). See [43, pp. 6-12] and [42, p. 46].

26/ 27.4 billion European units of account. [Eurostat, Iron and Steel, 1974 Yearbook, table II-7, and 1976, Vol. 1, table 7].

bond rates prevailing during a given period. For example, in January 1974, the 8.25 rate charged by the ECSC was below the borrowing cost for prime borrowers in the Eurobond market and in the capital markets of Germany, France, and Belgium for maturities from 5 to 20 years. 27/ During the second half of 1974, dramatic changes occurred in the cost of raising funds in international capital markets, and in international exchange rates. As a consequence, the ECSC once again set the rates of interest charged on loans to member companies in accordance with the cost incurred in raising the particular funds disbursed.

27/ Lending rates since 1969 changed as follows:

Date	Industrial Loans (Art 54) (normal)	reduced	Conversion Loans (Art 56) (normal)	reduced
1969	6.75	-	6.75	4.5
Nov. 1969	7.25	-	7.25	4.5
March 1970	8.25	-	8.25	5.5
1971	8.25	5.5	8.75	5.5
March 1972	7.75	4.75	7.75	4.75
July 1972	7.50	4.50	7.50	4.50
Dec. 1973	8.25	5.25	8.25	5.25
July 1974	9.25	6.25	9.25	6.25

Source: Letter of June 17, 1976 from the Directorate - General Credit and Investments, EC Commission, to the authors. For comparison, in January 1974, the borrowing cost for 20 year notes was 9.0 percent in Belgium and 9.68 percent in France. [Euromoney, February 1974, p. 81.] The rate paid by the United States Steel Corporation on $100 million borrowed under a revolving credit varied with the prime commercial rate and was 9.75 percent on December 31, 1973 and 10.25 percent on December 31, 1974. [United States Steel Corporation, 1974 Annual Report to Stockholders, p. 28.] Moreover, in 1976 the ECSC advertised the sale of 20-year bonds with a yield of 9 percent and the Bethlehem Steel Corporation issued 25-year debentures paying 8.75 percent. [Business Week, May 24, 1976, p. 11.]

TABLE 6A.4
ECSC LOANS TO ENTERPRISES, 1954-75 a/
(in millions of U.S. dollar) b/

	Belgium, Luxembourg, Netherlands	Germany	France	Italy	United Kingdom	Denmark	Community
Iron Ore Mines	.88	13.16	11.48	5.03	-	-	30.55
Conversion	86.77	125.75	86.32	29.37	60.11	-	388.32
Iron and Steel Industry	174.33	642.55	443.63	437.17	108.34	33.38	1,839.40
Coal Industry	3.54	300.00	119.58	6.43	178.25	-	607.80
Thermal Power Plants	9.57	58.17	64.56	-	-	-	132.30
Totals c/	275.09	1,139.63	725.57	478.00	346.70	33.38	2,998.37

a/ All the loans, except a small quantity included in the "conversion" rubric, were made from borrowed funds. By the end of 1974, about $6 million had been contributed to conversion loans from the ECSC annual budget allocations.

b/ The original data are in European Units of Account. They were converted into dollars at the rate of one U.A. = U.S. $1.18633.

c/ An additional $218.57 million was lent for the housing and retraining of employees, and for research, of which housing and retraining accounted for $214 million. Less than one-third of this was contributed from borrowed funds; the remainder was financed through budgetary allocations.

Sources: EC Commission, Report on the Loan Policy of the European Communities, pp. 8, 9; EC Commission, Ninth General Report on the Activities of the European Communities, pp. 46, 128.

The volume of loans to enterprises increased in a gradual manner until 1974, but rose sharply in 1975. Compared to 1974, the amount lent to steel firms doubled in 1975 and loans to all firms increased by 86 percent. A large fraction, 30 percent, of the nearly $600 million granted in 1976 went to the Italian steel industry. The British steel industry's share was 17 percent, but this does not include a loan for the replacement of coke ovens at the Port Talbot works of the British Steel Corporation (listed under loans to the coal sector). The British share of all industrial loans granted by the ECSC was 30.5 percent of the total, which exceeded even that of Italy (24 percent). 28/

Interest Subsidies. In certain cases the ECSC may grant loans to enterprises at a rate of three percentage points below the normal rate announced for a given period. The reduced

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28/ See [43, pp. 12-13] and [42, p. 46]. A small part of the ECSC grant to the Port Talbot works for the replacement of coke ovens was made at the reduced rate of 5.25 percent, three percentage points below the normal rate applied loans at the time [EC Commission, Press Release, July 28, 1975]. Loans to British coal and steel firms rose even more rapidly during the first three months of 1976. By the end of 1975 the total (including loans for research and employees' residences) was $350 million; on March 25, 1976 it was reported to have reached $1 billion. Nearly three-quarters (73.6 percent) of this amount was allocated to the British Steel Corporation; almost one-half of the money lent to the BSC was earmarked for the replacement or expansion of coke oven capacity [EC Commission, Press Release, March 25, 1976].

rate is applied during the first five years of such loans. 29/ It may be applied to loans for projects designed to relieve regional unemployment caused primarily by the contraction of coal mining or steelmaking operations ("conversion" loans). The primary purpose of this aid is to encourage manufacturing companies of all types to locate or expand plants in regions where structural changes caused the permanent layoff of numerous coal miners and steelworkers. Most of the loans under this provision have been made to firms outside the coal and steel sector. Since 1971, interest reductions may also be applied to loans for projects which the EC Commission considers of particular urgency at the moment. So far, they have been made available for investments in vocational training centers, public health (including environmental protection measures), and, more recently, coking capacity.

Until the end of 1975, subsidy disbursements in the first category amounted to about $25 million. Regarding the second category, they were approximately $10 million. 30/

The practice of granting loans at reduced interest rates was begun in 1967 with respect to conversion loans (Article 56). By the end of 1975, the loan volume subject to these reductions was about $215 million. Starting in 1971, interest reductions

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29/ Until the end of 1974, 15 percent of disbursements by the ECSC for the reduction of interst charges involved loans made by bodies other than the ECSC; i.e., private banks or the national governments. See [38, p. 65].

30/ European Community, Auditor's Reports, various years.

were also granted in the case of some industrial loans (Article 54), and by the end of 1975, the lower rates had been applied to a loan volume of $140 million. The ECSC steel industry received 17 percent of conversion loans, 31/ and 77 percent of all industrial loans ($37 million and $108 million, respectively), a total of $145 million. Applying the same ratios to the interest reductions under both programs, it is estimated that the steel industry received an interest subsidy of $11 million from 1967 until the end of 1975.

It should be mentioned, however, that actual disbursement of the subsidy occurs only when a reduced-interest loan is made by a private or by a financial agent of a member government, following authorization by the ECSC. When such a loan is made by the ECSC itself, "disbursement" merely involves the transfer of funds from the budget to the loan account. In either case, the ultimate source of the funds, from which the interest reductions are defrayed, is the levy paid annually by ECSC firms. The whole exercise, therefore, amounts to a shifting of funds among member firms, according to priorities which were broadly outlined by the Paris Treaty, and in the course of time specified by the ECSC. No subsidies from other sectors of the Common Market economy to the ECSC steel industry are involved.

31/ By the end of 1974, nearly half of all conversion loans had gone to the vehicle, steel, and chemical industries. See [43, Annex I, p. 9].

Supernational Assistance: Activities of the European Investment Bank

The European Investment Bank (EIB) was established in 1958 as the financial agent of the European Economic Community (EEC). Whereas the ECSC was comprised of only the coal and steel industries, the EEC had for its purpose the creation of a general common market. It was the function of EIB "to contribute to the balanced development of the Common Market." The method for achieving this goal consisted of long-term loans and loan guarantees to enterprises, public authorities, and financial institutions with the objectives to speed the development of backward regions, to facilitate readaptation of regions to structural changes and -- a rather broad criterion-- "to serve the interests of the Community as a whole." Initially limited to the Community area, the activities of the Bank were later extended to include certain nonmember countries. 32/

The Bank has its own resources, about $650 million, which were provided by contributions from member governments. As in the case of the ECSC, the Bank obtains the resources for its lending activities largely by borrowing in national and international capital markets, including that of the United States (where it enjoys AAA rating). At the end of 1975, total resources available to EIB amounted to nearly $6 billion.

32/ These remarks, as well as all statistical data for the period of 1958 until December 31, 1975, are based on Board of Governors, European Investment Bank, Annual Report 1975, passim.

Borrowers are charged a rate of interest sufficiently high to cover the cost of raising funds plus an administrative charge. The interest rate reached a high point of 10.5 percent in 1974, but it fell subsequently. Early in 1976, it stood at 9.0 percent for loans with a maturity of less than eight years, and 9.5 percent for longer term loans.

Most of the loans (87 percent of the total) have been made to firms or institutions located within the Common Market. Of this amount, 45 percent was earmarked for the development of southern Italy; France was second with 22 percent. The dominant criterion for extending loans has been regional development, but in recent years the volume of loans extended under the "common interest" criterion, especially for the development of energy resources, has increased rapidly. This change is also reflected in the breakdown of loans between the categories of "infrastructure" (primarily energy and transportation) and "industry" (including steel). From 1958 to 1965, infrastructure loans took 53 percent of the total; from 1966 to 1972, 60 percent; and from 1973 to the end of 1975, 71 percent. Nevertheless, large sums were allocated in 1976 and 1977 (as of May that year) to steel industries, with three-fourths of such loans going to the British Steel Corporation, and Italsider second with 15 percent.

From 1958 until May 5, 1977, the total loan volume extended by EIB for Community steel industry projects was divided as follows: 33/

	Number of Loans	Amount (in millions of U.S. dollars)
France	3	40
Germany	7	50
Italy	18	200
United Kingdom	11	250
Total	39	540

The total of these loans corresponded to about seven percent of all loans made available to Community recipients during the entire period. EIB officials stressed that the effect on employment was a major consideration in approving loan applications and that "the steel industry projects which the Bank has helped to finance are estimated to have involved the creation of almost 20,000 jobs and the safeguarding of a further 13,500." 34/

33/ Examples of interest rates to be paid on these loans are as follows: British Steel Corporation, December 1, 1975, $35.8 million, 10 years, 9.5 percent; BSC, December 3, 1976, $25 million, 10 years, 9 percent; BSC, December 23, 1976; $30 million, 10 years, 8-7/8 percent; Dalmine (Finsider), July 16, 1976, $16 million, 8 years, 9 percent. [European Investment Bank, Press Releases.] It should be added that the loans to BSC were all for steelworks production facilities while those to the Finsider group also included such objectives as research and environmental control equipment.

34/ Letter of May 5, 1977, from the European Investment Bank to the authors.

Public Financial Assistance to the Coal Industry of the European Community.

Public financial assistance to the Common Market's coal industry merits discussion in the context of a steel study for several reasons. In the first place, coal is now the most expensive raw material input per ton of steel produced; second, the steel industry of the Community relies for well over four-fifths of its metallurgical coke on coal produced in the area; third, much of this coal is costly to extract, and, without subsidies, would not be competitive with imported coal; and, fourth, the fate of the coal industry has been linked in some degree to that of the steel industry since the early postwar years when both industries were placed under the authority of the first supranational organization, the European Coal and Steel Community. In addition, since the energy crisis of 1973, the coal industry has assumed a renewed importance within the framework of a Community policy designed to reduce the area's rapidly increasing dependence on imported fuel.

In the early years of the ECSC, apprehensions about an energy shortage had resulted in a series of programs to spur the expansion of coal mining capacity in the Community. Within a few years, however, the situation had changed completely. Imported fuel oil began to make heavy inroads into the energy market and American metalurgical coal, favored by low production costs and declining oceanic freight rates, became price competitive with Ruhr coking coal at most steel producing centers in Western Europe. 35/ In 1958, the German Government imposed a quota on imported coal, and member governments and the ECSC took measures to permit a gradual retrenchment of the coal sector. Initially, two types of subsidies were applied, one to help cover the cost of an extensive social secruity program for coal miners, and the other to assist in measures aimed at increasing efficiency in coal mining, in part by mine closures and consolidations. A special plan to subsidize coking coal was introduced in 1967.

The largest assistance is in the form of Government subsidies to a social security fund for coal mine employees. A shrinking work force 36/ and a heavy burden of retirement benefits had led to a widening gap between contributions and disbursements.

Subsidies to the fund were initiated by the German Government in the 1950's when the financial position of coal had begun to weaken under the impact of competition from imported coal and oil. In the early 1960's, the governments of other coalproducing member nations adopted similar measures. The ECSC at first opposed these interventions [31, pp. 425-427] but reversed itself as the situation of the coal industry continued to deteriorate.

35/ See [49] and [31, pp. 472-507].

36/ The work force in ECSC coal mines contracted from over one million in 1958 to 325 thousand in 1974. EC Commission, Aids to the Community's Coal Industry, Brussels, September 10, 1975, table 6.

In a 1965 ruling, it condoned subsidies to social security funds 37/ as well as various other types of assistance which the national governments had adopted on behalf of coal mining enterprises. The other assistance programs are comprised of a variety of aids granted directly to the coal industries, and indirect aids designed to stimulate the demand for coal in the Community. Direct financial aid was given to facilitate the closure of marginal operations, to concentrate production on the most efficient mines, to preserve some degree of security of supply with energy resources and metallurgical coal, and to maintain stockpiles of coal. 38/ Indirect aids consist of

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37/ The ECSC rationalized its shift in position by reasoning that the subsidies to social secruity funds helped reduce obligations assumed by the coal firms in the past. They would therefore not significantly affect current production cost to distort competition among the national coal industries of the Community. Another argument was that the subsidies served the purpose of trimming the social overhead costs born by the coal mine operators to the lower level prevailing in the manufacturing sector. EC Commission, Aids to the Community's Coal Industry, pp. 15-17; and Offical Journal, April 26, 1973, p. 23.

38/ From 1955 to 1975, coal output in the original Community of six had declined from 253 to 124 million metric tons, and even before the 1973 energy crisis the view had become widespread that a basic security of supply should be preserved, especially with regard to coking coal. To this end the governments of coal producing member nations were permitted to subsidize the operating costs of coal mines and to participate in the funding of a coal stockpile. EC Commission, Aids to the Community's Coal Industry, Annex, p. 7, and table 1; Europe, March 25, 1972, p. 8, and December 9, 1972, p. 10; Vision, May 1975, pp. 71-74.

grants to coal using industries, primarily power generation by means of thermal plants. 39/

Until 1970, the role of the EC Commission in connection with assistance to the coal industry had been limited to the coordination and supervision of the aid programs introduced by the national governments. It then began to contribute relatively small amounts from its own budget to the special coking coal subsidy which had been started in 1967 by the member governments with ECSC approval. 40/ This program was subsequently revised and a new six-year plan, providing for the first time for contributions by steel firms, was introduced in 1973. Its principal aim was to bring about a reduction of Community coking coal prices to the level charged by foreign exporters. 41/ However, large increases

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39/ EC Commission, Aids to the Community's Coal Industry, pp. 7, 8.

40/ Under ruling 1/70, which expired on December 31, 1972, the ECSC allocated $8.8 million to the coking coal assistance fund. See [37, p. 89].

41/ See [37, pp. 154, 155]. The contribution by the ECSC was set at $4.75 million for 1974, $6 million for 1975, and $7.12 million for the remaining four years of the program. The steel industry's contribution is to be larger than those of the ECSC and the national governments. Per ton of coking coal the burden of the subsidy was distributed as follows (in U.S. dollars):

	1974	1975	1976	1977	1978	1979
ECSC	.32	.40	.47	.47	.47	.47
Steel Industry	1.31	1.31	1.31	1.31	1.47	.70
Governments	.74	.66	.58	.58	.32	.25
Total	2.37	2.37	2.36	2.36	2.26	1.42

in the price of imported coal led to corresponding adjustments by Community mines, and by 1975 the financial position of ECSC coking coal producers had greatly improved. As a consequence, several member governments refused to contribute the full amount they had been assessed under the new program. 42/ A renewed tightening of the world market for coking coal, predicted by several analysts, 43/ could make continuation of the program unnecessary.

As can be seen from table 6A.5, the total amount of subsidies by the national governments to the Community coal industry during the 10-year period from 1965 to 1973 was extremely large. It exceeded, in fact, the amount invested by the steel industry during the same period for the replacement and expansion of capacity. A large portion of the subsidy, 70 percent, helped alleviate the social security burden of the coal mining enterprises. More than half of the remainder covered operating losses, the stated objective of this aid being to facilitate an orderly contraction of the industry and, more recently, to preserve a degree of independence from imported energy and coking coal. 44/

42/ Europe, February 9/10, p. 11.

43/ Iron Age, May 17, 1976, p. 57, and Business Week, May 31, 1976, p. 59.

44/ European Communities Press and Information, Background Note, March 11, 1976, pp. 23, 26, 29, 31.

TABLE 6A.5

Coal Subidies in the ECSC a/

In millions of dollars, 1965-1974

Year	Social Security Subsidies	Direct Aid: For Rationalization	Direct Aid: For Covering Losses	Indirect Aids	Aid To Coking Coal	Direct, Indirect and Coking Coal Aids	Total
1965	1,067	15	82	54	nil	151	1,218
1966	1,151	25	169	87	nil	281	1,432
1967	1,299	39	323	89	92	555	1,842
1968	1,342	66	439	100	100	706	2,047
1969	1,447	83	430	117	94	724	2,171
1970	1,564	92	310	100	105	607	2,171
1971	1,662	136	354	109	54	655	2,315
1972	1,849	151	510	119	85	864	2,714
1973	2,251	195	417	94	296	1,001	3,253
1974	2,523	318	400	178	53	950	3,472
Total	16,155	1,120	3,434	1,047	879	6,494	22,635

Dollars Per metric ton of coal, 1965-1974

Year	Social Security Subsidies	Direct Aid: For Rationalization	Direct Aid: For Covering Losses	Indirect Aids	Aid To Coking Coal	Direct, Indirect and Coking Coal Aids	Total
1965	4.76	0.07	0.37	0.24	nil	0.68	5.44
1966	5.48	0.12	0.81	0.42	nil	1.35	6.83
1967	6.86	0.27	1.71	0.47	0.49	2.94	9.80
1968	7.57	0.36	2.43	0.56	0.56	3.90	11.47
1969	8.19	0.47	2.43	0.66	0.53	4.10	12.29
1970	9.17	0.55	1.83	0.59	0.61	3.57	13.74
1971	10.06	0.83	1.85	0.66	0.33	3.68	13.74
1972	12.17	1.00	3.36	0.78	0.56	5.69	17.86
1973	16.09	1.39	2.99	0.68	2.11	7.17	23.26
1974	18.92	2.41	3.03	1.35	0.40	7.19	26.11

By country in 1974 (in millions of dollars, and dollars per metric ton in parentheses)

Country	Social Security Subsidies	Direct Aid: For Rationalization	Direct Aid: For Covering Losses	Indirect Aids	Aid To Coking Coal	Direct, Indirect and Coking Coal Aids	Total
Germany	1,541 (15.54)	265 (2.68)	40 (0.40)	164 (1.65)	0 (0.0)	469 (4.73)	2,010 (20.27)
France	654 (28.58)	48 (2.04)	230 (9.80)	8 (0.36)	20 (0.36)	306 (13.04)	960 (41.92)
Belguim	328 (40.44)	5 (0.56)	108 (1.24)	6 (0.74)	33 (3.84)	152 (17.52)	480 (59.29)
The Netherlands b/	0 (0.0)	0 (0.0)	22 (21.64)	0 (0.0)	0 (0.0)	22 (21.64)	22 (21.64)
United Kingdom c/	0 (0.0)	37 (0.32)	112 (0.97)	0 (0.0)	26 (0.23)	178 c/ (1.55)	178 (1.55)

a/ The ECSC in its original form was composed of six members. British coal subsidies are available only for the year since Britain became a member of the Community. The British government does not subsidize the social security program of the National Coal Board. Total British aids in 1973 amounted to $615 million, of which $44 million was for rationalization, $9 million for stockpiling at the mines, $525 million for covering operating losses, and $36 million for coking coal. In 1974 the total was $178 million and the individual allocations, respectively, $37 million, $4 million, $12 million, and $26 million. These are not included in the table. Per ton of coal, British subsidies to the coal industry were $4.78 in 1973 and $1.55 in 1974. They are not included in the table.

b/ Subsidies granted by the Dutch government in 1974 were three times higher than in 1973 due to abnormally large operating losses incurred as the result of complete termination of coal mining in that country.

c/ The total of $178 million includes an allocation of $3.5 million to a fund for financing pithead stockpile:

Source: EC Commission, Aids to the Community's Coal Industry, Brussels, September 10, 1975, tables 7 through 12.

There is no doubt that most of the Community's coal mines could not have survived without the direct and indirect aids, even after the governments began to shoulder a large part of the social security burden. Revenue per ton of coal has been consistently below production cost in all the member countries since the ECSC came into being. In 1973, revenue was 89.0 percent of production cost in Germany, 60.1 percent in France, 48.0 percent in Belgium, and 63.2 percent in the Netherlands. 45/ If the social security contributions are added to the direct and indirect aids, the total subsidy in 1974 actually exceeded the pithead prices for coking coal in Belgium and for lower-grade coals in France. 46/ This does not mean that cessation of coal mining in those two countries would have meant the end of subsidy payments. In both cases, over two-thirds of the total subsidy consists of contributions to the retirement fund for present and former employees. This obligation would continue to exist after the mines were shut down.

Whatever the arguments in favor of the various subsidies--a more gradual transfer of coal industry employees, numbering nearly one million in 1952, and the maintenance of some independence from energy and coking coal imports--there is little

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45/ EC Commission, Aids to the Community's Coal Industry, table 4. For 1970 and 1960, respectively, the percentages were: Germany 91.4 and 94.8, France: 70.5 and 83.9, Belgium: 63.0 and 82.4, and the Netherlands: 79.4 and 93.4.

46/ On July 1, 1974 the ex-mine coking coal price was $52.61 in Belgium, $52.46 in Lorraine, and $50.06 in the Ruhr. EC Commission, Official Journal, May 24, 1975, p. 28.

evidence that the ECSC steel industry benefited directly from the financial assistance to the coal industry. With the exception of a few months in 1974, the c.i.f. prices of imported coking coal were consistently lower than the pithead prices quoted by Community coal producers 47/, and steel firms located in coastal areas increasingly turned to imported coal. Indirectly, however, the subsidies lowered the demand and, hence, the price level of coking coal in the world market. 48/ They thus benefited all steel companies purchasing all or part of their coking coal requirements in the world market or in domestic markets which were not sheltered by government measures from the influence of the world market. The parties unfavorably affected by the subsidies were the exporters of coking coal and steel companies with captive coal mining operations. A number of backward-integrated steel companies in the United States, for example, might have enjoyed a larger gap between the cost of producing a ton of coal in their own mines and the prices paid by steel companies purchasing coal in the domestic and international markets. In a wider sense,

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47/ ECSC, Annual Reports.

48/ In 1974, total deliveries to the coke ovens of the expanded Community were 107 million metric tons of which 19 million tons were imported from non-member countries. The countries of the original ECSC accounted for nearly 80 percent of the total. Moreover, about 20 percent of the coke produced is consumed by households and non-steel industries. EC Commission, Official Journal, May 24, 1975, pp. 18-21.

the European subsidies had the effect of lessening the comparative advantage derived by those companies from their favorable position with respect to an important input in steelmaking.

III. GERMANY

Only one German steel firm is Government controlled. The Peine-Salzgitter company was formed in 1970 through a merger of Salzgitter, which was wholly Government owned, and Ilseder Hutte, in which the Government held a 25.1 percent interest. 49/ In 1974, the company's two plants had a joint capacity of 5.6 million metric tons, 8.8 percent of German steel capacity. This amounted to 3.5 percent of total capacity for the original ECSC of six member countries and 2.9 percent of that expanded Community.

The various types of public financial assistance received by the German steel industry are related to activities such as worker training programs and the promotion of regional development. According to an official source, the industry received a total of $180 million in private loans secured by guarantees from the Federal Government during the period from 1952 through

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49/ Salzgitter was under the financial supervision of A.G. fur Berg-und Huttenbetriebe; the share in Ilseder was held by VIAG, or Vereinigte Industries-Unternehmen A.G. Both are public corporations, 100 percent owned by the German Government. See [68, p. 460].

1970. 50/ This amounted to 9.3 percent of the volume of funds which had been guaranteed and, to a small extent lent directly or furnished in the form of subsidies, by the Federal Government to the industrial sector of Germany. In comparison, in the 1960's the value of sales by the steel industry was slightly less than six percent of the entire industrial sector's sales revenue. However, more than half the guaranteed loans were received by the steel industry before 1960, i.e., during a period when the Government exerted some control over the prices of steel products [68, pp. 263, 264]. The steel industry's share of the total volume of guarantees, loans, and subsidies made available to the industrial sector fell from 47 percent in the seven years before 1960 to 4.6 percent in the period from 1960 to 1970. This is considerably less than the ratio of steel to total industrial sales.

According to an academic source, the steel industry received financial assistance in the form of loans, loan guarantees, and subsidies during the period 1960 through 1970 [62, pp. 155, 156]. The assistance was granted by both Federal

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50/ See [29, p. 145]. Slightly over 10 percent of the total volume was granted to the petroleum, electronics, and civilian aircraft industries in the form of loans and subsidies but no breakdown between these two types of assistance was provided. [The ratios of steel to total industrial sales were calculated from Eurostat, Quarterly Bulletin for Industrial Production, No. 3, 1976, pp. XXVI.] The industrial sector is defined as including manufacturing, extraction, and transportation of hard coal and lignite, extraction of petroleum and natural gas, mineral oil refining and construction (building and civil engineering].

and state authorities. In the 11-year period indicated, assistance totaled $57 million in loans at reduced interest rates, $287 million in loan guarantees, and $204 million in subsidies. 51/ Since investment by the German steel industry amounted to $3.950 billion from 1960 to 1970, it appears that Federal and state authorities assisted the industry in 13.9 percent of its total investment, and that loans accounted for 1.4 percent, loan guarantees for 7.3 percent, and subsidies for 5.2 percent of capital outlays.

In order to estimate the pure subsidy value of this assistance, it would be necessary to determine the aids received under comparable conditions by other German industries 52/ and the extent to which the various aids

51/ Loans were made at interest rates from two to six percent and two- to four-year grace periods. The federal government contributed $54 million and the states $3 million, primarily for training programs and the promotion of regional development. The total of loan guarantees was originally $309 million, but $32 million of a guarantee given by the Federal authorities in 1969 was later converted into a subsidy. This left a total of $70 million guaranteed by the Federal Government and $217 million by the state governments. Subsidies totaling $48 million were granted for regional development, with the states contributing nearly all of this amount. Finally, $125 million was provided in the form of tax bonuses, mostly as an incentive to invest and generate alternative employment opportunities in the economically declining coal mining regions [62, pp. 155, 156].

52/ Unfortunately, the information provided by this source for other industries is not comparable to that given for the steel industry either by period or by aid category. Data for isolated periods indicate, however, that the coal and petroleum industries received larger amounts of public assistance than the steel industry, and that the aircraft industry surpassed the steel industry in this respect toward the end of the 1960's [62, pp. 129, 280, 281, 305-311].

compensated for the cost resulting from meeting the conditions tied to them, such as the cost of locating or expanding plants in backward, remote, or declining areas, or the training and retraining of workers. In addition, allowance would have to be made for the negative effects of other types of intervention. For example, during most of the postwar years, the German Government severely limited the steel industry's use of lower priced coking coal imported from non-Community countries, primarily the United States. The amount of the burden varied with the price differential between imported and domestic coking coal; for the decade of the 1960's it can be estimated as having been on the order from $600 to $700 million or substantially more than the sum of public finanical assistance, including repayable loans, received by the industry. 53/

On balance it appears, therefore, that the favorable and unfavorable interventions by German authorities probably had a negative effect on the international competitiveness of the German steel industry.

53/ In some months of 1966, for example, coke processed from Ruhr coal cost $3.75 per ton more than that made from imported U.S. coal [Der Spiegel, May 30, 1966, p. 34]. With a coke rate of 0.56 and a pig iron output of 25.4 million tons, the cost penalty would have been $75 million dollars in that year. The cost differential in favor of imported coal continued into the 1970's with the exception of two months, August and September, of 1975. [EC Commission Official Journal, April 23, 1973, pp. 17, 38; and May 24, 1975, pp. 6, 22, 28].

IV. ITALY

The Government of Italy controls a significant portion of the country's steelmaking capacity. Through the public development corporation, Instituto per la Reconstruzione Industriale (IRI), it maintains a large share in the diversified Finsider group. Finsider in turn controls the dominant Italian steel firm Italsider, several smaller steel firms 54/ and many firms concerned with selling steel products, transporting raw materials, and utilizing byproducts from steelmaking. In 1975, Finsider accounted for 59 percent of steel output (more than 60 percent of capacity) and 98 percent of pig iron production in Italy. The group owns the largest steel plants of the industry. Among them is the Taranto works, with a capacity of 10.5 million tons, which is by far the largest steelworks in Western Europe.

A second Government corporation, the Ente di Gestione per la Aziende (EGAM), formerly controlled three specialty steel works 55/ which produce about four percent of Italian steel output. But in April 1977, EGAM was dissolved by the Italian Government, and the money-losing steel operations were transferred to IRI. Another four percent is produced by a plant belonging to the diversified Fiat company. This plant, however, ships most of its output to the various subsidiaries of

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54/ They are, Dalmine, Terni, and their subsidiaries.

55/ This group consists of the Breda, Cogne, and Sisma works, with a total capacity of about 1.0 million metric tons.

the parent company and sells only small quantities on the market [21, p. 393]. The remaining private sector of the Italian steel industry is therefore responsible for only about one-third of the industry's steel output and two percent of its pig iron production. Except for the medium-sized firm Falck, all the companies in this sector are minimills producing almost exclusively non-flat items such as bars and rods.

Because IRI controls such a large portion of steelmaking capacity and all the large integrated steel mills in Italy, the details of its financial basis and economic performance deserve closer scrutiny. The Institute was set up in 1933 by a Government decree "as an instrument for the recovery of the banking system and not for carrying out a political design in order to control some sectors of the national industry" [55, p. 77]. The original plan was for IRI to take over failing companies and, after restoring them to financial health, to return them to private ownership. But owing to "limited possibilities of the market," IRI became a permanent fixture of the Italian economy, acquiring and retaining an ever larger number of formerly private companies. By the early 1970's, the group consisted of several major banks and 130 firms in the manufacturing and service sectors [55, p. 8]. Finsider, organized in 1937, had become the largest component of the group. In 1975, it accounted for 32 percent of sales, 48 percent of exports, and 20 percent of the employment of all firms which IRI controlled. IRI's ownership share in Finsider is 55 percent, including certain accumulated reserves; Finsider in turn holds an interest of 57.3 percent in Italsider and of 56.8 percent and 98.6 percent, respectively, in the steel pipe producer Dalmine and the specialty steel firm Terni. 56/

By the end of 1975, the Italian Government had contributed $2.6 billion, or 49 percent, to IRI's total risk capital of $5.3 billion. The remainder came from private and institutional shareholders. But risk capital accounted for less than 20 percent, and the Government's contribution to this capital for less than 10 percent, of the net worth of all of the IRI-controlled firms. 57/ In contrast, long-term debts at the end of 1975

56/ The main Italsider works are Taranto, Bagnoli, and Cornigliano; their respective capacities in 1974 were approximately 10.5, 2.7, and 2.2 million metric tons. In 1974, Italsider accounted for 63 percent of Finsider's sales; Dalmine, for 14 percent; and Terni, for 6 percent. The remainder came from cement, chemical, engineering, and shipping firms controlled by Finsider [52, pp. 70, 72]. The three firms have further participations: Italsider holds 50 percent interest in Piombino (the other half is held by Fiat); Dalmine, a 100 percent interest in two pipemaking firms (Tubificio Dalmine and Montubi); and Terni, a 50 percent interest in the stainless steelmaker Terninoss.

57/ Net worth of all IRI operations (industrial and banking) was $28.4 billion on December 31, 1975, after allowing for losses. Equity capital covered only 18.6 percent of this (Government holdings 9.13 percent and privately-owned shares 9.4 percent), medium- and long-term obligations 46.8 percent, and short-term loans 22.5 percent according to the Annual Report for 1975 (Esercizio) pp. 35 and 43. This would cause the ratio of medium- and long-term debt to equity to be over 250 percent; in contrast, for the steel industry of the United States the ratio of long-term debt to stockholders' equity was 28.5 percent in 1974. See [4, p. 60].

(Continued)

were $13.3 billion, and short term obligations, $6.4 billion. One-eighth of the total debt is owed to banks controlled by IRI. 58/ Although these banks do not seem to favor IRI enterprises in their lending operations, a common ownership bond between large firms in key industries and large banks should influence the risk calculation of private lenders to these firms. 59/ This may be an important reason for IRI's ability to expand its operations to an unusually large extent on the basis of funds borrowed in the capital and money markets of Italy and other countries. It applies in particular to the steel sector of Finsider which increased its crude steel

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57/ (Continued)

Figures for the amounts borrowed in foreign currency are available only for the years 1969 and 1974. They accounted for 9.3 percent of long term loans and 4.4 percent of short-term loans raised during this period (IRI, Annual Reports, 1969 to 1974).

For other studies containing data on the financial status of the Italian steel industry, see [75, p. 46] and ECSC, Study of the Financial and Economic Situation of the Large Iron and Steel Enterprises in the Nine, undated, covering the years 1968 to 1972.

58/ They are the three banks "of national interest" Banca Commerciale Italiano, Banco de Roma, the interregional institution Banco de Santo Spirito, the Mediobanca for industrial credit, and the Mortgage lending institution Credito Fondiario [55, p. 9].

59/ The proportion of loans made by these banks to IRI-connected versus other industrial firms was only slightly larger in 1974 than the proportion of total sales revenues of the two groups of firms. See [54, pp. 16, 17], [52, p. 70], and [19, p. 23].

capacity from about 12 million (metric) tons in 1968 to 18 million tons in 1975. During this period, investment outlays by Finsider were nearly $54 per metric ton of steel produced compared to an average of $18 per ton in the original six ECSC countries and $14 per ton in the United States. 60/ The equity capital contributed by IRI represented less than five percent of the funds invested in the Finsider steel plants (totaling about $4.3 billion) during this period. 61/ About one-third of the remaining financial requirements of the expansion program were met from depreciation and personnel retirement funds and two-thirds from long-term borrowing. It is very doubtful that a private company would have been able to attract large amounts of long-term loans on such a thin equity basis. It would be even less probable that a private company would manage to expand its holding of long-term loans at a dramatic pace at a time when it and its parent were both sustaining huge losses.

Nevertheless, although heavy borrowing put Finsider in a position to weather a recession of two or three years, it can hardly represent a longrun solution. In the absence of a strong revival of the steel market, financial pressures in the

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60/ Calculated from investment and output figures contained in [51], [74], and Eurostat, Iron and Steel, 1974 Yearbook, tables 3 and II-7.

61/ It is not surprising that the scarcity of "own funds" (i.e., contributions by the Italian Government) has been the subject of complaints by the Institute in its official publications. See [54, pp. 18, 33-37] and [52, p. 126].

form of rising interest payments are likely to place an unmanageable burden on the company. Already in 1975, interest payments were two-thirds as high as employment costs, double the level of depreciation, and nearly 16 percent of total sales revenue. For the United States steel industry, interest on funded debt amounts to less than two percent of sales. 62/ A continuation of a weak steel market, and thus of losses to Finsider, should make it inevitable that the Italian Government bolster the company's financial position. This may take the form of a public loan of the type recently negotiated for the now dissolved EGAM conglomerate, or of a massive injection of public equity funds into the company portfolio.

In conclusion, it may be said that no evidence could be found of direct subsidization of Government-controlled steelmaking in Italy. Partial public ownership of Finsider did not seem to bring with it easy access to public funding of the company's investment program. But there is little doubt that the Government connection had a bearing on Finsider's ability to raise unusually large loans in private money and capital markets. On the other hand, it burdened the company with a number of problems which a privately-held company is less likely to experience. It was, for example, the regional development policy of the Italian Government, which obliged

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62/ See [53, p. 22] and Iron Age, April 26, 1976, pp. 40-43.

Finsider, to locate its largest plant in the economically backward South. 63/ The result was higher costs for the company in the form of investments in the industrial and social infrastructure. Moreover, political pressures obliged Italsider, the carbon steel arm of Finsider, to maintain and even expand the obsolescent and unprofitable Bagnoli plant near Naples. The political pressures were motivated primaily by the adverse effect which a cutback of the Bagnoli operation would have on an already poor job market in the region. 64/ But political forces were also at the root of Italsider's many costly confrontations with powerful labor unions.

Strikes, slowdowns, and excessive absenteeism interfered not only with steel production but also with the construction of new facilities. 65/ They have been blamed for a shortfall

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63/ This obligation was the subject of a decree issued in 1957. See [55, p. 11] and [87, pp. 189, 190].

64/ The Bagnoli mill also has been a special target of labor union agitation; and recently it also found itself embroiled in legal disputes with local authorities over plant modifications. See [51; 1971, p. 107; 1972, p. 14] and [53, p. 16].

65/ All the IRI Annual Reports from 1968 to 1974 devote considerable attention to the ill-effects wrought on the operation of integrated plants by the recurrence of "bitter confrontations" with the labor unions. The Annual Report for 1973, for example, contains the following passage:

> The activity of the Finsider Group was strongly affected both by heavy labor disputes which particularly hit the more vulnerable integrated process plants, and by increased absenteeism. Such factors both directly and indirectly caused the loss of 3.8 million working hours and 1.2 million tons of steel as compared with initial targets.

(Footnote continued on next page)

a shortfall of several million tons of output below the planned level in the early 1970's and, hence, for higher losses or lower profits than would otherwise have been realized, especially during the boom years 1969, 1973, and 1974. 66/ In 1975, labor unions strongly opposed management proposals to shorten the work week temporarily in order to cope with a decline in orders. This circumstance may have caused the management of Finsider to turn more intensively to foreign markets in that year. Furthermore, beginning in 1968, hourly employment costs in the steel industry rose considerably faster in Italy than elsewhere in the European Community, except for France. 67/

65/ (Footnote continued from preceding page)

It should be pointed out that in the last four years the Finsider Group has suffered an overall loss of 15.6 million working hours and about 5 million tons of steel, compared with the annual operational plans. It should be added that the targets of such plans had to be readopted, year by year, with reference to the targets indicated in the original four-year plans.

In the situation described above, the functioning of existing plants, above all the integrated process ones such as Taranto and Bagnoli, was upset. This especially affected routine maintenance work which resulted in a number of normally available drawbacks and failures. Moreover, the construction of new plant was delayed with the consequence of postponing the forecast time for the achievement of the planned productive capacity [51, 1973, pp. 13, 14].

66/ See [51, 1970, pp. 103, 104; 1971, pp. 106, 107; 1972, pp. 13, 14; 1973, pp. 13-16, 68]and [53, pp. 79-82].

67/ See [51] and Eurostat, Iron and Steel, 4/5 1975, table 51.

TABLE 6A.6

Financing of Finsider, 1968 to 1975
(millions of U.S. dollars) a/ b/

	1968	1969	1970	1971	1972	1973	1974	1975
Debt Financing	64.0	158.9	269.5	515.1	871.1	718.3	708.3	1,580.0
Medium- and Long-Term	101.4	123.2	87.7	384.9	759.6	641.8	120.0	790.0
Loans at Reduced Rates	59.4	75.0	74.4	229.9	740.0	26.2	295.2	500.0
Ordinary Loans	43.0	54.2	- 3.7	163.0	28.3	624.9	-167.4	290.0
Bonds	- 1.0	- 6.6	17.0	- 8.0	- 8.7	- 9.3	- 7.8	0.0
Short Term	- 37.4	35.7	181.8	130.2	111.5	76.5	588.3	790.8
Loan and Equity Financing by Instituto per la Reconstruzione Industriale	53.9	8.0	30.1	130.2	- 58.3	55.6	- 11.7	99.5
Equity Financing by Private Shareholders	0.6	2.4	-	40.0	-	-	-	-
Profits or Losses	19.2	23.4	- 15.5	- 67.8	- 60.5	24.4	50.8	-163.2
Investment Outlays	174.1	206.4	357.3	671.0	909.1	966.6	684.8	671.3

a/ Net increases in balances.

b/ The following exchange rates were applied: 1968-1971, $1 = 625 Lire; 1972, $1 = 581.50 Lire; 1973, $1 = 582.90 Lire; 1974, $1 = 650 Lire; 1975, $1 = 655 Lire.

Sources: Instituto per la Reconstruzione Industriale, Annual Reports 1968 to 1975; Finsider, Esercizio 1975-1976, Allegati.

TABLE 6A.7

Financing of the Instituto per la Reconstruzione Industriale Group, 1968 to 1974 (millions of U.S. dollars)a/ b/

	1968	1969	1970	1971	1972	1973	1974	1975
Debt Financing	309.4	252.1	1,106.4	1,438.8	1,799.7	2,069.7	2,245.5	4,139.6
Long- and Medium-Term	416.3	280.6	411.2	937.4	1,595.7	2,193.7	632.0	2,766.3
Short Term	-106.9	- 28.5	695.2	501.4	204.0	- 124.0	1,613.5	1,373.3
Equity Financing by Private Shareholders	26.4	41.0	16.0	42.4	50.2	40.8	5.2	n.a
Loans by IRI to Affiliated Companys	27.0	71.8	50.4	158.2	134.1	240.0	45.1	n.a
Equity Financing by IRI	16.1	97.1	110.1	128.6	88.4	257.1	173.1	n.a
Government Allocations to IRI c/	129.6	124.6	127.8	360.0	421.5	377.5	340.0	342.0
Self Financing d/	373.9	473.4	441.8	448.3	62 .	1,208.6	1,236.2	26,455.4
Profits or Losses	85.9	72.5	16.8	- 62.4	- 30.5	60.0	- 105.1	- 682.9
Total Investment Outlays	937.0	1,048.5	1,394.7	2,017.8	2,624.3	3,118.4	2,849.2	n.a.

a/ Net increases in balances.

b/ The following exchange rates were applied: 1968-1971, $1 = 625 Lire; 1972, $1 = 581.50 Lire; 1973, $1 = 582.90 Lire; 1974, $1 = 650 Lire; 1975, $1 = 655 Lire.

c/ The Institute has its own long- and short-term obligations. The difference between the amounts received by the Institute from the Government and the sum of equity and loans extended by the Institute to its affiliated companies consists of repayment of obligations and changes in portfolio (see Annual Report for 1968, p. 95).

d/ This category consists of amortization, increases in personnel retirement and other funds, and allocations of profits to reserve, net of losses (see Annual Report for 1968, p. 66).

Source: IRI, Annual Reports, 1968 to 1975.

TABLE 6A. 8

Profits and Losses of Banking and Industrial Firms in the Instituto per la Reconstruzione Industriale
(millions of U.S. dollars)

	1968	1969	1970	1971	1972	1973	1974	1975
Banks a/	30.4	32.0	32.3	34.8	37.8	42.9	52.5	60.4
Manufacturing b/	-1.9	-22.7	-64.6	-141.9	-116.9	-43.9	-131.8	-523.7
(Finsider, included in Manufacturing and Services)	(19.2)	(23.4)	(-15.5)	(- 67.8)	(- 60.7)	(24.4)	(50.8)	(-163.2)
Services, Toll Roads, and Construction c/	57.4	63.2	49.1	44.6	48.6	60.7	- 26.2	-186.2
All IRI Controlled Firms	85.9	72.5	16.8	-62.5	- 30.5	59.7	-105.5	-649.5

a/ This sector includes the three so-called "banks of national interest" (Banca Commerciale Italiana, Credito Italiano, and Banco di Roma), the interregional bank Banco di Santo Spirito, the industrial credit institution Mediobanca, and the mortgage bank Credito Fondiario.

b/ This sector includes the following divisions (percent of participation in total IRI sales of $12.6 billion in 1974): Iron and Steel (32.1), Engineering, including automotive, aerospace, and thermonuclear equipment (16.6), Food Processing (8.3), and Shipbuilding (4.6); the remainder consists of many small firms in different areas of manufacturing (3.8).

c/ The largest divisions in this sector are (percent of total IRI sales): Telecommunications (12.3), Air Transport (5.9), Construction (3.5), Radio and Television (2.6), and Maritime Transport (2.3).

Sources: IRI, Annual Reports 1968 to 1975. Finsider results for 1975 are from Metal Bulletin, June 2, 1976, p. 37.

Finsider's problems were aggravated in April 1976 by the decision of the Italian Government to dissolve EGAM (the Government-controlled specialty steel, minerals, and trading company) and to transfer its money losing steel operations to Finsider. Along with the companies, Finsider was also to take over a good part of the $1 billion debt attributed to EGAM. It has been claimed that as the result of the transfer, IRI's losses in 1977 would run three times as high as the $780 million loss incurred in 1976. 68/

V. FRANCE

The French Government does not have control over any steel company by means of ownership participation. It has, however, exerted considerable influence over the development of the French steel industry in the postwar period. Steel had been designated a priority sector by the French planning commission and, in return for loans from public funds, the industry was encouraged and at times coerced to comply with the directives of the Government in the areas of pricing, regional development,

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68/ Cogne and Breda, the two specialty producers formerly affiliated with EGAM, lost $43 million in 1975. EGAM then announced that it would liquidate its steelmaking affiliates by selling them to Ferriere, also a specialty steel producer (controlled by the Fiat conglomerate). The Italian Government refused its consent and instead advanced EGAM a loan of $100 million in January 1977, less than one-fifth of that requested by the corporation as a minimum to keep its operations going. See I & SM Magazine, September 1976, p. 13, and Metal Bulletin, June 2, 1976, p. 37; January 11, 1977, p. 39; January 21, 1977, p. 37; and May 3, 1977, p. 32.

and modernization. 69/ Price restraints imposed a cost upon the industry in the form of a decreased ability to generate funds for investment; regional development programs often meant higher infrastructure outlays for participating firms. Public financial assistance must therefore be considered together with the losses in the industry's profitability resulting from various types of Government interference.

In the immediate postwar period, large capital expenditures were made by the French steel industry as part of the Monnet industrial reorganization plan. At the time the industry was composed of relatively small firms whose plants had suffered from under-maintenance and, in some cases, partial destruction during the Second World War. 70/ These investments were in large part financed with credits made available by the French Government from Marshall Plan funds. The reorganization led to the establishment of several large companies prior to, and possibly because of, the impending formation of the European Coal and Steel Community. 71/

69/ See [81, pp. 248-250], [79, pp. 470-472], and [69, pp. 367-377].

70/ See [28, pp. 359, 360] and [69, pp. 202-204].

71/ The principal companies were Usinor, Wendel & Cie., Lorraine-Escaut, Sidelor, and Sollac. Further reorganization occurred soon after the ECSC came into effect. From 1948 to 1956, about 75 percent of the French steel industry was affected by these mergers. A basic motivation for carrying out this program seemed to have been concern over the French steel industry's ability to compete successfully against the large German firms whose plants (which had also been to some extent rebuilt and modernized with Marshall Plan Aid) were of larger scale and more productive. See [68, pp. 82, 84, 132] and [28, p. 336].

However, in the recession years of the early 1960's, the industry still suffered from severe structural problems and doubts were raised concerning the ability of French steel to compete in foreign markets. Investigations carried out by trade associations showed that in many important industries, including steel, productivity and plant size compared unfavorably to the results obtained for such industries in other Common Market countries, as well as for those of Japan and the United States. Negotiations between the steel industry and the Government, in which the industry trade association played a leading role, resulted in the formulation of a comprehensive reorganization plan, the "Plan Professional." Its objective was to raise the efficiency of French steelmaking and thus its competitiveness vis-a-vis its foreign rivals. The stated reasons for the need of Government intervention were: (1) steel was a strategic industry supplying other important sectors of the national economy with basic inputs, (2) a large portion of the labor force of certain regions depended on the industry for a livelihood, and (3) the investments necessary for the reorganization of the industry required immense financial resources which the already heavily indebted steel companies would be unable to mobilize. 72/ It should be remembered, however, that the heavy indebtedness was a consequence of price controls imposed by the French Government from 1954 to 1962.

72/ Ariel Francais, Commissariat General du Plan, "Les Rapports entre l'Etat et la Siderurgie au Cours des dix dernieres Annees," May 1975, Library of the European Community, Washington, D.C. According to Opera Mundi (August 29, 1968, p. 3) the indebtedness of the French steel industry in 1968 was $770 per ton of crude steel produced compared to $660 for the German industry and, respectively, $520, $470, and $13 for the steel industries of Holland, Belgium, and Luxembourg. Only the then rapidly expanding Italian industry carried a larger debt load with $1,150 per ton. A study by the International Iron and Steel Institute put France in the same league as Japan with respect to countries which raised a large portion of their financial needs from 1961 to 1971 by means of raising their long-term debt (31 to 32 percent in the case of France, Italy, and Japan, compared to 14 percent for Germany and 10 percent for the United States. See [56]. Borrowing from the Government caused the indebtedness of the industry to grow but it probably prevented the risk factor from growing commensurately. The ratio of debt to sales for the French steel industry, which had increased from 46 percent in 1960 to 70 percent in 1965 [69, p. 371], did indeed rise further to 105 percent in 1976 [Metal Bulletin, May 7, 1976, p. 36].

In 1964, the debt-to-equity ratio was 130 percent for the French steel industry compared to 142 percent for the Italian, 128 percent for the Japanese, 104 percent for the German, and 17 percent for the United States steel industry. [86, p. 452].

The agreement between the Government and the steel industry was signed in July 1966 and had a duration of five years. 73/ In the course of this period the industry invested

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73/ In 1968, the Government of The Netherlands voiced concern over the approval given by the ECSC executive of the financial aids provided by the Plan Professional. Not satisfied by the answer that, first, other French industries on the Government's priority list also had access to public loans at the same favorable conditions as those granted to the steel industry and, second, in return for the loans the recipient companies had to bear costly social responsibilities, the Dutch Government requested that the EC Commission take action against the French Government. (See Statement of the advocate general Karl Roemer in Royaume de Pays-Bas Contre Commission des Communates europeennes, Arret de la Cour, July 6, 1971, in Recueil de la Jurisprudence de la Cour, XVII, 1971-75, pp. 655-58 and 661-67. The relevant articles of the Paris Treaty are 88, which binds all member Governments to observe their duties under the treaty and 67, which empowers the Commission to issue orders of compliance.) When the Commission did not comply with this request, the Dutch Government lodged a complaint with the Community's Court of Justice. The Court sided with the EC Commission, however, repeating the latter's arguments concerning the non-discriminatory and compensatory nature of the French aid progrm. The term non-discriminatory refers to the fact that the French Government made loans available on similar terms to several industries which had been given priority status by the planning Commission. Compensatory means that one purpose of the loans was to recompense the industry for the additional cost of separation and resettlement payments to workers made superfluous by enterprise rationalization. This "social obligation" formed part of the 1966 agreement. [Recueil..., pp. 656, 657] and [69, pp. 374, 375].

The Court had already come to grips with a French subsidization scheme on a previous occasion. In a decision of February 13, 1970, it ruled that by maintaining a favorable difference in rediscounting steel exporters' bills of more than 1.5 percentage points under the normal rate, the French Government failed to fulfill its treaty obligations. The scheme which constituted a subsidy to French exports of steel products and adversely affected foreign competitors (including those from other member countries), was originally designed as a temporary emergency measure during the economic and political crisis of 1958. But the Commission brought suit when, after the crisis

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$1.212 billion of which $574 million, or 47.4 percent, was financed with loans received from the Fonds de Development Economique et Social (FDES), a financial institution of the French Government.

This institution has participated in the financing of investment in France within the framework of development programs set out in the various five-year plans. Participation by FDES in the nation's gross investment outlays exceeded 15 percent in the 1960's but declined to less than 11 percent by the mid-1970's. The transport, communications, and urban development sectors (including publicly-owned enterprises) have traditionally received more than one-half the total allocations, while the "industry and services" sector has rarely received more than seven percent of the total.

Within the latter sector, the steel industry received less than 30 percent of allocations from 1948 until the Government-industry agreement became effective in 1966; its share then rose to more than 44 percent in 1970 and remained at this level

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73/ (Footnote continued from preceding page)

was considered ended, the French Government not only continued the measure but further widened the spread between the rate of rediscounting applied to exports and domestic deliveries. [Court of Justice of the European Communities, Reports of Cases before the Court, Joined Case 6 and 11/69, Commission v. France, 1969 Volume, pp. 523-56.]

until the present time. The chemical industry and tourism were other important beneficiaries within this sector. 74/ Although the share received by the steel industry was probably less than four percent of the total lending program of the French Government, within the "industry and service" category of the program, steel's share was very large. On a national scale it also appears to have been larger than the ratio of industry value added to French GNP. 75/

The Government-industry agreement ended in 1971. From then on, the bulk of financial assistance was channeled into a single project, the Solmer integrated flat products plant at Fos-Sur-Mer and Europort South, France's largest seaport. The project grew out of the desire of Sacilor, the dominant French steel producer in the Lorraine area, to build a coastal plant. The French Government, engaged in a comprehensive industrial development program for the Mediterranean region around Marseilles, exerted pressures on the company to locate the plant in the south. When Sacilor experienced financial difficulties due to the recession of 1970-71, the Government and the French steel producers' association persuaded the other

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74/ See [72, pp. 4, 7, 9] and [24, p. 53].

75/ French GNP in 1974 was $243 billion (Less Collections de L'Insee, Rapport sur less Comptes de la Nation de l'annee 1974, p. 21). The value of French steel output was about $5.1 billion.

large French steel producer, Usinor, to participate in the venture. 76/

From 1971 to 1975, the French steel industry invested about $4 billion, or more than three times as much as the amount invested from 1966 to 1970 (2.3 times as much in terms of constant francs). The Fos project absorbed $1.6 billion, or 40 percent of the total. 77/ The Government provided $385 million directly to Solmer and $83.5 million to each of the two parent companies for improvement of their plants in northern France and in Lorraine. 78/

76/ Sollac, Sacilor's flat products subsidiary, and Usinor each have a 47.5 percent share in Solmer. Thyssen, the largest German steel producer, participates at present with a five percent interest but its share may eventually increase to 25 percent. See 33 Magazine, March 1975, p. 38; and Metal Bulletin, September 26, 1972, p. 27.

77/ 33 Magazine, March 1975, p. 38.

78/ In response to a letter from the authors, the Chambre Syndicale de la Siderurgie Francaise stated that the Government loan to Solmer was 1.85 billion French francs (approximately $385 million); a separate loan to Usinor and Sacilor was made in the amount of 800 million francs ($167 million) for improvements of these companies' plants in northern France and in Lorraine. In a note in Assemblee Nationale (February 15, 1975, p. 524), the entire amount of 2.65 billion francs is said to have been allocated to Solmer. The British trade magazine Metal Bulletin (February 23, 1973, p. 23, and February 27, 1973, p. 24) elaborated that the loan to the parent companies represented a detour in the financing of Solmer in order to avoid the appearance of excessive indebtedeness on the part of the subsidiary. The note in Assemblee Nationale also mentions that the 25-year loan was made at an interest rate of only 6.75 percent, which would approximately correspond to the Eurodollar rates for loans of shorter duration, and for prime bank rates in France in 1971 and 1972. ("Eurodollar

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In 1976, the steel industry received another $300 million in loans from the French government. The interest rate was 9.75 percent, which was then the basic rate charged by the government's lending agency (FDES) to all borrowers. In contrast, under the 1966/71 agreement the rate of interest was only three percent during the first five years and four percent during the remaining period of the loans. 79/ An overview of the loan assistance extended by the French Government to steel companies is given in table 6A.9. According to the figures and estimates presented in this table, the French industry invested $8.4 billion from 1948 through 1975 and borrowed somewhat less than $1.5 billion from FDES, or about 17.7 percent.

Approximately $3 billion was raised by private finance groups which were created by, or are closely associated with, the various steel industry trade associtions. A large portion

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78/ (Footnote continued from preceding page)

rates" and "international interest rates" are regularly listed in Euromoney.) Moreover, the same note also points out that Solmer was exempted from value-added and local taxes and that the company paid less than the market price for the terrain it acquired.

79/ Recueil de la Jurisprudence de la Cour, XVII, 1971-75, p. 656.

TABLE 6A.9

Government Loans Received by the French Steel Industry
1948 to 1975
(in millions of U.S. dollars and percent)

	1948-65	1966-70	1971-75	1948-75
Total Investment Outlays by Steel companies	$3,200	$1,212	$4,000	$8,412
Loans Received from the French Gov't.	$375	$563	$464	$1,490
Gov't Loans as a Percentage of Investment	11.7%	46.5%	13.8%	17.7%
Rate of Interest at which Gov't. Loans were made available	n.a.	3.0 for 5 yrs. then 4.0	6.75 to more than 10.0	n.a.

Sources: Conseil de Direction du Fonds de Developpement Economique et Social, Rapport pour 1968-1969, p. 174, Rapport pour 1971-1972, p. 203, and Rapport pour 1974-1975, p. 53; Metal Bulletin, April 27, 1976, p. 39: Philip Saint Marc, La France dans La CECA, livr. Armand Colin, Paris, 1961, pp. 252-53.

of the investment was financed by bond issues floated by the steel companies in collaboration with the Groupement de l'Industrie Siderurgique (GIS). This private organization was established in 1946 and is composed of 50 iron and steel and iron ore mining companies that account for 95 percent of the industry's sales. In the area of finance, one of its functions has been to guarantee loans to steel firms granted by other financial institutions. But its major activity has been the floating of debenture loans in various capital markets. 80/

The activities of this organization tend to spread the risk among financially weak and strong companies. No information could be obtained about the interest rates paid by the steel companies on GIS loans, especially in comparison with the rates paid by the companies on other loans obtained from private sources.

VI. THE UNITED KINGDOM

In 1976, about 86 percent of steelmaking capacity in the United Kingdom was controlled by the publicly-owned British Steel Corporation (BSC). 81/ The company was established by the 1967 Iron and Steel Act which specified that the government set aside $2,294 million as a "commencing capital" debt, equal to the cost of compensating the shareholders of the 13 companies absorbed plus government loans previously extended to the one

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80/ Jacques Ferry, "The Financing of Capital Investment in the Steel Industry," in [56, Appendix XXXV, pp. 1-5].

81/ Metal Bulletin, April 9, p. 31.

company already nationalized (Thomas and Baldwins) [48, p. VIII]. In addition, BSC assumed other financial obligations of the merged firms totaling $745 million. The burden of these debts, the lack of reserves and working capital, the low level of productivity of nationalized assests, labor problems, and the continued control of steel prices by the British Government as a means to keep inflationary pressures in check, caused the BSC severe financial difficulties during its first years of operation. The Iron and Steel Act of 1969 therefore reclassified $1,680 million of the $2,294 million initial debt as "public dividend capital," on which the company did not have to pay interest for the time being, but on which it was eventually expected to pay dividends of at least 8 percent. The new Act also raised the ceiling of BSC's borrowing limit from the $960 provided by the original Act, to $1.200 billion. 82/ But the lack of reserves was still a problem and in 1972 the public dividend capital was reduced (written-off) from $1.750 billion to $1.250 billion. Furthermore, $375 million of interest-bearing, long-term debt obligation to the Government was struck off the books. (Against the total of $875 million thus gained, $270 million in losses had accumulated up to that time [48, pp. 89, 261]). The limit of the company's borrowing

82/ See [48, p. 89]. BSC officials had previously recommended that $240 million of the overvalued original assets should be written off, but this was rejected by the Government. [48, pp. XIV and 88].

TABLE 6A.10

British Steel Corporation Capital, Long-Term Debt, and Borrowing Limits, 1968 to 1976 (millions of U.S. dollars)

	Sept. 1968	Feb. 1972	Mar. 1972 a/	Mar. 1976	Sept. 1976
Public Dividend Capital	1,680	1,750	1,250	981	1,602
Long-Term Debt to the British Government b/	751	1,273	648	1,793	3,600
Borrowing Limit	960	1,625	3,125	3,600	5,400

a/ In March 1972 the Public Dividend Capital was reduced by $500 million and the interest-bearing public debt $ 375 million, and the limit to the borrowing powers of BSC was raised from $1,625 (established in 1969) to $ 3,125. Iron and Steel Act 1972, chapter 12, pages 1 and 2, Her Majesty's Stationary Office, London, 1972.

b/ Private long-term debt seems to have played a subordinate role in the financing of BSC. It was $ 41 million in 1968, and $ 5 million

from 1969 to 1972, the last year for which this information is available.

Sources: First Report from the Select Committee on Nationalized Industries Session 1972-73, British Steel Corporation, Her Majesty's Stationary Office, London, 1973, pp. 88-90, 261. Metal Bulletin, February 20, 1976, p. 36, and April 30, 1976, p. 37.

TABLE 6A.11

British Steel Corporation
Production, Shipments, Employment, and Financial Data, 1968 to 1975
(in millions of metric tons, thousands of employees, and millions of U.S. dollars) a/

	1968 b/	1969	1970	1971	1972	1973	1974	1975	1968-75
Crude Steel Output	23.5	25.5	26.1	21.5	25.1	23.0	20.5	17.2	182.4
Domestic Shipments	14.1	16.2	16.8	13.4	14.4	15.4	13.0	10.5	113.8
Exports	3.6	3.0	2.8	3.7	3.6	2.7	2.1	2.2	23.7
Employment	254	253	252	230	227	220	228	210	
Investment Outlays	218	211	343	578	495	458	728	1,177	4,208
Depreciation	223	223e	223	239	245	245e	236	224	1,858
Interest	72	77	82	102e	125e	142e	157	240	997
Profits (Losses)	(46)	(26)	(24)	(166)	8	123	170	(566)	(527)
Loans from the Government c/	--	50	146	315	358	103	321	699	1,992
Public Dividend Capital c/	--	--	--	--	--	--	105	766	871

Notes: e = estimates

a/ The following exchange rates were applied: before 1971, 1 pound = $2.40; 1971: 1 pound = $2.44; 1972: 1 pound = $2.50; 1973: 1 pound = $2.45; 1974: 1 pound = $2.34; 1975: 1 pound = $2.22; 1976: 1 pound = $1.80.

b/ Reference is to fiscal years from April 1 of the year stated until March 31 of the following year.

c/ Net increases in balances.

Sources: First Report from the Select Committee on Nationalized Industries, Session 1972-73, British Steel Corporation, Her Majesty's Stationary Office, London, 1973, pp. 6, 92, and 97; Steel News (a BSC publication), July 24, 1975, and August 5, 1976 (Annual Report Special Supplements).

powers, which had already been raised in 1969 to $1.625 billion, was further increased in 1972, 1974, and 1976 to, respectively, $3.125 billion, $4.680 billion, and $5.4 billion. Early in 1976, the volume of long-term loans actually received from the Government was $2.160 billion and it was estimated to exceed the $3.6 billion mark toward the end of the same year. However, large cost overruns are developing in the ten-year investment program launched in 1973 and will soon require additional funding of large proportions. 83/ In 1975, the company also obtained $100 million of interest free funds in the form of additional public dividend capital, and in 1976 approximately $90 million to finance a program for anticyclical stockpiling of steel products. 84/

The loans made by the government before 1972 carried interest rates varying from 6-3/8 to 9-3/8 percent. The average rate paid on these loans was 7-7/8 percent [48, p. 289], or slightly higher than the 7-3/4 percent at which the ECSC then lent funds to member companies. Data for later years are not available except for a statement by the company's chairman asserting that BSC was being charged "usurer's rates" of 14 percent by the Government on its long-term loans. 85/ The

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83/ Metal Bulletin, April 6, 1976, p. 37 and April 30, 1976, p. 37.

84/ Metal Bulletin, April 6, 1976, p. 37, and Financial Times, August 5, 1976, p. 30.

85/ Metal Bulletin, December 9, 1975, p. 37. The maturity of these loans is generally 17 years.

average rate in the 1975-76 fiscal year seems to have risen to about 8.4 percent. 86/ From the sparse information available it does not appear that BSC is allowed to borrow from the British Government at subsidized interest rates.

In its first nine years of operation, from 1968 to 1976, BSC was profitable only during the boom periods 1969-70 and 1972-74. In 1973 and 1974, the company actually paid dividends to the Government of 6.8 and 8.9 percent respectively. Over the entire period, however, losses were twice as high as profits, although this result is heavily influenced by the abnormally high losses sustained in 1975 and 1976.

Some of the reasons for the poor performance of the company have already been mentioned. The additional cost incurred as a consequence of the indebtedness and inadequate maintenance of the "inherited" mills was probably offset largely by the reduction of the company's dividend capital and long-term loans in 1972.

Several other problems have continued to plague the company, however. One is severe overstaffing. Even though some cutbacks in employment were achieved, in 1974 and 1975 labor productivity in the British steel industry was only half that achieved in the steel industries of ECSC countries other

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86/ Interest payments then amounted to $210 million on a volume of long-term loans equal to $2.500 billion. BSC, Steel News, July 24, 1975, Supplement, p. IV, and Metal Bulletin, February 20, 1976, p. 36.

than France. 87/ Another problem has been the British Government's resistance to BSC requests for price increases. Whereas this may have favored British steel consumers and the export performance of the British steel and steel consuming industries, it kept British steel prices below the levels realized in the ECSC during periods of strong demand. It thus hampered the ability of the industry to generate funds internally, and increased its dependence on loans from the Government to carry out its investment program. BSC spokesmen have estimated that denial or reduction of price increases requested from December 1968 to March 1972 cost the company $266 million in revenues [48, p. 93]. For the period from late 1967 until March 1975, the "cost" of price restraints has been put at $1.8 billion. 88/ It seems that British steel prices were brought into line with those prevailing in the ECSC only after the 1972-74 boom had ended. 89/ At the beginning of 1973, British steel prices were estimated to have been 15 percent below the ECSC level. 90/ Even if the average differential

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87/ Calculated from Eurostat, Iron and Steel, No. 2, 1976, Table 48.

88/ British Steel Corporation Steel News, August 5, 1976, Supplement p. III.

89/ Eurostat, Iron and Steel, No. 4/5, 1975, pp. XL-LV, and Metal Bulletin, September 14, 1976, p. 37.

90/ Financial Times, February 3, 1973, p. 9.

had been only 10 percent during the three-year period from 1972 through 1974, the loss of potential revenue to BSC would have been about $650 million, an amount well in excess of the $566 million in losses incurred by the company in the 1975/76 fiscal year. Finally, the profitability of the BSC has also been affected by the rising interest costs of the loan-financed investment program, from about $72 million in the early 1970's to over $240 million in 1975. In 1968 and 1969, investment outlays of the BSC were only about equal to depreciation allowances; per ton of steel production they were hardly more than half the ECSC level. They increased to the ECSC level in 1971 and 1972, and then exceeded it in subsequent years. 91/

To be sure, an alternative strategy of limiting investment outlays to the level of depreciation allowances would only have improved the profits of the company temporarily. In the longer run, the result would have been even greater difficulties in keeping operating cost pressures in check. Whereas the program adopted in 1973 leaves some hope that the BSC may attain international efficiency standards by the late 1970's, a more conservative alternative program might lead either to a need

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91/ See [26, p. 8], [74], and [ECSC, Investment in the Community Coal Mining and Iron and Steel Industries, 1975, p. 61]. The increase in investment outlays by the BSC is in part due to inflation which raised the expected cost of the ten-year program from the $720 million originally calculated to $1.440 billion, or $1.6 billion according to a source cited in Metal Bulletin, April 30, 1976, p. 37.

for continued subsidization or an even costlier reorganization in the future.

To summarize, the relatively short existence of the British Steel Corporation has been subject to a number of extraneous influences and distortions. A heritage of indebted and obsolescent firms, continued Government interference, 92/ labor problems, and large investments for reorganization and expansion introduced losses or costs which must be considered in an attempt to estimate the extent of subsidies contained in the financing received by the company from public sources. Whether or not the company is viable without operating subsidies should become clear during the remaining years of the 1970's.

It might be interesting to speculate on what the fate of these firms would have been in the absence of nationalization, the allocation of public funds, the forgiveness of debt and interest payments, and price controls. Unfortunately, such speculation must remain beyond the scope of this study.

92/ For a brief history of the British steel industry prior to the second nationalization in 1967, see [17, p. 15-56]. The British Government not only controlled steel prices but also made decisions concerning industry structure which led to adverse effects on the achievement of economics of scale, the location of plants, and the completion of expansion programs. For recent interventions of this type see Metal Bulletin, September 24, 1976, p. 35 (location of a minimill), and December 31, 1976, p. 32 (delays in construction at the Port Talbot plant).

VII. BELGIUM

The Belgian Government has no ownership participation in any of the country's steelworks.

A general aid program to stimulate economic expansion, particularly in stagnant or declining regions, was introduced in 1959. The principal aid criteria were structural unemployment and a declining labor force due to out-migration from the region in which the borrowing firm was located or intended to locate. 93/ Under this program, the Government assumed part of the interest payments on the amount borrowed by industrial enterprises. The refund was between two and four percentage points of the interest actually paid. It was applied to a large portion, usually from one-half to two-thirds, of total outlays for a given investment project. Comprehensive data exist concerning the total investment to which the subsidy was applied, but only fractional information is available about the cost of the subsidies to the Belgian Government.

The laws defining the program of 1959 were superseded by a new law passed in December 1970. This led to a shift in emphasis from efforts to raise employment and productivity in

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93/ See [10, pp. 397-424]. According to Belgian steel industry sources, the program also reflected the desire of the Government to compensate industrial borrowers for the inflationary impact which large-scale public borrowing has had on interest rates for long-term loans.

the short run to the creation of a favorable investment climate in the longer run. 94/

The total investment volume of all industries, on which the Government granted refunds on interest payments, amounted to approximately $12 billion from 1959 through 1975. It involved $6.7 billion during the 11-year period of the first program ending in 1970 and $5.3 billion under the second program. From 1959 to 1970, such investments by steel firms comprised from 25 to 27 percent of the total, compared to the chemical industry with 30 percent and metal fabrication with 23.1 percent. But the steel industry's share fell sharply under the new law. In the period from 1971 to 1975, steel was in third position with 17 percent, following the chemical industry with 30 percent and metal fabrication with 23 percent. 95/

Information about the cost to the Belgian Government of these refunds could be obtained only for the more recent years of the entire period. It can be seen in table 6A.12 that from 1969 to 1975, the years for which data are available for all industries benefiting from the refunds, the steel industry's share of the total subsidy value declined from 21 percent to less than one percent, the average for the period being about

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94/ In technical terms, this meant that public utilities and service industries were to be included in the subsidy program. See [10, p. 407].

95/ See [70, p. 101] and [71].

TABLE 6A. 12

Assistance Given Under the Regional Development Programs
to the Belgian Steel Industry, 1969 to 1975

	1959-1968	1969	1970	1971	1972	1973	1974	1975	1969-1975
Investment Outlays by the Steel Industry (millions of U.S. dollars)	1,238	132	233	215	176	170	394	358	1,677
Cost to the Government of Regional Development Aid to the Steel Industry (millions of U.S. dollars)	n.a	28	22	13	7	10	4	2	86
Cost of Aid per Ton of Finished Steel (U.S. dollars per ton)	n.a	2.85	1.24	1.41	0.65	0.88	0.33	0.25	1.22
Subsidy Value as a Percent of Steel Industry Investment	n.a	21.2	9.4	5.8	4.0	5.8	1.0	0.4	5.1
Steel Subsidies as a Percent of Total Industrial Subsidies	25 to 27	14.0	13.3	13.1	7.9	4.0	1.2	0.6	10.0

Sources: Pavot Marcel, La Concentration Siderurgique et la Siderurgie Belge dans la CEE, Université Catholique de Louvain, 1972, p. 101; Ministère des Affaires Economiques, Administration de l'Industrie; Eurostat, Iron and Steel, 1976 Yearbook, table II-7.

10 percent. It appears that aid received by the steel industry as a proportion of total investment was relatively less than that for other industries. Since in value terms, steel output ranged from 11 to 17 percent of total industrial output from 1969 to 1975 96/ (depending on the year), the subsidies received by the steel industry were disproportionately low relative to the total amount of subsidies received by the entire industrial sector.

The refund of interest payments was applied to loans obtained from private lenders as well as on loans supplied by the semi-public Societe Nationale de Credit a L'Industrie (SNCI). This institution, which operates on the profit principle, raises funds in regular financial markets and makes them available to industrial companies for a service fee. But its main stockholders are public agencies. No data were available concerning the volume of credit extended by SNCI, except for the fact that by the end of 1975 the steel industry had obtained 13.5 percent of the total lent to the entire industrial sector, 97/ a proportion roughly equal to the steel industry's weight in this sector in terms of sales.

In order to qualify for aid under the general law for economic expansion, all investment programs must be submitted

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96/ Calculated from data in [36]. This includes all mining as well as sales of water and electric power.

97/ Letter of August 4, 1976, to the authors by the Groupement des Hauts Fournaux et Acieries Belges.

to another body, the Comite de Concertation de Politique Siderurgique (CCPS), which was formed in 1967. The Committee was composed of management, labor union, and Government representatives. Its assignments were to coordinate investment projects of individual steel firms and to find solutions to unemployment and other social problems caused in some regions by the rationalization efforts of the industry. 98/ Projects approved by the Committee were eligible for public financial assistance (channeled through intermediaries such as SNCI). 99/ The CCPS was virtually inactive from 1973 until 1976, a development which has been blamed by the steel producers' federation on increasing unwillingness of the labor unions to go along with rationalization projects resulting in sharp employment cuts. An attempt was made in January 1976 to revitalize the agency and strengthen its powers over the steel industry's rationalization policies. A new working group was to be established within the CCPS to formulate a program for further restructuring and modernizing the industry.

98/ See [20, pp. 4-7 and 15, 16]. Convention Instituant le Comite de Concertation de Politique Siderurgique, April 18, 1967, especially pages 4-7 and 15-16.

99/ This is according to an as yet unpublished manuscript by P. Maystadt and B. Michaux, under the direction of A. Jaquemin. The authors also point out that the CCPS may in certain circumstances limit the capacity of proposed plant additions. Thus, a ruling made on February 27, 1970, restricted the size of new oxygen converters to be installed by the firm Hainaut-Sambre to 150 cubic meters inner volume.

Meanwhile, however, the situation of the Belgian steel industry has greatly deteriorated. The highest labor costs among Common Market steel industries (and lagging productivity 100/) caused the firms in the French-speaking Charleroi and Liege areas to incur very large losses in 1975 and 1976. In January 1977, firms from these areas requested more than $380 million of Government aid in the form of low-interest loans. Later in the year the Belgian Government made available $250 million in loans. Opponents of this course of action protested that only the permanent shutdown of some plants and a dramatic shrinkage of the labor force in others would safeguard the international competitiveness of Belgian steel in the long run. 101/

VIII. THE NETHERLANDS

There is only one integrated Dutch steel company, Hoogovens, which produces about 90 percent of the country's raw steel output. 102/ About two-fifths of the company's stock

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100/ In 1975 the Belgian steel industry moved into top position in the EC as for employment cost and its labor productivity was below the average of the six original members. Calculated from [Eurostat, Iron and Steel, 1976 Yearbook, tables 3, 50, and II-88].

101/ Metal Bulletin, January 25, 1977, p. 36, and January 28, 1977, p. 36; The Economist, February 12, 1977, p. 85.

102/ It accounts for 92.3 percent of Dutch steelmaking capacity. Only one other company produces rolled steel products, NFK Staal, an electric furnace operator which now is wholly-owned by the German firm Thyssen. See [21, pp. 501-03] and Metal Bulletin Monthly, July 1976], pp. 18-19.

is held by public agencies, the rest by private interest. 103/ The public share seems to have remained without any significant change during the last 20 years.

Hoogovens is now part of ESTEL, a holding company whose other major component is the German firm Hoesch. But prior to this merger, Hoogovens had already acquired a 40 percent interest in a German firm which in 1966 was absorbed by Hoesch. When ESTEL was formed in 1972, Hoogovens' holding in Hoesch amounted to 14.5 percent.

The working relations between Hoogovens and the Dutch Government appear to be very close, at least as far as the company's expansion plans are concerned. Preliminary plans are drawn up by Hoogovens and submitted for approval to a joint ministerial and provincial commission. 104/ It is known that in 1973 the Government, through the partially-controlled National Investment Bank (Nationale Inveteringsbank), was engaged in a

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103/ The Dutch Government owns 29 percent of the firm's total stock, and the city of Amsterdam, 9 percent. See [68, p. 147] and Metal Bulletin Monthly, July 1976, p. 18.

104/ Eight ministries of the Dutch Government and the Province of North Holland are represented in this commission according to Metal Bulletin, February 20, 1976, p. 39 and American Metal Market February 20, 1976, p. 7.

large-scale general lending and loan-guarantee program. 105/ But in the absence of information concerning Hoogovens' involvement in this or similar Government programs, it is assumed that the company has not been the recipient of significant public financial assistance.

IX. LUXEMBOURG

Luxembourg's two steel companies are controlled by foreign private interests, chiefly the Belgian holding companies Societe Generale, and Launoit, and the French Schneider-Empain group. 106/

Because the value of steel output accounts for more than half of the country's gross national product and is four to five times as much as Government expenditures, 107/ it seems unlikely that Luxembourg has the financial capability to extend significant aid to its single major industry. It is concluded therefore, that except for minor subsidies related to the cost

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105/ See [41, pp. 97-99]. The European Commission objected to this system because decisions concerning the purpose for which the loans and guarantees were made in each case would be at the discretion of the Dutch authorities. According to the rules defined by the Commission in 1971, general aid programs are inadmissable unless they specify beforehand the extent to which individual sectors of the economy would benefit from them. Otherwise it would be impossible for the supranational authority to assess the effects on the competitiveness of individual Community industries.

106/ The companies are Arbed, with about 5.7 million tons capacity (Luxembourg plants only), and Rodange, with 600,000 tons capacity.

107/ Calculated from [34] and Metal Bulletin Monthly, July 1976, pp. 11-17.

of pollution abatement, 108/ the steel industry of Luxembourg has not received public financial assistance.

X. CANADA

The Canadian Government does not participate in the ownership of steel companies, but several provincial governments own, or partially own, steelworks. Two companies, the integrated Sydney Steel Corporation (Sysco) and the electric furnace based Sidbec-Dosco Limitee (Sidbec) are offshoots of the same failing company (Dominion Steel and Coal Corporation). These were purchased, respectively, by the provincial governments of Nova Scotia and Quebec. The companies have remained unprofitable since their acquisition. They have capacities of about one million tons each. Together they account for under 13 percent of Canadian steelworking capacity (15.7 million tons in 1974). 109/

Two other provincial governments, Alberta and Saskatchewan, each own a 20.1 percent share in the electric furnace operator Interprovincial Steel and Pipe Corporation Ltd. (Ipsco). In

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108/ This inference may be drawn from a discussion of a law proposed by the Government of Luxembourg in 1973 by the EC Commission. See [41, pp. 99-100]. The law's original purpose was "the promotion of economic expansion" but it was then modified to provide for assistance to specific regions and to firms encumbered with exceptionally high costs for evironmental protection.

109/ The Honourable Mr. Justice Willard Z. Estey, Commissioner, Steel Profits Enquiry, October 1974, pp. 86-89. The three largest steel companies are Stelco, Dofasco, and Algoma; they are all controlled by private Canadian interests and had 1974 raw steel capacities of, respectively, 6.0, 3.2, and 2.8 million short tons.

1974, this company had a capacity of 600,000 tons, or 3.8 percent of Canadian capacity. The company has a good profit record. 110/

The support of failing companies by the Nova Scotia and Quebec treasuries may distort competition; the removal of Sysco and Sidbec from the market (by closing them down) might increase the market share of viable competitors in Canada and abroad. But both companies are relatively small and have historically been followers of the prices set by the large three Canadian steel producers. Keeping them in operation may have adversely affected in a slight degree the growth rate of competitors in their product lines. However, the primary subsidy has probably been to steelworkers in the two provinces, at the expense of taxpayers.

The entire Canadian manufacturing sector, the steel industry included, has benefited from various accelerated depreciation provisions of the Income Tax Act. The period of capital recovery for machinery and equipment, two years, is one of the shortest and thus most favorable in the world. Steel producers, like other firms in Canada, have also received financial assistance under various Government programs designed to stimulate industrial research and the advancement of technology. 111/ As pointed out at the beginning of chapter 6, assistance which is accessible

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110/ Ibid. p. 28.

111/ The Bank of Nova Scotia, "Canada's Steel Industry," Monthly Review, Toronto, October 1975. On tax provisions, also see [4, p. 71].

to all industries in a given country generally does not have distortive effects on international trade. The technological performance of the Candian steel industry is adequate in comparison with other advanced steel industries. With reference to plant size and presence of oxygen steelmaking capacity, it is about at the same level as that of the United States, but it has moved faster in the adoption of continuous casting. 112/

XI. SOME OF THE LARGER NEW STEEL INDUSTRIES

Many of the less developed countries (LDC's), some of them having gained nationhood only after World War II, have built up sizable steelmaking capacity within recent decades. Some of them have begun to export steel products sporadically. A few are on the point of becoming net steel exporters. Others have made net steel exports their longrun policy goal. In many cases, policies (such as artificial exchange rates, direct public financial aids, tax rebates on exports in excess of indirect taxes, input-price subsidies or penalties, price controls of inputs and finished products, and embargoes or

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112/ Stahl und Eisen, August 12, 1976, and International Iron and Steel Institute, Release no. 125, of April 14, 1976. Incidentally, it was a Canadian company, Dofasco, which first adopted the oxygen process in the Western Hemisphere.

quotas on competing imports, among other Government interferences) 113/ make it very difficult to evaluate the opportunity cost or, with respect to exports, the comparative advantage of these new steel industries. Due to the usual absence of an adequate industrial and social infrastructure, investment costs per ton of capacity have, as a rule, been extraordinarily high in comparison with such costs in industrialized countries. 114/

113/ Most of the information on these points must be gleaned painstakingly from the daily press of the countries concerned or from specialized publications in both advanced countries and LDC's. See, for example, Instituto Brasiliero de Siderurgia, Annais do 30 Congresso, 1973, pp. 65-69, 189-90, and 288-302. Also see [18, chapter 2], [60, chapter 5], [27, chapter 5], [6, pp. 129-133, and [83, p. 75].

114/ Based on a survey of notices in the trade press (Metal Bulletin, Iron and Steel International, American Metal Market, Stahl und Eisen, Siderurgia Latinamericana, among others). In the late 1950's and early 1960's, construction costs for an integrated flat-products mill were approximately $350 per metric ton of capacity in the United States, $320 in western Europe, and slightly under $200 for the larger scale and less integrated Japan plants. For the Brazilian and Indian medium-sized plants built in the mid-1960's, the cost was between $400 and $650 even for those not designed for flat-rolling capacity (as Durgapur and Bhilai in India). The Pohang mill in Korea, built by Nippon Steel, was an exception with $270, but in this case water supply, harbor dredging and feeder railroads were financed separately by the Korean Government.

The Ogishima steelworks of Nippon Kokan will cost about $670 per capacity ton, about the same as that of Solmer in southern France. In contrast, the SIDOR (Venezuela, flat products), SICARTSA (Mexico, nonflat), Tubarao (at Vitoria, Brazil, semifinished steel only), and Sagunto (Spain, flat products) will all cost at least $1000 per ton. Acominas (nonflat, Brazil) is expected to cost $900 per ton. The rationale for such projects rests on a frail basis, especially regarding the nonflat mills. In the United States, minimills, costing $150 to $250 per ton (depending on the variety of

(Footnote continued on next page)

Short-Run Effects on the International Steel Market

Most of the countries in question traditionally have been steel importers. The stated objective of their steel industry development was partial or full self-sufficiency with respect to this vital input. Some of them, however, have begun to export substantial quantities of steel products, particularly to the steel markets of the United States and Western Europe. 115/ This may be a temporary phenomenon associated with the recession in the steel using sectors of many LDC's. Besides, most steel exporting LDC's still have an overall negative steel trade balance. 116/ Their export activities merely reflect excess capacity, probably of a temporary nature, with respect to certain product lines. Nevertheless, steel producers in the industrial countries have been particularly disturbed by the low prices at which steel from the new steel exporting countries was sold in their markets. 117/

114/ (Footnote continued from preceding page)

products offered) if based on scrap and about $100 more if direct ore reduction is applied, have been competing successfully against the integrated firms. This competition is limited, however, to nonflat items, except for certain plates and sheets with less exacting quality specifications.

115/ American Iron and Steel Institute, Annual Statistical Reports; Metal Bulletin, February 25, 1977, p. 39.

116/ I & SM Magazine, February 1976, p. 40.

117/ Metal Bulletin, February 25, 1977, p. 39; The Economist, February 12, 1977, p. 86.

In the case of low-priced competition from the large industrialized countries, "orderly marketing agreements" have occasionally been established. Before World War II, these took the form of international cartels; more recently "voluntary import quotas" have been negotiated for this purpose between the industries concerned, with public officials in the role of mediators. But attempts in 1977 to include LDC steel exporters in such negotiations failed. 118/ The large steel mills in most of these countries are Government controlled. They have become symbols for the economic and social achievement of certain administrations or political parties, and the idea of large-scale layoffs is politically inadmissible.

Undercutting prevailing price levels is usually the only way for the new steel exporters to gain access to traditional markets, because they rarely have established their own distribution system. A multiplicity of Government interferences with the domestic pricing system, including exchange rates, makes it extremely difficult to substantiate dumping charges. Moreover, public ownership of production permits such criteria as profitability and credit-worthiness to be moved to a secondary plane. A strategy of selling domestic surpluses abroad at marginal costs is thereby abetted. Such action is also favored by the existence of high fixed costs due to high interest charges and rigid employment policies.

118/ Metal Bulletin, March 1, 1977, p. 22.

Longrun Effects on the International Steel Market

During the 1960's and early 1970's, the Governments in a number of LDC's and in some countries on the periphery of industrialized Europe, such as Spain and Turkey, began to foster the development of steelmaking capacity. With few exceptions, direct investment costs per ton of capacity are considerably higher than in the traditional steel exporting countries. Many plants were initially conceived on a small scale for the purpose of import substitution [58, pp. 8-10]. Subsequently, very ambitious expansion programs brought the scale of those plants closer to minimum efficient size (by international standards), but put an intolerable strain on the existing industrial and social infrastructure. Billions of dollars spent on steel plants then led to the necessity to spend further billions on infrastructure, a viable transportation network in particular. In the meantime, operating costs were raised by interim measures such as the hauling of iron ore by truck over congested and poorly maintained highways, while the lack of skilled personnel resulted in extremely high compensation levels as well as unbalanced development and other inefficiencies. Even some of the largescale expansion projects, when they eventually come on stream, may not be well located with respect to export markets since their original locations were often determined by proximity to local markets, or, worse, by compromise between rival political or regional factions.

The import substitution goal of this development may have been justified by the traditional instability of the international steel market. The countries which decided to develop a sizable steel industry are also those which envisaged a rapid expansion of their entire manufacturing sector as a means to achieve their economic "take-off." It would have been risky to expose this sector to the dangers of widely fluctuating prices and, on occasion, even acute scarcity of steel in the international market.

The financing of the new steel capacity came from the following sources: (1) the public (central and local governments) and private sectors of the LDC's, (2) equipment suppliers (some of which are also steel producers and consultants), steel companies, private banking consortia, and export-import banks of Western industrialized nations, 119/ (3) international financial institutions (World Bank and Inter-American Bank); and, (4) the Government of the USSR. Table 6A.13 is an attempt to provide a schematic survey of growth plans, and the associated financial requirements for a number of new steel industries. Some of the countries listed (e.g., Spain, India, and Brazil) currently have steel producing

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119/ *Metal Bulletin* claims that most third world nations were actually encouraged by the major steel producing countries to set up their own steel industries, presumably to stimulate the sale of plant and equipment (March 15, 1977, p. 19).

TABLE 6A.13

Steel Capacity and Capacity Expansion Plans, Various Countries
(millions of metric tons)

	Raw Steel Output 1975	Capacity 1975	Percent of Capacity Controlled by the Public Sector	Planned Capacity 1980-82	Planned Capacity 1985-88	Net Change: 1975 to 1985-88	Approximate Cost of Net Expansion (billions of U.S. dollars)	Estim. Public Control of Added Capacity, percent	Projected Yr. for Export Capability
Latin America									
Argentina	2.240	3.0	70	10.0	15.0	12.0	$ 10.0	80	
Brazil	8.330	9.0	60	22.0	29.0	20.0	15.0	80	1981
Chile	.485	.8	100	1.3	2.2	1.4	1.0	100	
Mexico	5.350	6.5	50	12.9	18.0	11.5	8.4	65	1979
Peru	.440	.5	100	2.0	4.6	4.1	3.4	100	
Venezuela	1.100	1.5	86	5.9	15.0	13.5	9.2	90	1979
Asia									
India	7.745	10.0	65	15.0	18.0	8.0	4.8	75	1978
Iran	.600	.8	100	6.0	16.5	15.7	13.4	100	
Korea	1.985	2.2	100	6.0	10.0	7.8	5.7	100	1979
Saudi Arabia	-	-	-	2.5	4.0	4.0	8.4	100	
Taiwan	.500	.6	100	3.0	6.0	5.5	4.5	100	
Europe									
Spain	11.115	12.5	51	15.0	24.0	11.5	7.2	65	1978
Turkey	1.637	2.5	90	6.0	11.8	9.3	7.4	90	

Sources: Various issues of Metal Bulletin, Iron and Steel International, Stahl and Eisen, and Siderurgia Latinamericana; International Iron and Steel Institute data quoted.

capacities rivaling those of France and Britain in the mid-1950's and expansion targets which, despite some recent downward revisions, would enable them to match or exceed the present steel production of those European nations.

Column (3) in the table presents estimates of the portion of capacity in which Governments have 50 percent (or more) ownership participation. The remainder is owned by private stockholders and, in a few cases, by foreign steel firms. Thus, in Brazil, Nippon Steel holds a minority share of 17.5 percent in the large Usiminas steelworks, and Finsider and Kawasaki have each a 24.5 percent stake in a greenfield project at Vitoria. In some cases, foreign firms hold a large share in privately-owned steel firms in the countries listed, such as Mannessmann and Thyssen in Brazil and the United States Steel Corporation in Spain. 120/ Column (8) shows the portion of projected expansion of steelmaking capacity which is likely to be controlled by Governments.

120/ Mannesmann, the German pipe producer, controls an integrated plant (.6 million tons capacity) near Belo Horizonte; Thyssen, Germany's largest steel firm, has a considerable participation in Cosigua, a nonflat producer in the State of Rio de Janeiro (.5 million tons capacity) based on Thyssen's direct-reduction process; U.S. Steel has a 27 percent in Altos Hornos de Viscaya (2.5 million tons capacity) and is now in the process of assisting in the financing of the new Sagunto works of a subsidiary of that firm (with over $400 million). See [12, pp. 11-114, Siderurgia Latinamericana, April 1976, pp. 37-44, Metal Bulletin, October 19, 1976, p. 37.

Furthermore, although Governments may ultimately raise the dominant part of the required investment funds, a large percentage of the cost of the equipment and machinery is financed by loans from suppliers of these items, or by public or private lending agencies in the home countries of the suppliers. The Soviet Union has also financed several large projects, or is in the process of doing so, especially in India and Iran. 121/

Finally, international lending agencies have recently begun to lend substantial financial assistance to steel companies in several developing countries. The World Bank has become particularly active in this respect. Table 6A.14 summarizes some information in this regard. The maturity of the loans was 15-1/2 years for those made in 1972, and 15 years for the remainder. All loans also had a grace period of from four to five years. Brazilian firms, all of them controlled by the Brazilian Government, received more than 70 percent of the total. The same firms also received loans from the Inter-American Bank, 122/ but the total amounts and conditions under which they were granted could not be ascertained.

121/ See [27, p. XVI and Chapter 5] and Metal Bulletin, September 14, 1976, p. 40.

122/ In 1974, this Bank lent $40 million to CSN and $63 million to Cosipa, according to Folha de Sao Paulo, February 15, 1975, p. 12.

TABLE 6A.14

World Bank Financing of Steel Projects in Developing Countries a/

Date of loan	Company	Country	Loan amount (US $ millions)	Loan as a percentage of total project cost	Effective rate of interest (percent)
February 1972	Comp. Sider. Nacional (CSN)	Brazil	64.5	10.5	9
April 1972	Usiminas	Brazil	63.0	6.6	9
April 1972	Erdimir	Turkey	76.0	n.a.	8-3/4
June 1972	Cosipa	Brazil	64.5	9.7	9
September 1973	Sicartsa	Mexico	70.0	7.9	9
August 1975	CSN	Brazil	95.0	4.5	10
August 1975	Cosipa	Brazil	60.0	4.1	10

n.a. - not available.

a/ In addition, the Bank also lent, in July 1974, $70 million to the OTELINOX steel Kombinat in Romania (at 9 percent interest, 38 percent of total project cost).

Source: Letter of August 26, 1976 from the World Bank Industrial Projects Department, to the authors.

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Chapter 7

PERFORMANCE

In this chapter an effort is made to determine if the U.S. steel industry: (1) is efficient relative to the other major steel producing nations in the world and (2) has made efficient decisions regarding the selection of technology. Data are also presented on profit rates and debt-equity ratios for the EC, Japan, and U.S., and the question of whether United States steel firms (in view of their expressed capital needs) have employed sufficient debt financing is examined.

Authors such as Walter Adams and Joel Dirlam [1], David Ault [3], and H.G. Baumann [6] have argued that U.S. steel firms have not adopted new, more efficient technology rapidly enough, and thus have contributed to their own decline in world markets. These articles have led to many rejoinders by others such as Alan McAdams [16], G. S. Maddala and P. T. Knight [14], and D. A. Huettner [12].

It is difficult to provide a precise, conclusive resolution to these issues. One fundamental problem is that relative input prices vary across nations. For example, labor productivity data, presented below, reveal that, the U.S. steel industry has the highest rate of labor productivity of the countries studied except Japan. One cannot conclude, however, that the U.S. is therefore more efficient than all countries other than Japan; the U.S. has higher relative wage rates than all those countries, and thus U.S. producers have a greater incentive to substitute nonlabor inputs in the production of steel. Nonetheless, the data below should provide some insight into an understanding of these issues. Section I deals with issue (1) above, which we label "efficiency." Section II handles issue (2), label "technology diffusion."

The third section of this chapter presents data concerning profit rates on sales and on equity in Japan, the United States, and the European Coal and Steel Community. Differences in debt to equity ratios, and financial institutions that affect these profit rates, are examined.

I. EFFICIENCY

Labor Productivity

Table 7.1 shows data on labor productivity and labor costs of the major steel nations, excluding the Soviet Union. The data were calculated by the Productivity and Technology Division of the U.S. Bureau of Labor Statistics [8]. These data reflect the effort of BLS to update and adjust this series for the changing proportion of contract workers in foreign steel industries.

The authors' calculations of labor productivity in the steel industries of the United States and Japan are presented in table 7.2. These calculations were made in order to incorporate an excellent data set on Japanese contract workers. Data on the proportion of workers subcontracted on a plant by plant basis for the major Japanese steel firms are published

TABLE 7.1

Output per Hour and Hourly Labor Costs in the
Iron and Steel Industries of Five Major Countries: 1964 and 1972-75

Relative Levels: United States = 100

Year	United States	Japan		France		Germany		United Kingdom	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
OUTPUT PER HOUR									
1964	100	48	55	48	52	55	63	48	51
1972	100	80	96	59	66	73	81	48	51
1973	100	92	109	57	64	74	82	46	49
1974	100	93	111	58	65	78	87	42	44
1975	100	104	123	46	52	78	86	40	43
HOURLY LABOR COSTS									
1964	100	16	16	34	35	37	39	29	30
1972	100	32	33	47	47	57	57	32	33
1973	100	41	42	59	59	73	73	33	34
1974	100	43	45	57	57	74	74	32	33
1975	100	43	45	66	66	75	75	35	36

Source: U.S. Department of Labor, Bureau of Labor Statistics, "Comparative Growth in Manufacturing Productivity and Labor Costs in Selected Industrialized Countries," Nov. 8, 1976.

by the Tekkororen Steel Workers Federation in their annual publication Rodo Handbook (available only since 1969 and in Japanese).

• The data for the United States are derived from various issues of the American Iron and Steel Institute's Annual Statistical Report. The United States column in table 7.2 is the ratio of man-hours worked to net shipments, converted to metric tons.

Except for the data on contract workers obtained from the Rodo Handbook, all data for Japan were derived from various issues of the Japan Iron and Steel Federation's (JISF) Monthly Report of the Iron and Steel Statistics. The column for Japan is the ratio of man-hours worked to net shipments after the JISF data on man-hours worked were adjusted by the estimate of contract workers.

The estimates for the 1970's (the years for which good data were available on contract workers) correspond closely to the BLS relative estimates of the United States to Japan. Both estimates reveal that Japan has significantly improved its labor productivity rates, so that it achieved equality of labor productivity with the United States by 1973.

On the other hand, the United States continues to maintain a significant advantage in labor productivity over West Germany, France, and the United Kingdom; West Germany has the highest labor productivity of the three European producers examined. Thus, on the criterion of labor productivity, the United States

TABLE 7.2

Man-Hours per Metric Ton of Shipped Steel in the United States and Japan: 1956-75

Year	United States	Japan
1975	11.79	11.49
1974	10.20	10.70
1973	10.12	10.10
1972	11.29	11.90
1971	11.80	14.38
1970	12.50	15.30
1969	12.91	17.75
1968	13.14	21.32
1967	14.24	24.47
1966	14.12	27.37
1965	13.78	33.71
1964	14.46	37.04
1963	14.93	39.91
1962	15.75	45.81
1961	16.89	46.53
1960	16.84	45.95
1959	15.94	52.40
1958	18.07	63.33
1957	16.87	53.88
1956	16.70	57.29

Source: Calculated from data available in various issues of AISI, Annual Statistical Report; JISF, Monthly Report of the Iron and Steel Statistics; and Rodo Handbook.

steel industry is more efficient than the three largest European producers, and is approximately equal to the Japanese.

However, the data in table 7.1 reveal that the United States has the highest hourly labor costs of the countries examined. Thus, the United States has a greater incentive than these countries to substitute nonlabor inputs for labor in the production of steel and one cannot conclude the United States is more efficient overall.

Blast Furnace Input Productivity

Approximately 72 percent of the "charge" in a modern basic oxygen steelmaking melt shop is pig iron. Production of pig iron requires a number of raw materials, including iron ore, coal for coke, fuel oil, and limestone.

The "coke rate" is the amount of coke consumed per ton of pig iron produced. This ratio is regarded by many as an important measure of the efficiency of blast furnace operations. Table 7.3 presents data on the amount of coke consumed, in kilograms per metric ton of pig iron produced, for Sweden, the United States, Canada, the United Kingdom, Japan, and the original six members of the European Community. Compared with the other nations in the table, the United States, employed coke relatively intensively in recent years.

Other inputs are also used in the production of pig iron. Table 7.4 presents data on kilograms of fuel oil consumed per metric ton of pig iron produced in five selected countries. Compared with the other countries in the table, the United

States uses the least amount of fuel oil per ton of pig iron produced.

Table 7.5 compares the average fuel costs per ton of pig iron produced in Japan with that in the United States in 1974 and 1965. In 1974, the total fuel costs to produce a ton of pig iron were only slightly greater in Japan than in the United States. In 1965, on the other hand, Japanese fuel costs were 26 percent higher than those in the United States. However, the calculations in the two columns on the far right indicate that if U.S. producers employed Japanese blast furnace practice, the <u>fuel costs</u> would have been reduced.

The Japanese fuel usage derives from the use of relatively newer blast furnaces. The input usage rates achieved by the Japanese are not feasible for the United States, given the blast furnaces producers now have. Thus, the producers in the United States are making efficient decisions unless the fuel cost savings of a new furnace compensate for the capital costs of a new furnace. Carlsson [9, p. 22] has estimated that the fuel savings are inadequate to warrant scrapping blast furnaces which have not significantly depreciated. 1/

1/ Analogous to our procedure in the two right-hand columns of table 7.5, Carlsson has estimated the raw material costs of making pig iron, with Swedish input prices and alternately employing the blast furnace technology of Japan, the United States, West Germany, the United Kingdom and Sweden. Where comparable, his estimates correspond closely to ours and appear reasonable. Although Boylan [7, ch. 9] does not directly address the question posed here, his is the most detailed publicly available analysis on the subject of capital improvements in U.S. blast furnaces.

TABLE 7.3

Coke Consumption Per Ton of Pig Iron Produced: Selected Years, 1958-76.
(Kilograms per metric ton)

Year	West Germany	France	Italy	The Nether-lands	Belgium	Luxembourg	United Kingdon	Japan	United States	Canada	Sweden
1976								432	594	475	
1975	497	531	479	467	545	525	609	443	611	491	
1974	517	551	500	465	564	538	597	442	613	484	
1973	494	558	518	475	557	601	576	432	602	486	550
1972	487	563	509	456	559	645	590	442	614	486	540
1971	521	595	526	475	569	683	604	451	634	495	550
1970	559	629	524	484	586	730	610	478	636	544	545
1965	672	780	633	559	658	860	680	507	650	585	555
1960	834	980	680	787	852	1,092	820	619	720		650
1958	922	1,023	750	839	890	1,100	880	667	780		675

Source: Statistical Office of the European Community, Iron and Steel Yearbook, 1976, for the original six European countries for all years and the U.K. for 1973-75; Data for United States and Canada, for 1965 forward, were calculated from data available in various issues of the Annual Statistical Report of the American Iron and Steel Institute. Japan Iron and Steel Federation, Tekko Tokei Yoran, various issues for Japan; remaining data from Bo Carlsson, "Scale and Performance of Blast Furnaces in Five Countries - A Study of Best Practice Technology," Stockholm, mimeo, March 1975.

TABLE 7.4

Fuel Oil Consumed in Pig Iron
Production in United States, Japan,
West Germany, United Kingdom, and Sweden: 1965, 1970, 1973
(Kilograms per metric tons)

Country	1965	1970	1973
United States	2.3	6.0	14.7
Japan	37.9	38.0	58.0
West Germany	8.1	50.3	70.9
United Kingdom	9.4	19.6	n.a.
Sweden	11.1	22.5	39.3

Source: Bo Carlsson, "Scale and Performance of Blast Furnaces in Five Countries - A Study of Best Practice Technology," mimeo, March 1975; and the Japan Iron and Steel Federation, The Japanese Steel Industry in 1975.

TABLE 7.5
Fuel Costs per Ton of Pig Iron
Produced in United States and Japan: 1965 and 1974

	Japan		United States		[Japanese practice at U.S. input prices]	
	1974	1965	1974	1965	1974	1965
Kilograms of Coke Consumption per ton of pig iron	433	503	613	650		
Kilograms of Coal Consumption per ton of pig iron	818*	951	1054*	1118	818	951
Price per ton of coking coal (in dollars)	44.88	15.73	37.72	10.64	37.72	10.64
Cost of Coal per ton of pig iron (in dollars)	36.71	14.96	39.76	11.90	30.86	10.12
Fuel Oil Consumption per ton of Pig iron	58	38	14.7	2.3	58	38
Price per ton of fuel oil (in dollars)	76.36	13.52	74.96	18.36	74.96	18.36
Cost of fuel oil per ton of Pig iron (in dollars)	4.43	.51	1.12	.37	4.35	.70
Total fuel cost Per ton of Pig iron (in dollars)	41.14	15.47	40.88	12.27	35.21	10.82

* On the basis of consultations with steel industry engineers, it is estimated that the amount of coal required to produce one ton of coke was 1.89 tons for Japan and 1.72 for the United States.

Source: Tables 7.3 and 7.4 for fuel and coke usage; chapter 3 for input prices.

The United States uses fuel inputs relatively intensively in the production of pig iron. However, since its energy costs are relatively low, its fuel costs are not relatively high. In view of the capital costs involved in constructing new, less energy using, blast furnaces, it appears that the choice of blast furnace practice is appropriate.

II. TECHNOLOGY DIFFUSION

A number of authors have criticized the United States steel industry for failing to adopt new technology rapidly enough. 2/ As a result, these authors argue, the United States lost some of its competitive edge in world markets. Their arguments are evaluated in this section.

From the data shown on the adoption rates of the basic oxygen furnace (BOF) and continuous casting (CC), we conclude the evidence appears consistent with the hypothesis that the United States steel industry adopted new technology efficiently. In the case of the BOF, the measure indicates that the United States steel industry adopted the new technology more rapidly than any other nation.

This section also includes tests of hypotheses concerning the reasons for different adoption rates across countries. In particular hypotheses are tested concerning whether government

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2/ In particular, the U.S. adoption rate of the basic oxygen furnace has been criticized by Adams and Dirlam [13] and by Baumann [6]; and the U.S. adoption rate of continuous casting has been criticized by Ault [3].

ownership or insulation from foreign competition lowered adoption rates.

The Basic Oxygen Furnace

With the invention of the BOF in the early 1950's, the open hearth (OH) furances became obsolete; consequently, no new OH furnaces should have been built. Nevertheless, the economics of the situation was such that no OH capacity should have been retired until it incurred significantly high maintenance costs.

There have been many studies investigating the economics of new "melt shop" furnace construction. In tables 7.6 and 7.7, we present the relevant calculations from the Quintana, Bueno, and Vargas [19] and the Vaughn and Russell [24] studies, respectively.

The Quintana, Bueno, and Vargas calculations reveal that if a new plant of one million tons per year capacity were constructed, production costs of a BOF would be lower than the OH for all factor cost configurations. They also show that if scrap is cheap relative to iron ore, the electric furnace (EF) yields the lowest production costs of all furnace types.

Recently Vaughn and Russell [24], of Resources for the Future, performed similar calculations. They have found that the ratio of the scrap price to the hot metal price determines whether BOF or EF capacity should be constructed at a greenfield site (the lower the relative price of scrap the more attractive the EF becomes); however, the OH is economically inferior to either the BOF or the EF. In addition, Vaughn and Russell found that the

TABLE 7.6

Comparative Total Production Costs for Different Steelmaking Processes in One Million Ton Capacity Plants

Quintana, Bueno, and Vargas (1965)	BOF	Electric	Open hearth with oxygen lancing
(Price assumption)*			
(a)	100.0	113.9	106.3
(b) . . .	100.0	107.8	106.3
(c) . . .	100.0	112.0	108.0
(d) . . .	100.0	90.3	103.2
(e) . . .	100.0	89.6	103.0

* In this study, the sensitivity of total production costs to different price assumptions was investigated. While no numerical prices were provided, a total of 57 different combinations of high, medium and low input prices were tested. The inputs for which prices were varied were iron ore, washed coal, anthracite, oxygen, electricity, fuel oil, natural gas, and scrap. Those combinations given here are: (a) all high; (b) all medium; (c) all low; (d) iron ore high, washed coal and anthracite medium, others low; and (e) iron ore high, scrap low, so that BOF has an index of 100.

Source: Reproduced from G.S. Maddala and P.T. Knight, "International Diffusion of Technical Change - A Case Study of the Oxygen Steelmaking Process," Economic Journal, Sept. 1967, pp. 531-558.

TABLE 7.7

The Influence of the Scrap Price Level and the Type of Steel Output on the Optimal Grass Roots Steel Plant Investment Decision

		INVESTMENT IN SHOP TYPE BY:								
		Share of Total Output & Drawing Quality Steel			Share of Total Output & Commercial Quality Steel			Share of Total Output & Alloy Steel		
Scrap price level (% of base)	Scrap/hot metal price ratio (%)a/	Open hearth shop	Basic oxygen shop	Electric arc shop	Open hearth shop	Basic oxygen shop	Electric arc shop	Open hearth shop	Basic oxygen shop	Electric arc shop
100	48	0	78	22	0	0	100	0	0	100
110	54	0	78	22	0	0	100	0	0	100
120	58	0	78	22	0	0	100	0	0	100
130	62	0	78	22	0	0	100	0	0	100
140	67	0	78	22	0	0	100	0	0	100
150	72	0	78	22	0	0	100	0	0	100
160	77	0	78	22	0	0	100	0	0	100
170	82	0	92	8	0	7	93	0	0	100
180	86	0	92	8	0	73	27	0	0	100
190	91	0	92	8	0	93	7	0	0	100
200	96	0	100	0	0	93	7	0	0	100
210	101	0	100	0	0	93	7	0	0	100

a/ The price ratio is derived by using a molten iron shadow price of $54.07 per ton in the denominator, which represents the longrun marginal cost of hot metal in an integrated shop using between 85 and 90 percent of physically available blast furnace capacity.

Source: Reproduced from Vaughn and Russell, "An Analysis of the Historical Choice Among Technologies in the U.S. Steel Industries: Contributions from a Linear Programming Model," Engineering Economist, Fall, 1976, p. 13.

quality of steel is an important determinant of the optimal mix of BOF and EF capacity; specialty steel is best made in the EF; and drawing quality steel is usually most economically manufactured in the BOF.

Two studies by the United Nations Economic Commission for Europe [22], [23], also conclude that no new open hearth furnaces should have been constructed; this opinion was echoed by two United States Steel Corporation engineers [11].

The evidence seems strong that no new open hearth furnaces should have been constructed after the mid-1950's. However, the studies cited do not specify the rate at which a firm that owns a number of open hearth plants should convert these plants to basic oxygen capacity. This is a replacement decision.

A firm that has constructed an open hearth plant has already incurred the capital costs for it. Thus, while the capital costs per ton of new BOF capacity are less than for new open hearth capacity, the relative capital costs of the BOF versus the open hearth will generally not be as favorable for the BOF in a decision regarding replacement of open hearth capacity.

Two United States Steel engineers argued [11, p. 132] that "although BOP [BOF] vessels are economically attractive where new steelmaking facilities are being replaced, they were not and are not sufficiently attractive to warrant scrapping modern, efficient open hearths."

The Dilley and McBride [11] comments are supported by the recent calculations of Vaughn and Russell, who argue:

> Our model indicates that the variable cost advantage of the BOF furnace never approaches the $5 per ton figure quoted by Adams and Dirlam. On the contrary,...at best the variable cost advantage of the BOF never exceeds $1.10 per ton (in 1968 dollars) and, at low scrap-hot metal price relatives, actually becomes a disadvantage--the BOF costs over $7 per ton more than the open hearth. In sum, then, our evidence indicates that in order for the BOF to displace new, efficient, open hearth capacity in the 1950's, ...implies an interest rate no higher than about 2 percent, given a (1968 dollar) investment cost of $18.00 per ton and a scrap price 40 percent above the cost of molten iron. [24, p, 26]

This study concludes that it was not economical to replace new OH furnaces with the BOF. The appropriate measure for how efficient a steel industry was in adopting the BOF is: the percentage of <u>additional capacity</u> installed which is new BOF capacity; in view of the above discussion, the percentage of <u>total</u> capacity which is BOF would be inappropriately biased against those countries which had a low rate of growth in melt shop capacity. 3/

In table 7.8 we present our calculated BOF adoption rates for various countries. The adoption rate is defined as the change in BOF capacity divided by the change in total capacity. Two periods were considered: 1956-64 and 1964-74. Similar calculations were performed by Maddala and Knight [14] for the

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3/ It is also shown by Maddala and Knight [14] that relative to the OH, the BOF represented Hicks neutral technological change; i.e., capital and labor are saved in approximately equal proportions. Thus, different input prices across nations cannot explain different rates of adoption of the BOF versus the OH furnace.

1956-64 period. Like Maddala and Knight, this study took production in peak years as its estimate of capacity. For those countries on which these data were unavailable, we used estimates based on the Kaiser Engineers' L-D Process Newsletter.

In some cases a country's basic oxygen adoption percentage will exceed 100 percent. This means that a country's increase in basic oxygen capacity exceeds its increase in capacity. This can be accomplished by retiring non-oxygen capacity. Since the data do not distinguish between replacement investment and new capacity investment, our measure favors those countries making a large share of replacement investment. In view of the availability of data, however, the chosen measure is the closest possible to the appropriate measure for efficient BOF adoption. Further details regarding the compilation of the data are provided in the appendix to this chapter.

In both periods, the United States was the most rapid adopter of the BOF. Whether there is any systematic pattern to the observed data is now analyzed. It is important to note that since BOF saves capital and labor in approximately equal proportions, different relative capital and labor costs across nations would not explain different adoption rates.

Maddala and Knight [14] examined a number of hypotheses as possible explanations of the observed pattern of BOF diffusion across countries. Although most of these tended to be refuted

TABLE 7.8

New BOF Capacity Divided by the Change in Total Steelmaking Capacity, Various Countries: 1956-64 and 1964-74

Country	BOF Adoption Percentage 1956-64	BOF Adoption Percentage 1964-74
Argentina	0	50.7
Austria	99.6	98.2
Belgium	27.1	163.9
Brazil	.	78.4
Bulgaria	0	73.6
Canada	67.7	85.0
Chile	0	0
China	0	.
Czechoslovakia	0	0
Denmark	0	0
Finland	0	93.5
France	34.8	187.4
Germany, East	0	14.2
Germany, West	36.9	197.5
Hungary	0	0
Italy	5.9	72.8
Japan	61.3	99.7
Luxembourg	24.6	207.9
Mexico	0	26.9
Netherlands, The	115.3	110.6
Norway	.	64.1
Poland	0	55.4
Romania	0	55.2
Spain	21.5	66.0
Sweden	35.7	102.5
U.S.S.R.	8.9	53.9
United Kingdom	53.6	.
United States	131.8	356.1
Venezuela	0	0
Yugoslavia	0	27.6

a/ A dot indicates no data or estimate.

Source: Calculated from data available in United Nations, Economic Commission for Europe, Quarterly Bulletin of Steel Statistics, various issues; Kaiser Engineers, L-D Process Newsletter, various issues; see also the appendix to this chapter.

by the data 4/, the authors did believe that the data were supportive of two hypotheses: (1) that adoption rates will tend to be higher in countries where the government's ownership share in the industry is lower, and (2) that adoption rates will tend to be higher in countries where the industry is more heavily engaged in international competition for markets.

Hypothesis (1) is motivated by the theory that government ownership will introduce rigidities, lags, and ineffectiveness into the planning process. Hypothesis (2) is motivated by the theory that international competition compels the domestic industry to reduce inefficiency or face the prospect of losing its markets; thus, an industry involved in international competition must respond to technological developments in a long-run cost minimizing manner. Maddala and Knight, however, did not subject these hypotheses to statistical tests.

There is a need to examine, thoroughly and systematically through statistical procedures, the validity of the government ownership and international competition hypotheses. Moreover, now that the more recent (1964-74) data are available, it would

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4/ One of the more significant of these hypotheses, which comes from the literature of economic development, is that slower rates of adoption for the developing nations is to be expected; innovations which come from the developed nations are designed to meet the needs of the developed nations; i.e., they are biased toward saving labor. Developing nations would adopt new technology faster if it were biased toward saving capital. However, since the BOF saves capital and labor in approximately equal proportions, this explanation does not apply to the BOF adoption rates.

be useful to ascertain whether the patterns determining diffusion in the earlier period continue to prevail in the later period.

As measures of a country's involvement in international competition, two independent variables were employed in the same regression: exports divided by domestic shipments, and imports divided by domestic shipments. In all cases, final steel mill products were selected. The argument is that a country which is involved in either exporting or importing is involved in international competition. That is, a country that either imports significantly (perhaps without significant exports) or exports significantly (perhaps, such as Japan, without significant imports) is involved in international competition. Totally excluding either exports or imports would be inappropriate. 5/

BOF_1 and BOF_2 are defined as a country's BOF adoption rates in the 1956-64 and 1964-1974 periods, respectively. G_1 and G_2 are the percentages of government ownership in a country's steel industry in 1956 and 1964, respectively. Finally, I_1 and X_1, and I_2 and X_2 are defined as our measures of import and export involvement in international competition during the early and late periods, respectively.

On the theoretical level, however, the authors have serious reservations about the hypothesis that involvement in

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5/ See the appendix for further details on compilation of the data.

international competition is an exogenous variable which causes an increase in efficient technological decisions. Causation could flow in the opposite direction. It is not unreasonable to argue that an increase in efficient technological decisions results in lower costs, making the firm more capable of competing with foreign competition and resulting in a greater share of exports and a smaller share of imports.

Summarizing the theory with the first period as an example, it is unambiguously predicted that an increase in G_1 causes a decrease in BOF_1. Assuming competition causes efficency, it is predicted that an increase in I_1 leads to an increase in BOF_1 and, similarly, a subsequent increase in X_1. On the other hand, if an increase in efficient decisions leads to a greater ability to compete with foreign competition, then an increase in BOF_1 leads to an increase in X_1 and a decrease in I_1. Thus, both theories argue that BOF_1 and X_1 are positively related; however there are opposing predictions concerning the relationship between I_1 and BOF_1, depending on the theory.

Since the variables measuring involvement in international trade are not exogenous, a separate test was made of the hypothesis that an increase in government ownership of a country's steel industry leads to a decline in its basic oxygen furnace adoption rate. Results are also presented from regressing adoption rates on the share of government ownership, the share of imports, and the share of exports (table 7.9).

The sample sizes for the regressions with government ownership alone were 27 countries for the first period and 28 countries for the second period. The sample sizes for the regressions with our measures of involvement in international competition were 22 countries in the first period and 28 countries in the second period. Due to the lack of data on exports and imports during the first period for the five Latin American countries in table 7.8 and East Germany, these countries were deleted from the sample for the first period.

TABLE 7.9

Regression Results: BOF Adoption Rates as a Function of Government Ownership, Share of Imports, and Share of Exports

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$$BOF_1 = 44.8 - \underset{(-2.56)^{*}}{.386\ G_1} \qquad R^2 = .21$$

$$BOF_2 = 144.5 - \underset{(-4.01)^{*}}{1.16\ G_2} \qquad R^2 = .38$$

$$BOF_1 = 56.9 - \underset{(-2.42)^{**}}{.426\ G_1} - \underset{(-1.44)}{.147\ I_1} + \underset{(.25)}{.088\ X_1} \qquad R^2 = .32$$

$$BOF_2 = 157.3 - \underset{(-4.15)^{*}}{1.156\ G_2} - \underset{(-2.68)^{**}}{.435\ I_2} + \underset{(.70)}{.359\ X_2} \qquad R^2 = .52$$

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*,** Values in parentheses are the estimated t values; a single star indicates the estimated coefficient is signifcantly different from zero at the one percent or better significance level. A double star indicates significance at the five percent level.

Source: Federal Trade Commission, Bureau of Economics.

The regression results produce estimates for the government ownership variable which are consistent with the hypothesis. Moreover, employing one-tailed tests, the results are statistically significant at the one percent level. Thus, the greater the percentage of government ownership in a country's steel industry, the lower its BOF adoption rate is likely to be.

The coefficients for the impact of the share of exports on BOF adoption have the hypothesized sign, but the coefficients are not statistically significant. The coefficients for the impact of the share of imports on BOF adoption rates suggest that (in the context of the theory discussed) the effect of BOF adoption on keeping imports out dominates the incentive toward efficiency caused by imports. In the regression for the second period, the coefficient is significant at the five percent level.

With respect to the measures of involvement in international competition, these regressions yield little information for economic interpretation. Three of the four coefficients are not statistically significant and the direction of causation is indeterminate. With regard to the impact of government ownership, however, the regressions estimate that a one percent increase in government ownership led to a .386 percent decrease and a 1.16 percent decrease in the adoption rates of the basic oxygen furnace in the first and second periods, respectively.

Continuous Casting

Like the diffusion rate of the BOF, the diffusion rate of continuous casting (CC) has been a matter of concern. The economic decision regarding CC and its alternative, the primary rolling mill, unlike the BOF, is ambiguous. In particular, evidence was not found that the construction today of a new primary rolling mill is necessarily inefficient.

An important reason is that, given the state of technology today, it is difficult to manufacture some types of steel through CC. In particular, high alloy steel and rimmed carbon steels are difficult to cast continuously. 6/ Japan, which has the highest share of crude steel output manufactured by CC, except for Finland, therefore continues to construct primary rolling mills in some of its newest plants (e.g. NKK's Ogishima works). 7/ The Japanese engineers with whom the authors spoke, said that a CC share in excess of 40 percent would be non-optimal. The well researched study by Vaughan et al. [25, p. 37] concludes that "unless research on the development of new families of continuously castable steels with rimmed steel's desirable properties is successful, as much as half our total carbon steel output may continue to require conventional

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6/ See Schenk [20], U.N.E.C.E. [21], and Battelle Memorial Institute [5, p. V-70].

7/ See "Ogishima: Portent of the Future," Metal Bulletin Monthly, March 1977, pp. 17-19.

casting." Nonetheless, of all the new technologies examined by Vaughan et al., CC has the greatest potential for cost saving. 8/ In fact their model, which ignores the technological limitations of CC, recommends the adoption of CC for both capacity expansion and displacement of existing conventional casting.

Table 7.10 presents data on the total amount of CC output and the CC share in crude steel output for all significant steel producers in the world for the years 1969-75. For 1975, 9.1 percent of U.S. crude steel was continuously cast. Table 7.11 shows the adoption rates of CC; as in the BOF section, these adoption rates were calculated by dividing the change in continuously cast output by the change in production.

As in the BOF section, it is assumed that a higher adoption rate is superior to a lower one. Technological limitations make CC infeasible in some circumstances; however, without these limitations, CC should displace some conventional casting capacity. These two effects counteract each other so that the study takes as its measure of efficient adoption the percentage of additional capacity which is new "continuous casting" capacity. This is defined as CC for 1969-74. G_3 is the percentage of government ownership in a country's steel industry in 1972;

8/ The new technologies examined were: (1) scrap preheating, (2) direct reduction, (3) coal gasification for direct reduction, (4) cryogenic shredding of automobile derived scrap, and (5) continuous casting.

I_3 and X_3 are imports divided by net industry shipments and exports divided by net industry shipments, respectively, for the years 1972-74. The results of regressing CC on G_3, and CC on G_3, I_3 and X_3 are presented in table 7.12. The theory motivating these regressions is directly analogous to the theory motivating those presented in table 7.9. The regression runs included all 27 countries in table 7.11, excluding China for which adequate data on exports and imports were unavailable.

The results support the government ownership hypothesis at the one percent significance level (one-tailed test). The first regression implies that a one percent increase in government ownership led to a 0.44 percent decrease in the adoption rate of continuous casting.

While the variable measuring the impact of imports is significant, its coefficient has a sign opposite to that of its analogue in the BOF regressions. The coefficient estimating the impact of exports does not have the hypothesized sign. Thus, an overall reading of the BOF and CC regression results yields the conclusion that government ownership leads to inefficient decisions regarding the adoption of new technology. The results regarding the impact of involvement in international trade are ambiguous, however. Given the serious theoretical reservations about the appropriateness of including the participation in world trade variables (because they are endogenous), the results are not surprising.

TABLE 7.10

Continuous Casting Output (1) and Share of Crude Steel Output (2)

1969-75

(CC Output in thousands of Metric tons; Share of CS Output in percent)

	1969		1970		1971		1972		1973		1974		1975(P)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Belgium	-	-	-	-	-	-	-	-	-	-	208	1.3	479	
F.R. of Germany	3,308	7.3	3,738	8.3	4,112	10.2	6,075	13.9	8,072	16.3	10,337	19.4	9,813	24.3
France	135	0.6	190	0.8	434	1.9	816	3.4	1,845	7.3	2,737	10.1	2,764	12.3
Italy	513	3.1	721	4.2	1,166	6.7	2,524	12.7	3,375	18.1	4,953	20.8	5,887	26.9
Luxembourg	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Six	3,956	3.7	4,649	4.3	5,712	5.5	9,415	8.3	13,292	10.8	18,235	13.8	18,943	18.1
Denmark	-	-	-	-	-	-	-	-	-	-	-	-	73	13.1
United Kingdom	485	1.8	501	1.8	412	1.7	559	2.2	811	3.0	1,125	5.0	1,705	8.5
Total of Above	4,441	3.3	5,150	3.7	6,124	4.8	9,974	7.2	14,103	9.4	19,360	12.5	20,721	16.5
Austria	237	6.0	326	8.0	360	9.1	419	10.3	505	11.9	766	16.3	862	21.2
Finland	616	63.0	807	69.0	733	71.5	1,076	73.9	1,256	77.8	1,290	77.9	1,233	76.3
Norway	7	0.8	6	0.7	8	0.9	29	3.2	120	12.5	143	15.7	140	15.7
Portugal	16	4.0	18	4.7	16	3.9	18	4.2	28	5.5	30	7.5	35	8.0
Spain	520	8.7	894	12.1	1,139	14.2	1,481	15.5	2,038	18.9	2,218	19.3	2,333	21.0
Sweden	649	12.2	775	14.1	770	14.6	841	16.0	889	15.7	1,156	19.3	1,390	24.8
Switzerland (a)	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Turkey	18	1.5	..	..	..	..	..	..	..	..	..	..	..	..
Yugoslavia (+) (b)	-	-	-	-	..	..	..	..	..	..	185	6.5	..	..
Others	82	15.4	..	..	..	..	..	..	..	..	..	..	..	..
Total Western Europe	6,586	4.2	7,976	4.9	9,150	6.0	13,838	8.3	18,939	10.6	25,148	13.5	26,716	17.2

TABLE 7.10 (Continued)

Continuous Casting Output (1) and Share of Crude Steel Output (2)
1969-75

	1969		1970		1971		1972		1973		1974		1975(P)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
United States	3,651	2.9	4,521	3.8	5,272	4.8	6,973	5.8	9,270	6.8	10,722	8.1	9,653	9.1
Canada	1,100	11.8	1,268	11.3	1,264	11.5	1,393	11.7	1,551	11.6	1,823	13.4	1,740	13.4
Argentina (+)	..	..	70	3.8	..	..	..	..	..	..	649	27.6	536	24.2
Brazil	70	1.4	45	0.8	47	0.8	144	2.2	228	3.2	379	5.1	477	5.7
Chile	7	1.1	9	1.6	10	1.5	8	1.3	7	1.3	9	1.4	7	1.4
Mexico	209	6.0	385	9.9	454	11.9	569	12.8	576	12.1	650	12.7	696	13.2
Venezuela (c)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Latin American (Listed Countries)	..	..	510	4.0	..	..	..	..	..	..	1,687	10.1	1,716	9.8
USSR		..	4,983	4.3	5,911	4.9	6,907	5.5	6,968	5.3	7,355	5.4	..	..
Bulgaria	-	-	-	-	-	-	-	-	-	-	-	-	..	..
Czechoslovakia	40	0.4	42	0.4	57	0.5	71	0.6	92	0.7	91	0.7	..	..
Eastern Germany (+)	..	..	..	..	126	2.2	303	5.0	398	6.8	481	7.8	..	..
Hungary (+) (d)	-	-	-	-	-	-	-	-	-	-	150	4.3	..	..
Poland	236	2.1	259	2.2	292	2.3	309	2.3	309	2.2	320	2.2	..	..
Romania (e)	-	-	-	-	-	-	-	-	-	-	-	-	..	..
Total Eastern Europe	..	..	..	..	475	1.1	683	1.5	799	1.7	892	1.8	..	..

TABLE 7.10 (Continued)

Continuous Casting Output (1) and Share of Crude Steel Output (2)
1969-75

	1969		1970		1971		1972		1973		1974		1975(P)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Australia	140	2.0	195	2.9	199	3.0	-	-	133	1.7	223	2.9	47	0.6
Other Oceania	-	-	-	-	-	-	-	-	-	-	-	-	-	-
India (+) (f)	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Japan	3,304	4.0	5,270	5.6	9,958	11.2	16,462	17.0	24,716	20.7	29,411	25.1	31,802	31.1
Rep. of Korea (+) (g)	..	..	..	..	..	..	..	..	..	..	..	..	..	..
South Africa	523	11.3	613	12.9	612	12.5	784	14.7	917	16.0	1,105	18.9	1,279	18.7
Total of listed countries except those marked (+)	15,866	2.9	25,566	4.6	33,226	6.1	47,773	8.2	64,104	9.9	77,532	11.8	..	..
Percentage of World Steel Output Covered	94.0%		93.8%		92.5%		92.9%		92.9%		92.4%			

Footnotes and Sources: see next page.

Footnotes and Sources for Table 7.10

Key:

Dashes mean continuous casting output equals zero in the given year.

Dots mean we do not have information on continuous casting output for the given year.

(a) Switzerland installed continuous casters in 1959, 1965, 1966, 1970, 1971 and 1976.

(b) Estimated CC output, for 1974, based on reported capacity in 33 and Metal Bulletin Monthly.

(c) 150,000 tons of CC capacity, at the Sivensa company's Caracas works existed as of 1965.

(d)-(e) Estimated from Metal Bulletin and 33.

(f) India had two billet casters installed in 1965-1966.

(g) South Korea had two four strand billet casters installed in 1973 and a single strand bloom caster installed in 1974.

Sources: Data for non-footnoted countries comes from the International Iron and Steel Institute, mimeo on Continuous Casting Output: 1969-1975, April 14, 1976; Data in the footnotes derives from 33 Magazine, "Worldwide Continuous Casting Roundup," October, November, December, 1975 and Metal Bulletin Monthly, "Continuous Casting Reference List," July, August and September, 1975.

TABLE 7.11

New Continuous Casting Capacity Divided by the Change in Total Steelmaking Capacity, Various Countries: 1969-74.

Country	Continuous Casting Adoption Percentage
Argentina	113.7
Austria	70.6
Belgium	6.6
Brazil	12.7
Bulgaria	0.0
Canada	16.8
Chile	28.6
China	0.0
Czechoslovakia	1.7
Denmark	137.7
Finland	99.4
France	56.6
Germany, East	35.8
Germany, West	88.2
Hungary	34.6
Italy	61.1
Japan	75.7
Luxembourg	0.0
Netherlands, The	0.0
Poland	2.5
Romania	0.0
Spain	30.8
Sweden	75.5
U.S.S.R.	11.7
United States	109.2
Venezuela	0.0
Yugoslavia	30.0

Sources: Estimated from data available in International Iron and Steel Institute, mimeo, April 14, 1976; Metal Bulletin Monthly," Continuous Casting Reference List," July, Aug., and Sept. 1975 issues; 33 Magazine, "Worldwide Continuous Casting Roundup," Oct., Nov. and Dec. 1975 issues; see also the appendix to this chapter.

TABLE 7.12

Regression Results: Continuous Casting Adoption Rates as a Function of Government Ownership and International Competition.

$$CC = 67.69 - .44\,G_3 \qquad R^2 = .21$$
$$(-2.50)^{*}$$

$$CC = 70.76 - .45\,G_3 + .25\,I_3 - .42\,X_3 \qquad R^2 = .41$$
$$(-2.69)^{*} \quad (2.59)^{**} \quad (-1.42)$$

*, ** Values in parentheses are the estimated t values; a single star indicates the estimated coefficient is significantly different from zero at the one percent or better significance level. A double star indicates significance at the five percent level.

Source: Federal Trade Commission, Bureau of Economics.

In view of the results for the government ownership variable, it seems clear that extensive government ownership imposes some additional costs not quantified in the subsidy chapter (chapter 6). These are the costs of delayed implementation of efficient technological decisions. While these impacts are documented only with respect to BOF and CC adoption, similar effects should be found with regard to other capital decisions such as, perhaps, plant closures. 9/

9/ The problems of the British Steel Corporation in implementing its planned plant closures are extensive. Thus, the view of the American Iron and Steel Institute is oversimplified [2, p. 15]:

> In the free world countries, the government owned steel units are set up as companies designed to operate like private concerns

(Footnote continued on next page)

III. PROFIT RATES

Table 7.13 presents our calculations of net income as a percentage of sales, and as a percentage of equity, for the steel industries of the United States, Japan, and the European Community. The raw data for these calculations were obtained from the International Iron and Steel Institute (IISI) publication _Financing Steel Investment, 1961-1971_. The IISI has not been able to compile a set of financial data which is perfectly comparable across countries; however, it did make every effort to achieve comparability, and the data set is the best available for these purposes.

The United States has the highest profit rate, and the European Community the lowest, when profit is measured by net income divided by sales. However, when profit is measured by net income divided by stockholders' equity, the profit rates of the United States and Japan are approximately equal, and that of the European Community is, again, the lowest.

9/ (Footnote continued from preceding page)

> which are expected to make a profit. It is clear that the governments can and frequently do wield a heavy hand in making capital available, as well as pricing and other areas. Such actions place private steel producers in the United States and other free enterprise countries at a disadvantage. . . .

TABLE 7.13

Net Income as a Percentage of Sales and as a Percentage of Equity for the Steel Industries of the United States, Japan and European Community:* 1961-71

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
New Income % of Sales											
U.S.A.	5.22	4.08	5.60	6.20	6.08	5.89	5.04	5.44	4.80	2.86	2.73
Japan	4.68	3.25	4.02	3.94	2.95	3.29	2.86	2.65	2.67	2.10	1.26
ECSC *	3.54	2.16	1.52	2.16	1.91	0.69	0.84	0.85	1.79	2.46	.72
Net Income % of Equity											
U.S.A.	6.48	5.31	7.10	8.70	8.89	8.93	6.82	7.86	6.85	4.10	4.24
Japan	9.14	5.19	7.20	7.51	5.81	7.44	7.03	6.83	7.78	6.35	3.56
ECSC *	5.59	3.27	2.34	3.47	3.28	1.15	1.31	1.69	3.57	5.84	1.46

* ECSC here is the original six countries of the European Economic Community, less Italy for which data were unavailable, plus the United Kingdom.

Source: Calculated from data available in International Iron and Steel Institute, Committee on Economic Studies, Financing Steel Investment, 1961-1971, Brussels, 1974

Thus the Japanese steel companies are able to maintain lower markups or profit margins on sales while equity shareholders earn comparable rates of return on their investment. It follows that the Japanese have higher sales-to-equity ratios.

If we let NI = net income, S = sales and E = equity, then the following identity holds:

$$\frac{NI}{S} \cdot \frac{S}{E} = \frac{NI}{E}.$$

Since $\frac{NI}{S}$ is lower for the Japanese, while $\frac{NI}{E}$ is approximately equal, the Japanese steel producers generate more sales per dollar of equity than do their counterparts in the United States. The higher sales-to-equity ratios of the Japanese are in turn partly the result of higher debt-to-equity ratios. 10/

For the period 1961-71, the ratio of long-term debt to capital employed averaged 23.7 percent for the United States,

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10/ If we let D = debt and K = capital employed, then D+E = K. Suppose that a given amount of capital generates an equal amount of sales in both Japan and the United States; we then have that $\frac{K}{S}$ is equal for the United States and Japan.

However:

$$\frac{K}{S} = \frac{D+E}{S} = \frac{D}{S} + \frac{E}{S} \qquad \text{and}$$

$$\frac{K}{S} - \frac{D}{S} = \frac{K-D}{S} = \frac{E}{S}.$$

Then

$$\frac{S}{E} = \frac{S}{K-D}. \qquad D < K$$

From this last equation the statement in the text is apparent.

56.9 percent for Japan, and 38.8 percent for the European Community. In all areas, the share comprised by debt rose over the period. 11/ By 1971, the long-term debt share of capital employed was 27.9 percent for the United States, 67.7 percent for Japan, and 41.3 percent for the European Community. 12/

A question which naturally arises is: Could the steel producers of the United States adopt a corporate financial policy closer to that of the Japanese? The answer to this involves one of the more controversial areas of corporate finance.

F. Modigliani and M. Miller [17] take a position which argues for a substantial use of debt by the corporation. In their model they have established that, when corporate income taxes exist, increasing the share of debt financing (1) increases the value of the firm, (2) lowers the average cost of capital to the firm, and (3) raises the after-tax return on investment to the equity holders. The unqualified application of these results implies that the corporation should attain as high a share of debt financing as possible.

The traditional view of the matter is that increasing the debt-to-equity ratio lowers the average cost of capital

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11/ See [13, app. XXIV].

12/ Debt as a percentage of equity was 38.7 percent in 1971 for the United States steel industry, compared with 34.1 percent for the average for all United States manufacturing.

to the corporation up to a point, after which further increases in debt raise the average cost of capital. The point at which the firm should not increase its debt-to-equity ratio further depends on its ability to raise further capital through debt financing. However, even Modigliani and Miller observe that

> limitations imposed by lenders, as well as ... additional considerations which are typically grouped under the rubric of "the need for preserving flexibility," will normally imply the maintenance by the corporation of a substantial reserve of untapped borrowing power. [17, p. 442].

Thus, both the traditional and the Modigliani-Miller approaches agree that the amount by which a firm should increase its debt-to-equity ratio depends on its ability to maintain an untapped reserve of debt financing.

The ability to maintain financial flexibility, for a given debt-to-equity ratio, is in turn dependent on the institutional arrangements in the country involved. The financial environment in the United States has been described by Malkiel [15, p. 27] as follows:

> After leverage has progressed sufficiently far that bond-interest payments are jeopardized and the company runs a real risk of insolvency, creditors are unlikely to permit further increases in leverage.... Investing institutions do not like to make loans to companies for which there is a non-negligible probability of bankruptcy, even if the lender is compensated by a very high interest rate. These institutions feel their public image is impaired by the publicity attached to loan defaults and to subsequent collection efforts.

In view of these limitations and the fact that the average debt-to-equity ratio in the United States steel industry, for the years 1968-74, was 3.83 percentage points higher than the average for all United States manufacturing, 13/ this study cannot conclude that the United States steel industry has employed a suboptimal amount of debt.

On the other hand, as the data in table 7.14 indicate, the share of total capital composed of debt is much higher in Japan. By the standards of Japanese manufacturing, however, Japanese steel industry has below average debt-to-equity ratios.

TABLE 7.14

Debt as a Percentage of Total Capital in Japan:
Selected years, 1950-70.

Year	Manufacturing Firms	Steel Industry	All Industries
1950	68.6		73.1
1955	66.0		71.0
1960	72.4	46.0	77.4
1965	76.9	49.1	81.0
1970	80.1	62.9	83.9

Source: Richard Caves and Masu Uekusa, "Industrial Organization in Japan," in Asia's New Giant, Hugh Patrick and Henry Rosovsky (eds.), Washington, D.C.: The Brookings Institution, 1976; and International Iron and Steel Institute, Financing Steel Investment: 1961-1971, Brussels, 1974.

13/ See [2, table 15A].

The data appear to demonstrate that the financial institutions in existence in Japan permit higher debt-to-equity ratios. Unlike the United States, in Japan the majority of the corporate debt is held by banks; for example, during the years 1968-69, 76.7 percent of the external funds raised by the corporate sector were from private financial institutions, and only 2.8 percent from corporate bonds. 14/

The Japanese banks have been willing to assume the greater risks associated with high corporate leverage, in part because the Japanese banks are large in relation to the corporations to which they lend. The largest banks hold deposits about four times the sales of the leading manufacturing company; in the United States, this relationship would be closer to one-to-one. 15/

Moreover, the large city banks borrow heavily from the Bank of Japan. 16/ The Bank of Japan may stand behind the debt of a large corporation, especially if it is in an industry designated for growth. 17/ Thus, the Japanese banks are

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14/ See [4, p. 18].

15/ See [10, p. 39].

16/ The Bank of Japan has presented data on this in [4, pp. 21,22].

17/ Documentation of the extent to which this practice influenced the steel industry is in the appendix to chapter 6. The body of chapter 6 contains estimates of the net and crude subsidy values attributable to these implicit guarantees.

assuming less risk than their counterparts in the United States when making this type of loan.

It seems that the debt-to-equity ratios of the Japanese steel corporations are not too high in view of the institutional environment in which they operate; the lower debt-to-equity ratios of the United States steel industry are explained by these differences in financial institutions.

IV. CONCLUSIONS

In section I of this chapter two measures of efficiency were examined: labor productivity and blast furnace input productivity. With respect to labor productivity, the data show that in recent years Japan has achieved approximate equality with the United States. However, output per man-hour in the steel industries of West Germany, France, and the United Kingdom ranges from 86 percent to 40 percent of steelworker productivity in the United States. With respect to blast furnace input productivity, the data demonstrate that in recent years the United States was among the most intensive users of coke per ton of pig iron produced. The United States uses relatively little fuel oil, however; and due to relatively low energy costs, the fuel cost per ton of pig iron produced is slightly less than the Japanese fuel costs.

In section II of this chapter the adoption rates of the basic oxygen furnace and continuous casting in over 25 countries were analyzed. The analysis shows that in both the 1956-64 and 1964-74 periods, the United States had the highest rate of adoption of basic oxygen capacity. The continuous casting adoption rate for the United States was also among the highest in the world. The study tested the two hypotheses that a steel industry would make fewer inefficient technology decisions (i.e, have a higher adoption rate): (1) the smaller the share of government ownership in the steel industry, and (2) the greater the steel industry's involvement in international competition. The results strongly confirmed hypothesis (1) but were ambiguous with respect to hypothesis (2).

In section III of this chapter profit rates on sales and equity for the United States, Japan, and the European Community were presented. The European Community's profit rates were the lowest on both sales and equity. The Japanese steel industry's profit rates on sales were lower than those of the United States but were about equal on the basis of profit on equity. The argument was made that the implied higher sales-to-equity ratios of the Japanese resulted from their higher debt-to-equity ratios. The differences in the latter ratios were explained by different financial institutions.

APPENDIX 7

EXPLANATION OF DATA SOURCES FOR TABLES 7.8 - 7.12.

I. Basic Oxygen Furnace Adoption Rates.

The BOF adoption rates were measured by the change in BOF capacity divided by the change in crude steel output. The denominator in the ratio was taken as the estimate of crude steel capacity. This procedure was justified by the fact that the chosen years were years of synchronized peaks in world steel production; thus, production should approximate capacity in these years. This procedure seems superior to taking hypothetical engineering estimates for capacity; moreover, the latter procedure would limit the sample size, since such estimates are unavailable for many countries. By a similar argument, BOF output was used to estimate capacity.

For 27 of the countries, data on BOF output and crude steel production were obtained from two publications of the United Nations Economic Commission for Europe: the <u>Quarterly Bulletin of Steel Statistics for Europe (various issues) and The European Steel Market 1958</u>. For the five Latin American countries in the sample data were obtained from two sources: Kaiser Engineers, <u>L.-D. Process Newsletter</u>, various issues, and the IISI Latin American Panel Discussion: <u>Steel in Latin America</u>. For Canada BOF data came from the <u>Canadian Minerals Yearbook</u> 1964, p. 287; American Iron and Steel Institute's <u>Annual Statistical Report, 1975</u>; and Maddala and Knight [14].

II. Continuous Casting Adoption Rates

CC adoption rates were estimated in a manner analogous to the estimation of BOF adoption rates. The basic source was mimeographed data obtained from the International Iron and Steel Institute (IISI). This source was also used for output data. Where the IISI source failed to provide output data (Belgium, Luxembourg, The Netherlands, Denmark, Hungary, and Yugoslavia), the source used was the United Nations Annual Bulletin of Steel Statistics for Europe 1975. For Argentina and the Soviet Union, 1969 output was estimated by 1970 output.

Metal Bulletin Monthly, in the July, August, and September 1975 issues, and 33 Magazine, in October, November, and December 1975 issues, published their worldwide reference lists of all continuous casting machines in operation. These sources were used to supplement the IISI source. In particular, these sources were used to fill in gaps in the IISI data; in general, this meant verifying that the country had no continuous casting capacity throughout the period. However, through the magazine sources, it was estimated that Hungary had 150,000 metric tons of continuous casting capacity in operation in 1974, and Yugoslavia had 185,000 metric tons in 1974. Conversion factors for operating capacity from engineers' estimated capacity were obtained from data available in the European Coal and Steel Community Investment in the Community Coalmining and Iron and Steel Industries, Report on the 1976 Survey, August, 1976.

Countries with an insignificant change in steel production were excluded from the sample. This was defined as a country whose change in output was less than 50,000 tons. On this basis Denmark, with a change in steel output of 53,000 tons, was included in the sample. The IISI estimate of Denmark's 1975 CC output, 73,000 tons, was used for our 1974 estimate, yielding an adoption percentage of 137.7 (the highest of all countries in the sample). This estimate is supported by the ECSC Commission's Investment in the European Coalminin and Iron and Steel Industries which reported that Denmark achieved actual production of 100,000 tons after rounding of CC output. Two alternative measures were considered for Denmark: (1) Employ the two magazine reference list estimates for 1975 CC capacity, which would yield an adoption percentage of 924.5; or (2) employ the IISI estimate for 1974 CC capacity, yielding an adoption percentage of zero. Neither of the latter two measures was deemed an appropriate measure of the adoption responsiveness of the Danish steel industry to CC during the 1969-74 period.

III. International Competition

The variables measuring participation in world trade, denoted I and X, were imports divided by shipments and exports divided by shipments. All variables were measured in tons. I_1 and X_1, and I_3 and X_3 were the averages of these variables over the years 1962-64 and 1972-74, respectively, while I_2 was $\frac{I_1 + I_3}{2}$ and $X_2 = \frac{X_1 + X_3}{2}$.

In each regression, the choice of which measure to employ was dictated by the corresponding time period of the dependent variable. Data on shipments, exports, and imports were obtained, except for Latin American countries and Canada, from the United Nations Economic Commission for Europe publications: Quarterly Bulletin of Steel Statistics and Annual Bulletin of Steel Statistics for Europe. For East Germany and the U.S.S.R., I_3 and X_3 were computed for the two years, 1973 and 1974. The data available reports imports and exports of Belgium and Luxembourg in combined form. For these two countries exports and imports were allocated between the two on the basis of the share of shipments for each year.

For Latin American countries the data were obtained from ILAFA (Instituto Latin-Americano del Fierro y el Acero) and Siderurgia Latinamericana. Canadian participation in world trade for 1962-64 was computed from data in Canadian Minerals Yearbook, 1964.

IV. Share of Government Ownership

The share of government ownership was estimated for these years: G_1 = 1956, G_2 = 1964, and G_3 = 1972. Data for G_3 are available in the American Iron and Steel Institute Steel Industry Economics and Federal Income Tax Policy, February 1974, table II. Adjustments of these data for changes in government ownership to obtain G_2 and G_1 were made on the basis of reported changes in government ownership between editions of Iron and Steel Works of the World and on the basis of the collective knowledge of the authors.

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CHAPTER 8

SUMMARY AND INTERNATIONAL TRADE POLICY FOR STEEL

In this chapter the findings of the study are summarized, and their implications for international trade policy for steel are presented. The study has attempted to explain the pattern of U.S. steel trade flows over the past 20 years. During that time, imports as a percentage of U.S. apparent steel consumption rose gradually to a peak of 17.9 percent in 1971; since then the long-term trend has been arrested and slightly reversed. 1/

Section I of this chapter contains summaries of the findings of each chapter. Then an assessment is made of the relative importance of each chapter's hypotheses as explanations of the observed pattern of trade flows. Section II of this chapter discusses international trade policy. It contains estimates of the costs, to consumers and to the U.S. economy, of both an orderly marketing agreement and reference (or minimum) prices. An analysis is undertaken of the comparative advantages (as trade restrictions) of reference prices, orderly marketing agreements, and tariffs. In addition, the results of the study are utilized to analyze the arguments for and against free trade in carbon steel mill products. Both sections of the chapter have concluding parts which summarize the results.

1/ Table 2.24 reveals that the ratio of imports to apparent U.S. steel consumption was 14.1 percent in 1976. According to officials at AISI, the comparable figure for the first eight months of 1977 is 15.9 percent.

I. SUMMARY

Introduction

A number of hypotheses have been advanced, by various sources, as explanations of the trends in steel trade flows. These hypotheses are grouped under five major headings: (1) Changes in relative costs; (2) longrun monopoly type price umbrellas of U.S. producers, or more intransigent administered cyclical pricing of U.S. producers, or counter-cyclical dual pricing behavior by foreign producers (dumping); (3) price controls on U.S. producers that hampered domestic steel expansion and the ability of the U.S. steel industry to meet domestic steel needs; (4) government involvement in foreign steel industries that enabled foreign steel industries to undercut the prices of domestic producers who otherwise are more efficient; and (5) lethargic and inefficient management of domestic steel firms that resulted in inefficient technological decisions and insufficient use of debt financing.

Costs

Hypothesis (1) was examined in chapter 3. Our estimates of United States steelmaking costs relative to those of Japan and the EC yielded similar trends. During the 1950's and through most of the 1960's, U.S. relative costs were generally increasing. In 1968, the trend of increasing United States relative costs began to reverse. Sharp declines in its relative costs in 1973 and 1974 allowed the United States to regain the position it had held in the early 1960's relative to Japan and in the late 1950's relative to the EC. In 1975 and 1976, U.S. costs increased relative to Japan, causing U.S. relative costs to return to near the 1972 level.

A simple linear regression of Japanese steel imports (as a percentage of United States steel consumption) on the U.S./Japan relative cost series showed a strong correlation. A strong correlation was also found between the pattern of EC imports to the U.S. and the U.S./EC relative cost series for two major steel products. <u>These results support the hypothesis that costs have been an important factor influencing trade flows in steel</u>.

The sources of relative cost changes, as indicated by examination of individual productive inputs for the United States and Japan, defy easy summarization. Labor costs are clearly the dominant factor causing the absolute difference between U.S. and Japanese costs, and changes in relative labor costs have generally had the major influence on overall relative costs. At various times, however, other inputs have also had a significant impact on relative costs. The U.S. dollar devaluations in the early 1970's undoubtedly had an effect on the relative cost of all input items, but it especially improved the U.S. relative cost position with respect to labor.

An appendix to the costs chapter discusses the costs of complying with environmental regulations. It was found that the Japanese steel industry's capital expenditures to meet environmental standards have been greater than those of U.S.

industry. Moreover, it is anticipated that the Japanese industry's operating costs will rise by a slightly greater amount than will those of U.S. industry as a result of complying with future environmental standards. 2/

Pricing Behavior

Chapter 4 contains an examination of the pricing policy hypotheses of trade flows. Analyses of a number of theories previously offered to explain domestic steel pricing policies were undertaken. These theories, which argue that domestic steel prices are determined by either cost plus target rate of return (more so than demand) or dominant firm (dominant cartel) practices, all suggest that domestic pricing policies offered a price umbrella under which foreign producers were free to erode U.S. markets. In addition, the cyclical dumping issue was examined.

Long Run Pricing. The conclusion of this study is that the longrun pricing behavior of the domestic industry changed some time around 1960. While one or more of these theories may have applied to domestic pricing prior to 1960, the data

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2/ It should be explicitly stated that this appendix makes no judgment regarding the socially optimal level of emissions control or of the optimal rate of compliance with environmental regulations for the U.S. steel industry. Those questions require an analysis which measures the costs and benefits of emissions control. Since our purpose was only to examine the differential impact of environmental standards on the steel industries in the major producing nations, that analysis was not conducted.

reject these explanations of domestic steel pricing since 1960. Rather, the industry's pricing since 1960 appears to be best characterized as "barometric price leadership" [24, pp. 170-173]. This means that, while price leadership is practiced, the identity of the price leader sometimes changes. Moreover, price hikes are sometimes rebuffed as price increases tend to be followed only when reflective of basic changes in supply and demand conditions. The price leadership does not appear to have facilitated the sustained attainment of monopolistic prices. Thus, it appears that longrun pricing policy does not explain international steel trade flows.

Cyclical Pricing. Chapter 4 also analyzes hypotheses which attribute the changing trade flows to differences in cyclical pricing behavior. One of these hypotheses is that the domestic industry, unlike foreign steel industries, is characterized by "rigid" or "administered" pricing. The domestic industry would then be susceptible to import erosion during recessions. An extensive examination of the steel trade press data and related sources from 1967 through 1976 found that actual domestic steel mill prices rose and fell with demand. This result is contrary to the various series published by the Bureau of Labor Statistics. (The BLS series are based on list prices of the steel companies rather than on actual prices). When actual prices were examined, domestic steel prices appeared to be more flexible. Steel prices in the European Community and Japan were also observed to vary cyclically. It does not appear that administered pricing is a significant explanation of changing trade flows.

Counter-Cyclical Dual Pricing: Dumping. The other pricing hypothesis examined in chapter 4 was that of "cyclical dual pricing." This hypothesis alleges that, unlike the U.S., EC and Japanese steel producers raise export prices in booms and lower them in recessions to penetrate U.S. markets cyclically, while offering comparatively stable prices to their domestic buyers. Statistical testing of this hypothesis called for its rejection at conventional significance levels. In explaining this result, it was demonstrated that the Japanese do not have a higher percentage of fixed costs than the steel producers in the United States. Thus, this study concluded that none of the pricing hypotheses (the longrun price umbrella argument, the cyclical administered pricing argument, or the cyclical dual pricing hypothesis) explains the pattern of steel trade flows.

Price Controls

Hypothesis (3) was examined in chapter 5. An analysis of the effects of "jawboning" and price controls on the U.S. steel industry produced the conclusion that jawboning did not reduce steel industry profits, but that the price control program of 1971-74 did. This conclusion is based primarily upon statistical analysis, but it appears to be consistent with an historical review of Government actions toward steel price increases since 1961. After the major jawboning incident in 1962, the industry shifted from a pattern of across-the-board price increases to selective price increases, and the Government jawboning was limited to increases in list prices, not to changes in discounts, extra charges, and freight absorption. The statistical analysis indicates that the price control program of 1971-74 reduced steel industry profits by an estimated $1.1 billion to $1.7 billion after taxes. This amount could have paid for from 1.1 million to 2.2 million annual tons of shipped steel capacity on a new-plant cost basis, or from 2.1 million to 4.6 million annual tons on a roundout basis. This latter figure would amount to an increase of about 2.0 to 4.3 percent in total U.S. shipped steel capacity.

Since jawboning was not effective, it was concluded that it did not contribute to import erosion. The price controls did limit profits, and perhaps the industry's ability to expand. On the basis of the description of pricing behavior in chapter 4 and appendix A to chapter 5, however, it is apparent that price controls were economically effective only during 1973 and 1974; thus, they cannot explain import erosion which occurred prior to 1973. However, in view of the 1973-74 experience, the re-enactment of price controls (or possibly a stronger form of jawboning), might limit the domestic industry's expansion and its ability to meet domestic demand.

Subsidies

Hypothesis (4) was analyzed in chapter 6. Extensive research was conducted into the extent of government financial assistance in seven countries: the United States, Japan, West Germany, the United Kingdom, France, Belgium, and Italy. In addition, an examination of the extent of financial assistance offered by the European Community to its steel producers was conducted. Much of this basic research and data are published in the appendix to chapter 6.

In the main part of the chapter all the data are summarized in one table. This table assessed, for all seven countries, the net subsidy or tax, per ton of rolled steel output, in 1975 U.S. dollars. From this it was concluded that in none of the countries examined was the percentage subsidy or tax sufficient to explain international steel trade flows. This is especially true with respect to the two countries from which the U.S. imports the most, Japan and West Germany. Japan had a relatively low net subsidy of 46 cents per ton, or approximately .15 percent of the value of sales. 3/ The net effect of Government involvement in West Germany was not a subsidy but a penalty or tax on the industry of $3.49 per ton. The main reason for this is the West German Government's restriction on the use of imported coal. West German steel producers must use more West German coal than they would desire, given the availability of cheaper foreign coal.

3/ This estimate includes the indirect subsidy value imputed to the "priority" status accorded the Japanese steel industry in capital allocation.

An alarming paucity of documentation was found with respect to alleged subsidies to foreign steel producers. With the data and findings of chapter 6 now available, it is hoped that documentation of foreign government involvement in steel industries will improve in future discussions.

Performance

Chapter 7 contains analyses of the last of our hypotheses. Some have alleged that lethargic and inefficient managers of U.S. steel firms have made a series of poor decisions over the years, the result of which is that the United States has an inefficient steel industry.

Labor Productivity and Blast Furnace Productivity. The study found that on the basis of labor productivity, the United States and Japan are currently about equal. There has been a massive improvement in Japanese labor productivity in the last 20 years, overcoming what once was a large advantage in labor productivity favoring the U.S. On the other hand, the United States continues to maintain a significant advantage in labor productivity over West Germany, France, and the United Kingdom.

On the basis of input productivity in blast furnaces, it was found that in recent years the United States uses more coke per ton of pig iron produced than any other nation examined. However, U.S. fuel usage is relatively low, as are its costs of coal and fuel oil. Thus, the fuel costs per ton of pig iron for the U.S. are slightly lower than for Japan. Additional calculations revealed that if the U.S. experienced Japanese coke and fuel oil usage rates, U.S. costs would be lower; however, such practice is not feasible in view of the older blast furnaces operated by U.S. producers. Moreover, the fuel savings are inadequate to warrant scrapping blast furnaces which have not sufficiently depreciated.

Adoption Rates of New Technology. The issues of efficient adoption of the basic oxygen furnace and of continuous casting were studied. With respect to the basic oxygen furnace, the measure found that the United States steel industry was the fastest adopter in the world, in both the 1956-64 period and the 1964-74 period. The United States was also among the leaders in the adoption of continuous casting. 4/ With data on adoption rates and government ownership in approximately 27 countries, the results of the regressions which were run strongly support the hypothesis that the greater the percentage of government ownership of a country's steel industry, the lower are these adoption rates.

Financial Decisions. The performance chapter demonstrates that the lower debt-to-equity ratios of the U.S. steel producers, compared with the Japanese, are explained primarily by

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4/ The chosen measures were the closest possible to the appropriate measures of efficient BOF and CC adoption; nonetheless they favor those countries which had a large share of replacement investment.

the different financial institutions present in the respective environments. To the extent that an assessment could be made of the technological and financial decisions of the managers of U.S. steel firms, they were found to be efficient. Thus, the data do not appear to support the hypothesis that relatively poor performance by U.S. managers explains the pattern of international steel trade flows.

Conclusions

Of the five hypotheses examined as explanations of steel trade flows, three are not supported by the data. Neither the theories of pricing behavior, nor the subsidies hypothesis, nor the inefficient performance by U.S. managers hypothesis has found support in the data. With regard to a fourth hypothesis, the price controls program (but not "jawboning") was found to be potentially important in limiting the U.S. industry's ability to meet demand in the future, but was not found to be an explanation of past trade flows.

The remaining hypothesis, that imports are explained by changes in relative costs, was strongly supported by the data. This result was true both for the U.S./Japan relative cost series and the U.S./EC relative cost series. Imports as a percentage of U.S. apparent steel consumption rose during the 1960's when Japan and the EC were improving their cost positions relative to the U.S. However, as the longrun trend in costs was arrested around 1971, it was observed that the longrun trend in import erosion was stopped and to some extent reversed.

Of the five hypotheses examined, the only one appearing to explain trade flows in steel is that regarding changes in relative costs. The study concludes that the primary explanation of the import erosion of U.S. steel markets in the 1960's, and the arrest and slight improvement against further erosion in the 1970's, is that the costs of making steel in the United States, relative to those in Japan and the European Community, worsened during the 1960's and improved in the early 1970's.

II. INTERNATIONAL TRADE POLICY FOR STEEL

Introduction

Recently, considerable attention has been given to an appropriate U.S. policy for international trade in steel products. The Organization for Economic Cooperation and Development was recently called upon to study international steel trade policy [21]. The U.S. Government has stated that it intends to seek a steel sector negotiation at the latest round of GATT negotiations. Meanwhile, steel trade discussions are continuing under the auspices of the O.E.C.D. The AISI publication Steel Industry Economics and Federal Income Tax Policy called for protectionist measures. 5/ The study by Pifer, Marshall, and Merrill (PMM) [22], for the American Iron and Steel Institute (AISI), also came to predominantly

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5/ See [3, pp. 16-18]. While many of the facts of international steel trade have changed, 10 years ago the Committee on Finance of the U.S. Senate [29] released a staff study on steel imports which was slightly protectionist in its recommendations.

protectionist conclusions. On the other hand, the 1975 staff report of the Council on Wage and Price Stability (COWPS), entitled A Study of Steel Prices, strongly supported free trade in steel [8, pp. 28, 29]. The symposium on steel pricing, sponsored by COWPS, yielded sharp disagreement among the panel members on the advantages of free trade in steel [19, pp. II-7-II-9]. The most recent study by COWPS [9] observes that import restraints alone will solve the domestic industry's problems only if reduced import competition allowed them to increase prices [9, p. xiv]. The study by Charles Bradford [5] of Merrill Lynch, Pierce, Fenner and Smith also concludes that import protection will not solve the industry's problems.

In view of the wide interest in international steel trade policy, and given our own investigation of the factors affecting the pattern of U.S. steel trade flows, it appears desirable to analyze U.S. international steel trade policy. This section of the chapter addresses the question of what the policy of the United States should be regarding international trade in steel. It also contains a comparative examination of the impact of "orderly marketing agreements" (or "voluntary restraint agreements"), reference (or minimum) prices, and conventional tariff restrictions.

Reasons for Free Trade and Calculations of the Cost of Steel Protection

By far the most important reason for free trade in steel is the same reason motivating free trade in general: Free trade permits greater general welfare. Through free trade, the United States is able to import products that can be produced relatively more cheaply abroad, and specialize in products that can be produced relatively more cheaply in the United States. Specialization and trade make possible greater economic welfare. At the prices of goods prevailing after trade, the United States can consume commodities in amounts unavailable without trade. 6/ Thus, the primary motivation for free trade is the self-interest of the United States. Free trade increases income and provides consumers with consumption possibilities otherwise unattainable.

The appendix to this chapter contains estimates of a number of the effects of imposing quotas on steel. For the purposes of the calculations, we assumed that a quota imposed on imported carbon steel mill products would reduce imports from the 1976 level of 14.9 percent to 12 percent of apparent consumption. 7/ Compared with the existing tariff structure, this quota would impose an annual cost on consumers of about $1 billion ($1,003.9 million in 1976 dollars). Moreover, it was estimated that waste due to inefficient allocation of resources ("dead weight losses" to the domestic economy)

6/ See [26, pp. 9-15] and [12, pp. 21, 22].

7/ Imports of carbon steel mill products in 1976 represented 14.9 percent of apparent consumption of carbon steel mill products. The comparable percentage in 1976 for all steel mill products is 14.1.

would increase by $177 million. Foreign exporters of steel would extract $121 million in monopoly profits as a result of the quota, and the U.S. Treasury would lose $41.6 million in tariff revenues.

It is also estimated that a reference (or minimum) price of $322 per ton would yield the same basic cost estimates as the 12 percent quota. The differences between the impact of quotas and reference prices are explained in detail at the end of this chapter.

In addition, the estimate of the potential gains to consumers of eliminating the existing tariffs on steel mill products was $1,464 million. Thus, if tariffs were eliminated, a 12 percent quota would cost consumers about $2.5 billion per year ($2,467.9 million). These estimates, which show that the protection of carbon steel mill products results in high costs to consumers and significant misallocation of resources, reflect the fact that the industry is very large ($28.5 billion in 1976 sales). These estimates, and others, are summarized in table 8.1.

Arguments Against Free Trade

Reasons are often given for protecting a particular industry in specific situations. For the U.S. steel industry, the reasons advanced in recent years are employment, supply shortages, balance of payments, and national defense. Each of these arguments will be considered in detail.

TABLE 8.1

Summary of the Estimated Annual
Effects of a 12 Percent Quota and $322 Reference Price
Compared With Existing Tariffs and
No Tariffs: Carbon Steel Mill Products

(Millions of dollars)

	Impact of quota and reference price with existing tariff	Impact of quota and reference price with no tariff
Costs to consumers	1,003.9	2,467.9
Inefficiency costs due to resource misallocation	177.0	384.2
Gains to domestic producers	868.5	2,083.7
Monopoly profits accruing to foreign exporters	121.0	297.0
Losses in tariff revenue	41.6	217.6
Increase in the price of steel (in dollars per short ton)	11.0	27.0

Source: Federal Trade Commission, Bureau of Economics.

Employment. One argument for limiting free trade in steel is the allegation that it is important for the U.S. steel industry to continue to employ at least as many workers as it does today. 8/ However, apparent steel consumption has increased by approximately 2.6 percent per year from 1960 to 1976, reaching a high of 122.5 million tons in 1973 before falling to 101 million tons in 1976. PMM [22] have projected these trends forward to predict steel demand for 1980 and 1985. Their projections, converted to final product steel demand, are summarized in table 8.2.

TABLE 8.2

Demand Forecast for Final Steel Products in the United States

(Millions of net tons)

Year	High	Low
1980	128	111
1985	146	127

Source: Converted from Pifer, Marshall, and Merrill, Economics of International Steel Trade: Policy Implications for the United States, May, 1977, chart IV-1.

The high estimates are based on a simple projection of the longrun trend; the low estimates are based on a projection of the 2.6 percent growth rate from a lower 1976 base.

8/ See, for example, [3, p. 17], [22, p. 60] and [29, pp. 244, 245].

If the United States were to maintain its 1976 share of domestic apparent steel consumption, then, depending upon the demand estimate, an additional 36 million tons or 20 million tons over and above the 1976 production of finished steel will be produced in the United States in 1985. The share of apparent steel consumption captured by foreign producers could rise to 39 percent or 30 percent (depending on demand projections) without any shrinkage in the tonnage of finished steel products produced in the United States.

The highest share of apparent steel consumption that imports achieved was 17.9 percent in 1971; in 1976, imports captured 14.1 percent of the U.S. market. 9/ Barring a cost shift in favor of foreign producers, import penetration rates of 30 to 40 percent should not occur. Thus, United States steel producers can be expected to increase their production of steel between now and 1985.

Of course, factors such as technological advance may increase labor productivity; the increased tonnage manufactured by domestic mills may be produced by fewer employees in 1985. In the past 20 years, output per man-hour in the steel industry has increased by 2.1 percent per year [2, p. 25]. If

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9/ See [2, p. 8]; the comparable figure for the first eight months of 1977 is 15.9 percent.

productivity and demand trends continue, some increase in import penetration can be absorbed without an employment decrease. 10/

The employment question must, however, be considered at a more fundamental level than the factual one of whether there

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10/ In the pollution control appendix to chapter 3, it was indicated that environmental standards may speed the obsolescense and closure of open hearth plants. The recent labor settlement provides that approximately 40 percent of the steelworkers will achieve "permanent employment" status as of January 1, 1978. Layoffs and terminations will become more expensive to the domestic steel firms at that time, since employees enjoying "permanent" status who are laid off qualify for their regular pension plus $300 per month. (See chapter 4 for a more detailed account.) These combined effects may partly explain the recent plant closures.

Those workers who become unemployed as a result of imports are eligible for adjustment assistance under the Trade Act of 1974. (See U.S. Department of Labor [28] for details.) Between April 1975 and June 30, 1977, the Bureau of International Labor Affairs of the Department of Labor estimated that 34,380 steelworkers were certified for import induced adjustment assistance and were paid $40,349,630 in trade readjustment allowances. The amount paid to steelworkers exceeded the amount paid to any other industry. By September 30, 1977, an estimated 54,513 workers were certified as eligible for trade readjustment allowances. According to AISI [2, p. 21], the total reduction in wage employees, for all reasons (which includes recession induced layoffs), between 1974 and 1976 was 54,191 (from 393,212 in 1974 to 339,021 in 1976). Thus, the Department of Labor has not been restrictive in its certification of eligibility for trade adjustment assistance.

Some have criticized the adjustment assistance program since only a small percentage of those workers receiving trade readjustment allowances apply for the other available allowances: training, job search, and relocation allowances. The trade readjustment allowances can be justified on purely distributional grounds, however, since through the allowances a portion of the gains from free trade are shared with those who are adversely affected.

will be an increase or decrease in steel industry employment. Full employment for the aggregate United States economy must be considered a highly desirable goal. Neither Congress nor the Administration has suggested, however, that employment in the steel industry is preferable to employment in other domestic industries. Thus, the appropriate question is: Should the steel industry be protected as part of an overall policy with the goal of generating employment across all industries?

The answer is no, since protective trade measures are an inefficient method of generating aggregate employment. At full employment, protective trade measures affecting steel will increase the relative price of steel and employment in the steel industry, but overall employment will remain unchanged. At less than full employment, protective trade measures will, barring foreign retaliation, increase domestic demand. However, aggregate monetary and fiscal policies are significantly more efficient in generating aggregrate demand. The amount of stimulus to aggregrate demand is chosen by Congress, the Administration, and the Federal Reserve Board. Aggregate demand can be further stimulated by these authorities when it is believed that the benefits of such stimulation exceed the costs in terms of generating inflation and jeopardizing the achievement of full employment in the long run. 11/

11/ See [10] and [11].

On the other hand, protective trade measures increase demand (barring retaliation) while simultaneously raising the cost of imported goods to consumers and shifting production into less efficient forms of domestic production. Thus, full employment generated by aggregate monetary or fiscal policy generates higher real incomes and living standards than does full employment generated by protective trade measures. Since the steel industry has not been isolated as a preferred employment industry, 12/ monetary and fiscal policies are superior tools with which to achieve employment goals.

In addition, it should be observed that protective measures designed to increase employment may result in retalitory measures which frustrate the achievement of employment goals while decreasing real incomes. For example, Congress hoped to increase employment when it passed the Tariff Act of 1930. Within a year, 25 countries had raised their tariffs against American goods, and international trade declined sharply. 13/ Employment and output continued to decline.

12/ By this it is meant that Congress has not stated that a job created in the steel industry is preferable to the creation of a job in any other industry such as the computer industry, the automobile industry, agriculture, or services. Nor does it appear there is any obvious reason why Congress should.

13/ See [18, p. 651] and N.H. Engle, "Reciprocity in Foreign Trade Policy," Harvard Business Review, vol. 16 (Autumn, 1937), p. 42.

Supply Scarcities (Shortages). The recent report by PMM [22] emphatically alleged that without import protection steel is likely to become extremely scarce in the 1980's. 14/ AISI [2, p. 17] has also made the same point.

The PMM argument proceeds as follows: Steel is a highly cyclical industry [22, p. V] and the pricing policies of our trading partners, especially Japan, are greatly influenced by fluctuations in demand [22, p. 63]. Foreign producers are motivated to sell steel in the United States market at prices below full costs during recessions, and PMM claim [22, pp. 20-22] to have found evidence of this during 1975-76. 15/ It is claimed that such pricing is not the result of natural market forces; i.e., it results from Government involvement or subsidies in foreign steel industries, and the result of such pricing is to retard the growth of the U.S. steel industry [22, pp. 64, 65]. PMM allege that this slower growth in the domestic steel industry leads to U.S. buyers' paying exorbitant prices for foreign steel during booms and, as a result, the U.S. economy is worse off, on balance, over the whole business cycle [22, p. 64].

14/ The term shortage is used by PMM when what is often meant is scarcity. "Shortage" means that there is excess demand at a given price. Since demand and supply are not completely price inelastic, the price of steel could always rise sufficiently to clear the market and eliminate any shortage; scarcity, however, would remain.

15/ The appendix to the pricing chapter demonstrates that the PMM estimates are inaccurate.

The PMM interpretation is internally contradictory. 16/ PMM maintain two arguments: (a) due to Government subsidies, steel is sold in the United States by foreign producers at prices which fail to cover full costs, thus deterring domestic investment; and (b) U.S. buyers of imported steel pay more for steel, over the whole cycle, than they would by relying on domestic suppliers (and this foreign dependence is unacceptable). If (b) is valid, then foreign steel is sold in the United States at prices exceeding domestic prices, on average over the cycle, and foreign producers must be recovering full costs of production over the cycle. Thus, (a) cannot also be true.

More important than the logic of the PMM argument is that in an industry in which demand fluctuates over the business cycle, pricing at marginal costs, but below total costs, during a recession does not imply that pricing does "not reflect full production costs or private capital formation requirements." Although an efficient steel producer may suffer losses in meeting the prices of its competition during recessions, when the business cycle reverses, increasing output will strain capacity, marginal costs and prices will rise above average total costs, and profits will be earned. When making investment decisions, firms in a cyclical industry must necessarily anticipate what the average level of demand and average level

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16/ The AISI document [3, pp. 15-17] also makes these two contradictory assertions.

of profits will be. If the <u>average</u> level of profits over the business cycle is high, the industry will expand capacity and, conversely, it will contract capacity if the <u>average</u> level of profits is low.

Rather than being pernicious, pricing at marginal costs over business cycles is generally reflective of dynamic social optimality and efficiency. 17/ On the other hand, the term "administered prices" refers to concentrated industries' failure to reduce prices during recessions [24, pp. 285, 286]. This, it is often alleged, results in inefficiency, unemployment, and inflation.

One may apply the results of the peakload pricing literature to a cyclical industry by considering the recession as offpeak demand and the boom as peak demand. The general thrust of the American literature is that peak users should pay marginal operating costs plus marginal capacity costs, and offpeak users should pay only marginal operating costs. The French literature suggests optimal pricing rules that set prices equal to expected marginal operating costs plus expected marginal curtailment costs for each relevant demand period. 18/ In either event, socially optimal pricing calls for the application of marginal principles rather than rigid pricing. While the evidence on the <u>extent</u> of the harmful effects of inflexible

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17/ See [24, ch. 2], for example.

18/ See [13] for a summary of the peakload pricing literature.

administered prices is inconclusive [24, ch. 13], there is considerable theoretical and empirical evidence suggesting that flexible marginal cost pricing is socially optimal.

On the factual level, chapter 4 shows that prices vary cyclically in the U.S., Japan, and EC. It was also found that fixed costs as a percentage of total costs are not significantly less for U.S. producers than for the Japanese steel producers. In view of the new labor contract negotiated between the United Steelworkers of America and the major domestic steel producers, it is likely that, in the future, the share of total costs which are fixed will be as great for the U.S. producers as they are for the Japanese producers. Thus, different cost structures cannot explain different cyclical pricing policies.

Chapter 6 on Government involvement shows that subsidies in the Japanese steel industry are virtually nonexistent today and were not significant enough to influence trade during the past 15 years. Moreover, the Japanese do not use export pricing alone as a counter-cyclical device; i.e., a systematic test of the hypothesis of a "cyclical dual pricing structure" for the Japanese led to its rejection.

Regardless of the factual objections to PMM's argument (a), the fundamental point is that investment decisions are longrun decisions based on the longrun average level of profitability. Flexible pricing decisions based on marginal cost considerations will not deter investment in the steel industry if, on average, prices are sufficiently high to make the industry profitable. <u>Even though demand is cyclical, the free market, with free trade, provides sufficient incentive for the expansion of a cost-competitive domestic industry</u>.

Unfortunately, Government price controls might limit the industry's ability to make profits during a boom. Such restrictions can deter investment relative to what the private market would have dictated. It was estimated (in chapter 5) that price controls cost the domestic industry the dollar equivalent of 2 to 4.3 percent of its present capacity. To the extent that there is a capacity expansion problem, it would be attributable to Government price controls and not to cyclical pricing. 19/ Thus, even though the deterring effect on investment has not been severe in the past, price controls on steel are not recommended in the future.

Argument (b), above, is that U.S. buyers of foreign steel pay more for steel, over the whole cycle, than they would if they relied on domestic suppliers. 20/ This foreign dependence is alleged to be too costly and risky for U.S. purchasers of steel.

19/ For a similar, but stronger, statement of this view, see [5].

20/ PMM estimate [22, p. 64] that by 1985 the U.S. reliance on foreign steel will cost the U.S. economy a $3 billion premium in peak years.

It should be understood that when a domestic purchasing agent buys foreign steel, the cost savings or premiums of foreign purchases accrue to his firm. If, by committing his firm to foreign steel, a purchasing agent causes his firm's costs to rise, or the probable availability of steel to fall, the company's profits will decline. In fact, the sum of all individual company gains or losses by purchasing foreign steel is equal to the total U.S. economy's gain or loss; i.e., all gains and losses are "internalized" and there is no "externality." Purchasing agents have the free option of buying foreign steel or domestic steel. If they do what is best for their companies individually, they do what is best for the economy collectively. The private market has adequate incentives to insure efficient decisions regarding the purchase of foreign steel. (See footnote 23 for a discussion of some externalities which, although theoretically relevant, do not seem to alter this conclusion.)

The policy implication of argument (b) is that Government employees should decide when it is in the interest of a domestic buyer of steel to purchase foreign steel. It is untenable to propose that Government decisionmakers understand better than purchasing agents the <u>gains</u>, <u>losses</u>, and <u>risks</u> of buying foreign versus domestic steel. In fact, one of the authors of the PMM study stated in an earlier writing that "it seems reasonable to let the market make the decision about how much of a premium, if any, should be paid for domestic steel, without interference from government." 21/

Thus, this study concludes that private market forces provide appropriate incentives for the long-term development of the domestic steel industry. Marginal cost pricing is not pernicious; it is reflective of social efficiency. In this cyclical industry, the average rate of return, subject to a risk premium, will determine whether domestic steel producers obtain and invest funds in steel development. Domestic buyers of steel will purchase domestic or foreign steel depending on their assessment, over the long run, of the gains, costs, and availability risks of buying domestic or foreign steel. If the U.S. is a cost-competitive country in which to construct steel plants, such construction will occur. If the U.S. is not, then free trade will permit the U.S. to specialize in the

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21/ See [19, p. II-8]. After their experience with premium priced foreign steel during 1974, domestic buyers become careful about buying foreign steel.

> Our members report only a minor interest in foreign steel this year as compared to 60 percent last year. It is felt that to generate a genuine interest for imports the pricing advantage would have to be in the range of 15 percent under domestic prices. a/

Our interviews with purchasing managers as well as reports in the trade press confirm this wariness.

a/ "The Steel Market" Bulletin of the National Association of Purchasing Management, Aug. 1975, p. 6.

production of those products which it can produce relatively efficiently, and enjoy the benefits of foreign steel at less cost.

Government intervention for the ostensible purpose of alleviating supply shortages will distort an otherwise efficient, private market allocation of resources. The cyclical nature of the industry does not alter this conclusion. Government intervention in the form of trade restrictions (or perhaps price controls) will non-optimally distort the amount of domestic steel capacity that will exist.

Balance of Payments. It is argued that the purchase of imported steel contributes to balance of payments problems for the United States. 22/ The assertion that our balance of payments will improve in an amount equal to the reduction in foreign steel purchases that results from tariffs or quotas is a naive presentation of a very complicated subject. It is *possible* that the imposition of tariffs or quotas on steel can result in a *worsening* of the balance of payments. Moreover, employing tariffs or quotas to avoid trade deficits is a form of exchange control; on social welfare grounds, such controls are inferior to currency convertibility [15, p. 14].

First, as mentioned in the subsection on employment, retaliatory action on the part of foreign nations may occur. Second, there are indirect effects which will reduce the

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22/ PMM [22, pp. 65, 66] and AISI [3, p. 16] seek protection for the U.S. steel industry partly on balance of payments grounds.

value of U.S. exports: The rise in the price of imported and domestic steel raises the price of exports and discourages the production of U.S. exports which use steel as an input; the increase in the relative price of steel shifts domestic resources away from export and nontraded goods and into the production of steel. Lage and Ozzello [16] estimated that for every dollar's worth of steel kept out of the United States by import restrictions, approximately a half-dollar is spent on increased imports or reduced exports in other product lines because of the higher cost of steel inputs. Moreover, foreign countries' reduction in foreign exchange earnings diminishes their ability to purchase U.S. exports [15, p. 15]. This latter argument is especially applicable to developing nations.

Summarizing these arguments and others, Krueger has stated:

> It is even possible that the size of the ex ante deficit might increase if the value of the decline in exports exceeds the international value of the increase in import-competing production. Some of the most distinguished advocates . . . of import-substitution have recently conceded that it does not provide a solution to balance of payments problems on more pragmatic grounds [15, p. 15].

Thus, whether the U.S. trade balance will improve as a result of protecting steel is ambiguous.

As with the employment question, the steel trade deficit must be addressed on a more fundamental level. The balance of payments deficit is an economywide problem not limited to steel, and the appropriate question is: Should tariffs and quotas be utilized to correct these deficits?

The answer is no. Using quotas and tariffs to control deficits is tantamount to exchange controls. Exchange controls result in misallocation of resources compared with full convertibility of the dollar. As Krueger's summary has stated:

> most economists agree that exchange control systems are far inferior to either system of full convertibility. . . . The basis for rejection of exchange control is the high welfare cost of the system. . . . [S]uch regimes result in resource misallocation, and probably lead to dynamic inefficiencies as well [15, p. 16].

National Defense. To the extent that there is a legitimate national defense need for a domestic steel industry, Government protection of the industry may be required. It is argued in this study that (with respect to supply shortages) the economic gains, losses, and risks of relying on foreign steel are expropriated or borne by the individual firms. This means that all costs are internalized, and Government intervention would misallocate resources compared to an optimal private market allocation. 23/

23/ Nichols and Zeckhauser [17] argue that, in general, the presence of an international cartel indicates that a positive stockpile for a consuming nation is usually optimal. The benefits of stockpiling cannot be limited to the individuals who have stockpiled; thus, all costs and benefits are not internalized. Since the United States is a major steel producing nation and the world steel industry is not an overt cartel,
(Footnote continued on next page)

National defense is a benefit enjoyed by all, independent of their contributions to it; i.e., those firms which buy foreign steel, those firms which buy domestic steel, and those who buy no steel share the national defense benefits of domestic purchases. Thus, national defense benefits are not internalized and Government intervention may be indicated. The problems are: (a) to assess accurately any potentially unmet national security needs; and (b) if such needs exist, to determine the appropriate Government policy.

With regard to national security, the U.S. has a large domestic steel industry which should continue to meet the largest portion of national security needs. The domestic industry is supplying over 84 percent of domestic consumption. In addition, those countries from which the U.S. is importing

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23/ (Footnote continued from preceding page)

it does not appear that the hypotheses of the Nichols and Zeckhauser model are satisfied in the steel industry. In any event, their model would call for stockpiling, not for quotas or tariffs.

Borrowing may be necessary to rely on foreign or domestic supplies of steel; thus some may consider "imperfections in the capital market" a potential reservation to the private market determination of foreign steel dependence. There is no reason to believe, however, that steel purchasers would pay rates of interest that differ from those paid by other potential borrowers in a similar risk class; i.e., capital market "imperfections" do not apply to steel purchases. Moreover to the extent there were such imperfections, there is no reason to believe that there would be systematic discrimination against those firms that desire to purchase domestic versus foreign (or foreign versus domestic) steel.

the largest amounts of steel (Japan, West Germany, and Canada) [2, pp. 46, 47] are among its strongest allies, and should be considered reliable suppliers. Moreover, any possible foreign inclination to exert political pressure by means of steel embargo (and our concern about it) should be tempered by the realization that foreign supply could be replaced within three to five years (the length of time required to build a new steel plant).

In table 8.3 data are presented on imports and domestic shipments of steel mill products. In view of domestic shipments in 1973 and 1974, it is apparent that since 1975, idle capacity in the U.S. has exceeded imports. It appears that defense and essential civilian requirements were met in each of the last four years. Thus, in the event that access to imports were impaired, there is sufficient domestic capacity available to meet domestic needs. In short, interrupted foreign supply could be replaced, albeit at somewhat higher cost, quite quickly. If, in the future, the U.S. steel industry declines, then it may become necessary to re-evaluate the national security need for a domestic steel industry. At this time, however, national security does not appear to represent a reason for trade protection.

TABLE 8.3

Imports and Domestic Shipments
of Finished Steel Products: 1973-76
(Millions of net tons)

	1976	1975	1974	1973
Imports	14	12	16	15
Domestic shipments	89	80	109	111

Source: American Iron and Steel Institute, Annual Statistical Report, 1976, p. 30 and p. 45.

Summarizing all this, we note that:

> . . . in the opinion of the Office of Emergency Preparedness, it does not appear likely that steel imports have reached such levels as to threaten the impairment of national security. Based on available information, the domestic steel capacity as a whole appears to be more than sufficient to meet emergency defense and essential civilian requirements [20, p. 80].

Moreover, steel is produced from an exhaustible resource: iron ore. A larger domestic industry today would use up high quality domestic reserves more rapidly. This would leave the poorer quality and higher cost taconite reserves to be mined in the future. In the event of a future emergency, the United States would be forced to produce steel at a higher cost than if it had a smaller industry today. 24/

24/ The U.S. experience with oil is a case in point. Quotas on imported oil were in effect for the stated purpose of having a larger domestic industry in the event of a military emergency. If oil imports had not been restricted, then when the embargo of 1973 was implemented, the U.S. would have had larger domestic reserves.

In citing the national defense needs for steel, discussions typically focus on specialty steel. 25/ The military dependence on carbon steel is nowhere near as great. Specialty steel comprises approximately 10 percent of domestic industry shipments [2, pp. 30, 31]. Thus, whatever national defense argument there is that can be mounted, it does not extend forcefully to the 90 percent of the industry which produces carbon steel.

Based on these arguments, it appears that present levels of steel production and capacity are generally adequate to meet our national defense needs. However, if an additional national defense need is determined in the future, would trade protection be part of an optimal policy? It seems the answer is no, because tariffs or quotas amount simultaneously to a subsidy for producers and a tax on consumers. 26/ Raising the price to consumers would inefficiently discourage the consumption of steel; and this is not a desirable goal. Rather, it seems that stockpiling of steel would be indicated first, followed by direct subsidies to the domestic industry.

25/ See [28, pp. 246, 247] and [3, p. 17]. Currently quotas are in effect on imports of specialty steel products.

26/ Bhagwati [4] has shown that the optimal policy variables are those which effect the target variable most directly.

The Impact of "Orderly Marketing Agreements"

In recent years there has been a trend in international trade toward employing "orderly marketing agreements" (OMA's) or "voluntary restraint agreements" (VRA's). Inasmuch as OMA's or VRA's impose quantitative restrictions on imports, it should be understood that they are quotas. These OMA's are an especially undesirable form of trade restriction in two respects: (1) Since they are "voluntary," the international prohibitions on nontariff barriers are circumvented; and (2) they are more costly to consumers and impose more deadweight efficiency losses on the economy than "equivalent" tariffs.

With respect to the first point, the post World War II philosophy was that quotas should not be employed as a means of regulating international trade. This philosophy was reflected in the basic rules of the GATT. 27/ The fact that OMA's are "voluntarily" imposed by the exporter (partly for fear of mandatory controls) allows the GATT to be circumvented.

With respect to the second point, this study employs Corden's [6] terminology and refers to an "equivalent" tariff as that tariff rate which allows the same amount of imports as the quota. Assuming there is no change in the structure and conduct of the domestic industry, the quota allotment is added to the domestic supply curve to yield the total supply to the

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27/ See [20, p. 2] and Robert E. Baldwin, Nontariff Distortions in International Trade, Washington, D.C.: The Brookings Institution, 1970, p. 175.

domestic market; prices will rise by an amount equal to the price rise under the equivalent tariff. However, revenue which would go to the U.S. Treasury under a tariff is converted into profits. Under an OMA, the exporters, in cooperation with their governments, self-regulate their exports. The result is the same as an export cartel, enabling the exporters to extract as profits for themselves what would otherwise have been tariff revenue. In fact, profits of the exporters may increase after the imposition of an OMA; thus, it is not surprising that exporters often offer to negotiate an OMA. <u>This expropriation of tariff revenue as profits is a deadweight inefficiency loss for the domestic economy that is an addition to the deadweight losses imposed by the tariff.</u>

Utilizing the estimates in the appendix to this chapter, these differences are summarized in table 8.4. It is estimated that a rise of 3.5 percent in tarrif rates would limit imports and raise prices by an amount equal to the 12 percent quota. Both the quota and the equivalent tariff yield an annual cost to consumers of approximately $1 billion. However, the quota has the effect of transferring $121 million from the U.S. Treasury (in lost tariff revenues) to foreign exporters (in monopoly profits). With the tariff, only 5.6 percent of what consumers lose is lost to the domestic economy through inefficient resource allocations; i.e., the remainder is transferred to producers and taxpayers in the domestic economy. However, with the quota, 17.6 percent of what consumers lose is also lost to the domestic economy.

TABLE 8.4

Summary of the Estimated Annual Effects of an Orderly Marketing Agreement, Reference Prices, and an "Equivalent Tariff." a/

(Millions of dollars)

	Impact of 12 percent quota (OMA) with existing tariff	Impact of a $322 reference price with existing tariff	Impact of an increase in tariffs by 3.5 percent
Costs to consumers	1,003.9	1,003.9	1,003.9
Inefficiency costs due to resource mis-allocation	177.0	177.0	56.0
Gains to domestic producers	868.5	868.5	868.5
Monopoly profits accruing to foreign exporters	121.0	121.0	0.0
Changes in tariff revenue	-41.6	-41.6	79.4
Increase in the price of steel (in dollars per net ton)	11.0	11.0	11.0

a/ The estimates are based on 1976 data.

Source: Federal Trade Commission, Bureau of Economics.

An additional matter of concern is the impact of quotas on the structure and conduct of the domestic industry. Under quotas the domestic industry faces a residual demand curve, which is equal to the market demand curve minus the quota allotment. Imports in no way affect the residual demand curve. Facing the residual demand and marginal revenue curves, the domestic industry could increase its profits by restricting output below the competitive level. In fact, chapter 4 has concluded that price competition in the domestic industry would be adversely affected by a quota. Thus, prices would be expected to rise above those induced by the equivalent tariff. (This effect has been ignored in the estimates of table 8.4).

It has been shown by W.M. Corden [6] that, depending on the elasticities, the cartel output restriction can be greater than the amount by which imports decline. In that event, <u>a decline in domestic output and employment</u> is the paradoxical result of the quota. Even if this paradox is not achieved, a quota is likely to lead to lower domestic output and employment and higher prices and costs to consumers than would an equivalent tariff.

OMA's appear to be an especially undesirable form of trade restriction. They are particularly costly to the domestic economy, and they circumvent international prohibitions on nontariff barriers to trade.

Reference (or Minimum) Prices

A relatively new policy instrument has entered the international steel trade policy debate: reference, or minimum, prices. This instrument would establish a minimum price, and imports below this price would be prohibited via the rapid imposition of tariffs.

The minimum price would, in principle, reflect the costs of producing steel products and delivering them to the United States. A different minimum price might exist for different parts of the world. Reference prices have a number of problems, however, which are so severe that they should be viewed as more harmful to the U.S. economy than "equivalent tariffs."

A reference price can be established which, in principle, will yield the same market price and volume of imports as a tariff. This study estimates that immediate costs to consumers of a $322 reference price is about $1 billion annually. 28/ These and other estimated effects of reference prices are summarized in table 8.4. This reference price is inferior to the equivalent tariff in four important respects: (1) Revenues which could have gone to the U.S. Treasury in the form of tariffs are expropriated by foreign producers as profits; (2) reference prices have a lack of flexibility that discourages socially

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28/ In terms of the model in this chapter's appendix, a reference price of $322 in 1976 would have resulted in the same import restriction and market price increase as a 3.5 percent tariff.

optimal price flexibility over the business cycle; (3) problems with the proper administration, estimation and monitoring of reference prices are enormous (and will increase the costs of Federal bureaucracy); and (4) reference prices may circumvent the checks and balances of both the U.S. Congress and the international negotiations for trade liberalization. Each of these four points will be discussed in turn.

The unilateral imposition by the U.S. Treasury of a minimum price for steel imports effectively compels foreign steel producers to act as if they were a steel export cartel. Just as OPEC (collusively) establishes a minimum price for oil exports (expropriating the profits), reference price action by the U.S. Treasury compels steel exporters to charge a minimum price; to the extent that the Treasury price exceeds what the exporter would have charged, the exporter expropriates the higher profits on its sales. Tariffs can be raised such that the price of foreign steel equals the reference price; rather than being expropriated by foreign exporters, the U.S. Treasury, however, would obtain these additional tariff revenues. Thus, as with OMA's, it is not surprising to find foreign producers receptive to the imposition of reference prices at cartel, profit increasing levels. 29/

29/ Both Viscount Etienne Davignon (steel spokesman for the European Community) and Wilhelm Haferkamp (the European Commission's vice president for external affairs) confirmed that Europe is receptive to minimum prices for imports. See "U.S., Europeans Hopeful of Steel Settlement Soon," The Washington Post, Nov. 10, 1977, pp. B1, B2.

With respect to the second point, this chapter has argued at length that pricing at marginal costs over business cycles is generally reflective of social optimality and efficiency. 30/ Thus, socially efficient pricing requires that prices rise in booms and fall in recessions, (reflecting marginal operating plus marginal capacity costs during booms but only marginal operating costs during recessions). An administrative decision is required to lower the reference prices during business recessions (to cover only marginal operating costs). It is during recessions, however, that the domestic steel industry's pressure to raise reference prices would be the greatest. The fact that reference prices are being considered during the current recession is evidence of their inherent inflexibility. 31/ Compared to tariffs, the lack of flexibility in reference prices is (in the view of the authors) a severe shortcoming.

The proper administration, estimation, and monitoring of reference prices present enormous problems. To adjust reference prices, in a cyclically flexible manner, requires a knowledge of what costs are variable and what are fixed. This study has

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30/ See the section on supply scarcities.

31/ The decision of the U.S. Treasury in the Gilmore Steel case reflects this inflexibility. There it was required that prices cover average costs over the business cycle rather than marginal costs at different periods of the cycle. The resulting duties have virtually halted all plate imports. See Department of the Treasury, Office of the Secretary, "Carbon Steel Plate From Japan: Anti Dumping, Withholding of Appraisement Notice," Sept. 30, 1977, p.6.

shown (in chapter 4) that a portion of those costs often considered variable (labor and materials), are fixed over 3- to 5-year periods. For socially efficient pricing, only variable costs should be covered during recessions; thus efficient reference price setting requires repeated estimation of variable and total costs. 32/ Moreover, the principle behind reference prices is that costs be covered by prices. There is considerable variation around the world, however, in the costs of producing steel products; thus it is necessary to estimate costs for many products in various parts of the world to establish reference prices. The repeated estimation of variable and total costs for many products and countries around the world is a complicated and difficult undertaking that would require a costly expansion of U.S. Treasury capability. Moreover, references prices establish cartel-like prices above those which the market would have permitted. As with any cartel, its participants will have an incentive to cheat. In this case, however, the cartel participants are steel exporters and cheating means selling below the reference price. One would expect that a variety of quasi-legal kickback devices would emerge. As the U.S. Treasury would be called upon to monitor reference prices, a further bureaucratic expansion would be required.

32/ In fact, an estimation of demand conditions in the exporters home country is also required to determine which costs should be efficiently covered.

With respect to point (4), the basic post-World War II trend in the GATT negotiations has been toward trade liberalization; the United States has been a leader in that endeavor. While some doubt remains, it appears that reference prices do not come under the jurisdiction of the GATT negotiations. 33/ Thus, like OMA's, but unlike tariffs, reference prices may circumvent the international negotiations for trade liberalization. Moreover, it is possible that reference prices could be implemented without Congressional approval (in the steel industry as well as others). Despite the fact that a considerable revision in the protection afforded U.S. industries might be accomplished through reference prices, the checks and balances of Congressional authorization might be circumvented.

Thus, like OMA's, reference prices are particularly costly to the domestic economy and they circumvent international negotiations on trade barriers. In addition, they have a lack of flexibility that discourages socially efficient price changes over the business cycle, and there are associated costs of administration.

Conclusions

The arguments for free trade and protection in the steel market have been examined. The overwhelming and compelling

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33/ A GATT panel investigated whether reference prices would be covered under Article 16 of the GATT, and it concluded negatively. It is possible, however, that reference prices are included under Article 6 of the GATT. See John Jackson, World Trade and the Law of GATT, Indianapolis: Bobbs and Merrill, 1969.

argument for free trade is that it permits a higher standard of living for those countries involved. This study estimated the incremental cost to consumers of a 12 percent quota, or an additional 3.5 percent tariff, or a $322 reference (or minimum) price, is about $1 billion per year. If tariffs on carbon steel mill products were not in effect, the cost of the 12 percent quota would be about $2.5 billion per year.

Against the advantage of unrestricted trade, a number of objections have been raised. These objections--alleged unemployment, supply shortages, balance of payments difficulties, and unmet national defense needs--have been examined in detail. The result of the analysis is that none of these objections appears to constitute a valid reason for protection of the domestic steel market; thus, liberalization of trade restrictions is recommended. In addition, it was observed that Government price controls might lead to supply shortages and therefore are not recommended.

It was shown that orderly marketing agreements (OMA's) represent a form of quota restriction. OMA's are an especially undesirable form of trade restriction: They are more costly to the U.S. economy than equivalent tariffs; and since they have the appearance of being voluntary, they circumvent international prohibitions on nontariff barriers to trade. Under OMA's, existing and potential tariff revenues lost to the U.S. Treasury are expropriated by foreign exporters of carbon steel mill products. Moreover, the quotas introduce the risk that domestic producers (freed from import competition) will raise prices in a cartel-like fashion. Then prices and costs to consumers would be higher and employment lower than with an equivalent tariff. Thus, quotas or OMA's are an especially inefficient and costly form of protection.

Like OMA's, reference prices are a relatively costly form of trade restriction; they impose relatively high inefficiency waste costs on the U.S. economy and they avoid international negotiations on trade barriers. Additional disadvantages of reference prices are that their lack of flexibility discourages socially efficient price changes over the business cycle and they are likely to be costly to administer.

Among the various instruments which limit trade (tariffs, reference prices, quotas, and orderly marketing agreements), a sufficiently restrictive level can be chosen for any one of these such that its application is more costly to the U.S. economy than a less restrictive application of the other instruments. If, however, trade protection is to be instituted, tariffs seem to be the superior instrument. A tariff is capable of yielding a given level of protection for producers at a cost lower than that associated with the other instruments. An increase in tariffs of just 3.5 percent, however, was estimated to cost consumers approximately $1 billion annually; thus, the optimal policy is no trade protection.

APPENDIX 8

Methodology and Data for Estimation of the Costs of Import Protection for Carbon Steel Mill Products

The methodology employed to estimate the costs of protecting carbon steel mill products was originally developed by Corden [7]. It was employed by Magee [18] to estimate the benefits of removing restrictions on U.S. trade in general, and it has been applied to many individual industries. 1/

In figure 8A.1 the basic model is presented. The domestic demand curve for steel is assumed to have a price elasticity of -.25. Jondrow et al. [13] have estimated the price elasticity of demand at -.281. Rowley [23] reports estimates of steel's price elasticity of demand between -.1 and -.3. Thus, the assumption of -.25 is consistent with these earlier estimates.

The supply curve of the domestic producers, Sd, is assumed to have an elasticity of .6. This is more than twice the negative of the demand elasticity. There is evidence that supply elasticities considerably exceed demand elasticities, and that in the long run a supply elasticity of

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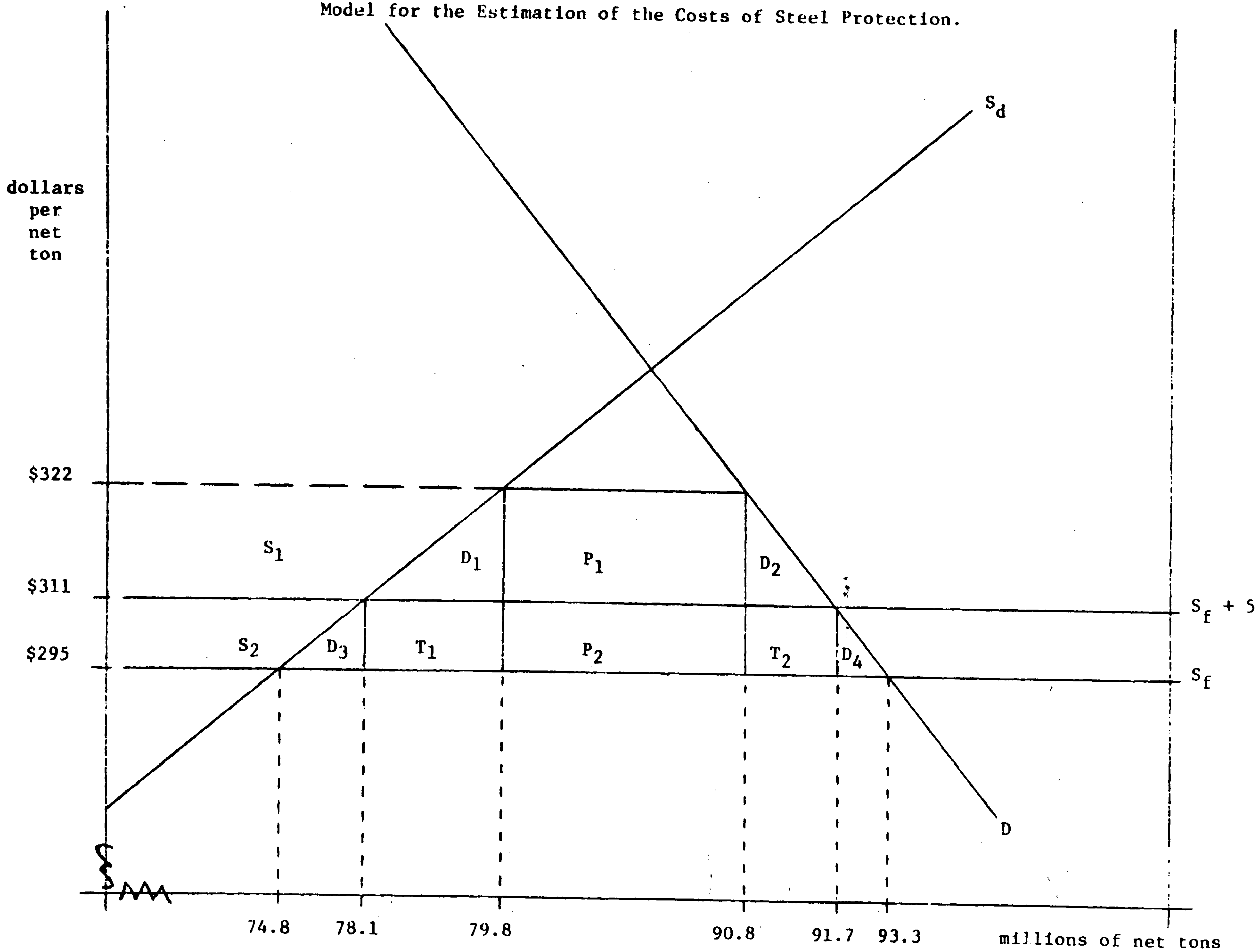
1/ See, for example, [27] and [13] for application of this method to the television and steel industries, respectively. The theoretical extension to producers' goods was made by Schmalensee [25].

Figure 9A.1

Model for the Estimation of the Costs of Steel Protection.



Source: Federal Trade Commission, Bureau of Economics.

.6 is too low. 2/ The estimate of .6 is a shortrun estimate, reflecting an average for peak and non-peak periods in the business cycle. The foreign supply curve, S_f, is assumed to have infinite elasticity.

The average price of carbon steel mill products was obtained for 1975 from Current Industrial Reports. 3/ A weighted average of 18 carbon steel mill products was taken; every carbon steel mill product with at least one million tons of intercompany shipments was included in the sample. The price of $311 for 1976 was obtained by inflating the 1975 price, using the Bureau of Labor Statistics index of steel mill products prices.

Data on apparent consumption of carbon steel mill products and on imports of steel mill products are available from AISI. 4/ Apparent consumption of these products was 91.7 million net tons in 1976, and imports were 13.6 million net tons.

2/ See: J. Wemelsfedler, "The Short Term Effect of Lowering of Import Duties in Germany," Economic Journal, vol. 70, March 1970, pp. 94-104; Harry G. Johnson, "Factor Market Distortions and the Shape of the Transformation Curve," Econometrica, vol. 34, July 1966, pp. 686-698; and A. A. Walters, "Production and Cost Functions: an Econometric Survey," Econometrica, vol. 31, January-April 1963, pp. 1-66.

3/ U.S. Dept. of Commerce, Bureau of the Census, Current Industrial Reports: Steel Mill Products, 1975, p. 7.

4/ American Iron and Steel Institute, Annual Statistical Report, 1976, tables 14, 17, and 21. In tables 17 and 21, AISI groups exports and imports into a "steel mill products" category and a more inclusive category called "total steel products." In table 14, however, only the "total steel products" category exists and these data correspond to the "steel mill products" category of tables 17 and 21. This study is using the expression "carbon steel mill products" to refer to the group of products AISI lists under this title in tables 17 and 21.

Since the domestic price is \$311, the foreign supply curve is assumed to be perfectly elastic at \$295. The difference reflects the 5 percent tariff. 5/

In table 8A.1 the calculations of the relevant areas of figure 8A.1 are presented. "Consumers' surplus" is used as the measure of consumer gains and losses. 6/ Thus, from figure 8A.1 the area $S_1+D_1+P_1+D_2$ equals the incremental costs to consumers of a 12 percent quota with the existing tariff. The amount $S_2+D_3+T_1+P_2+T_2+D_4$ would have to be added to $S_1+D_1+P_1+D_2$ to yield the costs to consumers of a 12 percent quota with no tariff.

The inefficiency costs of a 12 percent quota or \$322 minimum price for imports, in terms of resource misallocation ("deadweight inefficiency costs") with and without existing tariffs, are the areas $D_1+P_1+D_2+T_1+T_2$ and $D_1+D_2+D_3+D_4+P_1+P_2+T_1+T_2$, respectively. The gains to domestic producers of a 12 percent quota (or \$322 minimum price) with and without existing tariffs are the areas S_1 and S_1+S_2, respectively.

Monopoly profits accruing to foreign exporters from a 12 percent quota or \$322 minimum price are the areas P_1 with existing tariffs, and P_1+P_2 with no tariff. This estimate makes the most likely assumption that the exporters will be called upon

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5/ Data from Current Industrial Reports reveal that import duties were 4.8 percent of the value of carbon steel imports in 1975.

6/ See the above-mentioned articles [7], [13], [18], [25], and [27] for further justification and details of this approach.

TABLE 8A.1

Estimated Values of the Relevant

Areas in Figure 8A.1
(Millions of dollars)

P_1	=	121.0
P_2	=	176.0
T_1	=	27.2
T_2	=	14.4
D_1	=	9.4
D_2	=	5.0
D_3	=	18.4
D_4	=	12.8
S_1	=	868.5
S_2	=	1,215.2

Source: Federal Trade Commission, Bureau of Economics.

to monitor exports in order to comply with the quota. In that event, it is the exporters who extract the profits. An alternative would be restrictive licensing of domestic importers of steel. 7/ Then with monopoly power, the domestic importers will extract the profits. If such licenses are auctioned by the U.S. Government, the U.S. Treasury will reap these amounts. Either of the latter alternatives will reduce deadweight losses to the U.S. economy by the amounts of the monopoly profits accruing to foreign exporters. With respect to reference prices, the monopoly profits estimate is unambiguous.

Tariff revenues which will be lost with a quota or reference price are the areas $T_1 T_2$ with existing tariffs and $T_1+T_2+P_2$ with no tariff.

In calculating table 8A.1 it is necessary to observe that the area P_2 will remain as tariff revenue, and $P_1 + P_2$ will be the tariff revenue with an additional equivalent tariff. Thus, $P_1-T_1-T_2$ is the change in tariff revenue after a new equivalent tariff, and $D_1+D_2+T_1+T_2$ is the inefficiency costs of the equivalent tariff.

7/ An example is the system of importing oil into the U.S. in the 1960's.

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