

THE EFFECTS OF THE STEEL VOLUNTARY RESTRAINT AGREEMENTS ON U.S. STEEL-CONSUMING INDUSTRIES

Report to the Subcommittee on
Trade of the House Committee
on Ways and Means on
Investigation No. 332-270
Under Section 332 of the
Tariff Act of 1930

USITC PUBLICATION 2182

MAY 1989

United States International Trade Commission
Washington, DC 20436



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This report was prepared principally by

Gerald C. Berg, Project Leader

Hugh Arce and Andrew Parks,
Office of Economics

and

James Brandon, Richard Brown, Nancy Fulcher,
Georgia Jackson, Juanita Kavalasuskas, Karen Laney-Cummings,
Alison Lippa, Mark Paulson, and Lena Shapiro
Office of Industries

with assistance from

Peter Avery,
Office of Industries

Address all communications to
Kenneth R. Mason, Secretary to the Commission
United States International Trade Commission
Washington, DC 20436

PREFACE

On February 27, 1989, at the request of the Subcommittee on Trade of the Committee on Ways and Means of the U.S. House of Representatives (see appendix A), and in accordance with section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)), the United States International Trade Commission instituted Investigation No. 332-270, "The Effects of the Steel Voluntary Restraint Agreements on U.S. Steel-Consuming Industries." This report on the Commission's study contains estimates of the effects of VRAs on exports, imports, and domestic sales of major U.S. steel consuming industries for each of the years 1985 through 1988, an analysis of the likely effects of continuing these restraints in the future, and an analysis of other economic effects focusing on the following industries: automotive, construction, agricultural equipment, construction equipment, major household appliances, forging, and metal stamping.

Public notice of this investigation was given in the *Federal Register* of March 2, 1989 (54 F.R. 8835) and by posting copies of the notice in the Office of the Secretary, U.S. International Trade Commission, Washington, DC.

A public hearing in connection with this investigation was held in the Commission's hearing room on March 10, 1989. The calendar of witnesses who testified at the hearing appears in appendix B.

Information contained in this report was obtained from testimony at the hearing, written submissions from the public, fieldwork, the Commission's files, other Government agencies, and other sources.

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Executive Summary

Steel imports into the United States are currently restricted by "voluntary restraint agreements" (VRAs) with 19 major supplying nations and the European Community (EC).¹ By limiting steel imports, VRAs raise the price of steel in the U.S. market, which benefits the steel industry but raises production costs for steel-consuming industries.²

In this report, the Commission provides (1) estimates of the effects of the VRAs during 1985-88 on exports, imports, and domestic sales in steel-consuming industries in the United States,^{3,4} (2) an analysis of the likely future effects if the VRAs are extended in their current form, and (3) an analysis of other effects of the VRAs, focusing on seven major steel-consuming industries.

Effects of VRAs on Exports, Imports, and Domestic Sales, 1985-88

The Commission estimated the effects of the VRAs on exports, imports, and domestic sales of U.S. steel-consuming industries in three stages. First, estimates were made of the percentage increases in steel prices in the United States resulting from VRAs, based on the apparent decrease in steel imports. Second, the average price increase was used to estimate increases in production costs and product prices for U.S. steel-consuming industries. Third, estimates were made of the effects of these increases on exports, imports, and domestic sales.

The Commission made these estimates for the 79 industries in the Department of Commerce's input-output model of the U.S. economy, all of which use steel either directly or indirectly, for each year from 1985 to 1988. Following are the estimated effects on steel prices and on exports and imports in steel-consuming industries in 1986 dollars.

Steel prices—The VRAs caused increases in the prices of imported steel in the United States that averaged 1.7 percent in 1985, 4.3 percent in 1986, 4.2 percent in 1987, and 0.5 percent in 1988. The VRAs caused increases in prices of domestically produced steel that averaged 0.2 percent in 1985, 0.5 percent in 1986 and 1987, and 0.1 percent in 1988. The weighted-average increases in the prices of imported and domestic steel caused by VRAs were 0.6 percent in 1985, 1.6 percent in 1986, 1.4 percent in 1987, and 0.2 percent in 1988.

Exports—The VRAs caused U.S. exports in steel-consuming industries to decrease by \$258 million in 1985, \$673 million in 1986, \$699 million in 1987, and \$95 million in 1988.

Imports—The VRAs caused U.S. imports in steel-consuming industries to increase by \$332 million in 1985, \$992 million in 1986, \$964 million in 1987, and \$117 million in 1988.

The effect that the VRAs have had on domestic sales in each steel-consuming industry is the sum of sales lost to imports and sales lost because of reduced overall domestic purchases caused by higher prices. The total effect that the VRAs have had on sales in these industries is the sum of the effects on domestic sales and exports.

¹ Besides the EC, countries covered by VRAs include Australia, Austria, Brazil, Czechoslovakia, East Germany, Finland, Hungary, Japan, Mexico, the People's Republic of China, Poland, Portugal, Romania, South Africa, South Korea, Spain, Trinidad and Tobago, Venezuela, and Yugoslavia. Portugal and Spain are not included in the agreement with the EC.

² In this report, statements that the VRAs "raise" or "increase" the price of steel mean that VRAs cause the price to be higher than it would have been in the absence of VRAs.

³ The methodology used to estimate these effects was developed by the Commission for its 1985 study of the effects of steel VRAs (Inv. No. 332-214, *The Effects of Restraining U.S. Steel Imports on the Exports of Selected Steel-Consuming Industries*, USITC Publication 1788, December 1985). The application of the methodology to the present study was made with the assistance of Associate Professor Jose A. Mendez of Arizona State University, a former Commission employee and the primary author of the earlier report. All major decisions were made in close collaboration with, and cleared by, the Commission staff.

⁴ Commissioner Eckes approves the release of this report, but considers it unsound policy to represent the conclusions of this study as the product of the Commission. He notes that the estimates were made by an outside contractor in cooperation with Commission staff.

Following are the estimated VRA effects on domestic sales and total sales in steel-consuming industries in 1986 dollars.

Domestic sales—If the elasticity of U.S. demand facing the steel-consuming industries was zero, the VRAs would have caused domestic sales of each of these industries to decline by exactly the same amount that imports increased. If the elasticity was one, the VRAs would have caused domestic sales of these industries to decline by \$1,665 million in 1985, \$4,397 million in 1986, \$4,106 million in 1987, and \$478 million in 1988.

Total sales—If the elasticity of U.S. demand facing steel-consuming products was zero, the VRAs would have caused total sales of these industries to decline by \$591 million in 1985, \$1,665 million in 1986, \$1,663 million in 1987, and \$212 million in 1988. If the elasticity was one, the VRAs would have caused total sales to decline by \$1,924 million, \$5,070 million, \$4,806 million, and \$573 million in the same years, respectively.

Because of an upward bias in the methodology, the Commission's estimates of the effects of the VRAs should be interpreted as "upper bounds." The upward bias is greater for the estimates for 1986 than for 1985 and greater still for 1987 because of the progressive depreciation of the dollar. The effects of the VRAs in 1987, in particular, might have been significantly less than those estimated.

Probable Future Effects

On the basis of recent trends in steel consumption and steel imports in the United States and the assumption that imports from VRA and non-VRA countries will grow at the same rate, the Commission projected VRA limits if the VRAs are extended in their current form and the year in which the VRAs will become generally binding again. If imports grow at an annual rate of 1.1 percent, which was their average rate of growth during 1971-87, the VRAs will not become generally binding again until 1997. If imports grow at a rate of 3.7 percent, which they did during 1980-84, the VRAs will become generally binding in 1990. If imports decline at an annual rate of 0.9 percent, as during 1971-75, VRAs will never become generally binding again.

The growth rate of steel imports in the future will depend largely on the dollar exchange rate and on domestic and world economic conditions. If and when the VRAs become generally binding again, they will have greater effects on the exports, imports, and domestic sales of steel-consuming industries than they now have.

Other Effects of VRAs

The Commission investigated the automotive, construction (fabricated structural steel), agricultural equipment, construction equipment, major household appliance, forging, and metal-stamping industries. A description of the structure, recent performance, and trade patterns is provided for each of these industries as well as an analysis of the effects of the VRAs on the price, quality, and supply of steel products available to them, and on their competitiveness. Opinions of industry spokesmen about extension of the VRA program are also given. The Commission also analyzed information received from industries other than these seven.

The prices of steel used by the seven industries decreased in 1985 and 1986 but increased in 1987 and 1988. Industry representatives were not sure of the extent to which VRAs caused the recent price increases. Significant changes in the world economy and in steel markets since the VRAs have been in effect make it difficult to assess the effects of the VRAs alone. These changes include the substantial depreciation of the dollar since 1985 and increased demand for steel worldwide.

The recent increases in steel prices have been distributed unevenly among categories of customers. Price increases were not as great for large steel purchasers as for small ones, apparently because the larger purchasers buy a great deal of their steel through long-term contracts with prices set for the duration of the contract and smaller purchasers generally buy steel in spot transactions. Spot prices are more volatile than contract prices and increased faster in 1987 and 1988.

The Commission received contradictory information about product quality from steel purchasers. Quality problems reportedly led to increased costs for some steel-consumers. Smaller steel purchasers reported quality problems more often than larger ones.

Steel became less readily available in 1987 and 1988 as demand increased. Besides raising prices, many U.S. producers rationed available supplies by lengthening lead times for delivery and imposing limitations on tonnage. Many purchasers perceived this as a "shortage" because they could not buy all they wanted at the market price and obtain timely deliveries. Some evidence suggests that the perception of a shortage of steel may itself have led to increased demand which made steel more difficult to obtain for a time.

Some steel consumers reported that they lost sales as a result of poor steel quality and insufficient supply.

Spokesmen for the agricultural equipment, construction equipment, major household appliance, forging, and metal-stamping industries generally oppose extension of the VRAs, although there are some exceptions in the first three industries. Spokesmen for the construction (fabricated structural steel) industry, which is itself covered by the VRAs, favor extension. In the automotive industry, only Chrysler expressed a preference one way or the other, and it favors extension. If the VRAs are extended, many believe they should be modified to allow greater flexibility in periods of unusual scarcity.

Among spokesmen from industries besides the seven who expressed their views to the Commission, nearly all who said that the VRAs have had beneficial effects and favor extension are covered by the VRAs. Spokesmen who indicated adverse effects and oppose extension include some from industries that are protected by the VRAs and some that are not.

Other Information in This Report

This report also provides background information on the production and utilization of steel in the United States, a description of the VRA program, and arguments that have been made in favor of and in opposition to extension of the program.

Chapter 1

Introduction

The Purpose and Scope of This Study

Steel imports into the United States are currently limited by "voluntary restraint agreements" (VRAs) with most major foreign suppliers. When the limits set by the VRAs are binding, they reduce the supply of steel in the United States and thereby increase steel prices. Increased steel prices benefit the U.S. steel industry but harm other U.S. industries that use steel as an input in production.

The purpose of this study is to evaluate the effects of the steel VRAs on steel-consuming industries in the United States. The Commission provides estimates of the effects of these VRAs on the exports, imports, and domestic sales of steel-consuming industries during 1985-88 and projections of the likely future effects if the VRAs are extended in their current form. These estimates are made using the method developed by the Commission in its study of the effects of steel VRAs in 1985.¹ A detailed explanation of this methodology is provided in appendix D.

This report also provides an analysis of other effects of the VRAs focusing on seven major steel-consuming industries, namely: automotive, construction, agricultural equipment, construction equipment, major household appliances, forging, and metal stamping.

Background

Having been among the world's technological leaders and a major steel producer and exporter for more than half a century, the United States became a net importer of steel in 1959, the year of a 4-month strike by steelworkers. Imports captured increasing shares of the U.S. market in the 1960s, reaching 16.7 percent in 1968.² In that year, the United States Government negotiated limits on imports of certain steel products from Japan and six European nations. Import restrictions of some kind have been in force for most of the two decades since the implementation of those agreements in 1969 and have expanded to include more products and other foreign suppliers.

The Product

Steel is a generic term for a variety of iron-carbon alloys. Variations in the composition of elements in steel products result in variations in such properties as hardness,

strength, and resistance to corrosion, but in all cases the primary element in terms of weight is iron. Steel is often categorized as either carbon or alloy. Two important grades of alloy steel are stainless and tool, which are collectively referred to as "specialty" steels. Steel products are classified by their sizes and shapes and by whether they will be processed into other steel products before being used. For the purposes of the this study, semifinished steel products include ingots, blooms and billets, and slabs. Finished steel products include sheets and strips, plates, bars, wire rod, wire and wire products, rails and accessories, and pipes and tubes, and structural shapes and units.

Steel products are used either directly or indirectly in the production of nearly all manufactured goods. U.S. apparent consumption of steel was just over 90 million short tons in 1987 or 738 pounds per person. In that year, the United States shipped 76.5 million short tons of steel, which generated sales of \$28.9 billion. The steel industry currently employs 169,000 workers.³

The VRA Program

Following a presidential directive on steel policy issued on September 18, 1984, the U.S. Government negotiated VRAs with 19 supplying nations. Those agreements supplemented the VRA made with the EC in 1982.⁴ The VRAs limit imports of a variety of steel products, with product coverage varying by country. In some cases, the agreement specifies market share limits as a percentage of projected U.S. apparent consumption. In other cases, the agreement sets unchanging quantitative limits. Some countries are subject to both kinds of restrictions for different products. More detailed information on the VRAs, including market share and quantitative limits by country and product coverage by country, is provided in appendix G.

The VRA program is more flexible than many traditional import quotas in three respects. First, the VRA quotas that are based on market shares allow imports to vary with the level of domestic demand. Second, countries that underfill their quotas in one year are often allowed to carry forward at least part of the unused portion to the next year. Both of these provisions enable increased imports in periods of greater scarcity.

³ U.S. International Trade Commission, "Monthly Report on the Status of the Steel Industry," February 1989, USITC Publication 2153, p. 1.

⁴ The VRA with the EC does not apply to Portugal and Spain which were not members of the EC in 1982. Imports from Portugal and Spain are restricted by separate agreements that remained in force after they joined the EC in 1986. Other countries covered by VRAs include Australia, Austria, Brazil, Czechoslovakia, East Germany, Finland, Hungary, Japan, Mexico, the People's Republic of China, Poland, Romania, South Africa, South Korea, Trinidad and Tobago, Venezuela, and Yugoslavia.

¹ USITC Investigation No. 332-214, op. cit.

² U.S. Department of Commerce data as reported in *Annual Statistical Report of the American Iron and Steel Institute*, 1970, p.8.

The third flexibility of the VRA program is that it allows waivers of import limits for products that are found to be in "short supply" in the United States. Petitions for these waivers are usually made by individual companies. If the Department of Commerce approves, it issues the petitioner a license to import the product from a specified foreign supplier in excess of that country's export limit. As of February 7, 1989, 96 short supply waivers had been approved, totaling about 1.4 million tons.¹

The VRAs are scheduled to expire on September 30, 1989. The U.S. Government is currently considering extending them, possibly in a revised form.

The Commission's Study in 1985

At the request of the Senate Finance Committee in 1985, the Commission investigated the probable effects that the steel program would have on the exports of steel-consuming industries.² At that time, most of the VRAs had just been negotiated. The Commission estimated the probable effects by first comparing the restricted import levels for 1985-89 with hypothetical import levels that would have occurred if foreign suppliers had maintained their 1984 market share for finished steel products and if they had reached an estimated import level for semifinished steel products.³ Based on the difference between the actual and hypothetical import levels, the Commission estimated the effects on steel prices and production costs and the consequent effects on sales prices and foreign sales in 79 steel-consuming industries.

The Commission estimated that the steel VRAs would raise steel prices in the United States by an average of 2.9 percent in each year during 1984-89 and that they would reduce exports by \$903 million in 1985 and by progressively greater amounts in the following years up to a reduction of \$5.627 billion in 1989, representing 1.92 percent of U.S. exports.

The Commission also estimated the effects of the VRA with the EC for the two years it had already been in effect, 1983 and 1984.⁴ The Commission estimated that the VRA reduced U.S. exports of steel-using industries by \$189 million in 1983 and by \$402 million in 1984.

¹ A discussion of the flexibility of steel VRAs and its effects is given in David J. Cantor, "Steel Imports: Are the VRA Countries Filling Their Quotas?," Congressional Research Service, Washington, DC, February 1989.

² See USITC Investigation No. 332-214, op. cit.

³ In making its estimates of effects, the Commission did not consider the VRAs with Austria, the People's Republic of China, Portugal, Trinidad and Tobago, and Yugoslavia, which had not been negotiated at that time.

⁴ A slightly different methodology was used. For an explanation see USITC Investigation No. 332-214.

In addition, the Commission analyzed in depth the effects of steel VRAs in four major steel-consuming industries—namely, ball and roller bearings, construction machinery and equipment, pipes and tubes, and steel shipping drums and barrels. In general, the Commission found that VRAs had or probably would increase production costs in these industries and thus tend to decrease exports and encourage capital to move offshore.

The Commission cautioned, however, that its estimates were "worst case" estimates; the actual effects of the VRAs might be smaller. The Commission also noted that it was not possible to take into consideration exchange rate changes that might occur during the study period and that a significant depreciation of the dollar would mitigate the effects of the VRAs. After early 1985, the dollar did depreciate substantially against the currencies of many major steel exporters.

Views on Extension of the VRAs

A wealth of opinions have been expressed in public forums about the wisdom of extending the VRAs.

Arguments for extension

Four main arguments have been advanced for extending the VRA program. The first is that VRAs are an appropriate response to alleged unfair trade practices by foreign suppliers.⁵ This argument has three variants, namely that (1) it would be unfair for the domestic steel producers to have to compete with imports that are being dumped or subsidized, (2) the imposition of VRAs would give U.S. negotiators something to trade in exchange for agreements to mitigate these unfair trade practices by steel exporters, and (3) without VRAs, import penetration will increase enough to injure seriously the U.S. steel industry and such injury would be harmful to U.S. national interests.⁶

The second argument is that the steel industry needs several more years of ensured limits on imports to enable it to continue to modernize and improve efficiency in order to become or remain internationally competitive.⁷

⁵ The Department of Commerce has determined that foreign steel has been dumped in the U.S. market or that its sale has been subsidized in numerous cases in the 1980s involving more than a score of supplying nations.

⁶ See the testimony of James F. Collins and William J. Pendleton to the Commission, Mar. 10, 1989, and written statements to the Commission by Charles O. Verrill, Jr., et. al. on behalf of the Georgetown Steel Corp., Raritan River Steel Co., and certain other producers of carbon steel wire rod, Mar. 17, 1989, and the Maytag Corp., McLean, VA, Mar. 16, 1989.

⁷ Putnam, Hayes & Bartlett, Inc., "Economic Effects of Extending Steel VRAs," prepared for the American Iron and Steel Institute, Washington, DC, February 1989; American Iron and Steel Institute, "White Paper on Steel VRAs," Washington, DC. See also the testimony of Thomas Parkinson, James F. Collins, and Roger Schagrin to the Commission, Mar. 10, 1989.

The third argument is that without the VRAs the domestic steel industry will petition for relief under the U.S. trade laws and that the results would be more costly to both the industry and consumers.¹

The fourth argument, which is largely a rebuttal of arguments made by opponents of extension, is that VRAs have benefited the steel industry and have not caused higher steel prices or otherwise injured steel consumers.²

There are some who advocate extension of VRAs with modifications of their duration, product or country coverage, or other provisions.³

Arguments against extension

The main argument against extending the VRAs is that they generate costs to the economy that exceed their benefits; that is, that the costs to consumers and to steel-consuming industries is greater than the benefits to the steel industry.⁴

¹ Alan W. Wolff, statement before the DC Bar, Mar. 15, 1989. See also the written statement to the Commission by Charles O. Verrill, Jr., et al., op. cit., American Iron and Steel Institute, op. cit.

² Putnam, Hayes & Bartlett, Inc., op. cit. See also the testimony of Roy A. Herman, Paul J. Darling, George Vary, and William J. Pendleton to the Commission, Mar. 10, 1989, and the written statement to the Commission by Charles O. Verrill, Jr., et al., op. cit., and Alan W. Wolff, op. cit.

³ See the statement to the Commission by Andrew G. Sharkey, III, and David S. Sobie, the Steel Service Center Institute, Washington, DC, Mar. 17, 1989.

⁴ See the testimony of Frederick Hall, William C. Lane, and A. L. Leffler to the Commission, Mar. 10, 1989.

Apart from the effect on prices, some observers argue that the VRAs have reduced the quality of steel available to steel users, increased delivery lead times, and in some cases made steel products unavailable altogether.^{5,6}

A second argument is that the U.S. steel industry does not now need protection because depreciation of the dollar and recent improvements in efficiency have made the U.S. steel industry competitive in the world market. Advocates of this argument cite the industry's recent record of profitability and increased steel exports.⁷

A third argument is that if foreign suppliers are engaging in or are benefiting from unfair trade practices, as is alleged, a better policy would be to allow the injured industries to seek relief under U.S. trade laws.⁸

⁵ See the testimony of Patrick Thompson and Anthony J. Rose to the Commission, Mar. 10, 1989, and written statements to the Commission of the Steel Service Center Institute, Washington, DC, Mar. 17, 1989, S.E. Koehle of the Berg Steel Pipe Corp., Panama City, FL, Mar. 17, 1989, the Spring Manufacturers Institute, Inc., Wheeling, IL, Mar. 16, 1989, and Rockwell International Corp./Automotive Operations, Troy MI, Mar. 17, 1989.

⁶ A detailed discussion of the costs of the steel program is provided in "Rebuilding American Manufacturing in the 1990s: the Case Against Steel VRAs," the Stern Group, Inc., Washington, DC, February 1989.

⁷ The Stern Group, Ibid., pp. 42-48.

⁸ Gary Hufbauer, "Trade Policy for Troubled Industries," International Institute of Economics, Washington, DC, March 1986.

Chapter 2

The Effects of VRAs on Exports, Imports and Domestic Sales of U.S. Steel-Consuming Industries

Overview of the Methodology Used to Estimate the Effects in 1985-88 and the Industries Studied

The Commission used a three-part methodology to estimate the effects of the steel VRAs in the years 1985-88 on U.S. exports, imports, and domestic sales. First, estimates were made of the percentage increases in the prices of imported and domestic steel resulting from VRAs. When binding, VRAs raise the prices of both imported and domestic steel by limiting the supply of foreign steel in the U.S. market. A weighted average estimated percentage increase in the price of steel was then calculated. Second, the estimated average increase in the price of steel was converted, using input-output analysis, into estimated increases in production costs and product prices for domestic steel-consuming industries. Input-output analysis permits consideration of both direct and indirect effects of the steel price increase on steel consumers. The direct effect is higher costs for steel inputs; the indirect effect is higher costs for steel-containing products used as inputs. Third, the increases in production costs and product prices were translated into estimated decreases in exports and domestic sales for U.S. industries and estimated increases in imports. To the extent that U.S. industries attempt to cover their production cost increases by raising their product prices, they suffer lost sales as domestic consumers switch to relatively less expensive imports and as foreign consumers reduce their purchases of U.S. exports. U.S. industries suffer additional lost sales to the extent that domestic consumers reduce their total expenditures on the entire product category, whose average price has risen. A detailed description of the methodology is provided in appendix D.

The Commission estimated the effects of steel VRAs for all 79 industries listed in the 1977 U.S. input-output table. Sixty-eight of these industries reportedly made direct purchases of steel products and the remainder used steel indirectly.

Estimated Effects on Steel Prices

The estimated increase in the price of steel in the U.S. market depends on the percentage reduction in the supply of steel exports to the United States by countries subject to the VRAs. To determine this reduction, the Commission assumed that the countries that filled their quotas

would have maintained the share of U.S. apparent consumption that they had just before the VRAs were instituted. The VRA countries' share of U.S. apparent consumption might be expected to have increased because it was increasing at that time but also might be expected to have decreased because of the substantial depreciation of the dollar since 1984, which made imported steel relatively more expensive in the United States. The exchange rate effect is almost certainly the stronger of the two, although it is not certain by how much. Therefore, the Commission believes that assuming constant market share is the most reasonable approach, but one that causes an upward bias in the estimates of the effects of the VRAs on prices and on exports, imports, and domestic sales. Consequently, the estimates of these effects in this report should be interpreted as "upper bounds." The upward bias is greater for the estimates for 1986 than for 1985 and greater still for 1987 because of the progressive depreciation of the dollar. The effects of the VRAs in 1987, in particular, might have been significantly less than those estimated. The bias is probably smaller for 1988 estimates than for 1987 because many countries did not fill their quotas in 1988, thereby mitigating the bias.

Nearly all countries filled their quotas in 1985 and 1986; some did not fill them in 1987. In cases in which the quotas were not filled, the Commission could not make the same assumption about what export levels would have been in the absence of VRAs. The failure of a country to fill its quota in a given year suggests that the appreciation of its currency relative to the dollar or some other factor raised the price of its exports to such an extent that even in the absence of VRAs, it could not sell more than the limit set by the VRA. Thus, its exports to the United States were not constrained by the quota, but by market forces or some other factor. In cases in which a VRA country did not fill its quota, the Commission assumed that the country's actual import share in 1987 or 1988 is the share that the steel exporter would have exported in the absence of the VRAs.¹ That is, the VRAs have no effect on U.S. steel imports when countries fail to fill their allotted export quota. U.S. Department of Commerce data on export certificates indicate that the VRAs were not binding in 1987 for Austria, Hungary, Japan, Mexico, the Peoples Republic of China, Rumania, and Spain. They were binding for the remaining 12 countries and the European Community. In 1988, the VRAs were binding only for Mexico, according to preliminary data.

Market share data are presented in table 2-1. The import market shares listed in the first co-

¹ A country is considered to have "filled" its quota if its combined export tonnage in all covered categories was 94 percent or more of the combined tonnage allowed.

Table 2-1

Effects of VRAs: counterfactual and actual steel imports as shares of U.S. apparent consumption, estimated percentage decrease in steel imports, and estimated percentage increases in import, domestic, and weighted average prices of steel in the U.S. market, 1985-88.

Year	Total imports as a share of apparent consumption		Estimated percentage decrease in steel imports	Estimated percentage increase in—		Weighted-average price ³
	Counter-factual ¹	Actual ²		Import price	Domestic price	
1985	27.05	25.67	6.86	1.74	0.21	0.62
1986	28.12	24.70	16.15	4.32	0.51	1.59
1987	24.83	21.76	15.83	4.23	0.50	1.43
1988	21.73	21.38	2.03	0.50	0.06	0.16

¹ The counterfactual import share is the import share hypothesized in the absence of VRAs. Except for two adjustments, this share is the sum of the actual import share for non-VRA countries and the 1984 import share for the countries that negotiated VRAs in 1984 or 1985. For countries that negotiated VRAs after 1985, import shares in the year prior to signing an agreement are used in this calculation. For countries that did not fill their quotas in a given year, actual import shares are used in this calculation.

² The sum of the actual import share for both VRA and non-VRA countries.

³ Weighted by counterfactual import shares.

Source: Compiled from information in various issues of USITC, Monthly Report on the Status of the Steel Industry.

column are "counterfactual"—that is, they are the import market shares that would have occurred in 1984-88 in the absence of VRAs, if assumptions that are used are correct. The counterfactual market share in a given year is the sum of (1) the import shares of non-VRA countries in that year and (2) the import shares of the VRA countries in 1984, or in the year before signing an agreement, or the actual market share, as appropriate (see footnote 1 to the table). The import market shares in the second column in table 2-1 are the actual market shares.

Information on market shares for individual countries was drawn from monthly USITC publications.

The estimated percentage decreases in steel imports resulting from the VRAs are listed in column 3. The estimated increases in the average prices of imported steel and domestically produced steel in the U.S. market and the weighted-average increases of both are listed in the last three columns of table 2-1. These estimates are obtained by applying equations [3] through [5] in appendix D.

Estimated Effects on Exports, Imports, and Domestic Sales

On the basis of the estimated steel price increases and the methodology described, the Commission estimated the effects of the VRAs during 1985-88 on exports, imports, and domestic sales in the 79 U.S. steel-consuming industries. Two sets of estimates were made for the reduction in domestic sales, based on elasticities of domestic demand for individual product categories of zero and one. An elasticity of zero implies that domestic consumers do not reduce their overall purchases of the product even

though the average price has increased. Consequently, lost domestic sales is identical to the increase in imports. A domestic demand elasticity of one implies that consumers reduce their purchases of the product by the same percentage as the increase in its price. With this elasticity, lost domestic sales is the sum of increased imports and reduced domestic purchases of the product. Published estimates indicate that domestic demand elasticities for most products lie somewhere between zero and one.¹

The summary results of the estimated effects of the VRAs are shown in table 2-2. The last two columns in that table are estimated decreases in total sales which is the sum of lost domestic sales and decreased exports. The estimated effects for each of the 79 industries are given in appendix E.

The Effects of VRAs Beyond 1989

Based on available information, nearly all of the VRA countries exported less steel to the United States in 1988 than they were allowed. For these countries, the VRAs did not reduce imports in that year and, consequently, did not affect the price of steel in the United States or the operations of steel-consuming industries. The effects of VRAs in the future depends on whether or not they are binding.

The Commission projected VRA limits if the VRAs are extended in their current form and also projected the year in which the VRAs will become generally binding again.² These projections

¹ See H. Houthakker and L. Taylor, *Consumer Demand in the United States: Analyses and Projections*, Harvard University Press, 1970.

² A detailed explanation of these projections and the methodology used to make them is contained in USITC Publication No. 2165, "The Western U.S. Steel Market: Analysis of Market Conditions and Assessment of the Effects of Voluntary Restraint Agreements on Steel-Producing and Steel-Consuming Industries," March 1989.

Table 2-2

Effects of VRAs: estimated changes in exports, imports, domestic sales, and total sales of U.S. steel-consuming industries resulting from steel VRAs, 1985-88.

In millions of 1986 dollars

Year	Decreased exports	Increased imports	Decrease in domestic sales with demand elasticity of		Decrease in total sales with demand elasticity of	
			zero ¹	one ¹	zero ²	one ²
1985	258.4	332.4	332.4	1,665.2	590.9	1,923.6
1986	672.9	991.8	991.8	4,396.7	1,664.7	5,069.6
1987	699.5	963.6	963.6	4,106.1	1,663.1	4,805.6
1988	95.2	117.3	117.3	478.3	212.5	573.5

¹ Includes sales lost to imports.

² Sum of decreases in exports and domestic sales.

Note.—Because of rounding, subtotals may not sum up to totals.

were made for three rates of growth of imports that were observed for some period during the years 1971-87, under the assumption that the rate of growth of imports will be the same for VRA and non-VRA countries.

Between 1971 and 1987, steel imports into the United States increased at an average annual rate of 1.1 percent. If imports increase at that rate in each year beginning in 1990, the VRAs will not become generally binding until 1997.

In the 4 years between 1980 and 1984, while the dollar appreciated prodigiously, imports grew at an average annual rate of 3.7 percent—the fastest rate of growth for a 4-year period during 1971-87. If imports were to resume this rate of growth, the VRAs will become generally binding in 1990.

The lowest growth in imports over a 4-year period during 1971-87 was negative growth, or decline, in imports at a rate of 0.9 percent annually between 1971 and 1975. If imports decline at

this rate in the future, the VRAs will not become generally binding again, ever.

The growth in imports in the future will depend largely on the dollar exchange rate and on domestic and world economic conditions. Imports will grow faster to the extent that the dollar appreciates, domestic demand for steel increases, and the demand for steel in the rest of the world declines. If one or some combination of these causal factors is sufficiently strong, imports could increase at a rate as great or greater than the 3.7 percent experienced during 1980-84. If this occurs, the VRAs will become generally binding again soon and will have greater effects on exports, imports, and domestic sales of steel-consuming industries than they do currently. Thus, whereas extension of the VRAs ensures steel producers against significant future increases in import market shares, not extending the VRAs ensures steel-consumers against greater costs in the future.

Chapter 3

Other Effects of the VRAs

The Commission studied in depth seven major steel-consuming industries to analyze the effects of the VRAs. These industries include the automotive, construction, agricultural equipment, construction equipment, major household appliances, forging, and metal-stamping industries. The Commission studied the structure, recent performance, and trade patterns in each industry, analyzed the effects of the VRAs on the price, quality, and availability of steel to them, analyzed the effects on competitiveness, and solicited opinions about extension of the VRAs. Information for these case studies was obtained from testimony at the public hearing, written submissions from industry representatives, field interviews, and the Commission's files. The Commission also analyzed information received for industries other than these seven.

Background

A number of significant changes have occurred in the world economy and in steel markets since the VRAs have been in effect that make it difficult to assess the effects of the VRAs alone. One of these is the substantial depreciation of the dollar relative to the currencies of major steel exporters. Another is a substantial increase in the demand for steel worldwide and consequent increases in operating rates of steel mills.¹ These changes have contributed to higher steel prices and affected the terms under which steel can be purchased.

The Commission found the following with respect to price, quality, and availability of steel in the industries studied.

Price

Spokesmen for the steel-consuming industries were in general agreement that steel prices rose overall during the period in which the VRAs were in effect.² Most of the price increases appear to have occurred during 1987 and 1988. Many of the spokesmen cited changes in exchange rates and increases in steel demand as important factors contributing to the price changes.

Data provided to the Commission by the steel industry support information provided by the consuming industries. According to this data, average steel prices fell during the initial years of the VRAs, then began to rise in 1987, finally exceed-

¹ See app. H for a more detailed discussion of these factors and their relationship to the steel VRAs.

² Price increases were apparently higher for stainless steel products than for carbon steel products. This reflects not only the effects of strong demand for stainless products, but also relatively large price increases in two critical raw materials, nickel and chrome.

ing a previous period peak level (which occurred in 1984) in late 1987.³

Other information obtained in this investigation indicates that steel price increases have been distributed unevenly among categories of customers. Price increases were not as great for larger steel purchasers such as automotive, appliance, and equipment manufacturers as for smaller ones such as forgers and metal formers.

The unevenness of steel price increases reflects, to a large degree, differences in how steel is sold. Steel is sold both in long-term contracts and in "spot" transactions. Major steel purchasers, such as the automotive producers, often negotiate long-term contracts in which prices are set for the duration of the contract, typically a year or more. Industry representatives indicate that about half of cold-rolled and coated steel products are sold through long-term contracts whereas lesser proportions of other products are sold in this manner, especially most structural shapes. The remainder of steel is sold in spot markets at prices prevailing at the time of sale. Spot prices are more volatile than contract prices and increased much faster in 1987 and 1988.

The volatility of spot steel prices puts at substantial risk some steel-consumers who buy on the spot market but sell their finished products on the basis of contracts with fixed prices. One such group of steel-consumers is metal formers who sell to the automotive industry. These manufacturers lose a great deal when there is an unanticipated increase in the price of steel but also benefit a great deal when there is an unanticipated decrease.

Quality

Information obtained by the Commission on the quality of domestic steel seemed contradictory. A number of purchasers observed that the quality of domestic steel has improved during the period of the VRAs, which is an expected result of the closure of marginal mills by the steel industry and the modernization of others.

However, other purchasers observed that product quality has deteriorated. They said that there were many instances of unacceptable stock deliveries that resulted in production slowdowns and higher production costs. Poor quality steel had to be returned or reworked which made overtime pay necessary and also resulted in machinery failure. Smaller manufacturers, which rely to a great extent on distributors (many of which buy both domestic and foreign steel) to meet their needs, noted quality problems more frequently than did large manufacturers.

The difference of opinion about steel quality is not easily explained. One possibility is that the

³ Putnam, Hayes, & Bartlett Inc., *Effects of the Steel Voluntary Agreements*, 1989.

better production facilities were used during the period of low operating rates and that subsequent use of poorer facilities occurred during the market upswing. Another possibility is that steel buyers found that they could not obtain adequate supplies from their traditional suppliers when the market tightened and that other suppliers proved less satisfactory. A number of forgers indicated that this happened to producers in their industry. A third possibility is that quality control may, in some cases, have become less effective as mill operating rates increased.

Another quality issue that Commission staff discussed with producers and purchasers (primarily service center representatives) is the interaction between primary and secondary steel markets.¹ Some industry representatives advised the Commission staff that when steel demand is weak, steel producers sometimes sell prime material in the secondary market in order to maintain efficient scales of operation. During periods of strong demand producers reduce sales in the secondary market for two reasons. First, steel purchasers in the primary market might be less likely to reject material and rejected steel is a source of supply to the secondary market. Second, producers are less likely to sell materials initially in the secondary market. Thus, during strong markets, the quality of the available secondary steel may decline.

Availability

Steel-consumers have sometimes had difficulty finding steel products available for purchase while the VRAs have been in effect. Short supply requests that have been filed with the Department of Commerce are evidence of this.

Availability became a greater problem in 1987 and 1988, when the domestic steel industry's operating rates increased significantly. From the purchasers' perspective, the tightened market and the effects of the VRAs resulted in shortages of certain products and a subsequent disruption in their respective operations. This, in fact, does appear to have occurred in certain instances.

In response to increased demand, steel producers were in the position of having to decide how to ration available supply. Besides raising prices, industry sources indicate that producers generally did this by lengthening lead times for delivery and imposing limitations on tonnage. Because they could not buy all the steel they wanted at the market price and obtain timely deliveries, purchasers believed that there was a "shortage" of steel. Producers, however, viewed the rationing system as simply a way to ensure that they could supply customers with their historical tonnage on a continuous basis.

¹ Secondary steel is steel which does not meet certain standards and therefore is not sold as prime material.

As a result of problems associated with steel supply, a number of consumers indicated that they lost sales. As discussed above, it is difficult to determine the extent to which these problems would have occurred in the absence of the VRAs. In light of the underfilling of quotas in 1988, it seems unlikely that the VRAs were a significant cause in that year. The degree to which VRAs caused availability problems and lost sales is less clear for 1987, when quota utilization rates were higher and domestic steel industry operating rates were rising.

With regard to the nature and significance of supply problems, information provided by the Steel Service Center Institute (SSCI) and the National Association of Purchasing Management (NAPM) indicates that the perception that steel was in short supply caused some manufacturers to purchase additional inventories, which may have exacerbated any existing imbalances.

None of the NAPM companies surveyed during January 1985 through August 1986 believed that inventories were too low.² By November of 1987, however, 23 percent believed it was. In 1988, however, the number of companies reporting insufficient inventories decreased and the number reporting excess inventories increased. A similar series of opinions about inventories was reported for steel service centers.

Trends in inventories of steel plate, which had one of the more active markets during 1987 and 1988 lend further support to this assessment. Data compiled by the SSCI³ show that plate inventories declined in tonnage during 1987; the decline was sharper in terms of the number of months supply as shipments were increasing. During 1988 inventories increased markedly, exceeding those for all other carbon steel products by a substantial margin. The peak was reached in July of 1988 when 5.6 months of inventory were held; this compares with an average inventory level of about 3.5 months in early 1987.

Following are our findings for the seven industries.

The Automotive Industry

Structure of the domestic industry

The majority of the 60 major auto- and truck-assembly facilities located in the United States are situated in the midwestern States of Ohio, Michi-

² Surveys are conducted on a monthly basis.

³ Service centers are the single largest market for steel producers; in 1987 about 43 percent of domestic shipments classified by the industry were shipped to this segment.

gan, Illinois, Missouri, Kentucky, and Tennessee.¹ The industry is highly concentrated; about 90 percent of these facilities are owned by three companies—General Motors, Corp. (GM), Ford Motor Co., and Chrysler Corp. The remaining 10 percent is owned by other domestic companies and by Japanese producers who have established assembly plants in a number of locations in the United States.

Employment in the industry has been relatively stable in recent years, ranging from approximately 299,000 employees in 1983 to an estimated 309,000 employees in 1988.² Improvements in productivity attained through the modernization of factories and streamlined production processes have moderated the increase in employment in the years since the 1980–82 recession.

The U.S. automotive industry is one of the single largest end users of steel, purchasing 11.3 million tons of steel directly from domestic producers in 1987, (or about 15 percent of total U.S. steel consumption).³

The steel used represents about 5 to 6 percent of the average car's sales price,⁴ (approximately \$600) with average cost for body-in-white stamping⁵ (including acquisition, conversion, transportation, and handling) amounting to \$947 per vehicle in 1986.⁶ By far the largest quantity of material used in automobiles is steel. Use of carbon steel in automobiles declined from about 1,915 pounds in a typical car in 1978 to 1,440 pounds in 1988. At the same time, high-strength steel usage in automobiles increased from 133 pounds per car in 1978 to 232 pounds in 1988. Stainless steel consumption has also increased, from 26 pounds in a typical car in 1978 to 31 pounds in a car in 1988, whereas usage of other steels declined from 55 pounds in 1978 to 45 pounds in 1988.⁷

Conditions in the industry

Net sales for the global operations of GM, Ford, and Chrysler rose by 47 percent during 1983–87.⁸ Profits increased by 54 percent in the same period, and profit as a percent of sales increased by 4 percent, as shown in the following tabulation:

Item	1983	1987	Jan.- Sept 1988
Sales (million dollars)	135,837	200,057	165,413
Profit (million dollars)	6,151	9,466	8,217
Profit as percent of sales	4.5	4.7	5.0

The increase in profitability in 1987–88 was largely due to developments in engineering, assembly, reorganization of North American and European operations including joint ventures and divestitures, improvements in product quality, and plant renovations.

By 1988, an increase in demand for motor vehicles had stimulated an increase in capacity utilization, and operating rates in the industry rose to 82.1 percent, compared with a capacity utilization rate of 83.6 percent for all manufacturers. Factors contributing to improved operating rates were the 1987 decision by GM and Chrysler to close a dozen assembly plants in the United States and Canada and the closure of a domestic Volkswagen manufacturing facility. Despite these closures, overcapacity could become a serious problem for U.S. and foreign automakers. According to industry sources, the addition of Japanese plants in the United States and Canada, as well as new Korean plants and anticipated expansion of Japanese automotive production in the EC could result in excess global automotive capacity of approximately 5 million units by 1990.

U.S. production of automobiles, trucks, and buses rose by 24 percent during 1983–85, to 11,359,000 units, then declined by 6 percent, to 10,907,000 units in 1987.⁹ The increase in production in autos, trucks, and buses during 1983–85 reflects a recovery in the auto industry and increased consumer demand following the economic recession of 1980–82. U.S. production of automobiles by transplants increased by 38 percent from 1986, to 556,020 units in 1987.

The primary factor affecting performance of the automotive industry since 1982 is the growth in real disposable personal income, which has resulted in greater demand for automobiles. Another factor is the reduction in gasoline prices, which lowered motor-vehicle operating costs. The strong rebound in the automotive sector following the economic recession of 1980–82 paralleled a rise in the U.S. gross national product.

Trade Patterns

U.S. retail sales of automotive imports fluctuated upward from about 4.6 million units in 1984 to approximately 5.4 million units in 1988 (table 3–1). Japan, Canada and West Germany remained the largest sources of imports during the period (table 3–2).

¹ For the purpose of this study, the automotive industry includes manufacturers of cars, trucks, and buses.

² *U.S. Industrial Outlook 1988*, pp. 38–2, 38–4.

³ Does not include steel shipped to the automotive market from steel centers, distributors, nor does it include imports.

⁴ "Iron and Steel Study Says Automakers Could Cut Die Costs," *Ward's Automotive Reports*, Mar. 2, 1987, p. 67.

⁵ An automobile body that has been assembled, but not painted.

⁶ According to a 1987 study by the American Iron and Steel Association presented at a February 1987 Society of Automotive Engineers conference.

⁷ Al Wrigley, "Material Usage," *Ward's Automotive Yearbook*, 1988, p. 36.

⁸ Compiled from data supplied by *Automotive News*.

⁹ *Facts and Figures 88*, p. 6.

Table 3-1

Automotive industry: U.S. retail sales of domestic and imported passenger automobiles, trucks, and buses; and U.S. retail sales of imported passenger automobiles, trucks, and buses as a percent of total U.S. retail sales, 1980-88

Year	U.S. retail sales of-			Ratio of import sales to total sales
	Domestic motor vehicles	Imported motor vehicles	Total U.S. retail sales	Percent
		Quantity (Units)		
1980	7,690,454	3,775,979	11,466,433	33.2
1981	7,206,696	3,589,661	10,796,357	33.3
1982	6,819,218	3,722,336	10,541,554	35.3
1983	8,263,330	4,048,213	12,311,543	32.9
1984	9,930,700	4,552,864	14,483,564	31.4
1985	10,534,443	5,189,370	15,723,813	33.0
1986	10,522,202	5,800,033	16,322,235	35.5
1987	9,814,340	5,375,983	15,190,323	35.4
1988	10,378,335	5,395,954	15,774,289	34.2

Source: Estimated by the staff of the U.S. International Trade Commission from data of the Motor Vehicle Manufacturers Association.

Table 3-2

Automotive industry: U.S. Imports, by principal sources, 1982-88

Source	1982	1983	1984	1985	1986	1987	1988
	Value (million dollars)						
Japan	11,087	11,633	14,700	19,365	25,869	25,463	22,953
Canada	8,659	9,257	14,171	15,199	15,278	14,563	18,134
West Germany	3,181	3,359	4,577	6,240	8,131	8,909	6,451
Korea	-	-	0	-	788	2,061	2,487
Sweden	840	803	1,230	1,654	1,834	1,942	1,698
Mexico	1	1	42	286	546	1,266	1,272
United Kingdom	327	371	467	596	724	1,195	941
Yugoslavia	-	-	-	-	96	126	76
All other	464	467	437	545	469	982	986
Total	24,559	25,891	35,762	44,087	53,736	56,507	54,998

Source: Compiled from official statistics of the U.S. Department of Commerce.

U.S. automotive exports increased by 43 percent from 759,000 units in 1984 to just over 1 million units in 1988 (table 3-3). Canada was the largest market for U.S. automotive exports during the period, accounting for 74 percent of U.S. exports in 1988, followed by Saudi Arabia and Japan.

Effects of the VRAs

The VRAs appear to have had little effect on the automotive industry, according to industry representatives with whom the staff had discussions.

Prices.—According to auto manufacturers, flat-rolled steel prices declined during 1985-87, but it is not known to what extent prices would have declined without VRAs. Because automakers often hold long-term contracts with steel suppliers, ranging from 1 to 7 years in length, auto manufacturers are locked into prices which are relatively stable. Whereas prices for flat-rolled steel declined, prices for bar steel purchased by automakers from minimills fluctuated during 1985-87 but were generally higher at the end of that time, according to certain automakers. The automotive industry is the largest primary market for cold-finished bar.

Table 3-3

Automotive Industry: U.S. exports of domestic merchandise, by principal markets, 1980-88

Market	1980	1981	1982	1983	1984	1985	1986	1987	1988
<i>Quantity (1000 units)</i>									
Canada	574	531	386	595	702	837	823	755	805
Saudi Arabia	53	42	34	29	17	13	13	20	31
Japan	8	5	4	3	2	2	2	8	28
West Germany	7	5	3	4	5	4	4	12	28
Sweden	5	4	2	1	1	(¹)	(¹)	6	14
France	2	1	3	1	1	2	2	9	7
United Kingdom	3	2	1	1	1	1	1	2	8
Australia	(¹)	1	1	(¹)	(¹)	(¹)	(¹)	1	4
Belgium and Luxembourg	6	3	1	1	1	(¹)	1	3	5
Mexico	12	13	5	1	2	2	3	4	6
All other	144	144	69	34	28	27	37	68	146
Total	815	721	508	670	759	888	891	887	1,082
<i>Value (million dollars)</i>									
Canada	3,659	3,799	2,819	4,516	5,761	7,418	7,662	7,914	8,474
Saudi Arabia	488	518	499	389	233	172	148	316	465
Japan	80	63	53	41	43	28	64	105	355
West Germany	61	48	34	36	51	39	84	130	322
Sweden	25	22	15	8	7	4	10	47	139
France	33	24	35	12	10	28	48	133	107
United Kingdom	26	30	18	10	9	9	12	23	71
Australia	35	55	37	13	13	18	30	44	70
Belgium and Luxembourg	49	27	10	9	6	4	10	26	64
Mexico	111	127	53	8	28	25	20	30	43
All other	1,555	1,507	1,666	654	484	555	580	927	1,745
Total	6,121	6,221	4,738	5,695	6,645	8,299	8,668	9,694	11,857

¹ Less than 500 units.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Supply and Quality.—Generally, the supply of bar and flat-rolled steel has been sufficient to meet automakers' production requirements. However, automakers that have shifted from use of hot-dipped galvanized steel to higher value electrogalvanized steel for use in body and underbody components have encountered supply problems. According to industry sources, domestic steel producers have not had sufficient capacity to meet domestic automakers' needs. In addition, Japanese steel producers do not have adequate electrogalvanizing lines to provide the tonnage needed, according to domestic automakers. Automakers have, therefore, supplemented domestically produced electro-galvanized steel with European-sourced material.

One domestic automaker is concerned that 52100 bearing steel may be incorporated into an extension of the VRAs. According to representatives of this auto manufacturer, the product is available in limited amounts in the United States.

According to other industry representatives, changes in prices and availability of steel required by auto manufacturers cannot be attributed to the voluntary restraint arrangements. In situations wherein domestic supply has not met automakers'

needs, auto producers have sourced offshore to supplement steel requirements. Exchange-rate fluctuations, strong domestic and world demand, and reduced domestic capacity have contributed to price fluctuations, availability problems, and shifts in sourcing to a greater degree than the steel VRAs have.¹

Views on continuation of the VRAs

One U.S. automaker noted that its partnership with U.S. steel suppliers, in terms of production scheduling, quality control, and delivery, had become more efficient since the establishment of the steel VRA program. It therefore supports continuation of the program. Another U.S. auto manufacturer indicated that it holds a neutral position regarding the suspension or extension of the VRA program.

Construction: Fabricated Structural Steel

The construction industry purchases numerous types of steel products all of which it then uses in a variety of applications, including load-

¹ USITC staff discussion with industry representatives on Mar. 8, 1989.

bearing, reinforcing, sheathing, and ventilation functions, as well as for a wide array of hardware items. Of an estimated 10 to 15 million tons of steel consumed annually by the industry, approximately 6 million tons are used in structural steel applications, the largest single steel-consuming group within the industry. The following analysis focuses on the fabricated structural steel (FSS) segment of the construction industry and its experience during the period of the VRAs. This industry is unique among the seven studied in depth in the investigation in that it is not only a buyer but is also a seller of goods subject to the VRAs.

Structure of the Domestic Industry

The fabricated structural steel industry transforms steel mill products, primarily structural shapes and plates, into component parts of the load-bearing structures of buildings and bridges. Virtually all production is tailored for specific jobs or contracts and the work, therefore, is custom in nature.

The industry operates in regional markets, with firms usually serving a 200 to 300 mile radius. Larger firms may serve more expansive markets, but there are no firms with facilities located throughout the country. Because of the small marketing areas, the industry is geographically dispersed and comprises slightly over 1,000 firms.¹ The vast majority of these firms are either family-owned or closely held companies; no single producer is believed to account for more than 2 percent of production.

Employment in the industry has declined 10–15 percent since 1985, continuing a trend established in the late 1970's. Productivity has shown a concurrent increase, rising 11 percent in real terms from \$97,000 of sales per employee in 1983 to \$108,000 of sales per employee in 1987.²

Steel represents a significant portion of the costs of the FSS industry. Most contracts for FSS include erection of the steel on the jobsite, with steel representing 50–60 percent of total erected costs.³ If erection services are not included, steel costs can represent upwards of 80 percent of production costs.

Conditions in the Industry

Profitability in the industry since 1983 has been relatively low. As depicted in the tabulation

¹ Estimate of the American Institute of Steel Construction (AISC). U.S. Department of Commerce data for SIC 3441, an industry classification that is slightly broader than the fabricated structural steel industry, indicates approximately 1,400 firms.

² AISC annual report, 1987. Current dollar figures for 1987 were deflated to 1983 dollars using the Bureau of Labor Statistics' Producer Price Index (3441-P) for SIC 3441, Fabricated Structural Metal.

³ Interviews with industry officials.

below, net income after taxes for companies reporting to the industry's trade association (the American Institute of Steel Construction (AISC)) rose from a low of 0.02 percent of total sales in 1983 to 2.08 percent in 1987. This compares with a recent peak in net income of 4.36 percent in 1974.

Year	Net Income
1983	0.02
1984	.09
1985	1.83
1986	1.62
1987	2.08 ¹

¹ AISC annual report, 1987.

Discussions with industry officials indicate that 1988 profitability for the industry will again average about 2 percent.

Estimated industry shipments increased steadily since 1983, rising by 26 percent from 4,350,000 tons in 1983 to 5,500,000 tons in 1988 (table 3–4).

However, bookings⁴ for 1989 are expected either to be unchanged over their 1988 level or to decrease somewhat because of cutbacks in office building construction, the largest end-use category for FSS.

Financial performance during 1985–88 has been affected to some extent by geographic location. On the east coast, competition from low-cost Canadian fabricators apparently has narrowed profit margins, as well as decreased the volume of work available to domestic fabricators. On the west coast, competition from VRA nations, such as Japan and Korea, and from non-VRA nations, such as Singapore, Taiwan, and Thailand, has reportedly had a similar effect. In the Midwest and South, import competition is perceived as contributing less to plant closures than do certain other factors, such as decreased demand, unsuccessful business strategies, or asset liquidation by private firms. In addition, factors cited as affecting performance in various regions include increasing insurance costs and an inability to invest in plant modernization.

Some restructuring of production facilities has taken place, as smaller firms have exited the business or merged with other firms. Discussions with industry officials indicate that firms are exiting the industry primarily because of poor financial performance. In terms of operating rates, capacity utilization in the industry is estimated to have been between 60 and 70 percent between 1984 and 1987.

⁴ Shipments typically lag bookings by 3 to 6 months, although in some cases this lag can extend a year or more.

Table 3-4

Fabricated Structural Steel: U.S. producers' shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, 1980-88

(Quantity in thousands of short tons; value in thousands of dollars)

Year	Shipments ¹	Imports	Exports	Apparent consumption ¹	Ratio (percent) of—	
					Imports to consumption ¹	Exports to shipments
<i>Quantity</i>						
1980	5,580	164	48	5,696	2.9	0.9
1981	5,220	153	45	5,328	2.9	.9
1982	4,740	129	28	4,841	2.7	.6
1983	4,350	189	16	4,523	4.2	.4
1984	4,660	272	20	4,912	5.5	.4
1985	5,070	318	13	5,375	5.9	.3
1986	5,260	313	12	5,561	5.6	.2
1987	5,480	267	14	5,733	4.7	.3
1988	5,500	229	17	5,712	4.0	.3
<i>Value</i>						
1980	5,790,000	157,966	73,906	5,874,060	2.7	1.3
1981	5,760,000	158,777	71,152	5,847,625	2.7	1.2
1982	4,840,000	120,899	47,751	4,913,148	2.5	1.0
1983	3,200,000	129,059	29,503	3,299,556	3.9	.9
1984	3,350,000	183,147	37,505	3,495,642	5.2	1.1
1985	3,850,000	245,776	18,815	4,076,961	6.0	.5
1986	4,520,000	277,913	15,825	4,782,088	5.8	.4
1987	4,810,000	238,733	20,690	5,028,043	4.7	.4
1988	5,264,000	214,415	33,429	5,444,986	3.9	.4

¹ Estimated by the staff of the USITC.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Trade patterns

Because imports of both the raw materials and the end product are restricted by the VRA program, the program has direct, as well as indirect, effects on end-use markets. Imports of fabricated structural steel increased during the early years of the VRA program, rising by 17 percent from 1984 to 1985. Some of these imports were from VRA countries and consisted of structural mill steel fabricated in non-VRA countries prior to shipment to U.S. markets.¹ Customs rulings on FSS, however, have reduced most of this type of trade through determinations that the structural steel does not undergo a substantial transformation in such a case and that the VRA country is still the country of origin.

Fabricated structural steel imports have declined in the last 2 years of the program, falling by almost 28 percent, from 318,000 tons in 1985 to 229,000 tons in 1988 (table 3-5). During this time, domestic fabricators have had increasing success competing in the domestic market against imports. This increasing competitiveness of domestic fabricators is believed, primarily, to be caused by geographical demand shifts and the depreciation of the dollar since 1985.

Exports decreased by 41 percent between 1984 and 1986 and then increased by 40 percent by 1988. Exports had been on a decreasing trend prior to the implementation of VRAs, falling by

¹ Such imports primarily entered the Western U.S. market. (See *Conditions of Competition in the Western U.S. Steel Markets*, USITC Publication 2165.)

66 percent between 1980 and 1983 (table 3-6). The recent increase can be largely attributed to increasing construction activity in certain foreign markets and the increased use of steel designs for foreign buildings.

Effects of the VRAs

The VRAs do not seem to have materially affected the FSS industry.² Pricing and availability of steel inputs were not cited by industry officials as major problems, although tightness in the plate market in 1987 affected leadtimes to some fabricators. Most companies in eastern and midwestern markets express a preference for domestic steel. On the west coast imported steel, especially Japanese, was often cited as the preferred material.³

However, VRAs are believed to have benefited the industry because of their effect on the supply of imported FSS products, especially in the west coast market.⁴ In other markets, such as the Northeast, VRAs do not appear to have had much of an impact on foreign competition. In the Northeast, competition from non-VRA countries, especially Canada, has been a significant problem both before and during the VRA program.

² Although quotas for plate were binding from most sources in 1987, quotas for structural shapes have not been a restraining factor throughout the program.

³ Interviews with industry officials.

⁴ Fabricated structural steel is covered under the VRAs within the structural shapes category.

Table 3-5
Fabricated structural steel: U.S. Imports, by principal sources, 1980-88

Source	1980	1981	1982	1983	1984	1985	1986	1987	1988
<i>Quantity (short tons)</i>									
Canada	62,593	78,943	52,279	77,414	76,276	126,610	158,350	117,390	85,107
Korea	2,242	4,729	4,196	26,051	63,458	56,039	29,167	60,057	71,996
Japan	64,763	49,495	58,830	64,949	101,812	86,882	59,707	46,440	35,157
New Zealand	16	89	56	114	214	2,275	8,069	9,076	8,242
Sweden	1,019	373	128	178	1,484	498	1,491	2,234	3,795
Brazil	40	0	0	33	2,425	5,953	2,890	1,497	3,618
Mexico	1,367	428	680	3,474	6,534	2,798	1,358	1,543	3,376
Taiwan	653	2,903	282	277	948	4,152	19,851	8,036	3,323
United Kingdom ...	2,079	4,142	3,160	1,634	2,940	10,503	3,807	3,296	3,269
All other	29,667	11,719	9,708	15,184	16,219	22,044	27,843	17,113	11,426
Total	164,438	152,821	129,319	189,308	272,310	317,755	312,531	266,684	229,308
<i>Value (1,000 dollars)</i>									
Canada	60,753	106,608	60,352	70,186	76,960	117,933	158,056	125,748	99,347
Korea	958	3,850	5,850	13,512	33,201	34,867	22,290	39,919	50,050
Japan	62,321	29,315	32,698	23,347	39,416	42,673	31,873	19,778	18,628
New Zealand	15	64	39	92	197	2,722	8,771	9,040	8,814
Sweden	2,305	981	321	382	4,202	1,149	3,296	7,476	5,264
Brazil	16	0	0	14	1,076	9,285	1,470	1,381	3,899
Mexico	1,358	762	522	2,059	2,997	1,409	1,165	1,092	2,389
Taiwan	350	1,138	707	228	649	3,231	16,189	6,947	3,820
United Kingdom ...	2,814	4,466	4,362	2,826	3,055	6,576	4,356	3,657	4,177
All other	27,076	11,594	16,047	16,411	21,394	25,930	30,447	23,696	18,028
Total	157,966	158,777	120,899	129,059	183,147	245,776	277,913	238,733	214,415

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3-6
Fabricated Structural Steel: U.S. exports, by principal markets, 1980-88

Market	1980	1981	1982	1983	1984	1985	1986	1987	1988
<i>Quantity (short tons)</i>									
Mexico	8,318	10,760	3,116	786	360	1,651	1,723	716	3,349
Canada	3,651	3,953	1,981	2,311	2,090	2,205	1,806	2,281	3,152
Bahamas	1,214	2,692	2,023	2,074	2,903	2,689	3,766	3,123	1,852
Philippines	1,781	4,678	1,962	800	410	2	36	108	1,534
United Kingdom ...	671	525	329	152	329	143	126	728	1,004
Japan	308	140	46	189	154	49	403	959	583
Taiwan	857	860	769	59	82	12	36	29	579
Iceland	(¹)	(¹)	(¹)	106	24	77	20	193	437
Dominican Republic	767	600	134	240	229	64	530	248	357
Saudi Arabia	6,218	4,749	2,950	2,132	1,425	405	275	53	336
All other	29,133	16,477	13,310	7,581	12,198	5,520	3,150	5,124	3,342
Total	48,218	45,434	27,531	16,430	20,204	12,817	11,873	13,562	16,625
<i>Value (1,000 dollars)</i>									
Mexico	5,914	11,334	1,813	482	1,366	1,233	1,742	878	4,405
Canada	6,502	6,352	3,894	3,818	3,405	3,819	3,514	5,041	8,577
Bahamas	567	1,873	2,040	988	1,700	1,771	1,869	2,246	1,270
Philippines	2,240	8,494	5,611	1,932	680	21	24	467	1,912
United Kingdom ...	1,811	1,604	855	329	588	627	508	2,161	3,038
Japan	540	335	257	283	469	215	836	804	909
Taiwan	2,234	1,327	1,237	203	59	56	81	81	1,475
Iceland	2	1	7	293	27	149	31	364	338
Dominican Republic	996	563	104	230	160	55	265	229	358
Saudi Arabia	11,066	8,181	6,510	5,117	5,314	1,413	469	291	736
All other	38,434	31,088	25,423	15,828	23,747	8,456	6,485	8,128	10,411
Total	73,906	71,152	47,751	29,503	37,505	18,815	15,825	20,690	33,429

¹ Less than 1,000 pounds.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Prices.—Although prices for both structurals and plate rose in 1987 and 1988, most fabricators are not sure of the extent to which these increases can be attributed to the VRA program. These fabricators note that prices fell during 1984–86, and that it was not until early to mid-1987 that plate prices (current dollars) rose to the same levels prevailing in late 1984. For structurals, prices in mid- to late 1987 began to exceed late 1984 prices for the first time. Since mid-1987, prices have continued to strengthen, and in late 1988 were between 5 and 36 percent higher (current dollars) than in late 1984. Structural prices are expected to fall in the near future, as new domestic capacity for the popular wide-flange beams has recently come on line and additional capacity expansions are planned.

Most domestic fabricators contacted attributed the price increases after 1986 to increased worldwide demand and the depreciation of the dollar.² Pricing information submitted by some west coast fabricators shows costs for domestic steel beams averaging between 8 and 19 percent higher than costs for foreign beams between 1984 and 1988, representing a difference not deemed unusual in the industry because foreign steel generally sells at a discount.³ This pricing gap closed considerably with the deregulation of railroad freight rates, and domestic steel has been more competitive on a price basis in recent years.

Procurement.—Availability of plate and structurals does not appear to have been a major problem for the industry, although there apparently were some instances in 1987 and 1988 when fabricators found it difficult to acquire specific products, especially plate. In these instances, lead-times for delivery were extended by suppliers, generally by several weeks. No cases of lost sales due to lack of mill product availability were revealed during contact with industry officials or as a result of post-hearing briefs.

There were, however, several short supply requests filed for plate products and structural shapes and sections, including FSS. The eight requests made for plate were filed primarily by pipemakers and equipment manufacturers. In four cases, the requests were granted, totaling 45,500 tons. There have also been six requests for products falling in the structural shapes category, two of which were for FSS. The requests for shapes typically have been for special shapes that

are not rolled by domestic producers. In three of the four cases Commerce granted the requests.⁴

Substitution of materials.—Steel price levels are a primary concern of the fabricators, since the cost of steel represents a large proportion of final product cost in the FSS industry and it is difficult for the industry to absorb increases in mill steel costs. This is particularly important in markets where steel competes with reinforced concrete. Industry officials indicate that competition from reinforced concrete is very keen now, due partially to pricing and partially to technological advances that are expanding the ability and versatility of reinforced concrete as a structural material.

Competitiveness.—Because of their effect on the FSS industry's end product, the VRAs have improved the competitiveness of fabricators in certain regions. In the west coast and the northeast, however, domestic firms have been significantly outbid on a number of jobs by foreign fabricators.⁵ While the effect of VRAs on steel prices may have been a factor in the pricing differential, other factors giving advantages to foreign fabricators include lower labor rates, U.S. insurance and regulatory costs, exchange rates, and export rebates offered by foreign mills to foreign fabricators.⁶ Virtually all industry officials interviewed indicated that domestic prices for mill products have not, in their opinion, had a significant impact on their competitiveness, either in domestic or foreign markets.⁷

Views on continuation of the VRAs

Most firms in the industry appear to be in favor of extending the VRA program, expressing the view that a healthy domestic steel industry is important to their operations. Others, however, believe that the current program has achieved its goal of allowing the domestic steel industry to adjust and modernize. The latter group favors use of existing unfair trade laws as a preferable alternative to an extension of the program.

⁴ The grants totaled 13,550 tons, of which 13,000 tons was a single request for rolled, heavy-equipment track shoes not produced in the United States. The two requests for FSS involved antique City of London telephone booths and modular bridge sections. In the bridge sections case, filed by the EC, the U.S. Department of Commerce found that the product was not in short supply in the United States.

⁵ On Jan. 11, 1988, the American Institute of Steel Construction, Inc. petitioned the U.S. International Trade Commission and the U.S. Department of Commerce for import relief, claiming that certain fabricated structural steel from Canada was being sold in the United States at less than fair value. On Feb. 22, 1988, the Commission determined, with Commissioner Eckes dissenting, that there was no reasonable indication that the domestic industry was materially injured or threatened with material injury or that the establishment of an industry in the United States was materially retarded by reason of imports from Canada of the subject goods alleged to be sold at less than fair value (Inv. No. 731-TA-387).

⁶ Based on interviews with industry officials.

⁷ Eighteen fabricators and the AISC were contacted. Submissions were received from, or interviews conducted with, 10 fabricators of various sizes and geographic locations.

¹ *World Steel Intelligence*, "Steel Pricetrak #26," World Steel Dynamics, Paine Webber, Sept. 29, 1988.

² See also, Cantor, David J., "Steel Prices and Import Restraints," Congressional Research Service, Mar. 15, 1988.

³ A variety of nonprice factors considered in the purchase decision, such as delivery leadtimes, tend to dictate lower prices for imports in order for them to compete with domestic steel.

Many fabricators, especially those located in the Northeast, would like to see Canada included in an extended VRA program, with a view toward inclusion of imports of Canadian fabricated steel. Others urge that quotas should be relaxed for mill steel, such as plate or structural shapes, or that more flexibility should be built into the program. These fabricators blamed recent tight supplies for price increases in the domestic market.

A few of the officials contacted thought that a multinational agreement on steel trade that would remove the influence of governmental subsidization would be preferable to the type of quantitative restrictions imposed by VRAs. The firms would generally prefer having no restriction on the source of their raw materials, even though many expressed a preference for purchasing domestically produced material.

Agricultural Equipment

Structure of the domestic industry

The agricultural equipment analyzed in this study include wheel tractors, combines and other harvesting machines, tillers, cultivators, plows, turf equipment, animal feeders, driers, and fertilizer spreaders. These products are included in SIC product category 3523.

Until recently, there were six U.S. producers of farm equipment. These firms supplied over 60 percent of total U.S. production and numerous mid-sized and private specialty producers (known as "shortliners") accounted for the other 40 percent. However, recent consolidations of manufacturing facilities and liquidation of capital stocks have reduced the number of major producers to four: Deere & Co., Case IH (a Tenneco Inc. subsidiary), Massey-Ferguson Inc. (held by Canadian-based Varity Corp.) and Ford New Holland Inc.¹ Although these companies are headquartered in the Midwest and Eastern United States, the majority of their production capacity is located overseas and carries U.S. brand names. Until recently, for example, only farm tractors of more than 100 horsepower (hp) were produced in the United States, and only two main manufacturers are involved in their production.²

The mergers and acquisitions that have occurred in the industry have reduced production capacity by 27 percent and lowered employment by half since 1981.³ During 1985-88, total employment declined by 14 percent, from 67,000 to 57,300.

The primary steel products used to manufacture agricultural machinery are wire rods, plates,

¹ Standard & Poor's Industry Surveys, July 7, 1988.

² White-New Idea recently began producing and plans to market 40-60 hp tractors in the United States. It is the first smaller model to be U.S. built in a decade.

³ *Business Week*, "The Quotas That Saved Steel Are Backfiring On Buyers," Sept. 26, 1988.

hot- and cold-rolled sheets, hot-rolled bars, mechanical tubing, and some galvanized sheet steel. In 1987, the industry purchased 210,271 tons of steel directly from U.S. producers, only half the amount purchased by the industry in 1978, reflecting the effects of consolidation within the industry and reduced domestic demand for agricultural equipment.⁴

Large U.S. producers indicate that raw steel accounts for approximately 60 percent of material costs, but averages about 15 to 20 percent of production costs.⁵

Conditions in the industry

Relatively high interest rates, declining commodity prices, and poor farming conditions adversely affected agriculture sales during 1983-88 and thus decreased U.S. demand for farm equipment. The farm equipment industry has operated at a loss virtually every year since 1983, thus requiring large capital investments from some parent companies to keep operations viable. For example, Tenneco, Inc. reportedly subsidized its Case IH operations by \$154 million in 1987 and by \$43 million in 1988.⁶

Industrywide difficulties in the 1980s also have caused the largest U.S. producers of farm machinery to restructure and U.S. multinationals to transfer their production capacity to Europe. By concentrating production in the larger European farm machinery market, U.S. firms wanted to lower production costs and at the same time increasing their share of the European market. U.S. multinationals accounted for 40 percent of total EC output by 1988, although for some of the material supplies used, over 80 percent came from North America.

The positive effect of the relatively low value of the dollar on U.S. exports, and improved demand for replacement equipment in the U.S. market contributed to a partial recovery of the industry in early 1988. The recovery was limited, however, because the severe drought that year made it difficult for dealers to sell existing inventory, and dealers placed fewer orders. As a result, net industry shipments of farm machinery increased by only 2 percent in 1988 over 1987 levels and were 25 to 30 percent below 1983-1984 levels, respectively. (table 3-7)⁷

Net profits as a percent of sales have declined steadily in the 1980s, but have recovered somewhat in 1987, as shown in the following tabulation:⁸

⁴ Shipments of Steel Products by Market Classifications, American Iron and Steel Institute, 1987. Purchases from distributors and foreign suppliers are not included.

⁵ USITC staff interview with industry sources, February 1989.

⁶ *Farm Equipment*, "The Future of Case IH Still Questionable," February 1989.

⁷ U.S. Department of Commerce, *U.S. Industrial Outlook*, 1987.

⁸ Estimated data from *Value Line*, March 1989.

Table 3-7

Agricultural machinery: U.S. producers' shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, 1980-88

Year	Shipments	Exports	Imports	Apparent consumption	Ratio of—	
					Imports to consumption	Export to shipments
Million dollars				Percent		
1980	11,853	1,897	1,740	11,696	15	16
1981	13,038	2,205	1,529	12,362	12	17
1982	10,370	1,770	1,164	9,764	12	17
1983	8,543	1,452	1,325	8,416	16	17
1984	9,220	1,596	1,663	9,287	18	17
1985	7,470	1,303	1,525	7,692	20	17
1986	6,131	1,029	1,600	6,702	24	17
1987	6,315	1,075	1,781	7,021	25	17
1988	6,440	1,259	2,192	7,373	30	20

Source: Compiled from official statistics of the U.S. Department of Commerce.

Item	1984	1985	1986	1987
Million dollars				
Net profit or (loss) . . .	110	10	(425)	(155)
Net profit or (loss) as a percent of sales	1.5	5	(-)	(-)

Recent sales gains may be somewhat misleading because of an aggressive discounting program that was initiated by Case IH to clear out old model tractor inventory in order to introduce a new line of U.S.-built tractors. Nevertheless, 1987-88 marked the first back-to-back sales increases since 1978.¹

The outlook for 1989 appears somewhat better as farmers recuperate from the effects of the severe drought of 1988 with the help of extensive U.S. Government assistance and high crop prices. Retail sales of farm machinery were strong in early 1988, before the drought, and industry analysts expect farmers to resume updating their equipment in 1989. Analysts point to the fact that 30 million acres of land that lay idle during the drought will be put into production next year. It seems likely that this increased land use will generate increased sales of machinery for dealers.

Trade Patterns

In 1988, imports of farm machinery totaled \$2.2 billion (table 3-8) and, reflecting the largely offshore production base of U.S. producers, accounted for nearly 85 percent of U.S. tractor sales. Tractors, many of which carry U.S. brand names, were the most significant import category. Despite a 17-percent increase in exports during 1987-88 (table 3-9), there are few markets abroad for the type of equipment produced in the United States, and U.S. imports have consistently exceeded exports. A significant share of U.S. ex-

ports, especially those to Western Europe, were parts destined for U.S. subsidiaries that have established foreign facilities. Industry analysts do not expect a significant improvement in the farm machinery trade balance in the near future, as imports are expected to increase to at least \$2.3 billion in 1989 and exports, by less than 1 percent.

Effects of the VRAs

U.S. producers of farm machinery indicate that they have experienced few direct ill effects in their industry from the VRA program. Despite soft demand for agricultural equipment, this sector contributes a relatively large volume of business to domestic steel mills. Industry sources indicate that during 1984-88 consistent domestic sourcing has been accompanied by price discounts and, for the most part, adequate supply lines in the face of a tight steel market and rising steel costs.²

Supply and Quality.—Despite spot shortages for certain steel products during the period of the VRAs, many farm machinery producers chose not to apply to the U.S. Department of Commerce under the short supply request provisions, due to time constraints and to the perceived unreliability of the process. As an alternative, domestic producers have reportedly made "on spot" purchases of steel at premium prices from service centers. This occurred primarily when they were faced with lengthened leadtimes because the larger mills began allocating production to major consumers.³

The companies in the industry reportedly prefer not to buy steel from foreign sources because of quality concerns and even longer shipment lead-times, coupled with the possibility of damage to their beneficial relationship with domestic mills. Such practice occasionally has produced

¹ U.S. Department of Commerce, *U.S. Industrial Outlook*, 1987.

² USITC staff interview with industry sources, March 1989.

³ *Ibid.*

Table 3-8

Agricultural machinery: U.S. imports, by principal sources, 1980-88
(In millions of dollars)

Source	1980	1981	1982	1983	1984	1985	1986	1987	1988
Canada	805	692	475	431	525	390	345	474	509
Japan	183	192	173	197	294	345	385	368	396
United Kingdom	215	154	91	160	204	192	226	250	370
W. Germany	233	197	169	249	225	222	253	238	292
Italy	89	99	96	98	152	123	117	127	153
France	52	42	31	42	72	69	68	74	130
Belgium	68	51	26	24	28	29	43	46	64
Netherlands	15	14	15	34	49	39	40	41	45
Mexico	9	10	13	23	16	14	13	21	48
All other	72	78	75	66	99	101	110	141	185
Total	1,740	1,529	1,164	1,325	1,663	1,525	1,600	1,781	2,192

Note.—Because of rounding, figures may not add to the totals shown.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3-9

Agricultural machinery: U.S. exports, by principal markets, 1980-88
(In millions of dollars)

Market	1980	1981	1982	1983	1984	1985	1986	1987	1988
Canada	923	1,184	845	681	695	591	520	491	409
Saudi Arabia	22	47	139	300	253	93	70	113	127
France	50	51	71	52	44	24	37	58	106
Venezuela	42	49	43	11	16	34	46	46	45
Mexico	271	222	97	17	64	163	48	42	79
Australia	148	165	190	74	17	124	28	28	87
W. Germany	18	18	22	30	21	18	18	27	35
United Kingdom	23	34	32	23	22	18	24	26	43
Spain	11	9	7	5	7	6	18	18	21
All other	390	426	324	259	297	232	220	227	307
Total	1,897	2,205	1,770	1,452	1,596	1,303	1,029	1,075	1,259

Note.—Because of rounding, figures may not add to the totals shown.

Source: Compiled from official statistics of the U.S. Department of Commerce.

some operational difficulties, however. In order to continue operating, some farm machinery producers have reportedly had to use lower grade substitute materials (such as secondary metal or nonsteel products), thus increasing the likelihood of mechanical failure and adding to the material cost of production. However, most U.S. companies have not relied on substitution materials to any great extent.

Prices.—Although there has been a significant increase in the cost of steel in recent years, which has resulted in lower profit margins, industry sources indicate that 1987-88 steel prices for large industry purchasers were below list price.¹ At the same time, a weaker dollar has made foreign sources less desirable. Industry spokesmen note that companies are willing to absorb somewhat higher steel prices in order to guarantee reliable supply and high quality of steel products. Industry representatives were uncertain as to the effect of the VRAs on steel prices during those years.

¹ During the early 1980s, however, mills reportedly sold steel at substantial discounts on a frequent basis.

Competitiveness.—Industry spokesmen indicate that the main reason producers have raised prices recently is to cover higher costs, such as increased costs for tires for farm equipment. For exports, higher per unit prices may be attributable in part to the cost of meeting foreign local standards regulations.

Domestic producers of farm machinery have chosen to continue to fill their steel requirements domestically and have reportedly received preferential prices from U.S. mills. VRAs, therefore, do not appear to have had a major effect on the competitiveness of domestic farm machinery products. In addition, other factors, such as the low dollar have helped to keep some import prices high relative to domestic farm equipment.

Views on continuation of the VRAs

For the most part, farm machinery makers would like to see some modification of any continued protection for U.S. steel. One suggestion was to limit the extension of the VRAs to 3 years. A second option suggested by farm machinery manufacturers, aside from the VRAs, would be to

increase the use of joint ventures between U.S. and foreign steel producers.

Industry spokesmen indicate that the VRAs have had little effect on the farm machinery industry. However, if, in the future, U.S. steel prices continue to rise substantially, agricultural equipment manufacturers indicate that it is their intention to oppose the extension of restrictions on foreign steel sources.

Construction Machinery and Equipment

Structure of the domestic industry

Construction machinery is manufactured in the United States by establishments primarily engaged in the manufacture of heavy machinery and equipment used by the construction industry, including such equipment as bulldozers, power shovels, and hydraulic excavators. The U.S. construction machinery industry is composed of more than 900 producers concentrated in the Central and North Central states of Illinois, Michigan, Ohio, and Wisconsin. The major producers are Caterpillar Tractor Company, Clark Equipment Company, Dresser Industries, Inc., Gehl, Inc., J.I. Case, Inc., and John Deere and Company. Three of the largest producers are multinationals, producing a wide product line and accounting for approximately 53 percent of domestic sales/production.¹ Many small- and medium-size companies concentrate on producing a number of variations of basic machines for particular segments of the industry. Employment in the U.S. construction machinery industry was estimated at 88,900 in 1988, down from 95,000 in 1984. This decline resulted largely from major structural changes that have taken place in the U.S. industry over the past decade, including mergers and acquisitions, plant closings, joint venture agreements with foreign manufacturers, and shifts to offshore production.

The U.S. construction machinery industry is estimated to have consumed over 341,000 tons of steel in 1988, primarily utilizing plate, bar, hot- and cold-rolled sheet, tubing, and structural shapes. Discussions with U.S. industry officials indicate that purchases of steel account for about 12 to 24 percent of production costs.

Conditions in the industry

In general, the U.S. construction machinery industry was relatively prosperous during 1984-88. Increased domestic construction activity during the period and the low value of the U.S. dollar relative to the Japanese yen and West German mark were significant factors affecting domestic sales, exports, and net operating profits in the U.S. construction machinery industry. U.S. shipments increased by 25 percent, to \$14.5 bil-

lion during 1984-88 (table 3-10). As a result of this upswing in production and higher prices, U.S. producers increased net operating profits during 1984-88 by 15 to 20 percent.²

The U.S. construction machinery industry had an operating rate of about 70 percent during 1984-88 as a result of a decade of restructuring activities. The streamlining of the U.S. industry included the adoption of such measures as "just in time" (JIT) inventory practices, downsizing of plant operations, augmented product lines, and refinement of effective worldwide distribution and service capabilities emphasizing product quality.

Other industry changes during 1984-88 focused on increased globalization of the industry as high U.S. labor and material costs encouraged many U.S. companies to establish or expand foreign production through subsidiaries, joint ventures, or licensing.

Trade patterns

Although the U.S. market grew relatively slowly during 1984-88, U.S. imports of construction machinery increased by 162 percent during 1984-88, to \$3.0 billion (table 3-11), in part because large U.S. producers imported different models and sizes of machines from their foreign subsidiaries and joint venture operations in order to round out product lines. U.S. imports of construction machinery were estimated to be 21 percent of total U.S. consumption in 1988, representing an increase of 91 percent over 1984. The rise in U.S. exports during 1984-88 (up 20 percent, to \$3.2 billion) is largely attributable to shifts in exchange rates and increased construction activity in Canada and certain Latin American markets. These two markets accounted for 33 percent of all exports during those years (table 3-12).

Effects of the VRAs

Supply and quality.—Domestic manufacturers indicated that they have historically had difficulty in obtaining timely, high-quality domestic steel products, and that this has continued while the VRAs have been in force. To maintain smooth production schedules, the U.S. producers source a minimum of 80 percent of their steel from a variety of domestic sources, including mills, warehouses, and service centers.

For certain types of imported steel products, such as plate, VRA quotas were binding in 1987 from most sources; other VRA categories were not completely filled during this period. U.S. producers of construction machinery generally believe that the VRAs have caused both tight supply and price increases of imported specialty and structural steel products.³

¹ Estimated by staff of the U.S. International Trade Commission.

² Interview with officials of the Construction Industry Manufacturers Association.

³ Interviews with industry officials, February 1989.

Table 3-10

Construction machinery and equipment industry: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1980-88

(In millions of dollars)

Year	Shipments ¹	Imports	Exports	Apparent consumption ¹	Ratio (percent) of—	
					Imports to consumption ¹	Exports to shipments ¹
1980	15,994	36	5,7421	10,988	7	36
1981	16,930	887	6,316	11,501	8	37
1982	11,735	778	3,968	8,545	9	34
1983	10,305	641	2,393	8,553	7	23
1984	11,550	1,125	2,675	10,000	11	23
1985	12,799	1,958	2,732	12,025	16	21
1986	12,987	2,281	2,412	12,856	18	19
1987	13,766	2,400	2,350	13,816	17	17
1988	14,450	2,950	3,200	14,200	21	22

¹ Estimated by the staff of the U.S. International Trade Commission.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 3-11

Construction machinery and equipment industry: U.S. Imports for consumption, by principal sources, 1980-88

(In millions of dollars)

Source	1980	1981	1982	1983	1984	1985	1986	1987	1988
Japan	76	82	143	184	467	727	789	868	900
France	18	18	22	26	71	108	200	261	268
United Kingdom	34	46	51	58	83	140	251	257	262
West Germany	66	68	79	87	122	200	288	247	253
Canada	102	119	110	119	178	196	213	224	249
Italy	14	17	23	25	62	67	92	87	111
Belgium	28	26	35	40	78	135	124	66	110
Brazil	6	8	8	10	29	42	36	59	61
Sweden	4	7	8	8	12	29	52	48	59
Mexico	6	10	7	8	12	15	15	30	54
All other	382	486	292	76	11	299	221	253	623
Total	736	887	778	641	1,125	1,958	2,281	2,400	2,950

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3-12

Construction machinery and equipment industry: U.S. exports of domestic merchandise, by principal markets, 1980-88

(In millions of dollars)

Market	1980	1981	1982	1983	1984	1985	1986	1987	1988
Canada	683	748	480	561	358	413	404	496	633
Venezuela	244	266	147	171	153	119	123	100	245
United Kingdom	356	300	128	156	268	147	134	114	178
Australia	238	198	85	108	143	139	118	86	93
Mexico	82	78	92	102	108	129	115	84	99
Colombia	97	106	103	99	86	89	88	79	98
France	167	223	86	97	81	69	79	63	84
Belgium	159	231	92	94	120	111	83	61	116
Singapore	385	279	129	91	122	124	112	95	130
Brazil	241	302	109	85	88	81	92	75	132
All other	3,090	3,585	2,517	829	1,148	1,311	1,064	1,103	1,392
Total	5,742	6,316	3,968	2,393	2,675	2,732	2,412	2,350	3,200

Source: Compiled from official statistics of the U.S. Department of Commerce.

Import restraints did completely restrict company-specific supplies from one foreign source, forcing that company to seek out other suppliers in 1987 and to file four short-supply requests.¹ During this time, the company reportedly experienced production delays and increased overtime.

Prices.—Prices for steel inputs increased during the period of the VRAs. Domestic equipment producers attribute increased steel prices primarily to overall pricing strategies of the U.S. steel industry. They believe the U.S. steel companies have a great deal of pricing discretion in the U.S. market.² For this reason, U.S. producers are reluctant to single out the VRAs as an important cause of increased domestic steel prices.

Construction equipment producers also commented that economic factors, such as increased world demand for steel, coupled with the restructuring of the international steel industry, have been major factors determining the price and supply of raw steel during the period of the VRAs. In addition, the decline in the value of the U.S. dollar relative to foreign currencies and the recent decrease in U.S. interest rates have also been key factors affecting trade in steel products.

Competitiveness.—Industry representatives do not believe that the VRAs have had a significant effect on the overall competitiveness of the U.S. construction machinery industry.³ They indicate that to date they have preferred to absorb increases in the costs of materials and accept smaller profit margins in order to remain price competitive and retain market share. Both domestic sales and exports of construction machinery have increased and net operating profits have risen during 1984–88.

Views on continuation of the VRAs

Many domestic manufacturers of construction equipment and machinery oppose extension of the VRAs, those producers that import significant quantities of steel oppose the VRAs the most strongly. Some smaller U.S. producers are currently neutral on extension of the VRAs but indicate, however, that if U.S. companies raise prices substantially in the future, they will oppose extension.

Major Household Appliances

Structure of the domestic industry

Major household appliances include microwave ovens and ranges, electric and gas ranges, refrigerators, freezers, refrigerator-freezers, clothes washers and dryers, dishwashers, and

¹ Testimony from official of Caterpillar Tractor Co. at Mar. 10, 1989, hearing in conjunction with USITC investigation No. 332-270.

² Interviews with industry sources, February 1989.

³ Interviews with industry officials, February 1989.

room air-conditioners. In 1988, the U.S. industry producing major household appliances consisted of approximately 40 companies with nearly 90 establishments. Over 50 percent of these plants had 200 or more employees. Establishments manufacturing these products were located throughout the United States, with the heaviest concentration (over 53 percent of all major appliance establishments) in the following six states: Tennessee, Ohio, Michigan, Indiana, California, and Illinois. The industry is dominated by large, multi-product concerns that produce almost all of the major household appliances.

Total employment in the industry declined by 6 percent, from an estimated 85,000 in 1984 to 80,000 in 1988. The primary factors influencing the decline in employment were plant consolidations, along with improved manufacturing technology resulting in increased productivity. Productivity, as measured by the output per employee hour, increased by 6.7 percent during 1985–86, compared to a 3.7-percent increase for all manufacturing.⁴

The U.S. industry purchased approximately 1.5 million tons of steel from domestic mills in 1987.⁵ The most common types of steel products used in manufacturing major appliances are hot- and cold-rolled sheet, certain coated flat-rolled products, such as enameled and zinc coated (i.e., galvanized), and various types of stainless steel products. Industry sources reported that steel represents about 15 percent of materials cost and about 10 percent of total cost of production of major appliances. A small number of major appliance producers have multi-year purchasing contracts and have been able to exert some leverage in reducing the magnitude of any price increases.

Conditions in the industry

Net earnings for the appliance industry declined in 1985 before recovering somewhat in 1987, as shown in the following tabulation:⁶

Year	Net profit	
	(million dollars)	(percent)
1984	435.7	5.6
1985	68.0	.8
1986	205.4	2.0
1987	347.5	3.2

According to industry sources, increases in all raw material costs absorbed by manufacturers are the primary cause of decreased profit margins.⁷ The consumer price index for home appliances rose by 84.7 percent, compared to 222.2 percent

⁴ Data based on statistics from the Bureau of the Census, and the Bureau of Labor Statistics.

⁵ Compiled from statistics of the American Iron and Steel Institute.

⁶ Value line, December 1988. Data include all household appliances.

⁷ The slight rebound in 1987 profit margin is attributed by industry sources to increases in productivity.

in the composite index for "all items," from 1965 to 1987, thus indicating that price increases in household appliances have generally been less than those in other products.¹ A major factor in the price trend is stiff competition among domestic appliance manufacturers, which occurred as the market for most appliances became fairly saturated. This market is now driven largely by replacement demand.

The industry is mature and highly concentrated with about 5 companies holding more than 95 percent of the domestic production of major appliances and an estimated 89 percent share of the domestic market during this period. Import penetration remained fairly constant throughout 1985-88, accounting for approximately 11 percent of the domestic market. With the principal exception of microwave ovens, which accounted for approximately 80 percent of the total value of U.S. imports of major appliances in 1988, imported major appliances are not a major factor in the appliance market in the United States;² major appliances are heavy and bulky to ship, thus resulting in large transportation and distribution costs for producers. In addition, major foreign producers are oriented toward a home market that generally desires smaller, differently designed appliances to fit into smaller living spaces.

Capacity utilization rates for the industry increased from 71 percent in 1984 to 84 percent

¹ Bureau of Labor Statistics.

² The import penetration level of microwave ovens is estimated to be nearly 80 percent of U.S. consumption of these items.

Table 3-13

Major household appliances industry: U.S. producers' shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, 1984-88

Year	Shipments	Exports	Imports	Apparent consumption	Ratio of—	
					Imports to consumption	Exports to shipments
					Percent	
Quantity (1,000 units)						
1980	27,360	1,985	1,791	27,166	7	7
1981	26,984	1,719	1,904	27,169	7	6
1982	22,471	1,259	2,037	23,249	8	6
1983	28,320	898	3,647	31,069	12	3
1984	30,167	839	6,142	35,470	17	3
1985	30,288	685	14,910	44,513	33	2
1986	34,182	838	11,785	45,129	26	2
1987	36,308	1,405	12,155	47,058	26	4
1988	37,397	2,346	11,809	46,860	25	6
Value (million dollars)						
1980	6,698	603	255	6,350	4	9
1981	7,126	617	307	6,816	5	9
1982	6,449	449	306	6,306	5	7
1983	7,827	310	497	8,014	6	4
1984	8,952	265	809	9,496	9	3
1985	8,984	209	1,080	9,855	11	2
1986	9,754	241	1,228	10,741	11	2
1987	10,030	390	1,194	10,834	11	4
1988	10,331	662	1,223	10,892	11	6

Source: Compiled from official statistics of the U.S. Department of Commerce.

during 1987 due to an increase in demand for major appliances, coupled with reduced capacity (which resulted from plant consolidation).

Production of major household appliances has become a global industry with multinational companies from the United States, Canada, Japan, West Germany, and Sweden assuming the lead as manufacturers of these products, as shown in tabulation below:

Company	1988 Share of World Market
Whirlpool Corp., U.S.A	30 percent
AB Electrolux, Sweden	21 percent
Matsushita, Japan	20 percent
General Electric, U.S.A	16 percent

U.S. shipments of major household appliances increased in value by 15 percent and in volume by 24 percent during 1984-88 (table 3-13). The driving force behind increased shipments is the continued economic growth in the United States, which has fueled increased sales in the replacement market and new housing construction of single-family homes. Replacement purchases account for approximately 75 percent of all appliance sales.

Trade patterns

During 1984-88, U.S. imports of major household appliances rose by 92 percent as imports increased from 6.1 million units in 1984 to 11.8 million in 1988 (table 3-14), primarily as a result of increased demand for microwave ovens. Korea, Japan, and Singapore together accounted for nearly 82.2 percent of total imports in 1988.

Table 3-14
Major household appliances industry: U.S. imports for consumption, by principal sources, 1984-88

Source	1980	1981	1982	1983	1984	1985	1986	1987	1988
<i>Quantity (1,000 units)</i>									
Korea	102	190	407	729	1,742	2,671	3,932	5,471	5,653
Japan	1,075	1,142	1,019	1,824	3,091	10,073	5,640	4,193	3,396
Singapore	215	209	244	365	707	1,012	687	436	663
Brazil	(¹)	(¹)	(¹)	(¹)	26	72	227	289	322
Mexico	(¹)	(¹)	(¹)	(¹)	27	153	205	365	541
Sweden	107	19	41	146	97	59	84	102	119
Canada	125	114	122	255	97	119	241	296	239
Malaysia	(¹)	(¹)	(¹)	(¹)	(¹)	218	278	583	165
West Germany	(¹)	(¹)	(¹)	(¹)	10	128	22	19	24
Thailand	(¹)	(¹)	(¹)	(¹)	(¹)	0	2	33	285
All other	166	230	204	328	346	405	466	367	404
Total	1,791	1,904	2,037	3,647	6,142	14,910	11,785	12,155	11,809
<i>Value (1,000 dollars)</i>									
Korea	14,600	30,596	62,861	106,497	192,479	251,080	338,355	452,625	504,852
Japan	154,100	198,519	153,931	249,832	402,391	557,918	548,514	328,898	218,249
Singapore	30,746	36,288	37,174	51,036	89,402	107,518	59,529	52,794	97,800
Brazil	(²)	(²)	(²)	(²)	5,330	13,318	41,897	55,150	67,098
Mexico	(²)	(²)	(²)	(²)	3,173	10,890	19,020	44,413	62,566
Sweden	16,515	3,407	5,591	20,961	36,349	22,076	40,482	45,384	56,368
Canada	18,624	17,543	17,392	32,398	25,218	32,253	51,972	55,532	51,163
Malaysia	(²)	(²)	(²)	(²)	1	14,783	22,062	56,942	35,955
West Germany	(²)	(²)	(²)	(²)	5,094	7,415	13,702	20,466	22,233
Thailand	(²)	(²)	(²)	(²)	(²)	(²)	180	1,694	21,389
All other	20,469	21,049	28,758	35,971	49,459	63,247	92,013	80,179	85,475
Total	255,054	307,402	305,707	496,695	808,896	1,080,498	1,227,727	1,194,077	1,223,148

¹ Less than 500 units.

² Less than \$500.

Note.—Because of rounding, figures may not add to the totals shown.

Source: Compiled from official statistics of the U.S. Department of Commerce.

The near tripling of U.S. exports of major appliances during this period (table 3-15) can be attributed primarily to the depreciation of the U.S. dollar. Taiwan was the largest market for these products, followed by Canada and Mexico.

Effects of the VRAs

Supply and quality.—According to industry sources, approximately 90 percent of steel products purchased by major appliance producers are from domestic mills; the remainder are generally purchased from service centers. Industry officials noted that during the period of the VRAs, supplies of steel have tightened as leadtimes have increased as much as 16 to 20 weeks beyond normal. In addition, the availability of high-quality sheet steel, critical to the appearance of many major household appliances, has reportedly deteriorated. Both problems are believed to be the result of consolidation of the domestic steel industry, coupled with increased demand.¹

Although industry sources noted that tight supply had necessitated some product substitution in the manufacturing process, none reported adverse effects on production or sales.

¹ Industry sources believe that the U.S. Steel strike in 1986 exacerbated these problems.

Prices.—Almost all producers of major appliances reported price increases for steel products during the period of the VRAs. Testimony given at the ITC hearing by the American Home Appliance Association (AHAM), stated that in 1988, steel sheet and plate price increases averaged over 16 percent, tubing prices increased by an average of nearly 19 percent, and coil averaged an increase of over 13 percent.

Although a majority of the major appliance producers stated that VRAs had an effect on steel prices, it was difficult for them to quantify the effect on price increases. Other, important factors cited as influencing steel prices were the depreciation of the dollar and increased global demand for steel.

Competitiveness.—Most producers indicated that the effect of VRAs on domestic sales has probably been marginal, since increases in raw materials prices were largely absorbed by domestic manufacturers, among whom competition is high. However, at least one major appliance executive is proposing a 6 to 7 percent price increase for products if steel prices continue to increase. In addition, higher steel prices, along with other internal cost increases, have affected profit margins and reportedly have made less money available for reinvestment in new plant and equipment.

Table 3-15

Major household appliances industry: U.S. exports of domestic merchandise, by principal markets, 1984-88

Market	1980	1981	1982	1983	1984	1985	1986	1987	1988
<i>Quantity (1,000 units)</i>									
Taiwan	70	35	32	42	44	30	77	237	611
Canada	379	243	138	189	246	235	280	401	400
Mexico	(¹)	(¹)	(¹)	(¹)	13	22	35	71	226
Saudi Arabia	520	422	466	215	122	73	35	53	119
France	(¹)	(¹)	(¹)	(¹)	7	11	13	74	108
Hong Kong	54	58	30	26	27	19	14	24	43
Spain	(¹)	(¹)	(¹)	(¹)	4	3	5	14	32
Arab Emirates	71	64	28	21	16	15	10	17	32
Finland	(¹)	(¹)	(¹)	(¹)	(¹)	4	27	78	77
West Germany	(¹)	(¹)	(¹)	(¹)	10	6	9	14	57
All other	891	897	565	405	351	267	333	423	642
Total	1,985	1,719	1,259	898	839	685	838	1,405	2,346
<i>Value (1,000 dollars)</i>									
Taiwan	15,349	11,208	11,040	13,094	13,766	9,498	25,644	77,789	203,861
Canada	72,171	56,088	38,077	48,093	60,558	66,722	75,941	111,481	119,029
Mexico	(²)	(²)	(²)	(²)	5,300	7,659	6,262	12,446	67,437
Saudi Arabia	160,458	145,932	155,890	76,173	46,333	23,418	13,837	18,515	28,219
France	(²)	(²)	(²)	(²)	2,110	1,988	3,260	13,104	21,766
Hong Kong	16,983	21,283	11,001	9,700	9,076	6,379	4,815	7,775	13,977
Spain	(²)	(²)	(²)	(²)	2,106	1,864	2,834	6,833	12,530
Arab Emirates	25,995	25,573	11,040	8,942	5,289	4,320	3,230	6,063	10,932
Finland	(²)	(²)	(²)	(²)	154	929	4,434	10,205	10,648
West Germany	(²)	(²)	(²)	(²)	4,239	2,612	4,060	5,806	10,035
All other	311,898	356,550	222,206	154,606	115,739	83,189	96,966	120,110	163,944
Total	602,854	616,634	449,254	310,608	264,670	208,577	241,283	390,125	662,376

¹ Less than 500 units.² Less than \$500.

Note.—Because of rounding, figures may not add to the totals shown.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Producers who export major appliances believe the VRAs have had a modest effect on exports, despite the large increase in exports during the time of the program. Most producers believe that foreign manufacturers can purchase steel products at lower cost than U.S. manufacturers can. They suggested that if increased steel prices are eventually incorporated in final appliance prices, the recent increase in exports may be curtailed.

Views on continuation of the VRAs

Although the industry has been unable to quantify the extent to which VRAs have contributed to steel price increases, the industry association opposes extension of the program, citing the domestic steel industry's return to profitability. Of the five major appliance manufacturers, two concur with the association's position; one strongly recommends that VRAs be phased out over the next 3 to 5 years; one company supports renewal, since no negative effects of the program have been identified; and one company takes no position on continuation of the VRAs.

The Forging Industry

Structure of the Domestic Industry

The forging industry comprises companies that shape, refine, and improve the mechanical properties of metals by subjecting them to impact or pressure. The forging industry's products are shipped to three types of markets: (1) the motor-vehicle, construction, agricultural, and manufacturing markets, which use small to medium-sized, low-value forged products; (2) the shipbuilding, petroleum exploration, rail, and heavy industrial markets, in which large, relatively low-value forged products are consumed; and (3) the aerospace and power-generating equipment markets, which require relatively high-value forged products. Forged products are produced in sizes and weights that vary significantly. They include products such as industrial fasteners and non-powered handtools, which may weigh one pound or less, to products such as large locomotive crankshafts and rotor shafts for power generation equipment, which may weigh one ton or more. The principal raw material used to produce low-value forgings is carbon steel (primarily

billets and bars); whereas products required by the aerospace and power-generating equipment markets are generally manufactured from aluminum, titanium, or other lightweight metals. Although numerous manufacturing techniques are used to produce forged products, approximately one-half of all forgers employ the hot impression die manufacturing method.¹

The number of companies in the United States producing forged products of iron or steel declined from about 390 to 370 during 1980-88. These producers are largely concentrated in heavily industrialized sections of the country such as the West, Midwest, and Northeast. The size of the companies varies from small operations specializing in few forged products to large operations producing a broad range of diversified products. During 1980-88, the number of production and related workers fluctuated, from a high of about 30,000 workers during 1980-81, to a low of 18,000 workers in 1986-88. The decline in the number of workers is largely attributed by industry officials to increased automation (which requires fewer workers), the closing of facilities due to a cutback in the demand for petroleum exploration (a principal market for certain forgers), and the substitution of nonmetal products, such as plastics used by the automotive and manufacturing industries.

During 1980-88, shipments of steel mill products by domestic mills to independent forgers fluctuated downward from about 1.2 million net tons in 1980 to 932,000 net tons in 1988, or by about 22 percent.² Certain forging producers have asserted that the cost of steel represents between 20 and 30 percent of total production costs.

Conditions in the industry

The operational performance of the forging industry varied widely during 1980-88. From 1980 to 1985, with the increase in the value of the dollar against major foreign currencies, import penetration in forged products increased from an estimated 9 percent to 21 percent and domestic shipments fell by 19 percent, from \$3.5 billion to \$2.8 billion (table 3-16). This decline, coupled with overcapacity and alleged unfair foreign trade practices,³ affected the industry's ability to generate profits sufficient to fund increased capital investments in modern plant and

¹ For a full description of the forged products used in the principal markets, the manufacturing process, and other relevant information, see USITC Publication 1833, *Competitive Assessment of the U.S. Forging Industry*, April 1986.

² Data provided by the American Iron and Steel Institute.

³ On Oct. 9, 1986, petitions were filed with the U.S. Government alleging that U.S. imports of certain forged steel crankshafts from Brazil were being subsidized and

equipment, as shown in the tabulation below. In turn, this further affected the competitive position of the industry.

(Millions of Dollars)

Year	Capital expenditures	Inventories
1980	148.6	528.9
1981	181.0	564.6
1982	158.4	620.8
1983	80.2	477.9
1984	97.3	640.0
1985	95.6	568.6
1986	74.4	552.0
1987 ¹	80.5	555.0
1988 ¹	90.0	560.0

¹ Estimated by the staff of the U.S. International Trade Commission.

Since 1985, however, a weaker U.S. dollar, corporate restructuring, affirmative unfair trade findings, advances in U.S. plant productivity largely reflecting improvements in manufacturing equipment, and tighter inventory controls have contributed to improvements in domestic industry conditions. U.S. shipments, for example, increased by 39 percent, to \$3.9 billion in 1988, and capital expenditures increased in both 1987 and 1988, though still significantly below the early 1980 level. Apparent consumption followed the trend of domestic shipments. After reaching a high of 31 percent in 1986, the share of imports to consumption declined to 27 percent in 1988. Reportedly, capacity utilization ranged between 60 and 65 percent during the period.

According to data presented in the Commission's report, the *Competitive Assessment of the U.S. Forging Industry*, the ratio of net profit to net sales declined from about 8 percent to 2 percent during 1981-85. With a general upturn in the operational performance of the industry subsequent to 1985, however, it is estimated that the ratio of profits to sales increased to about 6 percent in 1988.⁴

Trade Patterns

U.S. imports of forgings of iron or steel more than doubled during 1984-88, increasing from an estimated \$607 million to \$1.4 billion (table

³—Continued

that imports of these products from Brazil, West Germany, Japan, and the United Kingdom were being sold in the United States at less than fair value. As a result of affirmative findings by the Department of Commerce and the U.S. International Trade Commission, additional antidumping duties have been assessed against West Germany and the United Kingdom and countervailing duties have been assessed against Brazil. Margins on imports from Japan were found to be de minimis.

⁴ Based on information obtained in interviews with domestic forging producers.

Table 3-16

Forgings of iron or steel: U.S. producers' shipments, imports for consumption, exports of domestic merchandise, and apparent consumption, 1980-88

Year	Shipments	Imports	Exports	Apparent consumption	Ratio (percent) of—	
					Imports to consumption	Exports to shipments ¹
1980	3,476	350	125	3,701	9	4
1981	3,864	386	101	4,149	9	3
1982	3,161	340	79	3,422	10	2
1983	2,707	363	69	3,001	12	3
1984	3,175	607	73	3,709	16	2
1985	2,809	728	70	3,467	21	2
1986	2,560	1,128	60	3,628	31	2
1987	3,400	1,173	64	4,509	26	2
1988	3,900	1,408	77	5,231	27	2

Source: Estimated by the staff of the U.S. International Trade Commission; producers' shipments during 1980-86 were compiled from official statistics of the U.S. Department of Commerce.

3-16).¹ U.S. forging producers reported disadvantageous exchange rates and the rising cost of foreign products as the principal reasons for the increase in the value of imports. Canada, the largest supplier of imports to the U.S. market, increased its share of total imports from an estimated 47 percent to about 58 percent during 1980-84, before declining to a low of 34 percent in 1988 (table 3-17).² Approximately 65 percent of imports from Canada consists of automotive parts such as crankshafts and connecting rods used by U.S. automotive manufacturers. Reportedly, about 10 percent of all forging operations in Canada are under U.S. ownership, and it is estimated that these operations account for approximately 40 percent of Canadian exports to the United States. The share of imports from

Japan, the second-largest supplier, fluctuated upward from an estimated 11 percent of total U.S. imports in 1980 to 21 percent in 1988.

During 1980-84, the share of imports of forgings from countries subject to the VRAs (i.e., Japan, Brazil, Mexico, United Kingdom, Italy, France, and West Germany) declined from an estimated 43 percent to 34 percent of total U.S. imports, before increasing to 55 percent in 1988. The share of imports from non-VRA countries was relatively low throughout the period. Industry sources allege that some VRA quotas were circumvented by downstream dumping of imports of certain forged products not covered under the VRAs.

During 1984-88, U.S. exports of forgings of iron or steel increased by 5 percent, from an estimated \$73 million to \$77 million (table 3-16). The major export markets for U.S.-produced forged products are Canada and Mexico. The automotive industries in these countries are the principal consumers of U.S. exports.

The share of U.S. exports to countries subject to the VRAs remained at an estimated 26 percent of total U.S. exports during most of 1980-1984, whereas during 1984-88, the share of U.S. exports to those countries increased from an estimated 26 percent to 34 percent.

¹ Import and export data for all forged products of iron or steel are not separately provided for by official statistics. Import and export data presented in tables 3-16, 3-17, and 3-18 are estimates compiled from information presented in the Commission's report, *Competitive Assessment of the U.S. Forging Industry*, and data compiled from official statistics of the U.S. Department of Commerce, which include forged and nonforged products.

² Official data for import and export product classification include such a large volume of nonforged products that tables showing the value of imports and exports on a country basis would be misleading. Data on country shares are therefore provided. The country shares, however, continue to reflect substantial trade in non-forged products.

Table 3-17
Forgings of iron or steel: U.S. import shares of principal suppliers, 1980-88
(In percent)

Source	1980	1981	1982	1983	1984	1985	1986	1987	1988
Canada	47	49	50	59	58	54	39	37	34
Japan	11	11	10	8	9	10	18	20	21
W. Germany	8	7	7	6	6	5	9	10	9
United Kingdom	12	13	12	7	6	7	7	7	7
France	4	4	7	6	6	7	7	7	6
Mexico	1	1	1	1	1	1	3	4	5
Italy	6	6	5	4	4	4	4	4	4
Brazil	2	2	2	2	2	2	2	3	3
Sweden	(¹)	(¹)	(¹)	1	1	1	2	2	2
Taiwan	(¹)	(¹)	(¹)	2	2	2	2	1	1
Total	91	93	94	96	95	93	93	95	92

¹ Less than 0.5 percent.

Source: Estimated by the staff of the U.S. International Trade Commission using data of the U.S. Department of Commerce.

Table 3-18

Forgings of Iron or steel: U.S. export shares to principal markets, 1980-88

(In percent)

Market	1980	1981	1982	1983	1984	1985	1986	1987	1988
Canada	15	19	17	23	27	25	28	26	28
Mexico	9	10	9	7	12	13	16	13	14
Belgium	0	0	0	0	0	0	0	0	5
United Kingdom	5	5	4	4	3	3	4	4	4
Venezuela	3	5	5	2	3	3	4	4	4
Australia	2	2	3	2	2	2	2	3	3
Japan	4	3	3	3	4	2	2	2	2
Singapore	2	2	2	2	2	2	2	2	2
W. Germany	3	2	3	2	2	2	2	2	2
Saudi Arabia	7	5	7	6	4	3	3	2	2
Total	50	53	53	51	59	55	63	58	66

Source: Estimated by the staff of the U.S. International Trade Commission using data of the U.S. Department of Commerce.

Effects of the VRAs

Prices.—One of the principal issues of concern to forgers is the apparent effect the VRAs have had on prices. According to a number of major forging producers, the implementation of the VRAs resulted in price increases of 20 to 40 percent, principally for billets and bar material, during 1985-88. These increases reportedly could not easily be passed along to customers without losing sales to competitive sources. Forging producers have also expressed concern about having to pay surcharges for scrap and certain alloys, beginning in 1987.

Upward price pressures would appear to be a continuing problem for the forgers. According to the trade press,¹ during the last half of 1988, several major mills raised prices on certain bar products. LTV Steel Co. raised prices \$25 and \$30 a ton (5 to 7 percent) on hot-rolled and cold-rolled bars, respectively, and Bethlehem Steel increased prices on hot-rolled bars by \$25 a ton (5 percent). During the same period, Inland Steel and North Star Steel raised prices by \$10 to \$20 per ton for carbon- and alloy-grade special bar quality products (1 to 3 percent) and Bliss and Laughlin hiked prices by \$15 to \$27 per ton (2 to 3 percent). With respect to surcharges, Bethlehem Steel decided to reduce its scrap surcharge from \$40 to \$25 per ton, effective in February 1988.

Inasmuch as the VRAs for steel bars were not binding (80 percent of quotas were filled in 1987; the available information indicate that the level was significantly lower in 1988), such price increases would appear to be directly attributable more to stronger global demand and reduced supply of steel products in the U.S. market, reflecting domestic restructuring and capacity cutbacks, and to the depreciation of the dollar relative to other currencies rather than the VRAs.

¹ *American Metal Market*, Jan. 20, 1988.

The VRAs would have had more direct effect on prices of billets as quotas for semifinished steel, which include billets, were filled from most sources in 1987. In 1988, however, it would appear that quota tonnages were not as filled. Such a low percentage would have mitigated the price effects.

Supply and quality.—A second issue of concern to producers is the inability to obtain adequate steel tonnages of bar and billet material to fill customer orders on a timely basis. Allegedly, these shortages are a reflection both of limitations imposed by the VRAs and of reduced capacity of domestic steel producers.² Several forgings representatives suggested that domestic steel producers have been more inclined to eliminate lower value steel bar operations rather than more profitable flat-rolled steel products operations when closing facilities.

Reflecting limited domestic supply and rising global demand, the lead-times for delivery of steel products increased from 4 to 8 weeks beginning in early 1988 according to certain Midwest forgings producers; prior to that period, production material reportedly could be obtained in 2 weeks or less. In addition, inadequate timely supply has reportedly caused producers to purchase from non traditional domestic sources, thus fostering uncertainty as to the quality of the material purchased. One major forgings producer in the Midwest noted that mill material often had to be reworked in order to continue supplying production lines with feedstock. This delay creates additional expense, slows production time, and adversely affects machinery life.

According to certain forgers, the increase in prices for forged metal products has increased the use of nonmetal materials in certain automotive, manufacturing, and aerospace applications.

² As of February 1989, forging producers had not filed short-supply requests with the Department of Commerce for additional bar or billet material.

Competitiveness.—Although supporting data have not been made available to the Commission, a number of forging producers have reported a decline in domestic sales, allegedly as a result of the VRAs. Unreliable delivery schedules and rapidly changing pricing patterns by domestic steel producers have reportedly caused difficulty in honoring current contracts and quoting effectively on future orders, both domestically and abroad. Whereas certain forging producers may have experienced declines in operational performance subsequent to implementation of the VRAs, the performance of the industry as a whole appears to have generally improved, as illustrated by increases in shipments, capital expenditures, and capacity utilization.

Views on continuation of the VRAs

The Forging Industry Association opposes the extension of the VRAs on steel imports beyond their current targeted expiration date of Sept. 30, 1989. According to the association, forging producers need a continuing availability of quality raw material on a timely basis, at competitive prices. However, in the event that the Administration chooses to extend the VRA program on steel imports, the association is advocating a number of modifications, two of which address the problem of supply shortages directly. One would set a target quota for bar and billet material suitable for forging (SBQ). An alternative would be complete elimination of SBQ material from inclusion in future VRA agreements.

Both the association and independent forgers expressed concern that without eased import restrictions to increase the steel supply of bars and billets and to exert some price pressure on domestic producers, their industry would be adversely affected by spot shortages and higher prices.

The Metal-Stamping Industry

Structure

Metal stamping is the process of giving shape and utility to hot-rolled, cold-rolled, and stainless sheet and coil by cutting, piercing, and forming it in presses. Metal stampings are commonly used to contain and guide solids, liquids, and gases; to support assemblies; to encase electronic components and appliances; and to impart or facilitate motion or power, primarily in automobiles. The principal market for metal stampings, 90 percent of which are steel, is the automotive industry, which accounts for approximately 50 percent of metal stampers' revenues. Other important markets are the aerospace, electronics, computer,

business machine, appliance, furniture, farm equipment, construction, and defense industries.

The domestic metal-stamping industry comprises approximately 4,000 firms, predominantly located in New England and Midwestern states, and employs about 300,000 workers. Industry sources maintain that metal stampers, typically small businesses with \$25 million or less in total assets, are the largest domestic consumers of steel, accounting for approximately 25 percent of domestic steel consumption. Service centers supply domestic metal-stampers with approximately 70 percent of their steel; domestic metal stampers are usually too small to negotiate directly with steel mills. In metal-stamping operations, labor costs generally account for between 15 and 30 percent of the pre-tax cost of finished products, whereas the cost of steel accounts for between 30 and 60 percent, depending on the capital intensity of the production process employed.

Conditions in the industry

Reflecting the manufacture of smaller automobiles during 1983-84 and the inability of many domestic metal stampers to achieve production efficiencies or to pass cost increases through to consumers during 1987-88, domestic metal stampers¹ posted returns on sales significantly below the average of U.S. manufacturers during these periods, as shown in the tabulation below:
(In percent)

Year	Metal stampers ¹	All manufacturers ²
1983	1.98	4.45
1984	2.64	5.10
1985	5.06	4.18
1986	4.37	4.03
1987	3.91	4.10
1988	3.40	5.10

¹ Weighted averages of return on sales of domestic metal stampers as reported in *Annual Statement Studies*, 1983-88 Issues, Robert Morris Associates (Philadelphia, PA).

² Average of quarterly return on sales of all U.S. manufacturers with \$25 million or less in assets, as reported in *Quarterly Financial Reports*, 4th quarter issues, 1983-87, and 3rd quarter issue, 1988.

As noted in table 3-19, the value of shipments increased by 30 percent during 1983-88, from \$23.4 billion in 1983 to \$30.5 billion in 1988. Import penetration appears to have increased steadily, rising from 5.4 percent of apparent consumption in 1983 to 8.7 percent in 1988.²

¹ Represented in SICs 3465, 3466, 3469, and 3499.

² Statistical breakouts on imports and exports of stampings are not separately provided for in U.S. foreign trade statistics. Data presented represent aggregations developed by the U.S. Department of Commerce for SICs 3465, 3466, 3469, and 3499.

Table 3-19

Metal stampings: U.S. producers' shipments, imports for consumption,¹ exports of domestic merchandise,¹ and apparent consumption, 1980-88

Year	Shipments	Imports	Exports	Apparent consumption	Ratio (percent) of—	
					Imports to consumption	Exports to shipments
Value (million dollars)						
1980	20,797	917	1,645	20,069	4.6	7.9
1981	22,137	1,027	1,679	21,485	4.8	7.6
1982	20,215	1,048	1,878	19,385	5.4	9.3
1983	23,406	1,232	1,825	22,813	5.4	7.8
1984	28,519	1,645	2,129	28,035	5.9	7.5
1985	29,233	1,775	2,028	28,980	6.1	6.9
1986	29,211	1,990	1,900	29,301	6.8	6.5
1987	² 28,582	2,346	2,157	28,771	8.2	7.5
1988	² 30,499	2,662	2,484	30,677	8.7	8.1

¹ Represents data aggregated for SICs 3465, 3466, 3469, and 3499.

² Estimated by the staff of the U.S. International Trade Commission.

Source: Producers' shipments, exports, and imports compiled from official statistics of the U.S. Department of Commerce, except as noted.

According to industry sources, the need to modernize, principally encouraged by foreign competition, is currently the prime motivator of change within the domestic metal-stamping industry. Industry officials and the metal-stamping trade press agree that a large segment of the domestic stamping industry, primarily small and midsize firms, are less efficient than some foreign competitors, particularly the Japanese; Japanese metal stampers enjoy higher yields relative to domestic metal stampers as they consume 70 to 75 percent of the raw material they purchase, whereas the domestic industry consumes 60 to 65 percent of purchased materials. In addition, the domestic industry requires an average of 6 months to bring a stamping die from finished design to "first hit," whereas Japanese stampers typically do so in about 6 weeks.¹

Modernization has had a number of implications for the domestic industry. Capacity utilization has decreased as less efficient presses have been idled in favor of modern presses, which stamp more quickly and with greater precision. As a result, capacity utilization currently ranges from 50 to 60 percent.² In addition, a moderate rate of attrition or consolidations has occurred as smaller companies have exited the industry or have pooled resources in order to modernize.

Trade patterns.—Reflecting technological advances incorporated by principal foreign competitors, the surplus trade pattern existing throughout 1980-85 was reversed in 1986 when the United States became a net importer of metal stampings. As shown in table 3-20,³ exports increased by 17, percent from \$2.1 billion in 1984

to \$2.5 billion in 1988. More dramatically, however, total imports increased by 62 percent, from \$1.6 billion in 1984 to \$2.7 billion in 1988, attributable primarily to the significant growth of imports from Taiwan, Japan, and Canada, which increased exports to the United States by 69, 56, and 52 percent, respectively (table 3-21). The globalization of metal-stampings trade, noted by the industry,⁴ is reflected by the simultaneous increase of both import penetration and the exports-to-shipments ratio since 1986.

Effects of the VRAs

Supply and quality.—Metal stampers have experienced reduced steel availability⁵ since January 1987, largely as a result of spot shortages characterized by a tighter steel market. Although the market tightened during 1987-88, several factors indicate that the implementation of VRAs has had a marginal effect in causing tighter markets in most product areas. Whereas import limits imposed by the VRAs for hot-rolled sheet and cold-rolled sheet were nearly filled during 1987, it is estimated that a far lower percent of allowable imports of these products was actually imported in 1988.⁶ Moreover, the devaluation of the dollar made the U.S. steel market relatively unattractive to foreign steel producers; steel could be traded more profitably in other markets.⁷

⁴ U.S. International Trade Commission, Hearings on *The Effects of the Steel Voluntary Restraint Agreements on U.S. Steel-Consuming Industries*, inv. No. 332-270, Mar. 10, 1989.

⁵ By the term "availability," the domestic industry means the accessibility of the right steel product with adequate quality, competitive price, and timely delivery.

⁶ David J. Cantor, "Steel Imports: Are the VRA Countries Filling Their Quotas?" *Congressional Research Service, The Library of Congress*, Feb. 3, 1989.

⁷ Peter Marcus, *WSD Price Tracks #29*, February 1989.

¹ *Modern Metals*, January 1989, p. 134.

² *Ibid.*

³ Data on metal stamping are not specifically provided for in the U.S. tariff schedules. Data used are those compiled by the U.S. Department of Commerce on an SIC basis. The data, however, do not include all stamped products, nor do they reflect trade solely in stamping.

Table 3-20
Metal stampings: U.S. exports,¹ by principal markets, 1980-88
(In millions of dollars)

Market	1980	1981	1982	1983	1984	1985	1986	1987	1988
Canada	904	989	1,131	1,287	1,613	1,514	1,433	1,583	1,798
Mexico	205	178	124	87	107	136	102	143	205
Taiwan	155	89	202	32	22	74	44	63	83
Japan	21	36	58	84	97	59	43	62	48
Korea	9	17	22	21	39	23	61	39	41
United Kingdom ...	35	28	24	20	22	23	24	28	38
West Germany ...	17	13	12	12	13	10	13	15	37
Italy	21	19	19	14	5	7	16	27	30
Singapore	4	5	4	7	6	5	9	10	14
Switzerland	5	6	7	29	6	5	5	20	13
All other	269	299	275	232	199	172	150	167	177
Total	1,645	1,679	1,878	1,825	2,129	2,028	1,900	2,157	2,484

¹ Represents data aggregated for SICs 3465, 3466, 3469, and 3499.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table 3-21
Metal stampings: U.S. imports,¹ by principal sources, 1980-88
(In millions of dollars)

Market	1980	1981	1982	1983	1984	1985	1986	1987	1988
Taiwan	139	179	198	298	378	420	501	642	638
Japan	192	204	209	217	271	300	343	365	424
Canada	133	186	158	159	239	250	277	329	363
Korea	65	78	82	100	126	129	149	172	203
West Germany ...	68	67	70	73	95	106	143	165	171
Mexico	42	35	43	65	89	89	63	75	127
Hong Kong	44	43	45	49	70	70	69	83	96
United Kingdom ...	56	53	48	41	55	58	64	64	81
France	31	35	29	29	49	50	55	66	77
Italy	26	25	26	40	41	47	52	56	56
All other	121	122	140	161	232	256	274	329	426
Total	917	1,027	1,048	1,232	1,645	1,775	1,990	2,346	2,662

¹ Represents data aggregated for SICs 3465, 3466, 3469, and 3499.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

The metal-stamping industry contends that the quality of the steel it purchases¹ has significantly deteriorated since the market tightened in 1987 and that lead times increased sharply, as shown in the tabulation below:²

Period	Hot-rolled	Cold-rolled	Stainless
January 1987	21	16	25
January, 1988	33	23	30
December, 1988 ..	17	13	24

In addition, metal stampers have been unable to purchase steel in the secondary market, in which substandard and excess steel are sold at discounts, since 1987. It appears that a tighter steel market, combined with the devaluation of the dollar, which made domestic steel producers more price-competitive in the market for high-grade steel, significantly reduced the domestic mills' incentive to sell in this discount market.

Case studies provided by the Precision Metalformers Association indicate that problems of

availability have adversely affected the bidding, production, and delivery practices of metal-stamping firms, particularly those not associated with large automakers.³ First, stamping substandard steel has reportedly resulted in excessive die wear and die damage, resulting in more "downtime"; greater sort, rework, and scrap rates; and end products of poor quality, all of which makes domestically produced stampings less competitive in the international market. Second, longer lead times have reportedly created production bottlenecks and have motivated domestic metal stampers to carry larger inventories, thereby reducing working and investment capital. Moreover, longer leadtimes, combined with downtime resulting from lower quality steel, have apparently made it difficult to assure prospective customers, most of whom are accustomed to "just in time" delivery, that deliveries will be made on time; domestic metal stampers who successfully bid for business are usually given only 4 to 6 weeks to make deliveries.

¹ As noted above, approximately 70 percent of this industry's purchases are made from service centers.

² Leadtime data reflect the results of a survey of metal stampers and other metal fabricators conducted by the Precision Metalformers Association.

³ Case studies are attached to the PMA's written submission in response to the USITC's hearings on *The Effects of the Steel Voluntary Restraint Agreements on U.S. Steel-Consuming Industries*, inv. No. 332-270, Mar. 10, 1989.

Although there are exceptions, metal stampers have not reportedly changed their sources of steel during the 1980s, although some service centers have apparently shifted away from foreign sources to domestic sources as the depreciation of the dollar made foreign steel prices less competitive in the U.S. market. Some domestic metal stampers have indicated that the service centers' greater reliance on domestically produced steel reinforced the declining quality of steel available to domestic stampers.

Prices.—As a result of the strong demand for steel and the depreciation of the dollar, the price of steel increased during 1987–88. According to data compiled by the industry, the average cost of various grades of hot-rolled sheet, cold-rolled sheet, and stainless sheet increased by 24, 12, and 40 percent, respectively, during 1987–88. The largest price increase occurred in 300 series stainless sheet, the price of which increased by 52 percent during 1987–88; the largest increase in carbon sheet, which is more commonly used by stampers than are stainless grades, occurred in drawing-quality hot-rolled sheet, the price of which increased by 35 percent during 1987–88.¹

According to industry sources, competitive pressures have prevented the metal-stamping industry from passing the higher cost of steel through to consumers, particularly the automotive industry, which has resulted in efforts to decrease production costs in order to maintain profit margins. Modernization programs have entailed large investments since 1983, particularly for automotive stampers, whose investments increased from \$235 million in 1983 to \$1.2 billion in 1986 (accounting for 43 and 73 percent of the metal-stamping industry's total investment in new machinery and facilities in 1983 and 1986, respectively). Investments in new facilities and machinery for the industry as a whole also increased during the 1983–86 period, constituting about 6 percent of the industry's assets in 1983 and approximately 15 percent of the industry's assets in 1986.²

Competitiveness.—A review of industry conditions suggests that the domestic metal stamping industry did in fact experience difficulties during 1987–88 as a result of increased prices and lengthened lead times. Given the strong international market for steel and the significant depreciation of the dollar, however, the degree to which VRAs contributed to the higher prices and longer lead times is not clear.

Industry officials indicate that foreign stampers developed a competitive advantage in the late 1970s and early 1980s when they implemented more efficient machinery and production methods. As a result of improved quality and lower prices relative to domestic stampers, import

¹ Price data reflect the results of a survey of metal stampers and other metal fabricators conducted by the Precision Metalformers Association.

² U.S. Department of Commerce, *Annual Survey of Manufacturers*.

penetration increased in value terms during the early 1980s.³ After increasing in 1986, imports increased again in 1987 and 1988, despite the depreciation of the dollar.

With respect to foreign markets, the value of U.S. exports grew significantly as domestic stampers improved the quality of their products and as the dollar depreciated. Export growth rates during 1987–88, 13.5 percent and 15.2 percent respectively, were significantly above the 1980s average of 5.9 percent.

Views on continuation of the VRAs

Continuation of the VRAs is opposed by the Precision Metalformers' Association and all other members of the industry who were contacted. These sources maintain that the implementation of the VRAs adversely affected the domestic metal stamping industry by increasing prices and reducing availability, and that continued price and availability problems would have a significant effect on their competitive position.

Other Steel-Consuming Industries

Spokesmen from several industries besides the seven provided information about the effects of the VRAs to the Commission and expressed opinions about their extension. Nearly all who favor extension are from industries whose products are covered by the VRAs. Those who oppose extension include some from industries whose products are covered by the VRAs and some that are not.⁴

Companies in support of VRA extension

Companies in support of VRA extension stated that the import restraints have had positive effects on their operations by promoting market stability (in terms of steel availability).⁵ Many of these companies also stated that there had been no steel price increase directly attributable to the VRAs, citing other contributory factors including the USX strike, increased worldwide demand for steel, and the depreciation of the dollar.⁶ In addition, improved production efficiency stemming from modernization of the domestic steel industry (attributed to the effects of the VRAs) has reportedly improved the competitiveness of companies for whom steel is a major cost. A spokesman for one group of consumers noted that their increased competitiveness was reflected in a significant increase in their exports during 1987–88.⁷

³ Data expressing trade in terms of quantity are not available.

⁴ Views developed on the basis of information from the Commission's hearing in connection with this study, and from written submissions to the Commission.

⁵ See, for example, transcript, p. 136 (testimony of Paul Darling, President of Corey Steel Co.).

⁶ Transcript, pp. 139–141 (testimony of Mr. Roy Herman, President of UNR-Leavitt), and others.

⁷ Transcript, pp. 249–250 (testimony of the Committee on Pipe and Tube Imports (CPTI)), and CPTI submission, Mar. 17, 1989.

Four industry associations also stated to the Commission their support for extension of the VRAs. Three of the four groups also support expansion of the restraint program to include additional countries or product categories, while the fourth (Steel Service Center Institute (SSCI)) recommended that the agreements be continued for 3 years with certain modifications. A few steel consumers recommended that VRAs be extended for a period less than 5 years.

Information on companies supporting extension of the VRAs is provided in Table 3-22.

In addition, the Commission received information on other steel consumers that support extension of the VRAs.¹ A coalition of steel using manufacturers was also formed which supports extension of the VRAs.

Companies in opposition to VRA extension

Companies opposed to extension of the steel VRAs represent a diverse range of steel-consuming businesses, including manufacturers of steel windows, commercial food preparation equipment, and material-handling equipment. Three industry associations also stated their opposition to extension of the VRAs. In general, these associations and most member companies contend that the VRAs have had adverse effects on their operations in terms of higher steel prices, reduced steel availability, and deteriorating steel quality.²

These companies indicated that the VRAs have contributed to higher prices for steel by limiting steel supplies from foreign sources. Although some of these consumers stated that the role of VRAs in price increases is difficult to quantify,³ they believe that higher prices have adversely af-

¹ See submissions for specific views and recommendations.

² Ibid.

³ See, for example, submission by Enron Gas Pipeline Co. dated Mar. 10, 1989.

ected their company's competitiveness relative to similar foreign manufacturers.⁴ Some also noted that customer resistance to higher prices has hindered their ability to pass on increased steel costs and has subsequently resulted in lower profit margins.⁵ One company indicated that steel price increases and the associated higher production costs have adversely affected its exports.⁶

Companies opposing extension of the VRAs also stated that the VRAs have adversely affected the availability of steel products, resulting in long lead times (up to 6 months) and delayed or cancelled deliveries. In some cases, the lack of availability of steel reportedly has caused some manufacturers to delay production, increase inventories, and miss production deadlines.⁷

Spokesmen for these companies also stated that the VRAs have led to deteriorating steel product quality which has resulted in manufacturing downtime, increased start-up time, and additional costs for inspection and reworking or removal of substandard material.⁸ Table 3-23 presents information on companies that indicated to the Commission their opposition to VRA continuation.

In addition, a coalition of steel using manufacturers was formed in opposition to extension of the VRAs.⁹

⁴ Transcript, p. 85 (Burton Berrettini, representing the National Association of Food Equipment Manufacturers (NAFEM)) and p. 120 (Albert Leffler, CEO of the Material Handling Industry of America).

⁵ Transcript, pp. 84-85 (NAFEM).

⁶ Transcript, p. 85 (NAFEM) and submission of the National Association of Food Equipment Manufacturers, Mar. 10, 1989, p. 4.

⁷ Submissions by the Spring Manufacturers Institute, Mar. 16, 1989, p. 1; Enron Gas Pipeline Co., Mar. 10, 1989; the National Association of Food Equipment Manufacturers, Mar. 10, 1989, p. 4; and the William Bayley Co., Mar. 15, 1989, p. 2.

⁸ Transcript, p. 84 (NAFEM) and submission of the Spring Manufacturers Institute, p. 1.

⁹ See submissions for specific views and recommendations.

Table 3-22

Steel consumers supporting VRA extension, by type of business and type of steel consumed

Name	Type of business	Type of steel consumed
Company:		
Corey Steel ¹	Producer of cold-finished steel bar and warehouse of metal (principally steel) products	Bar, wire rod, coiled sheet
Fisher Tank	Fabricator and erector of steel tanks for the storage of water, chemical, and petroleum products	Plate
Thompson Steel Co ¹	Producer of cold-rolled strip steel and distributor of steel sheet and strip	Steel sheet
UNR-Leavitt Div. of UNR Industries ¹	Producer of pipe and tube products, principally square and rectangular structural tubing	Flat-rolled steel (mainly hot-rolled sheets or bands)
Association:		
American Wire Producers Assn. ^{2,3}	Producers of wire and wire products	Wire rod
Committee of Domestic Steel Wire Rope and Specialty Cable Manufacturers ^{2,4} ...	Producers of wire rope	Wire rod and wire
Committee on Pipe and Tube Imports ²	Producers of pipe and tube products	Steel sheet, strip, billets, and bars
Steel Service Center Institute ^{2,5}	Processors, warehouse, and distributors of steel	Most types of steel mill products

¹ Some, or all, of the company's end products are covered by the VRAs.

² Some, or all, of the member companies' end products are covered by the VRAs.

³ The member companies of the American Wire Producers Association represent approximately 75 percent of the domestic wire industry.

⁴ The Committee of Domestic Steel Wire Rope and Specialty Cable Manufacturers consists of seven U.S. producers that account for the majority of steel wire rope production in the United States.

⁵ The Steel Service Center Institute is an association of about 350 companies who process and distribute approximately one-third of the steel consumed in the United States.

Source: Submissions to the U.S. International Trade Commission in connection with investigation no. 332-270, *The Effects of the Steel Voluntary Restraint Agreements on U.S. Steel Consuming Industries*, and testimony from the investigation hearing.

Table 3-23

Steel consumers opposing VRA extension, by type of business and type of steel consumed

<i>Name</i>	<i>Type of business</i>	<i>Type of steel consumed</i>
Company:		
Berg Steel Pipe ^{1,2}	Producer of large diameter line pipe for oil and natural gas pipelines, and for offshore exploration and production platforms	Plate
Davis Walker Corp. ^{1,2,3}	Fabricator of wire and wire products	Wire rod
Enron Gas Pipeline Operating Co. ⁴ ...	Operator of a natural gas pipeline system	Large diameter pipe
Hoesch Tubular Products Co. ¹	Producer of oil country tubular goods for oil and gas exploration	Unfinished pipe
Senco Products, Inc. ¹	Producer of collated nails and staples used in construction, furniture manufacturing, auto production, manufactured housing, and packaging	Wire rod
William Bayley Co	Manufacturer of steel windows used in schools, office buildings, and prisons	Light hot-rolled sections
Association:		
Material Handling Industry of America ⁵	Producers of equipment for the movement and control of materials throughout the manufacturing and distribution process	Most types of basic steel mill products
National Association of Food Equipment Manufacturers ⁶	Producers of commercial food preparation equipment and supplies	Stainless steel sheet and strip
Spring Manufacturers Institute ⁷	Producers of precision mechanical	Carbon and alloy sheet, springs strip, wire, bars

¹ Some, or all, of the company's end products are covered by the VRAs.

² Davis Walker urged that wire drawers be exempted from the wire rod import restraints should the VRAs be continued.

³ On March 9, 1989, Davis Walker filed for protection from its creditors under Chapter 11 of the Bankruptcy Act.

⁴ Enron stated that if the VRAs are continued, they should include a short supply mechanism to address availability problems more promptly.

⁵ The Material Handling Industry annually purchases steel valued at above \$4 billion.

⁶ The National Association of Food Equipment Manufacturers represents about 600 firms with annual combined sales of approximately \$4.8 billion. The food service equipment industry purchases about 120,000 tons of stainless steel a year.

⁷ The Spring Manufacturers Institute represents 270 companies in the United States that employ about 18,685 people. Total sales volume for the entire industry exceeds \$1 billion annually.

Source: Submissions to the U.S. International Trade Commission in connection with investigation No. 332-270, *The Effects of the Steel Voluntary Restraint Agreements on U.S. Steel Consuming Industries*, and testimony presented at the investigation hearing.

APPENDIX A
LETTER FROM CHAIRMAN SAM GIBBONS OF THE SUBCOMMITTEE ON
TRADE OF THE HOUSE WAYS AND MEANS COMMITTEE TO ACTING
CHAIRMAN ANN BRUNSDALE REQUESTING THIS INVESTIGATION

M. GIBBONS, FLORIDA, CHAIRMAN
SUBCOMMITTEE ON TRADE

DAN ROSTENKOWSKI, ILLINOIS
MARTIN, GEORGIA
THOMAS J. DOWNNEY, NEW YORK
J. J. PEASE, OHIO
FRANK RUSSELL, ILLINOIS
WARD A. GEPHARDT, MISSOURI
MARK J. GUARINI, NEW JERSEY
BERT T. MATSUI, CALIFORNIA

ALVIN M. CRANE, ILLINOIS
WALTER JAGT, MICHIGAN
FRENZEL, MINNESOTA
K. SCHULZE, PENNSYLVANIA
LIAM M. THOMAS, CALIFORNIA

OFFICE
ARCHER, TEXAS

DAN ROSTENKOWSKI, ILLINOIS, CHAIRMAN
COMMITTEE ON WAYS AND MEANS

ROBERT J. LEONARD, CHIEF COUNSEL AND
STAFF DIRECTOR
RUFUS VERKA, SUBCOMMITTEE STAFF DIRECTOR

PHILIP D. MOSELEY, MINORITY CHIEF OF STAFF
THELMA J. ASKEY, SUBCOMMITTEE MINORITY

COMMITTEE ON WAYS AND MEANS

U.S. HOUSE OF REPRESENTATIVES

WASHINGTON, DC 20515

SUBCOMMITTEE ON TRADE

89 FEB 13 A 4:30

OFFICE OF THE CHAIRMAN

February 10, 1989

To: Econ

The Honorable Anne Brunsdale
Acting Chairman
U.S. International Trade Commission
500 E Street, S.W.
Washington, D.C. 20436

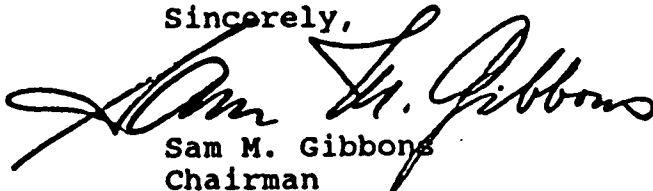
Dear Madam Chairman:

On behalf of the Subcommittee on Trade of the Committee on Ways and Means, I request that the Commission conduct a study pursuant to section 332 of the Tariff Act of 1930 on the effects of the steel voluntary restraint agreements (VRAs) on U.S. steel consuming industries. The study should provide estimates of the effects of these VRAs on exports, imports, and domestic sales of the major consuming industries for each of the years from 1985 through 1988. It should also include an analysis of the likely effects of continuing these restraints in the future. The estimates should be provided using the same approach and providing the same product detail as the Commission's 1985 study (investigation number 332-214).

The Commission should also explore other economic effects of VRAs focusing on the following: the automotive industry, the construction industry, heavy agricultural and construction equipment manufacturers, appliance and household goods producers, forging producers, and metal stampers.

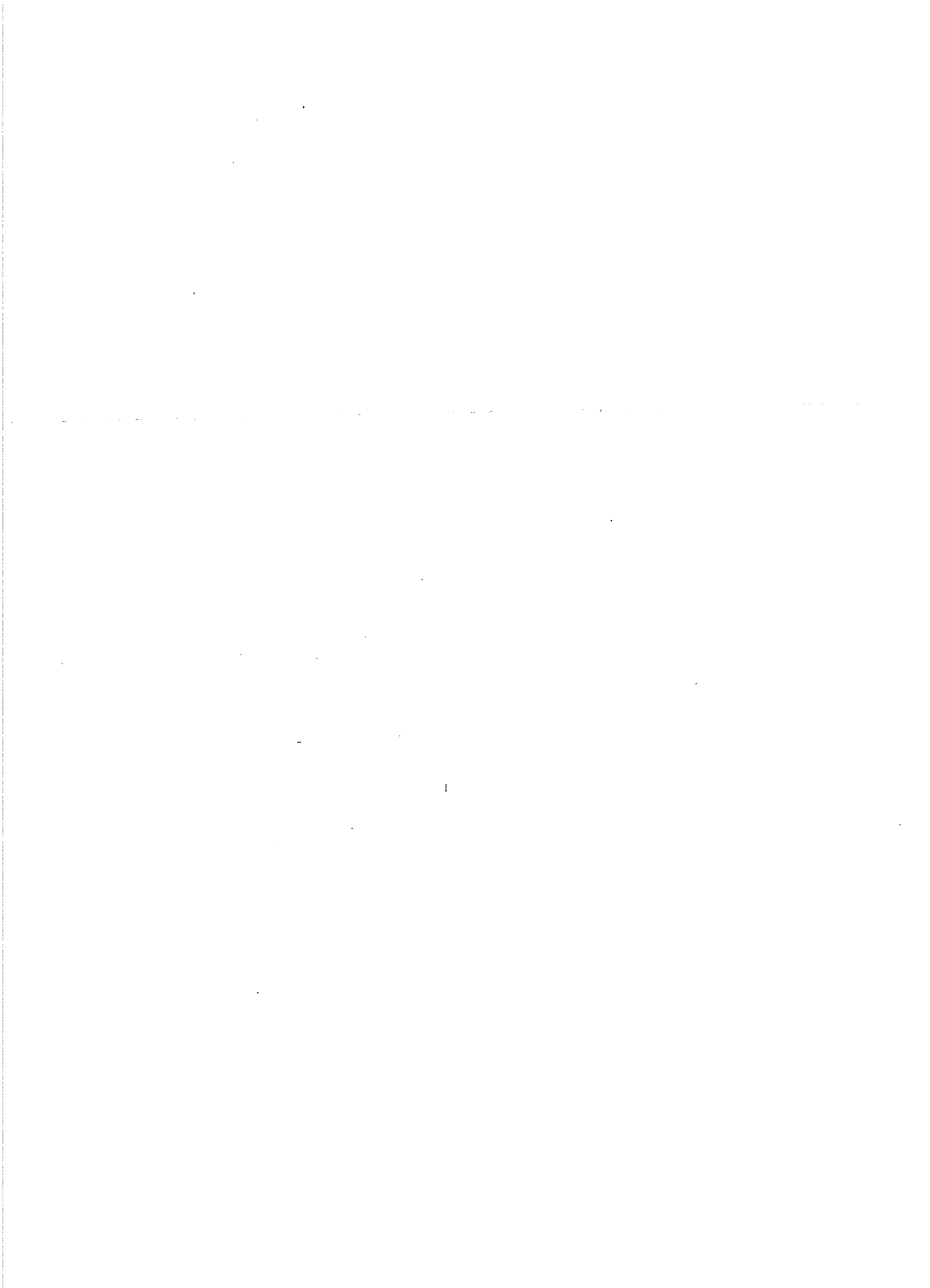
The Subcommittee would appreciate receiving the final report on this investigation on or before May 8, 1989. We realize that a public hearing may not be possible in light of the limited time available to complete the investigation. We would, however, request that the Commission provide an opportunity for interested parties to submit written comments on these issues.

Sincerely,


Sam M. Gibbons
Chairman

SMG/jnc

A-3



APPENDIX B
PUBLIC NOTICE OF THE COMMISSION'S INVESTIGATION

Vertical line of dots on the left side of the page.

INTERNATIONAL TRADE
COMMISSIONAgency Form Submitted for OMB
ReviewAGENCY: United States International
Trade Commission.ACTION: In accordance with the
provisions of the Paperwork Reduction
Act of 1980 (44 U.S.C. Chapter 35), the
Commission has submitted a request for
the extension of approval for
questionnaires to the Office of
Management and Budget for review.

PURPOSE OF INFORMATION

COLLECTION: The forms are for use by
the Commission in connection with
Investigation No. 332-209, Competitive
Conditions in the Steel Industry and
Industry Efforts to Adjust and
Modernize, instituted under the
authority of section 332(g) of the Tariff
Act of 1930 (19 U.S.C. 1332(g)).

Summary of Proposals:

- (1) Number of forms submitted: two.
- (2) Title of form: Annual Surveys
Concerning Competitive Conditions in
the Steel Industry and Industry Efforts
to Adjust and Modernize—
Questionnaires for U.S. Producers and
Importers.
- (3) Type of request: extension.
- (4) Frequency of use: annual, through
1989.
- (5) Description of respondents: firms
which produce or import carbon and
alloy steel products.
- (6) Estimated annual number of
respondents: 305.
- (7) Estimated total number of hours to
complete the forms: 6,800.
- (8) Information obtained from the form
that qualifies as confidential business
information will be so treated by the
Commission and not disclosed in a
manner that would reveal the individual
operations of a firm.

**ADDITIONAL INFORMATION OR
COMMENT:** Copies of the forms and
supporting documents may be obtained
from Mark Paulson (USITC, tel. no. (202)
282-1432). Comments about the
proposals should be directed to the
Office of Information and Regulatory
Affairs, Office of Management and
Budget (OMB), Washington, DC 20503.
Attention: Francine Picoult, Desk Officer
for the U.S. International Trade
Commission. If you anticipate
commenting on a form but find that time
to prepare comments will prevent you
from submitting them promptly you
should advise OMB of your intent as
soon as possible. Ms. Picoult's telephone
number is (202) 395-7340. Copies of any
comments should be provided to
Charles Ervin (U.S. International Trade

Commission, 500 E Street SW.,
Washington, DC 20436).Hearing impaired individuals are
advised that information on this matter
can be obtained by contacting our TDD
terminal on (202) 252-1810.

By order of the Commission.

Kenneth R. Mason,
Secretary.Issued: February 23, 1989.
[FR Doc. 89-4779 Filed 3-1-89; 8:45 am]
BILLING CODE 7020-02-M[Investigation No. 701-TA-298
(Preliminary)]Fresh, Chilled, or Frozen Pork From
Canada

Determination

On the basis of the record¹ developed
in the subject investigation, the
Commission determines,² pursuant to
section 703(a) of the Tariff Act of 1930
(19 U.S.C. 1671b(a)), that there is a
reasonable indication that an industry in
the United States is materially injured or
threatened with material injury by
reason of imports from Canada of fresh,
chilled, or frozen pork, provided for in
subheadings 0203.11.00, 0203.12.90,
0203.19.40, 0203.21.00, 0203.22.90, and
0203.29.40 of the Harmonized Tariff
Schedule of the United States, that are
alleged to be subsidized by the
Government of Canada.

Background

On January 5, 1989, a petition was
filed with the Commission and the
Department of Commerce by the
National Pork Producers Council
(NPPC), Des Moines, IA, and others,
alleging that an industry in the United
States is materially injured by reason of
subsidized imports of fresh, chilled, or
frozen pork from Canada. Accordingly,
effective January 5, 1989, the
Commission instituted preliminary
countervailing duty investigation No.
701-TA-298 (Preliminary).

Notice of the institution of the
Commission's investigation and of a
public conference to be held in
connection therewith was given by
posting copies of the notice in the Office

¹ The record is defined in § 207.2(f) of the
Commission's Rules of Practice and Procedure (19
CFR 207.2(f)).

² Acting Chairman Brunsdale and Commissioner
Case determine that there is no reasonable
indication that an industry in the United States is
materially injured or threatened with material
injury, or that the establishment of an industry in
the United States is materially retarded, by reason
of imports from Canada of fresh, chilled, or frozen
pork that are alleged to be subsidized by the
Government of Canada. Commissioner Lodwick did
not participate in this investigation.

of the Secretary, U.S. International
Trade Commission, Washington, DC,
and by publishing the notice in the
Federal Register of January 11, 1989 (54
FR 1014). The conference was held in
Washington, DC, on January 26, 1989,
and all persons who requested the
opportunity were permitted to appear in
person or by counsel.

The Commission transmitted its
determination in this investigation to the
Secretary of Commerce on February 21,
1989. The views of the Commission are
contained in USITC Publication 2158
(February 1989), entitled "Fresh, Chilled,
or Frozen Pork from Canada:
Determination of the Commission in
Investigation No. 701-TA-298
(Preliminary) Under the Tariff Act of
1930. Together With the Information
Obtained in the Investigation."

Issued: February 22, 1989.

By Order of the Commission.

Kenneth R. Mason,
Secretary.[FR Doc. 89-4778 Filed 3-1-89; 8:45 am]
BILLING CODE 7020-02-M

[Investigation No. 332-270]

The Effects of the Steel Voluntary
Restraint Agreements on U.S. Steel
Consuming IndustriesAGENCY: United States International
Trade Commission.ACTION: Institution of Investigation,
announcement of public hearing, and
request for written submissions.

EFFECTIVE DATE: February 27, 1989.

FOR FURTHER INFORMATION CONTACT:
Gerald Berg (202) 252-1233, Research
Division, Office of Economics, U.S.
International Trade Commission,
Washington, DC 20436.

Background: Following receipt of a
letter on February 13, 1989, from the
Chairman of the Subcommittee on Trade
of the House Committee on Ways and
Means, the Commission instituted
investigation No. 332-270 under section
332(g) of the Tariff Act of 1930 (19 U.S.C.
1332(g)) for the purpose of studying and
reporting on the effects of the steel
voluntary restraint agreements (VRAs)
on U.S. steel consuming industries.

As requested by the Subcommittee,
the Commission in its report will seek to
provide estimates of the effects of these
VRAs on exports, imports, and domestic
sales of major steel consuming
industries for each of the years 1985
through 1988. The Commission will also
provide analysis of the likely effects of
continuing these restraints in the future.
The Commission will provide the

estimates using the same approach and product detail as in the Commission's 1985 study (USITC Publication 1788, Report on Investigation No. 332-214, December 1985—copies are available from the Publications Office (202) 252-1807). The Commission will also explore other economic effects of VRAs focusing on the following: the automotive industry, the construction industry, heavy agricultural and construction equipment manufacturers, appliance and household goods producers, forging producers and metal stampers.

The Subcommittee requested that the final report on this investigation be submitted on or before May 8, 1989.

Public Hearing and Written Submissions: Interested persons are invited to present, either at a public hearing or in written statements, information concerning matters to be addressed in this study and to comment on the analytical approach used in the Commission's 1985 study. In addition, interested persons are requested to provide, as appropriate, response to the following questions regarding conditions in steel consuming industries and the effects of VRAs.

Industry conditions:

Please describe the primary market factors that have affected your industry during 1984-89 (i.e., how have supply and demand conditions for your products changed and what have been the principal factors underlying the changes).

What was your company's return on sales in each year during 1984-88?

Steel prices:

How has the price of steel purchased by your firm changed in each year during 1984-89?

How much of the changes, if any, do you attribute to the steel VRAs? (Please explain.)

What other factors (such as changes in exchange rates, raw materials costs, and/or world demand) may have contributed to steel price changes?

Steel supply:
Please describe any difficulties you have experienced in obtaining steel products during 1984-89? Such problems might include inability to purchase a certain product, relatively long lead times, or quality problems.

Please explain the extent to which you attribute these difficulties to the steel VRAs.

What other factors may have contributed to these difficulties?
Effects of the VRAs on competitive conditions:

How have steel price changes affected your unit production costs in each of the years during 1984-89?

Please explain how steel supply problems affected your operations, if at all, during 1984-89 (i.e., discuss the extent to which they may have resulted in lost sales, production bottlenecks, or changes in production schedules).

How do you believe the VRAs have affected your ability to compete with imports?

How do you believe the VRAs have affected your ability to export?

What other effects, if any, have the VRAs had on your company (e.g., have they affected investment decisions, the level of steel inventories held, or other areas of your operations)?

Other:

What positive effects, if any, do you believe the VRAs have had on your operations (such as improved quality or lower prices of domestic steel products)?

Implications:

Please describe the effects that you expect, if any, of continuation of the VRAs on your operations and your ability to compete in the U.S. and foreign markets.

In addition to your oral or written comments, please supply a copy of your most recent annual report and 10K report with your response (if unavailable, comparable reports that supply financial information for the years 1984-88 would be appreciated).

The public hearing on this investigation will be held in the Commission Hearing Room, 500 E Street, SW., Washington, DC 20436, beginning at 9:30 a.m. on March 10, 1989. All persons shall have the right to appear by counsel or in person, to present information and to be heard. Requests to appear at the public hearing should be filed with the Secretary, United States International Trade Commission, 500 E Street, SW., Washington, DC 20436, no later than noon, March 8, 1989.

Written statements and post-hearing briefs should be submitted to the Secretary of the Commission at the same address. Commercial or financial information that a submitter desires the Commission to treat as confidential must be submitted on separate sheets of paper, each clearly marked "Confidential Business Information" at the top. All submissions requesting confidential treatment must conform with the requirements of § 201.8 of the Commission's *Rules of Practice and Procedure* (19 CFR 201.8). All written submissions, except for confidential business information, will be made available for inspection by interested persons in the Office of the Secretary to the Commission. To be assured of consideration by the Commission,

written submissions should be received no later than March 17, 1989.

Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on (202) 252-1810.

By order the Commission.

Issued: February 28, 1989.

Kenneth R. Mason,
Secretary.

[FR Doc. 89-4978 Filed 3-1-89; 8:45 am]

BILLING CODE 7020-02-0

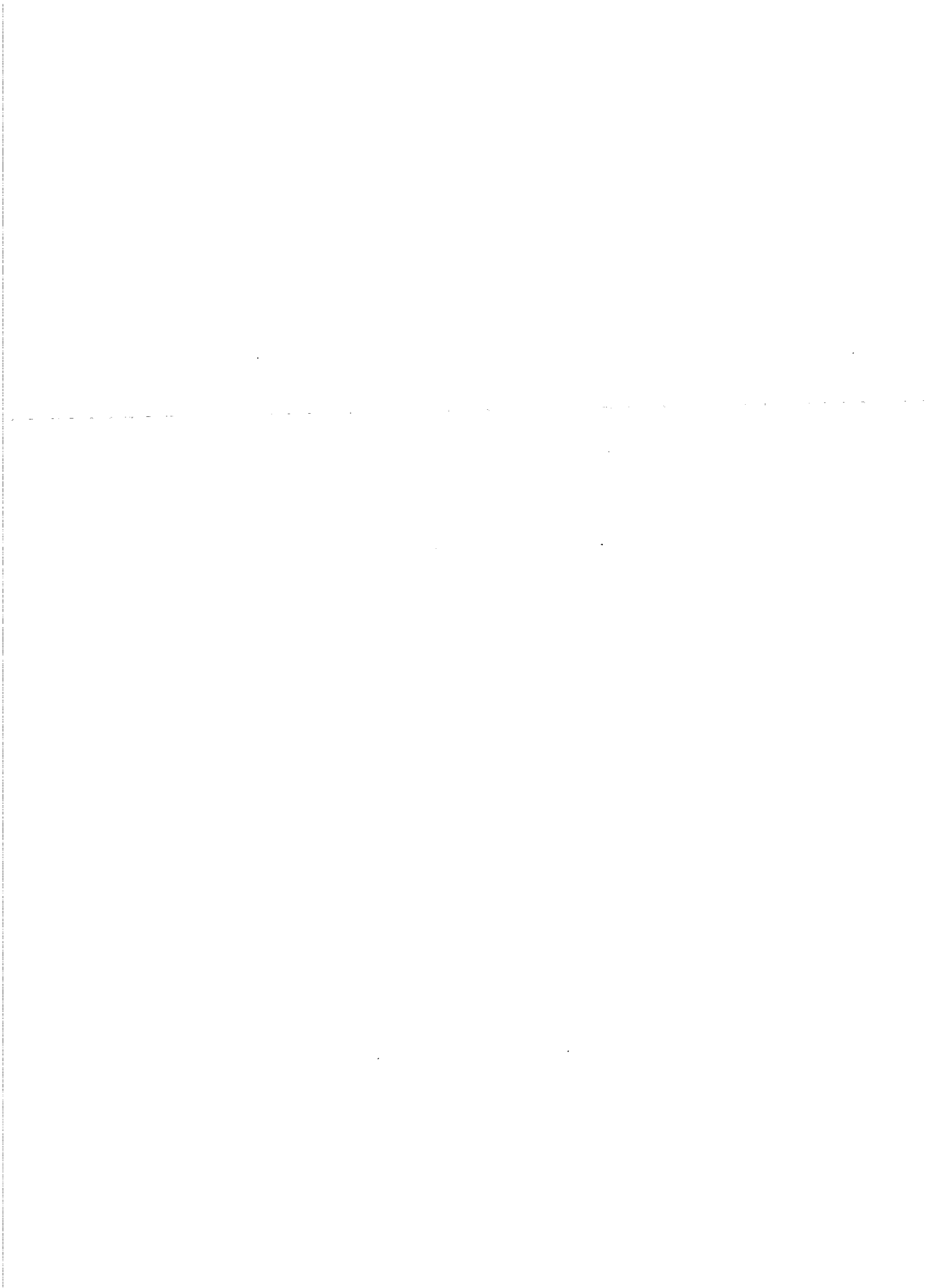
DEPARTMENT OF JUSTICE

Information Collections Under Review

February 27, 1989.

The Office of Management and Budget (OMB) has been sent the following proposals for the collection of information for review under the provisions of the Paperwork Reduction Act (44 U.S.C. Chapter 35) and the Paperwork Reduction Reauthorization Act since the last list was published. Entries are grouped into submission categories. Each entry contains the following information: (1) The title of the form or collection; (2) the agency form number, if any, and the applicable component of the Department sponsoring the collection; (3) how often the form must be filled out or the information is collected; (4) who will be asked or required to respond, as well as a brief abstract; (5) an estimate of the total number of respondents and the amount of time estimated for an average respondent to respond; (6) an estimate of the total public burden (in hours) associated with the collection; and (7) an indication as to whether Section 3504(b) of Public Law 96-511 applies. Comments and/or suggestions regarding the item(s) contained in this notice, especially those regarding the estimated response time, should be directed to the OMB reviewer, Mr. Edward H. Clark on (202) 395-7340 AND to the Department of Justice's Clearance Officer, Mr. Larry E. Miesse, on (202) 633-4312. If you anticipate commenting on a form/collection, but find that time to prepare such comments will prevent you from prompt submission, you should so notify the OMB reviewer AND the DOJ Clearance Officer of your intention as possible. Written comments regarding the burden estimate or any other aspect of the collection may be submitted to Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503, AND to Mr. Larry E. Miesse.

APPENDIX C
CALENDAR OF PUBLIC HEARING



TENTATIVE CALENDAR OF PUBLIC HEARING

Those listed below appeared at the United States International Trade Commission's hearing:

Subject : The Effects of the Steel Voluntary
Restraint Agreements on U.S. Steel
Consuming Industries

Inv. No. : 332-270

Date and Time : March 10, 1989 - 9:30 a.m.

Sessions were held in connection with the investigation in the Main Hearing Room 101 of the United States International Trade Commission, 500 E Street, SW, in Washington, D.C.

WITNESS AND ORGANIZATION:

TIME
CONSTRAINTS

Coalition of American Steel Using Manufacturers
Washington, D.C.

20 Minutes

Fred Hallett, Vice President of White
Consolidated and Chairman of the Coalition
of American Steel Using Manufacturers and
the Association of Home Appliance Manufacturers

Paul A. London, The Stern Group, Inc.

Precision Metalforming Association
Richmond Heights, Ohio

20 Minutes

Patrick Thompson, Chairman of the Precision
Metal Forming Association and President of
Trans-Matic Manufacturing Company
of Holland, Michigan

Anthony J. Rose, President of A.J. Rose
Manufacturing Company, Cleveland, Ohio

Paul Sessions, President of J.H. Sessions & Son,
Bristol, Connecticut

Accompanied by Messrs. Jon Jenson and
Greg Estell, Precision Metalforming Association

WITNESS AND ORGANIZATION:

TIME
CONSTRAINTS

National Association of Food
Equipment Manufacturers (NAFEM)

10 Minutes

Burton Berrettini, Director of Corporate
Purchasing, Intermetro Industries Inc.,
Wilkes Barre, Pennsylvania

Caterpillar, Inc.
Washington, DC

10 Minutes

William C. Lane, International Governmental
Affairs Representative, Peoria, Illinois

Material Handling Institute of America
Charlotte, North Carolina

10 Minutes

A. L. Leffler, Chief Executive Officer

American Iron and Steel Institute
Washington, DC 1/

15 Minutes

Robert M. Borst, President, Fisher Tank
Co., Chester, Pennsylvania

Paul J. Darling, President and Chief Executive
Officer, Corey Steel Co.,
Cicero, Illinois

Roy A. Herman, President, UNR-Leavitt,
Chicago, Illinois

Brendan K. McCormick, Executive Vice President,
Thompson Steel Co., Inc.
Canton, Massachusetts

1/ According to testimony, AISI arranged for this panel of witnesses to appear before the Commission, but none of them is a member of AISI.

-more-

WITNESS AND ORGANIZATION:

TIME
CONSTRAINTS

ARMCO Inc.
Washington, DC

20 Minutes

George Vary, International Trade Counsel,
on behalf of
ARMCO Inc. and the American Iron and Steel
Institute

John P. Merrill, Jr., Managing Director,
Putnam, Hayes & Bartlett, Inc.

Thomas Parkinson, Principal, Putnam, Hayes,
& Bartlett, Inc.

Steel Manufacturers' Association
Washington, DC

10 Minutes

James F. Collins, President
(on behalf of 45 member companies)

Collier, Shannon, Rill & Scott
Washington, DC

10 Minutes

William J. Pendleton,
Secretary and Director of Corporate Affairs,
Carpenter Technology Corp.
and
Chairman of the Operating Committee
of the Specialty Steel Industry of the
United States

David A. Hartquist)--OF COUNSEL

AUS Consultants, Industry Analysis Group
Philadelphia, Pennsylvania

10 Minutes

John E. Jacobson, Vice President
(Speaking on steel industry: semifinished, plate,
sheet & strip, bars, wire rod, structurals, rails,
pipe and tube, alloy and stainless)

WITNESS AND ORGANIZATION:

TIME
CONSTRAINTS

Shagrin Associates
Washington, DC
on behalf of

10 Minutes

The Committee on Pipe and Tube Imports (CPTI)

Roger B. Schagrin)--OF COUNSEL

APPENDIX D
METHODOLOGY AND DATA USED TO ESTIMATE THE EFFECTS OF
VOLUNTARY RESTRAINT AGREEMENTS ON EXPORTS, IMPORTS,
AND DOMESTIC SHIPMENTS IN U.S. STEEL-CONSUMING INDUSTRIES

10-11-1918

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METHODOLOGY AND DATA

Introduction

The methodology employed in this study to estimate the effects of the steel restraints on U.S. imports, exports, and domestic shipments consists of three steps. First, an estimate is made of the percentage increase in the price of imported steel as a result of limiting steel imports. The methodology takes into account exchange-rate movements that have altered the import supply of several supplier countries and have resulted in unbinding export limits. Second, the estimate of the percentage increase in the price of imported steel is converted, using input-output analysis, into an increase in production costs and product prices for domestic steel-consuming industries. Third, the domestic price increases are translated into the increase in imports and decrease in exports and domestic sales that occur when expenditures switch away from domestic products towards foreign substitutes. Two sets of estimates are developed for the reduction in domestic sales. The first is based on a zero demand elasticity and implies that domestic consumers do not reduce their overall purchases of the product even though the aggregate price has increased. This may be considered the smallest likely effect of the steel price increase on domestic sales. It consists of the sum of lost export sales and lost sales as domestic consumers switch to foreign products. The second set of estimates are based on a demand elasticity of unity for the product category. Published estimates indicate that this demand elasticity is likely to lie between zero and one for most products.

Estimating the Effects of VRAs on Imported Steel Prices

The percentage increase in the price of imported steel is estimated using a partial equilibrium analysis commonly used to determine the percentage increase in the price of a product given a reduction or limitation in its import supply. Similar treatments can be found in David G. Tarr and Morris E. Morkre, *Aggregate Costs to the United States of Tariffs and Quotas on Imports: General Tariff Costs and Removal of Quotas on Automobiles, Steel, Sugar and Textiles, An Economic Policy Analysis*, Bureau of Economics Staff Report to the Federal Trade Commission, December 1984, and Donald J. Rousslang and John W. Suomela, *Calculating the Consumer and Net Welfare Costs of Import Relief*, Staff Research Study 15, Office of Economics, USITC, July 1985. As is common, the analysis considers only the effect on the aggregate market for steel mill products.

Under the assumption that domestic and imported steel are imperfect substitutes, it can be shown that the percentage increase in the price of imported steel (denoted as p_m) and domestic steel (denoted as p_d) are determined, respectively, from the following (reduced form) equations:

$$\ln[1+p_d] = [-(n_{dm})/(n_{mm}(e_d+n_{dd})-(n_{dm}n_{md}))] \ln[1+q_m] \quad [1]$$

$$\ln[1+p_m] = [-(n_{dd}+e_d)/(n_{mm}(e_d+n_{dd})-(n_{dm}n_{md}))] \ln[1+q_m] \quad [2]$$

where q_m is the percentage changes in the quantity of imported steel; e_d is the supply elasticity of domestic steel; n_{md} is the demand elasticity of imported steel with respect to a change in the price of domestic steel; and n_{dm} is the demand elasticity of domestic steel with respect to a change in the price of imported steel. For convenience the equations have been written in constant elasticity form. Equations [1] and [2] can be simplified to

$$\ln[1+p_d] = [-.0292] \ln[1+q_m] \quad [3]$$

$$\ln[1+p_m] = [-.2454] \ln[1+q_m] \quad [4]$$

[3] and [4] are then weighted by the projected (i.e., absent the VRAs) share of domestic and import supply to obtain t , the weighted-average change in the price of steel induced by the restraints. Specifically,

$$t = W_d \ln[1+p_d] + W_m \ln[1+p_m] \quad [5]$$

¹ This appendix was prepared with the assistance of Professor Jose A. Mendez of Arizona State University.

where W_d and W_m are the projected domestic and import share for steel. The above equations use data from the following tabulation of elasticity estimates, as provided by Robert W. Crandall, *The U.S. Steel Industry in Recurrent Crisis, Policy Options in a Competitive World, 1981*:

<i>Demand</i>	<i>Estimate</i>
$-\eta_{dd}$	-1.55
η_{dm}	0.60
$-\eta_{mm}$	-4.55
η_{md}	4.00
<i>Supply</i>	
ϵ_d	3.50

Estimating the Effects of Change in Steel Price on Steel-Consuming Industries' Costs and Product Prices

The methodology that is used to calculate the effect of an increase in the price of steel on the costs of production and product prices of steel-consuming industries is an adaptation of that found in James Melvin, "Short-Run Price Effects of the Corporate Income Tax and Implications for International Trade," *American Economic Review*, vol. 69, December 1979. This adaptation was applied in the two following publications: the Commission's *The Effects of Restraining U.S. Steel Imports on the Exports of Selected Steel-Consuming Industries* (Inv. 332-214, USITC Publication 1788, December 1985) and Jose A. Mendez, "The Short-Run Trade and Employment Effects of Steel Import Restraints," *The Journal of World Trade Law*, Vol. 30, September/October 1986.

The analysis takes into account the two ways in which an increase in the price of steel can affect production costs. A steel price increase can have an immediate effect on the production costs of those industries that use steel as an input. A steel price increase can also affect the production costs of those industries that use steel-containing products as inputs. Input-output analysis is used to measure the total effects on production costs. These, in turn, are translated into industry price increases under the assumption that the increase in the costs of production experienced by industries is passed forward to consumers of the product.

Derivation of direct effects of the steel price increase

To derive the immediate impact of the steel price increase, the Commission follows the analysis outlined by Melvin (1979). For any industry i , the condition that total cost (which includes the payments for intermediate goods and the factors of production) equals total revenue may be expressed as

$$P_i X_i = P_1 X_{1i} + P_2 X_{2i} + \dots + P_n X_{ni} + wL_i + rK_i \quad i=1,2,\dots,n \quad [6]$$

where P_i , w , and r are, respectively, the price of commodity i , the wage rate, and the return to capital. L_i is labor and K_i is the stock of capital employed by industry i . The X_{ji} refers to the amount of good j used in the production of good i . The above may be rewritten by dividing by $P_i X_i$ to obtain

$$1 = a_{1i} + a_{2i} + \dots + a_{ni} + l_i + k_i \quad i=1,2,\dots,n \quad [7]$$

The a_{ji} 's are the technical or input-output coefficients and l_i and k_i are, respectively, $(wL_i/P_i X_i)$ and $(rK_i/P_i X_i)$. In input-output analysis, the a_{ji} 's are often referred to as the "direct requirements coefficients." They indicate that a_{ji} cents of industry j were required to produce a dollar's worth of i 's output.

The immediate effect of an increase in the weighted-average price of steel of (say) " t " percent is to raise steel-consuming industries' production costs in proportion to the percentage of their total costs accounted for by steel. Letting $i=2$ refer to the steel industry, costs per unit in the i th industry rise by $s_i = (a_{2i} * t)$. For instance, a $t=10$ percent increase in the weighted-average price of steel would raise an industry's per-unit costs by $s=1$ percent if the amount of steel they used per dollar of output, a_{2i} , is .10 or 10 percent. To reflect this direct and immediate effect on costs per unit, equation [7] can be rewritten as

$$1+s_i = a_{1i} + a_{2i}(1+t) + \dots + a_{ni} + l_i + k_i \quad [8]$$

for $i=1,2,\dots,n$ industries.

Derivation of total effect of steel price increase

Equation [8] captures the immediate effect of the rise in the price of steel on industry X_i 's unit production costs or price. However, as noted earlier, the price of X_i is also affected indirectly by the increase in the price of steel. Industry i uses in its production the output of other industries whose price, like that of industry i , has been affected by the increase in the price of steel. The total effects can be expressed as

$$1+p_i = a_{1i}(1+p_1) + a_{2i}(1+t+p_2) + \dots + a_{ni}(1+p_n) + l_i + k_i \quad [9]$$

for $i=1,2,\dots,n$ industries. The p_i 's incorporate the direct and indirect effect of the price increase.

The objective now is to express the p_i 's in terms of t . To do so, subtract equation [7] from equation [9]. The expression that results is

$$p_i = a_{1i}(p_1) + a_{2i}(p_2) + \dots + a_{ni}(p_n) + a_{2i}(t) \quad [10a]$$

for $i=1,2,\dots,n$ industries. Placing the equations for all n industries in matrix form, [10a] becomes

$$P = [A] P + [a_{2i}] t \quad [10b]$$

where A is the United States input-output table; t is the initial change in the weighted-average price of steel induced by the restraints, and P is a vector of the percentage changes in prices. [10b] can now be solved for the total percentage increase in the price of all commodities as a result of the t -percent increase in the price of steel. However, before continuing further, consider the interpretation of equation [10b].

The first term on the right-hand side of equation [10b] captures the indirect effects of the steel price increase as the costs of other domestic steel-consuming products rises. The second term on the right-hand side of equation [10b] measures the direct effect of an increase in the price of steel on steel-consuming industries. Solving equation [10b] for the total percentage increase in the domestic price of steel-consuming industries due to a t -percent increase in the weighted-average price of steel obtains

$$P = [1-A]^{-1} \times [a_{2i}] t \quad [10c]$$

This equation is combined in the next section to determine the effect of steel restraints on U.S. imports, exports, and domestic shipments.

Estimating the Effects of the Steel Price Increase on U.S. Exports, Imports, and Domestic Sales

As noted above, limits on steel exports to the United States cause the price of steel to rise in the U.S. market. This price increase, in turn, raises production costs for industries that use steel directly (as an input) or indirectly (through the purchase of products that contain steel). As domestic steel-consuming industries attempt to cover their production cost increases by raising product prices, they experience a reduction in domestic sales. The domestic price increases induce domestic and foreign consumers to switch expenditures away from domestic products toward foreign substitutes. The sum of these expenditure changes represents a portion of the sales that are lost by domestic producers. Domestic producers also experience an additional reduction in sales because domestic consumers—in addition to switching from the domestic to the foreign substitute—reduce their aggregate expenditures on the product category. Although switching expenditures allows domestic consumers to lessen the effects of the increase on the price of the domestic product, these consumers still face a higher total price for the product.

Effect on imports

The change in the value of imports is calculated by the following equation:

$$dM_i = M_i N_{md} p_i \quad i=1,2,\dots,n \quad [11]$$

where M_i is the initial value of imports in the i th steel-consuming industry and N_{md} is the (compensated) cross-price elasticity of demand for industry i imports with respect to a change in the price of the domestic substitute. As defined earlier, p_i is the percentage increase in the domestic price of the i th steel-consuming industry.

As written, equation [11] is not operational. A comparable set of estimates of N_{md} for all steel-consuming industries does not exist. However, a comparable set of estimates of N_{mm} , the own-price import demand elasticity for the i th industry, is readily available for all industries. Thus, equation [11] may be made operational as follows. In conjunction with the assumption that commodities are weakly separable or that all price effects outside the i th product group can be ignored, the following well-known properties of compensated demand elasticities,

$$-D_i N_{dd} + M_i N_{md} = 0$$

$$D_i N_{dm} - M_i N_{mm} = 0$$

$$M_i N_{md} = D_i N_{dm},$$

may be used to rewrite [11] as

$$dM_i = M_i N_{mm} p_i \quad i=1,2,\dots,n \quad [11a]$$

Effect on exports

The change in the value of exports is calculated by the following equation:

$$dX_i = -X_i N_{xx} p_i \quad i=1,2,\dots,n \quad [12]$$

where X_i is the initial value of exports by the i th steel-consuming industry and N_{xx} is the (compensated) export-price elasticity of demand for industry i 's product.

Effect on domestic sales

The change in the value of domestic sales comprises three parts. It consists of those sales lost as domestic consumers switch their expenditures towards imports (estimated by [11a]); it consists of the sales lost to foreign consumers (estimated by [12]); and it consists of the sales lost as domestic consumers reduce their expenditures on the entire product category. The reduction in total sales is calculated by the following equation:

$$dT D_i = -dM_i + dX_i + D_i N_i (D_i/M_i + D_i) p_i \quad i=1,2,\dots,n \quad [13]$$

where D_i is the initial value of domestic sales, N_i is the own-price elasticity of demand for the entire product category, and $(D_i/M_i + D_i) p_i$ measures the weighted-average increase in the price of the product category.

Equation [13] is applied for two cases. In the first case, it is assumed that $N_i = 0$. That is, the demand for the product category is inelastic or unresponsive to a change in the product category's price. For the second case, it is assumed that $N_i = 1$ or is of unit elasticity. Although the Commission lacked estimates of N_i for each of the 79 input-output sectors, 37 of the 44 estimated own-price elasticities contained in a study by H. Houthakker and Lester Taylor (*Consumer Demand in the United States: Analyses and Projections*, Harvard University Press, 1970) were between zero and one.

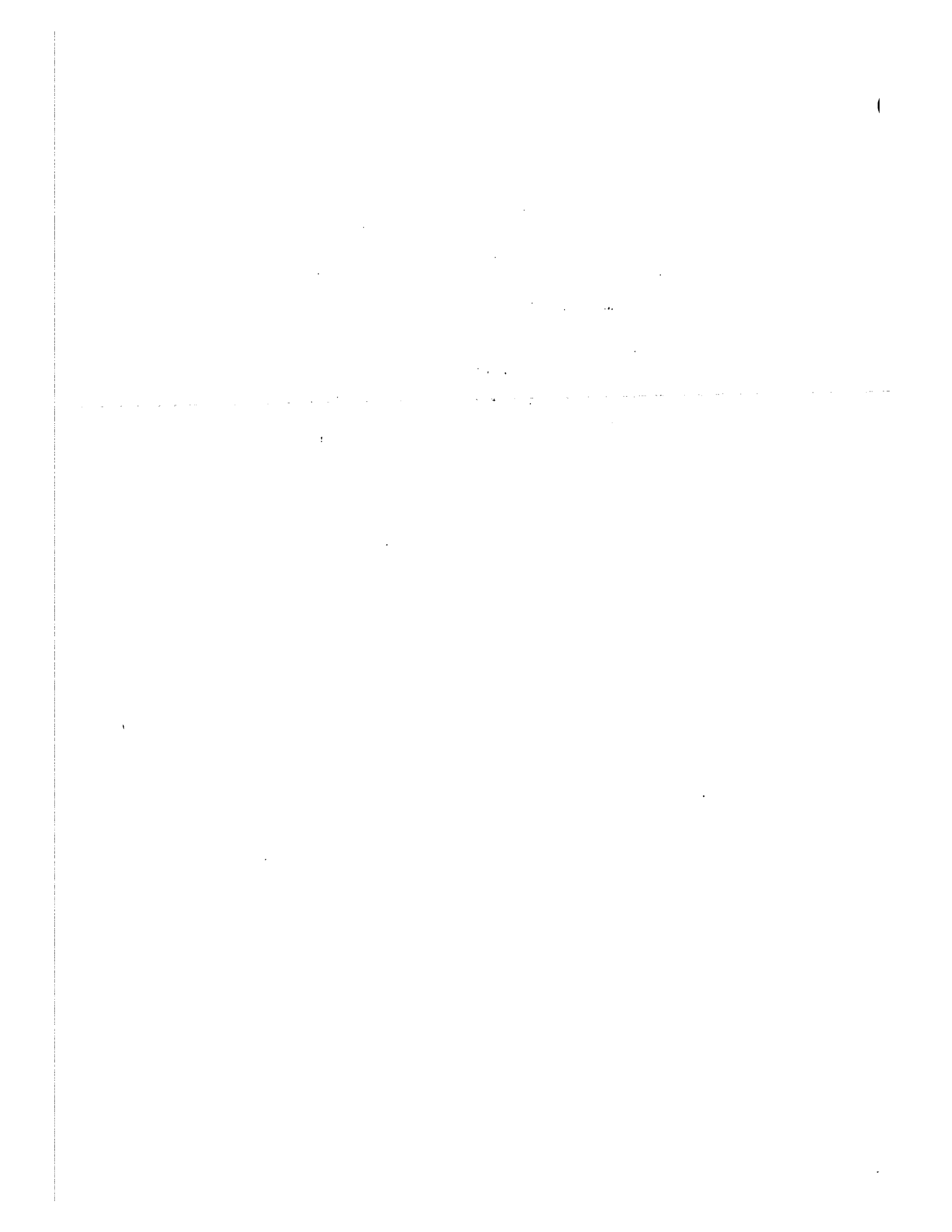
After equations [11a], [12], and [13] are placed in matrix form, the p_i are then replaced with [10c] to estimate the effects of the steel price increase.

Description of Data

The 79-sector ($n=79$) U.S. input-output coefficient matrix, A , in [10b] is obtained from the U.S. Department of Commerce, *The Detailed Input-Output Structure of the U.S. Economy, 1977*.

Data on U.S. imports, M_i , and U.S. exports, X_i , are from official statistics of the U.S. Bureau of the Census. Imports are classified by the Tariff Schedules of the United States (TSUS), and exports are classified by Schedule B. These trade data are concorded to the Bureau of Economic Analysis input-output categories using a concordance prepared by the Commission's Office of Industries. Imports are measured inclusive of international transport costs, but exclusive of duties paid, i.e. c.i.f. Exports are values f.a.s. at the U.S. port. Domestic shipments, D_i , are from data tapes developed by the U.S. Bureau of Labor Statistics. Domestic shipment and trade data are deflated to 1977 dollar values using U.S. price deflators to make them comparable to the technical coefficients of the input-output table. The price deflators are constructed from estimates of constant-dollar domestic shipments prepared by the U.S. Bureau of Labor Statistics.

The import-, N_{mm} , and export-, N_{xx} , demand elasticities are obtained for each of the 79 2-digit input-output industries from Robert E. Baldwin and Wayne E. Lewis, "U.S. Tariff Effects on Trade and Employment in Detailed SIC Industries," in U.S. Department of Labor, Bureau of International Labor Affairs, *The Impact of International Trade and Investment on Employment, 1978*.



APPENDIX E
ESTIMATED EFFECTS OF VRAs ON EXPORTS, IMPORTS, AND
DOMESTIC SALES IN 79 STEEL-CONSUMING INDUSTRIES

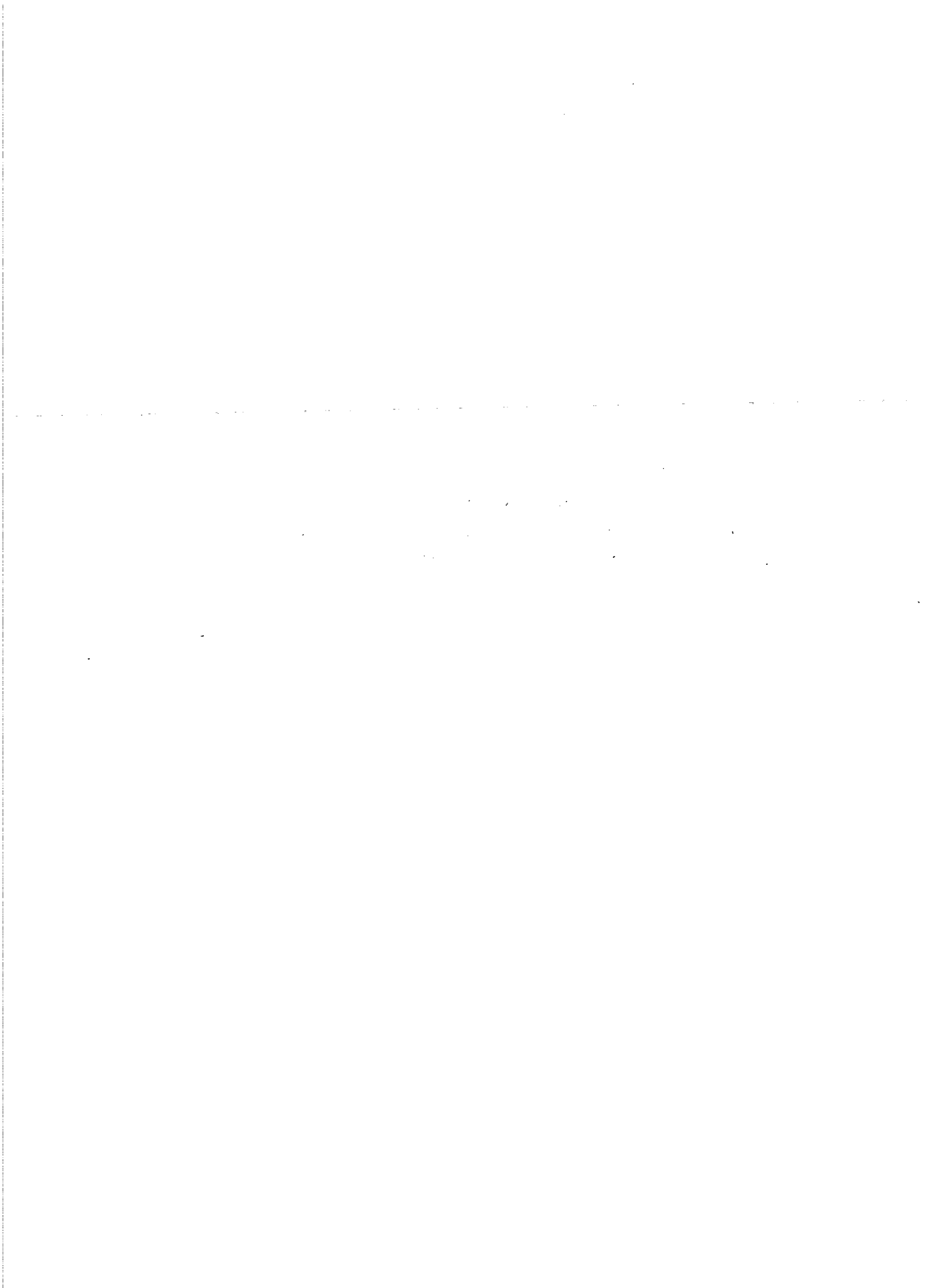


Table E-1

Effects of VRAs: Estimated changes in U.S. exports, imports, domestic sales, and total sales, by industry, 1985

(In thousands of 1986 dollars)

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales ¹	Reduction in total sales	
					Zero demand elasticity	Unit demand elasticity
01	Livestock and livestock products	63	23	4,640	86	4,703
02	Other agricultural products	3,541	337	7,341	3,878	10,882
03	Forestry and fishery products	13	45	820	57	832
04	Agricultural, forestry, and fishery services	0	0	9,144	0	9,144
05	Iron and ferroalloy ores mining	263	399	1,247	662	1,509
06	Nonferrous metal ores mining	62	246	1,003	308	1,065
07	Coal mining	812	28	3,832	839	4,644
08	Crude petroleum and natural gas	125	12,870	36,439	12,995	36,564
09	Stone and clay mining and quarrying	129	211	1,472	341	1,601
10	Chemical and fertilizer mineral mining	234	554	1,540	788	1,774
11	New construction	0	0	130,392	0	130,392
12	Maintenance and repair construction	0	0	57,455	0	57,455
13	Ordnance and accessories	311	25	3,821	336	4,132
14	Food and kindred products	1,079	751	11,778	1,830	12,857
15	Tobacco manufactures	217	7	1,611	224	1,827
16	Broad and narrow fabrics, yarn and thread mills	95	267	2,790	362	2,886
17	Miscellaneous textile goods and floor coverings	37	100	653	138	690
18	Apparel	85	3,178	5,506	3,264	5,592
19	Miscellaneous fabricated textile products	56	156	1,789	212	1,845
20	Lumber and wood products, except containers	1,029	1,158	7,071	2,187	8,099
21	Wood containers	9	42	290	51	299
22	Household furniture	279	18,456	32,146	18,735	32,425
23	Other furniture and fixtures	23	315	1,458	338	1,481
24	Paper and allied products, except containers	1,880	1,304	9,054	3,184	10,934
25	Paperboard containers and boxes	0	5	1,169	5	1,169
26	Printing and publishing	836	315	19,937	1,151	20,773
27	Chemicals and selected chemical products	2,532	1,621	10,572	4,152	13,103
28	Plastics and synthetic materials	1,011	343	4,490	1,354	5,502
29	Drugs, cleaning and toilet preparations	1,392	1,047	15,553	2,439	16,945
30	Paints and allied products	51	20	1,370	71	1,421
31	Petroleum refining and related industries	1,474	2,840	32,707	4,314	34,182
32	Rubber and miscellaneous plastic products	423	2,729	8,196	3,152	8,619
33	Leather tanning and finishing	40	128	232	169	272
34	Footwear and other leather products	27	2,366	2,595	2,392	2,622
35	Glass and glass products	98	359	2,466	457	2,564
36	Stone and clay products	2,231	19,375	82,798	21,606	85,028
37	Primary iron and steel manufacturing	569	5,397	17,851	5,968	18,420
38	Primary nonferrous metals manufacturing	3,508	28,243	129,245	31,751	132,752
39	Metal containers	207	812	23,681	1,019	23,888
40	Heating, plumbing, and structural metal products	371	1,868	91,458	2,238	91,829
41	Screw machine products and stampings	324	1,298	41,316	1,622	41,640

See footnote at end of table.

E-4

Table E-1—Continued

Effects of VRAs: Estimated changes in U.S. exports, imports, domestic sales, and total sales, by industry, 1985

(In thousands of 1986 dollars)

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales ¹	Reduction in total sales	
					Zero demand elasticity	Unit demand elasticity
42	Other fabricated metal products	2,978	15,361	68,922	18,339	71,900
43	Engines and turbines	6,349	3,733	20,397	10,082	26,746
44	Farm and garden machinery	2,336	3,098	19,511	5,434	21,847
45	Construction and mining machinery	8,611	3,298	26,949	11,909	35,560
46	Materials handling machinery and equipment	684	1,375	6,603	2,058	7,287
47	Metalworking machinery and equipment	7,376	10,594	25,738	17,970	33,114
48	Special industry machinery and equipment	2,374	3,979	18,205	6,353	20,580
49	General machinery and equipment	2,425	3,162	19,130	5,587	21,555
50	Miscellaneous machinery, except electrical	574	2	4,639	576	5,213
51	Office, computing, and accounting machines	60,704	42,282	84,970	102,986	145,674
52	Service industries machines	1,407	248	14,085	1,656	15,492
53	Electric industrial equipment and apparatus	5,582	2,710	27,187	8,292	32,769
54	Household appliances	1,367	1,784	10,455	3,151	11,823
55	Electric lighting and wiring equipment	853	2,004	4,558	2,857	5,410
56	Radio, TV, and communication equipment	2,635	13,804	27,139	16,440	29,774
57	Electronic components and accessories	11,153	1,513	14,263	12,666	25,416
58	Misc. electrical machinery and supplies	20,031	14,071	30,499	34,102	50,530
59	Motor vehicles and equipment	16,951	56,982	111,535	73,933	128,486
60	Aircraft and parts	72,001	30,132	106,343	102,133	178,344
61	Other transportation equipment	1,493	2,802	10,846	4,295	12,340
62	Scientific and controlling instruments	1,917	1,071	4,232	2,988	6,150
63	Optical, ophthalmic, and photographic equipment	912	1,514	7,532	2,426	8,444
64	Miscellaneous manufacturing	2,268	7,687	9,105	9,955	11,373
65	Transportation and warehousing	0	0	8,601	0	8,601
66	Communications, except radio and TV	0	0	2,589	0	2,589
67	Radio and TV broadcasting	0	0	1,786	0	1,786
68	Electric, gas, water, and sanitary services	0	0	6,434	0	6,434
69	Wholesale and retail trade	0	0	11,322	0	11,322
70	Finance and insurance	0	0	9,700	0	9,700
71	Real estate and rental	0	0	27,342	0	27,342
72	Hotels, personal and repair services exc. auto	0	0	3,793	0	3,793
73	Business services	0	0	30,432	0	30,432
74	Eating and drinking places	0	0	49,730	0	49,730
75	Automobile repair and services	0	0	4,135	0	4,135
76	Amusements	0	0	2,117	0	2,117
77	Medical, educ. services and nonprofit org	0	0	9,587	0	9,587
78	Federal Government enterprises	0	0	5,854	0	5,854
79	State and local government enterprises	0	0	0	0	0
Total, all industries		258,416	332,445	1,665,196	590,861	1,923,612

¹ Based on domestic demand elasticity of one. If the elasticity equals zero, the reduction in domestic sales is identical to the decrease in imports.

Table E-2

Effects of VRAs: Estimated changes in U.S. exports, imports, domestic sales, and total sales, by industry, 1986

(In thousands of 1986 dollars)

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales ¹	Reduction in total sales	
					Zero demand elasticity	Unit demand elasticity
01	Livestock and livestock products	159	61	12,409	220	12,568
02	Other agricultural products	7,029	979	13,942	8,007	20,971
03	Forestry and fishery products	32	108	2,239	140	2,271
04	Agricultural, forestry, and fishery services	0	0	24,953	0	24,953
05	Iron and ferroalloy ores mining	468	873	2,808	1,341	3,276
06	Nonferrous metal ores mining	317	666	2,323	983	2,640
07	Coal mining	1,847	62	9,841	1,910	11,488
08	Crude petroleum and natural gas	198	23,370	53,549	23,569	53,747
09	Stone and clay mining and quarrying	375	729	3,728	1,105	4,103
10	Chemical and fertilizer mineral mining	589	1,138	3,701	1,728	4,291
11	New construction	0	0	356,436	0	356,436
12	Maintenance and repair construction	0	0	157,360	0	157,360
13	Ordnance and accessories	675	85	10,619	760	11,294
14	Food and kindred products	3,063	1,988	30,185	5,051	33,248
15	Tobacco manufactures	665	17	4,309	682	4,974
16	Broad and narrow fabrics, yarn and thread mills	281	696	7,804	977	8,085
17	Miscellaneous textile goods and floor coverings	105	353	1,861	458	1,966
18	Apparel	260	9,295	15,322	9,555	15,582
19	Miscellaneous fabricated textile products	169	500	4,711	669	4,880
20	Lumber and wood products, except containers	2,915	3,110	19,960	6,024	22,875
21	Wood containers	28	117	808	145	836
22	Household furniture	704	56,194	92,472	56,897	93,175
23	Other furniture and fixtures	56	969	4,118	1,025	4,174
24	Paper and allied products, except containers	5,536	3,506	24,738	9,042	30,274
25	Paperboard containers and boxes	0	18	3,418	18	3,418
26	Printing and publishing	2,243	986	55,935	3,228	58,177
27	Chemicals and selected chemical products	6,278	4,112	26,035	10,388	32,311
28	Plastics and synthetic materials	2,792	900	12,094	3,692	14,886
29	Drugs, cleaning and toilet preparations	4,029	3,251	44,213	7,280	48,242
30	Paints and allied products	127	82	3,570	209	3,697
31	Petroleum refining and related industries	2,873	4,903	58,385	7,776	61,258
32	Rubber and miscellaneous plastic products	1,146	7,851	22,380	8,997	23,526
33	Leather tanning and finishing	112	333	579	446	691
34	Footwear and other leather products	74	6,694	7,165	6,769	7,240
35	Glass and glass products	247	1,038	6,710	1,284	6,956
36	Stone and clay products	5,522	55,614	226,252	61,137	231,774
37	Primary iron and steel manufacturing	1,423	11,659	39,845	13,082	41,268
38	Primary nonferrous metals manufacturing	9,378	97,645	341,500	107,023	350,878
39	Metal containers	613	1,007	63,793	1,620	64,406
40	Heating, plumbing, and structural metal products	817	5,517	233,808	6,334	234,624
41	Screw machine products and stampings	881	3,512	105,720	4,394	106,601

See footnote at end of table.

Table E-2—Continued
Effects of VRAs: Estimated changes in U.S. exports, imports, domestic sales, and total sales, by industry, 1986

(In thousands of 1986 dollars)

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales ¹	Reduction in total sales	
					Zero demand elasticity	Unit demand elasticity
42	Other fabricated metal products	7,747	43,359	182,795	51,105	190,542
43	Engines and turbines	16,063	11,639	51,224	27,702	67,287
44	Farm and garden machinery	5,054	8,582	48,095	13,636	53,149
45	Construction and mining machinery	18,205	9,360	66,091	27,566	84,296
46	Materials handling machinery and equipment	1,695	4,290	16,568	5,985	18,263
47	Metalworking machinery and equipment	20,531	32,358	72,303	52,889	92,834
48	Special industry machinery and equipment	6,263	13,147	47,972	19,410	54,235
49	General machinery and equipment	5,935	9,023	48,787	14,958	54,722
50	Miscellaneous machinery, except electrical	1,426	7	11,642	1,433	13,068
51	Office, computing, and accounting machines	159,737	136,981	214,114	296,718	373,852
52	Service industries machines	3,289	909	35,542	4,198	38,831
53	Electric industrial equipment and apparatus	14,370	7,474	69,738	21,844	84,108
54	Household appliances	3,422	5,144	28,918	8,566	32,340
55	Electric lighting and wiring equipment	2,277	6,115	12,623	8,392	14,900
56	Radio, TV, and communication equipment	7,088	39,124	72,854	46,213	79,942
57	Electronic components and accessories	32,781	4,176	35,183	36,957	67,964
58	Misc. electrical machinery and supplies	53,906	44,929	83,981	98,835	137,887
59	Motor vehicles and equipment	41,664	174,037	307,998	215,701	349,662
60	Aircraft and parts	190,139	93,889	319,563	284,028	509,701
61	Other transportation equipment	3,433	7,861	28,278	11,294	31,711
62	Scientific and controlling instruments	5,132	3,213	11,727	8,344	16,859
63	Optical, ophthalmic, and photographic equipment	2,679	4,561	20,086	7,240	22,766
64	Miscellaneous manufacturing	6,047	21,670	25,365	27,718	31,413
65	Transportation and warehousing	0	0	22,086	0	22,086
66	Communications, except radio and TV	0	0	6,806	0	6,806
67	Radio and TV broadcasting	0	0	4,846	0	4,846
68	Electric, gas, water, and sanitary services	0	0	16,070	0	16,070
69	Wholesale and retail trade	0	0	30,429	0	30,429
70	Finance and insurance	0	0	27,907	0	27,907
71	Real estate and rental	0	0	75,642	0	75,642
72	Hotels, personal and repair services exc. auto	0	0	10,461	0	10,461
73	Business services	0	0	84,050	0	84,050
74	Eating and drinking places	0	0	136,216	0	136,216
75	Automobile repair and services	0	0	11,390	0	11,390
76	Amusements	0	0	5,735	0	5,735
77	Medical, educ. services and nonprofit org	0	0	26,599	0	26,599
78	Federal Government enterprises	0	0	15,636	0	15,636
79	State and local government enterprises	0	0	0	0	0
	Total, all industries	672,907	991,788	4,396,718	1,664,695	5,069,625

¹ Based on domestic demand elasticity of one. If the elasticity equals zero, the reduction in domestic sales is identical to the decrease in imports.

Table E-3
Effects of VRAs: Estimated changes in U.S. exports, imports, domestic sales, and total sales, by industry, 1987

(In thousands of 1986 dollars)

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales ¹	Reduction in total sales	
					Zero demand elasticity	Unit demand elasticity
01	Livestock and livestock products	150	56	11,363	206	11,513
02	Other agricultural products	7,013	764	13,244	7,778	20,258
03	Forestry and fishery products	38	113	2,048	151	2,086
04	Agricultural, forestry, and fishery services	0	0	22,865	0	22,865
05	Iron and ferrous alloy ores mining	366	726	2,469	1,091	2,834
06	Nonferrous metal ores mining	311	546	2,042	856	2,352
07	Coal mining	1,415	63	8,947	1,479	10,362
08	Crude petroleum and natural gas	135	25,220	49,914	25,355	50,049
09	Stone and clay mining and quarrying	407	453	3,336	860	3,743
10	Chemical and fertilizer mineral mining	462	1,072	3,404	1,534	3,866
11	New construction	0	0	321,646	0	321,646
12	Maintenance and repair construction	0	0	141,249	0	141,249
13	Ordnance and accessories	648	83	9,745	731	10,393
14	Food and kindred products	3,022	1,951	27,715	4,973	30,737
15	Tobacco manufactures	910	17	3,855	927	4,766
16	Broad and narrow fabrics, yarn and thread mills	287	733	7,176	1,020	7,463
17	Miscellaneous textile goods and floor coverings	109	341	1,741	450	1,850
18	Apparel	298	9,891	15,181	10,188	15,479
19	Miscellaneous fabricated textile products	172	543	4,390	715	4,562
20	Lumber and wood products, except containers	3,458	3,096	18,580	6,554	22,038
21	Wood containers	28	139	762	167	790
22	Household furniture	719	58,383	91,359	59,102	92,078
23	Other furniture and fixtures	59	852	3,890	911	3,949
24	Paper and allied products, except containers	6,391	3,733	23,325	10,124	29,716
25	Paperboard containers and boxes	0	18	3,152	18	3,152
26	Printing and publishing	2,362	944	52,680	3,306	55,042
27	Chemicals and selected chemical products	6,481	3,901	24,141	10,382	30,622
28	Plastics and synthetic materials	3,161	886	11,400	4,047	14,562
29	Drugs, cleaning and toilet preparations	3,870	3,471	42,020	7,341	45,890
30	Paints and allied products	144	94	3,288	238	3,432
31	Petroleum refining and related industries	2,873	4,439	52,867	7,313	55,740
32	Rubber and miscellaneous plastic products	1,297	8,133	21,752	9,430	23,049
33	Leather tanning and finishing	128	414	615	542	743
34	Footwear and other leather products	96	6,856	7,234	6,952	7,330
35	Glass and glass products	268	1,028	6,163	1,296	6,430
36	Stone and clay products	5,971	56,783	211,837	62,755	217,808
37	Primary iron and steel manufacturing	1,371	10,953	35,821	12,324	37,192
38	Primary nonferrous metals manufacturing	10,042	63,737	299,864	73,780	309,907
39	Metal containers	516	1,113	58,367	1,629	58,883
40	Heating, plumbing, and structural metal products	886	5,077	215,146	5,963	216,032
41	Screw machine products and stampings	866	3,703	97,421	4,569	98,267

See footnote at end of table.

Table E-3—Continued
Effects of VRAs: Estimated changes in U.S. exports, imports, domestic sales, and total sales, by industry, 1987

(In thousands of 1986 dollars)

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales ¹	Reduction in total sales	
					Zero demand elasticity	Unit demand elasticity
42	Other fabricated metal products	8,478	45,206	172,434	53,684	180,912
43	Engines and turbines	16,453	11,270	47,137	27,723	63,590
44	Farm and garden machinery	4,419	8,724	44,229	13,143	48,648
45	Construction and mining machinery	14,950	8,947	61,116	23,897	76,066
46	Materials handling machinery and equipment	1,685	4,192	15,695	5,877	17,380
47	Metalworking machinery and equipment	20,758	28,413	65,572	49,171	86,329
48	Special industry machinery and equipment	7,060	13,553	44,298	20,613	51,358
49	General machinery and equipment	6,223	9,287	45,389	15,510	51,612
50	Miscellaneous machinery, except electrical	1,317	8	10,813	1,325	12,130
51	Office, computing, and accounting machines	173,670	154,972	233,282	328,642	406,952
52	Service industries machines	3,649	1,151	33,462	4,800	37,111
53	Electric industrial equipment and apparatus	14,250	8,889	65,419	23,139	79,670
54	Household appliances	3,810	4,993	27,018	8,803	30,828
55	Electric lighting and wiring equipment	2,594	6,618	12,463	9,212	15,057
56	Radio, TV, and communication equipment	7,469	35,063	68,257	42,532	75,726
57	Electronic components and accessories	37,051	4,518	34,749	41,569	71,800
58	Misc. electrical machinery and supplies	57,582	49,732	85,279	107,314	142,861
59	Motor vehicles and equipment	42,153	166,313	289,096	208,466	331,249
60	Aircraft and parts	190,620	84,626	291,540	275,246	482,160
61	Other transportation equipment	2,999	7,305	25,913	10,304	28,913
62	Scientific and controlling instruments	5,244	3,374	11,418	8,617	16,662
63	Optical, ophthalmic, and photographic equipment	2,499	4,293	19,097	6,792	21,596
64	Miscellaneous manufacturing	7,821	21,866	25,141	29,687	32,962
65	Transportation and warehousing	0	0	20,625	0	20,625
66	Communications, except radio and TV	0	0	6,521	0	6,521
67	Radio and TV broadcasting	0	0	4,785	0	4,785
68	Electric, gas, water, and sanitary services	0	0	14,887	0	14,887
69	Wholesale and retail trade	0	0	27,971	0	27,971
70	Finance and insurance	0	0	26,065	0	26,065
71	Real estate and rental	0	0	70,736	0	70,736
72	Hotels, personal and repair services exc. auto	0	0	9,609	0	9,609
73	Business services	0	0	80,560	0	80,560
74	Eating and drinking places	0	0	125,715	0	125,715
75	Automobile repair and services	0	0	10,582	0	10,582
76	Amusements	0	0	5,500	0	5,500
77	Medical, educ. services and nonprofit org	0	0	25,146	0	25,146
78	Federal Government enterprises	0	0	14,592	0	14,592
79	State and local government enterprises	0	0	0	0	0
	Total, all industries	699,482	963,641	4,106,128	1,663,123	4,805,609

¹ Based on domestic demand elasticity of one. If the elasticity equals zero, the reduction in domestic sales is identical to the decrease in imports.

Table E-4
Effects of VRAs: Estimated changes in U.S. exports, imports, domestic sales, and total sales, by industry, 1988

(In thousands of 1986 dollars)

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales ¹	Reduction in total sales	
					Zero demand elasticity	Unit demand elasticity
01	Livestock and livestock products	23	8	1,301	31	1,324
02	Other agricultural products	1,012	79	1,552	1,091	2,564
03	Forestry and fishery products	4	22	239	26	243
04	Agricultural, forestry, and fishery services	0	0	2,673	0	2,673
05	Iron and ferroalloy ores mining	46	100	288	146	334
06	Nonferrous metal ores mining	45	66	233	111	277
07	Coal mining	182	13	1,035	195	1,216
08	Crude petroleum and natural gas	17	2,555	5,408	2,572	5,424
09	Stone and clay mining and quarrying	51	64	387	115	438
10	Chemical and fertilizer mineral mining	57	157	409	214	466
11	New construction	0	0	37,029	0	37,029
12	Maintenance and repair construction	0	0	16,229	0	16,229
13	Ordinance and accessories	79	11	1,120	90	1,199
14	Food and kindred products	426	210	3,179	636	3,606
15	Tobacco manufactures	126	2	437	128	563
16	Broad and narrow fabrics, yarn and thread mills	38	72	819	110	857
17	Miscellaneous textile goods and floor coverings	15	38	200	53	216
18	Apparel	43	1,106	1,716	1,150	1,759
19	Miscellaneous fabricated textile products	22	60	506	83	529
20	Lumber and wood products, except containers	513	333	2,131	846	2,645
21	Wood containers	5	15	87	20	92
22	Household furniture	109	6,372	10,225	6,481	10,334
23	Other furniture and fixtures	9	112	468	120	476
24	Paper and allied products, except containers	874	477	2,727	1,352	3,602
25	Paperboard containers and boxes	0	2	364	2	364
26	Printing and publishing	315	111	6,141	426	6,456
27	Chemicals and selected chemical products	852	564	2,845	1,416	3,697
28	Plastics and synthetic materials	455	113	1,333	568	1,788
29	Drugs, cleaning and toilet preparations	516	394	4,906	910	5,422
30	Paints and allied products	16	6	376	22	392
31	Petroleum refining and related industries	305	493	6,019	798	6,324
32	Rubber and miscellaneous plastic products	188	1,059	2,634	1,247	2,821
33	Leather tanning and finishing	18	60	81	78	100
34	Footwear and other leather products	14	810	850	824	864
35	Glass and glass products	35	119	706	153	741
36	Stone and clay products	828	6,720	24,474	7,547	25,302
37	Primary iron and steel manufacturing	233	1,563	4,255	1,796	4,488
38	Primary nonferrous metals manufacturing	2,066	8,078	34,541	10,143	36,606
39	Metal containers	90	156	6,698	246	6,788
40	Heating, plumbing, and structural metal products	116	572	24,749	667	24,865
41	Screw machine products and stampings	113	491	11,219	604	11,333

See footnote at end of table.

Table E-4—Continued
Effects of VRAs: Estimated changes in U.S. exports, imports, domestic sales, and total sales, by industry, 1988

(In thousands of 1986 dollars)

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales ¹	Reduction in total sales	
					Zero demand elasticity	Unit demand elasticity
42	Other fabricated metal products	1,118	5,626	20,167	6,744	21,286
43	Engines and turbines	2,165	1,556	5,514	3,721	7,679
44	Farm and garden machinery	591	1,112	5,106	1,702	5,697
45	Construction and mining machinery	2,075	1,053	7,051	3,128	9,127
46	Materials handling machinery and equipment	251	486	1,830	737	2,081
47	Metaworking machinery and equipment	2,728	3,428	7,676	6,156	10,404
48	Special industry machinery and equipment	999	1,745	5,151	2,744	6,151
49	General machinery and equipment	875	1,192	5,276	2,067	6,151
50	Miscellaneous machinery, except electrical	192	2	1,252	193	1,443
51	Office, computing, and accounting machines	23,525	20,608	29,991	44,133	53,516
52	Service industries machines	552	154	3,900	706	4,452
53	Electric industrial equipment and apparatus	1,978	1,359	7,671	3,337	9,649
54	Household appliances	557	586	3,135	1,143	3,691
55	Electric lighting and wiring equipment	359	912	1,565	1,271	1,924
56	Radio, TV, and communication equipment	1,072	4,044	7,990	5,116	9,062
57	Electronic components and accessories	5,315	660	4,132	5,975	9,447
58	Misc. electrical machinery and supplies	7,875	6,647	10,650	14,522	18,525
59	Motor vehicles and equipment	5,519	18,568	32,869	24,087	38,389
60	Aircraft and parts	25,152	9,961	33,664	35,113	58,816
61	Other transportation equipment	415	773	2,918	1,188	3,333
62	Scientific and controlling instruments	717	420	1,358	1,136	2,075
63	Optical, ophthalmic, and photographic equipment	305	496	2,235	801	2,540
64	Miscellaneous manufacturing	1,049	2,687	3,053	3,736	4,101
65	Transportation and warehousing	0	0	2,389	0	2,389
66	Communications, except radio and TV	0	0	768	0	768
67	Radio and TV broadcasting	0	0	562	0	562
68	Electric, gas, water, and sanitary services	0	0	1,719	0	1,719
69	Wholesale and retail trade	0	0	3,254	0	3,254
70	Finance and insurance	0	0	3,023	0	3,023
71	Real estate and rental	0	0	8,212	0	8,212
72	Hotels, personal and repair services exc. auto	0	0	1,104	0	1,104
73	Business services	0	0	9,453	0	9,453
74	Eating and drinking places	0	0	14,486	0	14,486
75	Automobile repair and services	0	0	1,223	0	1,223
76	Amusements	0	0	647	0	647
77	Medical, educ. services and nonprofit org	0	0	2,936	0	2,936
78	Federal Government enterprises	0	0	1,700	0	1,700
79	State and local government enterprises	0	0	0	0	0
	Total, all industries	95,238	117,257	478,222	212,495	573,460

¹ Based on domestic demand elasticity of one. If the elasticity equals zero, the reduction in domestic sales is identical to the decrease in imports

Table E-5

Effects of VRAs: Estimated percentage changes in U.S. exports, imports, domestic sales, and total sales, by Industry, 1985

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales		Reduction in total sales	
				Zero demand elasticity	Unit demand elasticity	Zero demand elasticity	Unit demand elasticity
01	Livestock and livestock products	0.013	0.003	0.000	0.006	0.000	0.006
02	Other agricultural products	0.019	0.004	0.000	0.009	0.005	0.013
03	Forestry and fishery products	0.008	0.005	0.000	0.006	0.000	0.007
04	Agricultural, forestry, and fishery services	0	0.000	0.000	0.040	0.000	0.040
05	Iron and ferroalloy ores mining	0.053	0.053	0.018	0.049	0.026	0.060
06	Nonferrous metal ores mining	0.027	0.027	0.008	0.024	0.007	0.026
07	Coal mining	0.016	0.016	0.000	0.013	0.003	0.016
08	Crude petroleum and natural gas	0.028	0.028	0.009	0.027	0.009	0.027
09	Stone and clay mining and quarrying	0.026	0.026	0.003	0.022	0.005	0.024
10	Chemical and fertilizer mineral mining	0.053	0.053	0.018	0.051	0.026	0.059
11	New construction	0	0	0.000	0.035	0.000	0.035
12	Maintenance and repair construction	0	0.000	0.000	0.039	0.000	0.039
13	Ordinance and accessories	0.018	0.009	0.000	0.015	0.001	0.016
14	Food and kindred products	0.010	0.004	0.000	0.004	0.001	0.004
15	Tobacco manufactures	0.017	0.008	0.000	0.007	0.001	0.007
16	Broad and narrow fabrics, yarn and thread mills	0.010	0.010	0.001	0.008	0.001	0.008
17	Miscellaneous textile goods and floor coverings	0.006	0.006	0.001	0.005	0.001	0.005
18	Apparel	0.011	0.020	0.006	0.010	0.006	0.010
19	Miscellaneous fabricated textile products	0.017	0.017	0.001	0.014	0.002	0.014
20	Lumber and wood products, except containers	0.021	0.022	0.002	0.014	0.004	0.016
21	Wood containers	0.043	0.047	0.005	0.035	0.006	0.036
22	Household furniture	0.103	0.614	0.116	0.202	0.118	0.204
23	Other furniture and fixtures	0.008	0.047	0.002	0.010	0.002	0.010
24	Paper and allied products, except containers	0.047	0.017	0.002	0.013	0.005	0.016
25	Paperboard containers and boxes	0	0.007	0.000	0.005	0.000	0.005
26	Printing and publishing	0.066	0.025	0.000	0.018	0.001	0.018
27	Chemicals and selected chemical products	0.019	0.019	0.002	0.012	0.005	0.015
28	Plastics and synthetic materials	0.024	0.022	0.001	0.013	0.004	0.017
29	Drugs, cleaning and toilet preparations	0.043	0.043	0.002	0.027	0.004	0.029
30	Paints and allied products	0.023	0.021	0.000	0.013	0.001	0.013
31	Petroleum refining and related industries	0.029	0.029	0.002	0.019	0.002	0.019
32	Rubber and miscellaneous plastic products	0.016	0.050	0.004	0.012	0.005	0.012
33	Leather tanning and finishing	0.014	0.031	0.008	0.014	0.010	0.016
34	Footwear and other leather products	0.013	0.030	0.035	0.039	0.036	0.039
35	Glass and glass products	0.013	0.027	0.003	0.018	0.003	0.019
36	Stone and clay products	0.255	0.563	0.048	0.205	0.053	0.210
37	Primary iron and steel manufacturing	0.027	0.046	0.008	0.028	0.009	0.029
38	Primary nonferrous metals manufacturing	0.074	0.273	0.057	0.262	0.064	0.269
39	Metal containers	0.188	0.282	0.007	0.191	0.008	0.192
40	Heating, plumbing, and structural metal products	0.046	0.227	0.005	0.228	0.006	0.229
41	Screw machine products and stampings	0.131	0.131	0.004	0.131	0.005	0.132
42	Other fabricated metal products	0.189	0.299	0.036	0.163	0.043	0.170
43	Engines and turbines	0.141	0.141	0.026	0.140	0.069	0.183
44	Farm and garden machinery	0.173	0.173	0.027	0.170	0.047	0.190
45	Construction and mining machinery	0.142	0.142	0.017	0.138	0.061	0.181
46	Materials handling machinery and equipment	0.094	0.094	0.019	0.093	0.029	0.103

Table E-5—Continued
Effects of VRAs: Percentage changes in U.S. exports, imports, domestic sales, and total sales, by Industry, 1985

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales		Reduction in total sales	
				Zero demand elasticity	Unit demand elasticity	Zero demand elasticity	Unit demand elasticity
47	Metalworking machinery and equipment	0.295	0.295	0.054	0.132	0.092	0.170
48	Special industry machinery and equipment	0.127	0.127	0.028	0.127	0.044	0.143
49	General machinery and equipment	0.079	0.078	0.013	0.077	0.022	0.087
50	Miscellaneous machinery, except electrical	0.028	0.020	0.000	0.025	0.003	0.028
51	Office, computing, and accounting machines	0.406	0.355	0.075	0.151	0.183	0.258
52	Service industries machines	0.074	0.074	0.001	0.070	0.008	0.077
53	Electric industrial equipment and apparatus	0.157	0.093	0.009	0.091	0.028	0.109
54	Household appliances	0.133	0.053	0.011	0.066	0.020	0.075
55	Electric lighting and wiring equipment	0.077	0.099	0.013	0.029	0.018	0.034
56	Radio, TV, and communication equipment	0.045	0.063	0.018	0.036	0.022	0.039
57	Electronic components and accessories	0.206	0.019	0.004	0.035	0.031	0.063
58	Misc. electrical machinery and supplies	0.665	0.344	0.084	0.183	0.205	0.303
59	Motor vehicles and equipment	0.092	0.092	0.030	0.059	0.039	0.068
60	Aircraft and parts	0.401	0.639	0.040	0.140	0.134	0.235
61	Other transportation equipment	0.071	0.111	0.010	0.038	0.015	0.043
62	Scientific and controlling instruments	0.034	0.026	0.004	0.014	0.010	0.021
63	Optical, ophthalmic, and photographic equipment	0.041	0.041	0.006	0.032	0.010	0.035
64	Miscellaneous manufacturing	0.028	0.036	0.028	0.034	0.037	0.042
65	Transportation and warehousing	0	0	0.000	0.004	0.000	0.004
66	Communications, except radio and TV	0	0	0.000	0.002	0.000	0.002
67	Radio and TV broadcasting	0	0	0.000	0.009	0.000	0.009
68	Electric, gas, water, and sanitary services	0	0	0.000	0.003	0.000	0.003
69	Wholesale and retail trade	0.000	0.000	0.000	0.002	0.000	0.002
70	Finance and insurance	0	0	0.000	0.003	0.000	0.003
71	Real estate and rental	0	0	0.000	0.005	0.000	0.005
72	Hotels, personal and repair services exc. auto	0.000	0.000	0.000	0.004	0.000	0.004
73	Business services	0	0.000	0.000	0.007	0.000	0.007
74	Eating and drinking places	0	0	0.000	0.029	0.000	0.029
75	Automobile repair and services	0	0	0.000	0.005	0.000	0.005
76	Amusements	0.000	0.000	0.000	0.004	0.000	0.004
77	Medical, educ. services and nonprofit org	0.000	0.000	0.000	0.003	0.000	0.003
78	Federal Government enterprises	0.000	0.000	0.000	0.013	0.000	0.013
79	State and local government enterprises	0	0.000	0.000	0.000	0.000	0.000

Table E-6
Effects of VRAs: Estimated percentage changes in U.S. exports, imports, domestic sales, and total sales, by industry, 1986

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales		Reduction in total sales	
				Zero demand elasticity	Unit demand elasticity	Zero demand elasticity	Unit demand elasticity
01	Livestock and livestock products	0.033	0.006	0.000	0.016	0.000	0.016
02	Other agricultural products	0.048	0.010	0.002	0.021	0.012	0.032
03	Forestry and fishery products	0.020	0.012	0.001	0.016	0.001	0.017
04	Agricultural, forestry, and fishery services	0	0.000	0.000	0.102	0.000	0.102
05	Iron and ferroalloy ores mining	0.134	0.134	0.039	0.125	0.060	0.146
06	Nonferrous metal ores mining	0.069	0.069	0.018	0.063	0.027	0.072
07	Coal mining	0.041	0.041	0.000	0.034	0.007	0.041
08	Crude petroleum and natural gas	0.071	0.071	0.031	0.072	0.032	0.072
09	Stone and clay mining and quarrying	0.066	0.065	0.011	0.057	0.017	0.063
10	Chemical and fertilizer mineral mining	0.136	0.135	0.039	0.126	0.059	0.146
11	New construction	0	0	0.000	0.088	0.000	0.088
12	Maintenance and repair construction	0	0.000	0.000	0.100	0.000	0.100
13	Ordinance and accessories	0.047	0.023	0.000	0.039	0.003	0.041
14	Food and kindred products	0.026	0.011	0.001	0.010	0.002	0.011
15	Tobacco manufactures	0.044	0.020	0.000	0.017	0.003	0.019
16	Broad and narrow fabrics, yarn and thread mills	0.025	0.025	0.002	0.020	0.002	0.020
17	Miscellaneous textile goods and floor coverings	0.015	0.015	0.002	0.013	0.003	0.013
18	Apparel	0.028	0.052	0.016	0.027	0.017	0.027
19	Miscellaneous fabricated textile products	0.044	0.044	0.004	0.035	0.005	0.036
20	Lumber and wood products, except containers	0.054	0.055	0.005	0.035	0.011	0.040
21	Wood containers	0.117	0.121	0.013	0.089	0.016	0.092
22	Household furniture	0.260	1.561	0.332	0.547	0.337	0.551
23	Other furniture and fixtures	0.020	0.120	0.006	0.025	0.006	0.025
24	Paper and allied products, except containers	0.118	0.044	0.005	0.033	0.012	0.040
25	Paperboard containers and boxes	0	0.019	0.000	0.013	0.000	0.013
26	Printing and publishing	0.168	0.063	0.001	0.045	0.003	0.047
27	Chemicals and selected chemical products	0.047	0.047	0.005	0.031	0.012	0.038
28	Plastics and synthetic materials	0.061	0.055	0.003	0.034	0.010	0.042
29	Drugs, cleaning and toilet preparations	0.109	0.109	0.005	0.068	0.011	0.075
30	Paints and allied products	0.059	0.053	0.001	0.032	0.002	0.033
31	Petroleum refining and related industries	0.075	0.075	0.004	0.047	0.006	0.049
32	Rubber and miscellaneous plastic products	0.040	0.128	0.011	0.030	0.012	0.032
33	Leather tanning and finishing	0.036	0.078	0.021	0.036	0.028	0.043
34	Footwear and other leather products	0.035	0.076	0.110	0.117	0.111	0.119
35	Glass and glass products	0.034	0.068	0.007	0.046	0.009	0.047
36	Stone and clay products	0.649	1.433	0.129	0.527	0.142	0.539
37	Primary iron and steel manufacturing	0.069	0.118	0.021	0.071	0.023	0.073
38	Primary nonferrous metals manufacturing	0.189	0.694	0.197	0.688	0.216	0.707
39	Metal containers	0.478	0.718	0.008	0.481	0.012	0.486
40	Heating, plumbing, and structural metal products	0.116	0.579	0.014	0.579	0.016	0.581
41	Screw machine products and stampings	0.334	0.333	0.011	0.334	0.014	0.337
42	Other fabricated metal products	0.481	0.760	0.099	0.419	0.117	0.437
43	Engines and turbines	0.359	0.359	0.082	0.361	0.195	0.474
44	Farm and garden machinery	0.441	0.441	0.078	0.435	0.123	0.480
45	Construction and mining machinery	0.361	0.361	0.050	0.352	0.147	0.448
46	Materials handling machinery and equipment	0.238	0.238	0.063	0.242	0.088	0.267

Table E-6—Continued
Effects of VRAs: Estimated percentage changes in U.S. exports, imports, domestic sales, and total sales, by industry, 1986

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales		Reduction in total sales	
				Zero demand elasticity	Unit demand elasticity	Zero demand elasticity	Unit demand elasticity
47	Metalworking machinery and equipment	0.750	0.750	0.157	0.351	0.257	0.450
48	Special industry machinery and equipment	0.323	0.323	0.091	0.331	0.134	0.374
49	General machinery and equipment	0.200	0.198	0.036	0.197	0.060	0.221
50	Miscellaneous machinery, except electrical	0.066	0.061	0.000	0.063	0.008	0.071
51	Office, computing, and accounting machines	1.034	0.903	0.310	0.484	0.669	0.843
52	Service industries machines	0.187	0.188	0.005	0.179	0.021	0.195
53	Electric industrial equipment and apparatus	0.399	0.237	0.025	0.231	0.072	0.279
54	Household appliances	0.339	0.138	0.030	0.169	0.050	0.189
55	Electric lighting and wiring equipment	0.195	0.252	0.038	0.078	0.052	0.092
56	Radio, TV, and communication equipment	0.115	0.161	0.051	0.094	0.060	0.104
57	Electronic components and accessories	0.523	0.048	0.011	0.090	0.094	0.173
58	Misc. electrical machinery and supplies	1.692	0.874	0.274	0.513	0.602	0.839
59	Motor vehicles and equipment	0.235	0.235	0.092	0.162	0.114	0.184
60	Aircraft and parts	1.021	1.625	0.106	0.361	0.320	0.574
61	Other transportation equipment	0.180	0.283	0.028	0.099	0.040	0.111
62	Scientific and controlling instruments	0.087	0.067	0.010	0.037	0.027	0.054
63	Optical, ophthalmic, and photographic equipment	0.104	0.104	0.018	0.081	0.029	0.092
64	Miscellaneous manufacturing	0.067	0.091	0.077	0.090	0.098	0.111
65	Transportation and warehousing	0	0	0.000	0.009	0.000	0.009
66	Communications, except radio and TV	0	0	0.000	0.008	0.000	0.008
67	Radio and TV broadcasting	0	0	0.000	0.023	0.000	0.023
68	Electric, gas, water, and sanitary services	0	0	0.000	0.007	0.000	0.007
69	Wholesale and retail trade	0.000	0.000	0.000	0.004	0.000	0.004
70	Finance and insurance	0	0	0.000	0.008	0.000	0.008
71	Real estate and rental	0	0	0.000	0.012	0.000	0.012
72	Hotels, personal and repair services exc. auto	0.000	0.000	0.000	0.009	0.000	0.009
73	Business services	0	0.000	0.000	0.019	0.000	0.019
74	Eating and drinking places	0	0	0.000	0.075	0.000	0.075
75	Automobile repair and services	0	0	0.000	0.011	0.000	0.011
76	Amusements	0.000	0.000	0.000	0.010	0.000	0.010
77	Medical, educ. services and nonprofit org	0.000	0.000	0.000	0.008	0.000	0.008
78	Federal Government enterprises	0.000	0.000	0.000	0.033	0.000	0.033
79	State and local government enterprises	0	0.000	0.000	0.000	0.000	0.000

Table E-7

Effects of VRAs: Estimated percentage changes in U.S. exports, imports, domestic sales, and total sales, by industry, 1987

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales		Reduction in total sales	
				Zero demand elasticity	Unit demand elasticity	Zero demand elasticity	Unit demand elasticity
01	Livestock and livestock products	0.030	0.006	0.000	0.014	0.000	0.015
02	Other agricultural products	0.043	0.009	0.001	0.020	0.012	0.031
03	Forestry and fishery products	0.018	0.010	0.001	0.015	0.001	0.015
04	Agricultural, forestry, and fishery services	0	0.000	0.000	0.094	0.000	0.094
05	Iron and ferroalloy ores mining	0.121	0.121	0.032	0.110	0.049	0.127
06	Nonferrous metal ores mining	0.062	0.062	0.015	0.056	0.023	0.064
07	Coal mining	0.037	0.037	0.000	0.032	0.005	0.037
08	Crude petroleum and natural gas	0.064	0.064	0.034	0.067	0.034	0.067
09	Stone and clay mining and quarrying	0.059	0.059	0.007	0.052	0.013	0.058
10	Chemical and fertilizer mineral mining	0.122	0.122	0.037	0.116	0.052	0.132
11	New construction	0	0	0.000	0.080	0.000	0.080
12	Maintenance and repair construction	0	0.000	0.000	0.090	0.000	0.090
13	Ordnance and accessories	0.042	0.021	0.000	0.036	0.003	0.038
14	Food and kindred products	0.024	0.010	0.001	0.009	0.002	0.010
15	Tobacco manufactures	0.039	0.018	0.000	0.015	0.004	0.019
16	Broad and narrow fabrics, yarn and thread mills	0.023	0.023	0.002	0.018	0.003	0.019
17	Miscellaneous textile goods and floor coverings	0.014	0.014	0.002	0.012	0.003	0.013
18	Apparel	0.025	0.047	0.017	0.027	0.018	0.027
19	Miscellaneous fabricated textile products	0.039	0.039	0.004	0.032	0.005	0.034
20	Lumber and wood products, except containers	0.048	0.049	0.005	0.033	0.012	0.039
21	Wood containers	0.109	0.108	0.015	0.084	0.018	0.088
22	Household furniture	0.235	1.407	0.347	0.543	0.351	0.547
23	Other furniture and fixtures	0.018	0.108	0.005	0.024	0.006	0.024
24	Paper and allied products, except containers	0.107	0.040	0.005	0.031	0.014	0.040
25	Paperboard containers and boxes	0	0.016	0.000	0.012	0.000	0.012
26	Printing and publishing	0.152	0.056	0.001	0.042	0.003	0.044
27	Chemicals and selected chemical products	0.043	0.043	0.005	0.029	0.012	0.036
28	Plastics and synthetic materials	0.055	0.049	0.003	0.032	0.012	0.041
29	Drugs, cleaning and toilet preparations	0.098	0.098	0.005	0.065	0.011	0.071
30	Paints and allied products	0.053	0.048	0.001	0.030	0.002	0.031
31	Petroleum refining and related industries	0.067	0.067	0.004	0.043	0.006	0.045
32	Rubber and miscellaneous plastic products	0.036	0.116	0.011	0.030	0.013	0.031
33	Leather tanning and finishing	0.033	0.071	0.028	0.039	0.034	0.047
34	Footwear and other leather products	0.032	0.068	0.113	0.119	0.114	0.121
35	Glass and glass products	0.031	0.061	0.007	0.042	0.009	0.044
36	Stone and clay products	0.585	1.291	0.133	0.495	0.147	0.509
37	Primary iron and steel manufacturing	0.062	0.106	0.020	0.064	0.022	0.066
38	Primary nonferrous metals manufacturing	0.170	0.625	0.129	0.607	0.149	0.627
39	Metal containers	0.432	0.647	0.008	0.442	0.012	0.446
40	Heating, plumbing, and structural metal products	0.104	0.521	0.013	0.535	0.015	0.537
41	Screw machine products and stampings	0.300	0.300	0.012	0.309	0.014	0.312
42	Other fabricated metal products	0.433	0.684	0.104	0.397	0.124	0.417
43	Engines and turbines	0.324	0.324	0.080	0.334	0.196	0.450
44	Farm and garden machinery	0.397	0.397	0.079	0.401	0.119	0.441
45	Construction and mining machinery	0.325	0.325	0.048	0.327	0.128	0.406
46	Materials handling machinery and equipment	0.215	0.215	0.062	0.231	0.086	0.255

Table E-7—Continued
Effects of VRAs: Estimated percentage changes in U.S. exports, imports, domestic sales, and total sales, by industry, 1987

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales		Reduction in total sales	
				Zero demand elasticity	Unit demand elasticity	Zero demand elasticity	Unit demand elasticity
47	Metalworking machinery and equipment	0.676	0.676	0.139	0.320	0.239	0.420
48	Special industry machinery and equipment	0.291	0.291	0.094	0.306	0.143	0.355
49	General machinery and equipment	0.180	0.178	0.038	0.184	0.063	0.209
50	Miscellaneous machinery, except electrical	0.059	0.060	0.000	0.059	0.007	0.066
51	Office, computing, and accounting machines	0.931	0.814	0.352	0.530	0.744	0.921
52	Service industries machines	0.169	0.169	0.006	0.169	0.024	0.187
53	Electric industrial equipment and apparatus	0.359	0.213	0.030	0.218	0.077	0.265
54	Household appliances	0.305	0.122	0.029	0.158	0.052	0.181
55	Electric lighting and wiring equipment	0.176	0.227	0.041	0.078	0.057	0.094
56	Radio, TV, and communication equipment	0.104	0.145	0.046	0.089	0.055	0.099
57	Electronic components and accessories	0.471	0.043	0.012	0.089	0.106	0.184
58	Misc. electrical machinery and supplies	1.524	0.787	0.305	0.523	0.656	0.873
59	Motor vehicles and equipment	0.212	0.212	0.088	0.153	0.110	0.175
60	Aircraft and parts	0.920	1.464	0.096	0.330	0.311	0.545
61	Other transportation equipment	0.162	0.255	0.026	0.091	0.036	0.102
62	Scientific and controlling instruments	0.078	0.061	0.011	0.036	0.027	0.053
63	Optical, ophthalmic, and photographic equipment	0.093	0.094	0.017	0.078	0.028	0.088
64	Miscellaneous manufacturing	0.061	0.082	0.078	0.089	0.105	0.117
65	Transportation and warehousing	0	0	0.000	0.008	0.000	0.008
66	Communications, except radio and TV	0	0	0.000	0.006	0.000	0.006
67	Radio and TV broadcasting	0	0	0.000	0.022	0.000	0.022
68	Electric, gas, water, and sanitary services	0	0	0.000	0.006	0.000	0.006
69	Wholesale and retail trade	0.000	0.000	0.000	0.004	0.000	0.004
70	Finance and insurance	0	0	0.000	0.008	0.000	0.008
71	Real estate and rental	0	0	0.000	0.011	0.000	0.011
72	Hotels, personal and repair services exc. auto	0.000	0.000	0.000	0.008	0.000	0.008
73	Business services	0	0.000	0.000	0.018	0.000	0.018
74	Eating and drinking places	0	0	0.000	0.069	0.000	0.069
75	Automobile repair and services	0	0	0.000	0.011	0.000	0.011
76	Amusements	0.000	0.000	0.000	0.010	0.000	0.010
77	Medical, educ. services and nonprofit org	0.000	0.000	0.000	0.006	0.000	0.006
78	Federal Government enterprises	0.000	0.000	0.000	0.031	0.000	0.031
79	State and local government enterprises	0	0.000	0.000	0.000	0.000	0.000

Table E-8
Effects of VRAs: Estimated percentage changes in U.S. exports, imports, domestic sales, and total sales, by industry, 1988

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales		Reduction in total sales	
				Zero demand elasticity	Unit demand elasticity	Zero demand elasticity	Unit demand elasticity
01	Livestock and livestock products	0.003	0.001	0.000	0.002	0.000	0.002
02	Other agricultural products	0.005	0.001	0.000	0.002	0.002	0.004
03	Forestry and fishery products	0.002	0.001	0.000	0.002	0.000	0.002
04	Agricultural, forestry, and fishery services	0	0.000	0.000	0.011	0.000	0.011
05	Iron and ferroalloy ores mining	0.013	0.013	0.004	0.012	0.006	0.014
06	Nonferrous metal ores mining	0.007	0.007	0.002	0.006	0.003	0.007
07	Coal mining	0.004	0.004	0.000	0.004	0.001	0.004
08	Crude petroleum and natural gas	0.007	0.007	0.003	0.007	0.003	0.007
09	Stone and clay mining and quarrying	0.007	0.006	0.001	0.006	0.002	0.007
10	Chemical and fertilizer mineral mining	0.013	0.013	0.005	0.013	0.007	0.015
11	New construction	0	0	0.000	0.009	0.000	0.009
12	Maintenance and repair construction	0	0.000	0.000	0.010	0.000	0.010
13	Ordinance and accessories	0.005	0.002	0.000	0.004	0.000	0.004
14	Food and kindred products	0.003	0.001	0.000	0.001	0.000	0.001
15	Tobacco manufactures	0.004	0.003	0.000	0.002	0.000	0.002
16	Broad and narrow fabrics, yarn and thread mills	0.002	0.002	0.000	0.002	0.000	0.002
17	Miscellaneous textile goods and floor coverings	0.002	0.001	0.000	0.001	0.000	0.001
18	Apparel	0.003	0.005	0.002	0.003	0.002	0.003
19	Miscellaneous fabricated textile products	0.004	0.004	0.000	0.004	0.001	0.004
20	Lumber and wood products, except containers	0.005	0.005	0.001	0.004	0.001	0.005
21	Wood containers	0.014	0.012	0.002	0.009	0.002	0.010
22	Household furniture	0.026	0.154	0.037	0.059	0.037	0.059
23	Other furniture and fixtures	0.002	0.012	0.001	0.003	0.001	0.003
24	Paper and allied products, except containers	0.012	0.004	0.001	0.004	0.002	0.005
25	Paperboard containers and boxes	0	0.001	0.000	0.001	0.000	0.001
26	Printing and publishing	0.017	0.006	0.000	0.005	0.000	0.005
27	Chemicals and selected chemical products	0.005	0.005	0.001	0.003	0.002	0.004
28	Plastics and synthetic materials	0.006	0.005	0.000	0.004	0.002	0.005
29	Drugs, cleaning and toilet preparations	0.011	0.011	0.001	0.007	0.001	0.008
30	Paints and allied products	0.006	0.005	0.000	0.003	0.000	0.003
31	Petroleum refining and related industries	0.007	0.007	0.000	0.005	0.001	0.005
32	Rubber and miscellaneous plastic products	0.004	0.013	0.001	0.003	0.002	0.004
33	Leather tanning and finishing	0.004	0.008	0.004	0.005	0.005	0.006
34	Footwear and other leather products	0.004	0.007	0.013	0.014	0.013	0.014
35	Glass and glass products	0.003	0.007	0.001	0.005	0.001	0.005
36	Stone and clay products	0.064	0.141	0.015	0.055	0.017	0.057
37	Primary iron and steel manufacturing	0.007	0.012	0.003	0.007	0.003	0.008
38	Primary nonferrous metals manufacturing	0.019	0.068	0.016	0.067	0.020	0.071
39	Metal containers	0.047	0.071	0.001	0.049	0.002	0.050
40	Heating, plumbing, and structural metal products	0.011	0.057	0.001	0.059	0.002	0.060
41	Screw machine products and stampings	0.033	0.033	0.002	0.034	0.002	0.035
42	Other fabricated metal products	0.047	0.075	0.013	0.045	0.015	0.047
43	Engines and turbines	0.035	0.035	0.011	0.038	0.025	0.052
44	Farm and garden machinery	0.043	0.043	0.010	0.045	0.015	0.050
45	Construction and mining machinery	0.036	0.036	0.005	0.036	0.016	0.047
46	Materials handling machinery and equipment	0.023	0.023	0.007	0.026	0.010	0.030

Table E-8—Continued
Effects of VRAs: Estimated percentage changes in U.S. exports, imports, domestic sales, and total sales, by industry, 1988

Input-output sector	Industry description	Reduction in exports	Increase in imports	Reduction in domestic sales		Reduction in total sales	
				Zero demand elasticity	Unit demand elasticity	Zero demand elasticity	Unit demand elasticity
47	Metalworking machinery and equipment	0.074	0.074	0.016	0.036	0.029	0.049
48	Special industry machinery and equipment	0.032	0.032	0.012	0.034	0.018	0.041
49	General machinery and equipment	0.020	0.020	0.005	0.021	0.008	0.024
50	Miscellaneous machinery, except electrical	0.008	0.010	0.000	0.007	0.001	0.008
51	Office, computing, and accounting machines	0.102	0.089	0.045	0.066	0.098	0.117
52	Service industries machines	0.018	0.019	0.001	0.019	0.003	0.022
53	Electric industrial equipment and apparatus	0.039	0.023	0.004	0.025	0.011	0.031
54	Household appliances	0.033	0.013	0.003	0.018	0.006	0.021
55	Electric lighting and wiring equipment	0.019	0.025	0.005	0.009	0.008	0.012
56	Radio, TV, and communication equipment	0.011	0.016	0.005	0.010	0.006	0.011
57	Electronic components and accessories	0.052	0.005	0.002	0.010	0.015	0.023
58	Misc. electrical machinery and supplies	0.167	0.086	0.039	0.063	0.086	0.109
59	Motor vehicles and equipment	0.023	0.023	0.009	0.017	0.012	0.020
60	Aircraft and parts	0.101	0.160	0.011	0.037	0.038	0.064
61	Other transportation equipment	0.018	0.028	0.003	0.010	0.004	0.011
62	Scientific and controlling instruments	0.009	0.007	0.001	0.004	0.003	0.006
63	Optical, ophthalmic, and photographic equipment	0.010	0.010	0.002	0.009	0.003	0.010
64	Miscellaneous manufacturing	0.007	0.009	0.009	0.010	0.013	0.014
65	Transportation and warehousing	0	0	0.000	0.001	0.000	0.001
66	Communications, except radio and TV	0	0	0.000	0.001	0.000	0.001
67	Radio and TV broadcasting	0	0	0.000	0.003	0.000	0.003
68	Electric, gas, water, and sanitary services	0	0	0.000	0.001	0.000	0.001
69	Wholesale and retail trade	0.000	0.000	0.000	0.000	0.000	0.000
70	Finance and insurance	0	0	0.000	0.001	0.000	0.001
71	Real estate and rental	0	0	0.000	0.001	0.000	0.001
72	Hotels, personal and repair services exc. auto	0.000	0.000	0.000	0.001	0.000	0.001
73	Business services	0	0.000	0.000	0.002	0.000	0.002
74	Eating and drinking places	0	0	0.000	0.008	0.000	0.008
75	Automobile repair and services	0	0	0.000	0.001	0.000	0.001
76	Amusements	0.000	0.000	0.000	0.001	0.000	0.001
77	Medical, educ. services and nonprofit org	0.000	0.000	0.000	0.001	0.000	0.001
78	Federal Government enterprises	0.000	0.000	0.000	0.003	0.000	0.003
79	State and local government enterprises	0	0.000	0.000	0.000	0.000	0.000

APPENDIX F
U.S. APPARENT CONSUMPTION, PRODUCERS' SHIPMENTS, EXPORTS, AND
IMPORTS OF CERTAIN STEEL MILL AND FABRICATED STEEL PRODUCTS

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Table F-1

U.S. apparent consumption, producers' shipments, exports, and imports of certain steel mill and fabricated steel products, 1984-88.

(In short tons)

Item ¹	1984	1985	1986	1987	1988
<i>Apparent consumption</i>					
Semifinished	2,864,573	3,725,184	3,414,086	4,311,051	4,529,816
Plate	6,032,859	6,016,668	4,919,031	5,535,339	9,114,989
Sheet and strip	50,821,204	49,520,991	47,826,825	50,607,166	50,637,823
Bars & certain shapes	14,821,191	14,119,002	13,496,786	14,174,922	15,922,539
Wire rod	4,671,178	4,433,174	4,850,509	5,297,601	5,528,360
Wire	1,614,576	1,467,474	1,353,121	1,316,275	2,121,014
Wire products	976,211	917,975	889,928	930,881	(²)
Structural shapes and units	6,469,671	7,049,677	6,923,564	7,134,105	7,390,312
Rails and related products	1,593,711	1,299,929	910,276	734,794	807,855
Pipe and tub	9,498,172	8,385,854	5,671,711	6,192,583	7,479,551
Total	99,363,346	96,935,928	90,255,837	96,234,717	103,532,259
<i>Producers' shipments</i>					
Semifinished	1,306,044	1,374,524	1,388,649	2,095,599	1,746,267
Plate	4,338,993	4,327,347	3,531,806	4,065,183	7,361,445
Sheet and strip	40,878,749	40,850,298	40,055,641	43,288,266	44,707,915
Bars and certain shapes	13,232,473	12,667,539	12,101,642	12,937,033	14,618,068
Wire rod	3,090,036	2,961,769	3,493,632	3,838,788	4,044,688
Wire	962,726	874,135	797,859	786,963	1,072,698
Wire products	259,616	262,268	278,068	304,761	(²)
Structural shapes and units	4,156,233	4,698,305	4,815,432	5,081,809	5,313,459
Rails and related products	1,238,900	931,313	647,697	504,561	507,278
Pipe and tube	4,275,759	4,095,825	2,836,458	3,569,647	4,443,251
Total	73,739,529	73,043,323	69,946,884	76,472,610	83,815,069
<i>Exports</i>					
Semifinished	73,536	89,708	58,885	73,543	61,430
Plate	88,184	82,988	69,565	96,538	119,393
Sheet and strip	389,577	375,396	507,420	556,991	1,374,056
Bars and certain shapes	133,595	99,096	81,224	121,869	141,461
Wire rod	8,646	4,740	5,876	8,217	10,161
Wire	19,979	19,146	26,760	26,669	36,668
Wire products	22,085	19,253	24,731	23,257	27,847
Structural shapes and units	119,256	89,031	71,525	101,373	111,614
Rails and related products	19,079	13,430	13,131	15,755	18,855
Pipe and tube	207,426	199,258	121,050	152,155	250,390
Total	1,081,363	992,046	980,167	1,176,367	2,151,875

See footnotes at end of table.

Table F-1—Continued

U.S. apparent consumption, producers' shipments, exports, and imports of certain steel mill and fabricated steel products, 1984-1988.

(In short tons)

<i>Item¹</i>	<i>1984</i>	<i>1985</i>	<i>1986</i>	<i>1987</i>	<i>1988</i>
	<i>Imports</i>				
Semifinished	1,632,065	2,440,368	2,084,322	2,288,995	2,844,979
Plate	1,782,050	1,772,309	1,456,790	1,566,694	1,872,937
Sheet and strip	10,332,032	9,046,089	8,278,604	7,875,891	7,303,964
Bars and certain shapes	1,722,313	1,550,559	1,476,368	1,359,758	1,445,932
Wire rod	1,589,788	1,476,145	1,362,753	1,467,030	1,493,833
Wire	671,829	612,485	582,022	555,981	540,380
Wire products	738,680	674,960	636,591	649,377	572,451
Structural shapes and units	2,432,694	2,440,403	2,179,657	2,153,669	2,188,467
Rails and related products	373,890	382,046	275,710	245,988	319,432
Pipe and tube	5,429,839	4,489,287	2,956,303	2,775,091	3,286,690
Total	26,705,180	24,884,651	21,289,120	20,938,474	21,869,065

¹ All grades of steel.

² Shipment and apparent consumption data for wire and wire products have been combined and are reported in the category designated "wire."

Source: Compiled from official statistics of the U.S. Department of Commerce and the American Iron and Steel Institute.

Table F-2

U.S. imports of steel mill products and certain fabricated steel products, 1985-88

(In thousands of dollars)

Item	1984	1985	1986	1987	1988
Semifinished:					
Carbon and certain alloy	347,234	464,013	395,377	471,519	668,601
Stainless	9,843	12,603	18,481	46,294	93,015
Plate:					
Carbon and certain alloy	400,028	529,124	422,991	515,780	751,668
Stainless	12,184	8,124	24,791	19,628	34,972
Strip:					
Carbon and certain alloy	3,994,025	3,614,623	3,242,585	3,356,322	3,453,256
Stainless	200,314	188,329	215,434	211,699	254,799
Bars and shapes:					
Carbon and certain alloy	567,298	513,160	458,228	512,279	539,238
Stainless	65,890	74,822	74,263	71,185	93,510
Wire rod:					
Carbon and certain alloy	492,197	452,683	427,381	453,316	511,809
Stainless	65,890	34,025	30,136	31,996	45,283
Wire and wire products:					
Carbon and certain alloy	812,503	743,393	726,823	746,901	735,972
Stainless	61,926	59,958	52,332	57,380	75,217
Structural shapes:					
Carbon and certain alloy	805,016	863,168	845,461	814,917	954,803
Rails and related products:					
Carbon and certain alloy	131,806	147,183	89,613	79,886	122,369
Pipe and tube:					
Carbon and certain alloy	2,379,779	2,120,392	1,294,765	1,262,57	1,948,868
Stainless	82,130	94,329	95,240	81,019	136,195

Source: Compiled from official statistics of the U.S. Department of Commerce.

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APPENDIX G
STEEL EXPORTS AND EXPORT CEILINGS NEGOTIATED UNDER THE VRAs

Table G-1

Steel exports to the United States, VRA export ceilings, and exports as a percent of export ceilings, for countries and products covered by VRAs, 1985¹

Country/Product	Exports to the United States	VRA export ceiling ²	Exports as a percent of ceiling
	Metric tons		Percent
Australia:			
Semifinished			
Sheet and strip	139,794	148,543	94.1
Wire rods	7,852	7,852	100.0
Wire	3,926	3,926	100.0
Pipes and tubes	30,346	30,302	101.0
Total	181,918	190,623	95.4
Finland:			
Semifinished	11,760	19,051	61.7
Plate	94,187	89,413	105.3
Sheet and strip	61,027	61,027	100.0
Bars	3,670	3,670	100.0
Wire rods	8,564	8,564	100.0
Pipes and tubes	9,469	9,469	100.0
Total	188,677	191,194	98.7
Japan:			
Semifinished	108,569	113,399	94.0
Plate	50,637	39,251	129.0
Sheet and strip	3,211,198	3,101,929	103.5
Bars	201,285	211,317	95.3
Wire rods	307,642	303,854	101.2
Wire and Wire	207,520	196,885	105.4
Structural shapes	1,005,586	847,517	118.7
Fabricated structurals	102,851	113,399	90.7
Pipes and tubes	1,518,598	1,290,994	117.6
Total	6,711,886	6,218,545	107.9
Korea:			
Semifinished	47,959	53,850	89.1
Plate	64,210	64,313	99.8
Sheet and strip	710,007	709,711	100.0
Bars	84,367	77,624	108.7
Wire rod	22,849	21,350	107.0
Wire and wire products	250,296	237,527	105.4
Structural shapes	124,216	114,528	108.5
Fabricated structurals	68,315	66,467	102.8
Pipes and tubes	824,207	784,090	105.1
Total	2,196,426	2,129,460	103.1
Mexico:			
Semifinished	8,926	113,399	7.9
Plates	20,844	19,780	105.4
Sheet and strip	78,937	78,756	97.7
Bars	8,984	12,984	69.2
Wire rods	56,547	49,561	114.1
Wire and wire products	14,190	15,366	92.3
Structurals	25,382	24,870	102.1
Pipes and tubes	155,351	161,701	96.1
Total	367,161	476,417	77.1

See footnotes at end of table.

Table G -1—Continued

Steel exports to the United States, VRA export ceilings, and exports as a percent of export ceilings, for countries and products covered by VRAs, 1985¹

Country/Product	Exports to the United States	VRA export ceiling ²	Exports as a percent of ceiling
	Metric tons		Percent
Spain:			
Semifinished	28,238	28,238	100.0
Plate	74,026	74,026	100.0
Sheet and strip	162,833	161,013	101.0
Bars	58,374	58,048	100.6
Wire rods	46,677	46,677	100.0
Wire and wire products	35,986	36,250	99.3
Structural shapes	200,967	207,457	96.9
Pipes and tubes	86,364	82,229	105.0
Total	693,265	693,938	99.9
Brazil:			
Semifinished	787,765	825,547	95.4
Plate	51,558	55,675	92.6
Sheet and strip	398,147	410,238	97.1
Bars	147,802	133,819	110.4
Wire rods	54,988	53,976	101.9
Wire and wire products	26,164	28,945	90.4
Structural shapes	24,596	24,327	101.1
Pipes and tubes	269,452	274,154	98.3
Total	1,760,482	1,806,681	97.4
Eastern European Countries Venezuela, Portugal, China, Trinidad and Tobago:			
Semifinished	37,470	54,200	69.1
Plate	369,776	359,895	102.7
Sheet and strip	239,601	254,110	94.3
Bars	99,077	98,884	100.2
Wire rods	172,916	159,887	108.1
Wire and wire products	40,246	40,702	98.9
Structural shapes	18,437	18,144	101.6
Pipes and tubes	175,461	182,799	96.0
Other	103,123	100,933	102.2
Total	1,256,107	1,269,554	98.9
South Africa:			
Semifinished	85,157	113,399	57.5
Plate	67,030	61,493	109.0
Sheet and strip	192,015	184,686	104.0
Bars	14,473	13,311	108.7
Wire rods	14,368	13,344	107.7
Wire and wire products	31,166	30,509	102.2
Structural shapes	97,315	87,615	111.1
Pipes and tubes	50,297	50,297	100.0
Total	531,821	554,654	95.9
European Community³:			
Semifinished	294,831	287,064	102.7
Plate	2,163,805	2,223,355	97.3
Sheet and strip	136,750	141,672	96.5
Bars	168,974	174,959	96.6
Wire rods	66,296	70,584	93.9
Structural shapes	649,044	646,993	100.3
Rails and rails products	86,594	85,932	100.8
Pipes and tubes	837,777	770,975	108.7
Total	4,403,871	4,401,534	100.1

¹ Figures are for first 15 months of the VRA programs from Oct. 1, 1984, through Dec. 31, 1985.² Final export ceiling based on yearend apparent consumption figures as calculated by Data Resources Institute.³ Except Portugal and Spain.

Source: Calculated by the staff of the U.S. International Trade Commission from U.S. Department of Commerce, International Trade Administration data.

Table G-2

Steel exports to the United States, VRA export ceilings, and exports as a percent of export ceilings, for countries and products covered by VRAs, 1986

Country/Product	Exports to the United States	VRA export ceiling ¹	Exports as a percent of ceiling
	Metric tons		Percent
Australia:			
Semifinished	43,854	45,360	96.7
Sheet and strip	136,844	142,946	95.7
Wire rods	5,139	5,166	99.5
Wire and wire products	2,567	2,584	99.3
Pipes and tubes	15,189	12,937	117.4
Total	203,593	208,993	97.4
Austria:			
Sheet and strip	102,060	93,373	109.3
Wire rods	1,603	3,004	53.4
Pipes and tubes	17,770	23,907	74.3
Total	121,433	120,284	101.0
Finland:			
Semifinished	13,519	13,608	99.4
Plate	60,177	52,886	113.8
Sheet and strip	94,858	96,186	98.2
Bars	1,618	1,643	98.5
Wire rods	3,781	3,833	98.6
Pipes and tubes	4,538	4,901	92.6
Total	178,491	173,057	103.1
Japan:			
Semifinished	52,894	62,053	85.2
Plate	13,780	14,049	98.1
Sheet and strip	2,297,819	2,312,339	99.4
Bars	107,033	169,690	63.1
Wire rod	227,577	246,022	92.5
Wire and Wire	130,264	144,717	90.0
Structural shapes	494,667	585,532	84.5
Rails and rail products	81,244	88,803	91.5
Pipes and tubes	432,437	422,806	102.3
Total	3,837,715	4,046,011	94.9
Korea:			
Semifinished	45,353	45,360	100.0
Plate	47,175	43,657	108.1
Sheet and strip	596,998	582,390	102.5
Bars	57,950	54,992	105.4
Wire and wire products	200,461	188,387	106.4
Structural shapes	125,525	145,015	86.6
Pipes and tubes	372,462	341,602	109.0
Total	1,445,927	1,401,403	103.2
Mexico:			
Semifinished	67,817	90,719	74.8
Plate	11,204	12,056	92.9
Sheet and strip	69,591	63,309	109.9
Bars	20,192	17,838	113.2
Wire rods	38,481	41,385	93.0
Wire and wire products	12,295	10,831	113.5
Structural shapes	15,663	17,134	91.4
Pipes and tubes	99,837	89,578	111.5
Total	335,080	342,850	97.7

See footnote at end of table.

Table G-2—Continued

Steel exports to the United States, VRA export ceilings, and exports as a percent of export ceilings, for countries and products covered by VRAs, 1986

Country/Product	Exports to the United States	VRA export ceiling ¹	Exports as a percent of ceiling
	Metric tons		Percent
Spain:			
Semifinished	37,852	45,360	83.5
Plates	55,424	53,657	103.3
Sheet and strip	146,690	150,006	97.8
Bars	22,997	38,823	59.2
Wire rods	41,552	42,547	97.7
Wire and wire products	26,659	31,227	85.4
Structural shapes	180,408	184,619	97.7
Pipes and tubes	31,660	35,964	88.0
Total	543,242	582,203	93.3
Brazil:			
Semifinished	627,416	641,066	97.9
Plates	42,179	40,044	105.3
Sheet and strip	275,015	292,676	94.0
Bars	44,742	58,654	76.3
Wire rods	37,896	41,130	92.1
Wire and wire products	21,808	24,983	87.3
Structural shapes	14,637	24,627	59.4
Pipes and tubes	119,748	115,767	103.4
Total	1,183,441	1,238,947	95.5
Eastern European Countries, Venezuela, Portugal, China, Trinidad and Tobago:			
Semifinished	20,310	37,562	54.0
Plates	81,726	88,442	92.4
Sheet and strip	164,556	180,044	91.4
Bars	15,203	15,048	101.0
Wire rods	31,339	32,035	97.8
Wire and wire products	23,219	23,194	100.1
Structural shapes	14,996	17,589	85.3
Pipes and tubes	60,992	62,370	97.8
Other	40,995	61,610	66.5
Total	453,336	498,843	90.9
European Community²:			
Semifinished	264,152	544,316	48.5
Plates	246,527	227,894	108.2
Sheet and strip	2,349,106	2,196,041	107.0
Bars	224,471	247,322	90.8
Wire rods	196,260	207,530	94.6
Wire and wire products	206,207	228,397	90.3
Structural shapes	690,460	698,824	98.8
Rails and rail products	52,642	57,239	92.0
Pipes and tubes	335,118	305,786	109.6
Total	4,564,843	4,713,349	96.9

¹ Final export ceiling based on yearend apparent consumption as calculated by Data Resource Institute.

² Except Portugal and Spain.

Source: Calculated by the staff of the U.S. International Trade Commission from U.S. Department of Commerce, International Trade Administration data.

Table G-3

Steel exports to the United States, VRA export ceilings, and exports as a percent of export ceilings, for countries and products covered by VRAs, 1987

Category	Exports to the United States	Final export ceiling ¹	Share of export ceiling filled
	Metric tons		Percent
Australia:			
Semifinished	49,189	46,866	104.96
Sheet and strip	132,718	146,089	90.85
Wire rods	5,276	5,282	99.89
Wire and wire products	2,637	2,641	99.85
Pipes and tubes	15,135	16,521	91.61
Total	204,955	217,399	94.28
Austria:			
Sheet and strip	95,274	117,375	81.17
Bars	2,216	2,131	103.99
Wire rods	597	5,122	11.66
Pipes and tubes	25,252	35,403	71.33
Total	123,339	160,031	77.07
Finland:			
Semifinished	12,653	13,608	92.98
Plate	51,003	50,215	101.57
Sheet and strip	93,888	97,063	96.73
Bars	1,480	1,784	82.96
Wire rods	3,452	4,164	82.90
Pipes and tubes	4,832	5,163	93.59
Total	167,307	171,997	97.27
Japan:			
Semifinished	83,876	95,683	87.66
Plate	20,353	23,512	86.56
Sheet and strip	2,342,048	2,549,497	91.86
Bars	109,563	184,231	59.47
Wire rods	236,357	297,732	79.39
Wire and wire products	106,466	174,796	60.91
Structural shapes	569,790	681,545	83.60
Rails and rail products	57,869	70,454	82.14
Pipes and tubes	635,980	680,169	93.50
Total	4,167,472	4,757,619	87.60
Korea:			
Semifinished	24,622	24,632	99.96
Plate	39,946	39,857	100.22
Sheet and strip	575,511	580,402	99.16
Bars	53,797	61,597	87.34
Wire and wire products	208,711	215,269	96.95
Structural shapes	139,019	143,217	97.07
Rails and rail products	3,406	3,500	97.31
Pipes and tubes	400,018	395,334	101.18
Total	1,445,030	1,463,808	98.72
Mexico:			
Semifinished	60,599	113,623	53.33
Plate	10,779	11,750	91.74
Sheet and strip	62,016	57,326	108.18
Bars	13,515	12,036	112.29
Wire rods	48,998	53,978	90.77
Wire and wire products	12,099	12,847	94.18
Structural shapes	17,619	17,235	102.23
Pipes and tubes	86,365	80,167	107.73
Total	311,990	358,962	86.91

See footnotes at end of table.

Table G-3—Continued

Steel exports to the United States, VRA export ceilings, and exports as a percent of export ceilings, for countries and products covered by VRAs, 1987

Category	Exports to the United States	Final export ceiling ¹	Share of export ceiling filled
	Metric tons		Percent
Spain:			
Semifinished	38,701	48,989	79.00
Plates	46,011	44,279	103.91
Sheet and strip	115,732	155,850	74.26
Bars	33,167	45,128	73.50
Wire rods	42,499	48,435	87.74
Wire and wire products	20,893	34,938	59.80
Structural shapes	151,781	155,085	97.87
Pipes and tubes	28,644	46,338	61.82
Total	477,428	579,042	82.45
Brazil:			
Semifinished	728,485	652,468	111.65
Plates	33,609	32,680	102.84
Sheet and strip	314,641	325,771	96.58
Bars	67,053	70,641	94.92
Wire rods	53,721	53,719	100.00
Wire and wire products	26,220	27,814	94.27
Structural shapes	25,975	26,755	97.08
Pipes and tubes	64,946	66,188	98.12
Total	1,314,650	1,256,036	104.67
Eastern European Countries, Venezuela, Portugal, China, Trinidad and Tobago:			
Semifinished	81,748	91,564	89.28
Plates	110,020	113,552	96.89
Sheet and strip	216,335	232,166	93.18
Bars	12,398	12,273	101.02
Wire rods	88,439	77,894	113.54
Wire and wire products	56,306	55,671	101.14
Structural shapes	16,507	16,119	102.41
Pipes and tubes	63,679	61,954	102.78
Unspecified	103,968	130,112	79.91
Total	749,400	791,305	94.70
European Community²:			
Semifinished	587,293	585,771	100.26
Plates	233,037	230,075	101.29
Sheet and strip	2,236,084	2,260,078	98.94
Bars	191,426	217,922	87.84
Wire rods	221,847	230,016	86.45
Wire and wire products	191,017	218,897	87.26
Structural shapes	609,845	603,958	100.97
Rails and rail products	46,570	49,429	94.22
Pipes and tubes	359,581	384,852	93.43
Total	4,676,700	4,780,998	97.82

¹ Final export ceiling based on yearend apparent consumption as calculated by Data Resources Institute.² Except Portugal and Spain.

Source: Calculated by the staff of the U.S. International Trade Commission from U.S. Department of Commerce, International Trade Administration data.

APPENDIX H
THE STEEL MARKET DURING 1984-88

THE STEEL MARKET DURING 1984-88

The steel market underwent a number of changes during 1984-88 which influenced the extent to which the steel VRAs affected consuming industries, as follows:

In the initial years of the program (1984-85), the value of the dollar in international markets was relatively strong, so much so that the U.S. steel market appears to have been one of the highest price, and therefore one of the most lucrative, steel markets in the world. Reflecting these conditions, imports rose significantly from their early 1980s levels, increasing their share of the U.S. market from 16-22 percent in the early 1980s, to a peak of 26 percent in 1984.

In terms of the strength of the U.S. market, demand was relatively weak during the mid-1980s, which had a pronounced effect on steel industry operations. Capacity utilization did not exceed 70 percent, for example, until 1987; the fact that it did in 1987 reflects the fact that substantial capacity had been closed.

Conditions changed during the latter part of the VRA period, as demand for steel in the U.S. market in 1987 and 1988 increased substantially. By 1988, the industry was operating at close to 90 percent of its capability.

Growth in demand was not, however, restricted to the U.S. market; world steel production reached a record high in 1988, resulting in a global tightening of market conditions in all regions.

The increase in world production and the corresponding increases in capacity utilization had a predictable effect on prices, which rose internationally. The upward price pressures in the U.S. market were accentuated by declines in the value of the dollar relative to countries from whom the United States imports steel. By the second quarter of 1988, the real value of the dollar had declined by a steel-trade-weighted average of 35 percent against VRA countries and by 15 percent against non-VRA countries from their respective highs in the first and second quarters in 1985.¹

The decline in the value of the dollar, combined with the effects of an increase in steel demand internationally, resulted in a reduction in foreign sales activity in the U.S. market, as evidenced by the apparent failure of most foreign producers to fill their quotas in 1988. In this regard, available information suggests that approximately 75 percent of quota tonnage was used during 1988, as opposed to 94 percent in 1987 and close to 100 percent in 1985 and 1986. The reduction in sales activity, however, varied among countries and product lines. Certain countries, such as Mexico, Brazil, and Eastern European countries, filled a much higher percentage of their allotted tonnage in 1987-88 than other countries. In terms of the effect of the restraints in product areas, virtually all the quotas for semifinished steel and steel plate were filled in 1987; moreover, these product lines apparently had the highest quota utilization rates in 1988.

In summary, it would appear that demand for imports was at its highest during 1985 and 1986. During these years, however, the U.S. industry's operating rates were relatively low, a factor that should have minimized any supply problems, though there were instances in which problems in particular product areas developed.

In contrast to 1985 and 1986, the U.S. industry was not in a position to accommodate an increased level of steel demand during 1987 and 1988 without extending lead times. By 1988, most exporters were similarly unwilling to supply additional steel to the less profitable U.S. market in light of strong demand in their respective home markets and other export markets.

¹ See USITC, *The Western U.S. Steel Market: Analysis of Market Conditions and Assessment of the Effects of Voluntary Restraint Agreements on Steel-Producing and Steel-Consuming Industries*, March 1989, p. 7-8n.

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