AGGREGATE COSTS TO THE UNITED STATES OF TARIFFS AND QUOTAS ON IMPORTS:

General Tariff Cuts and Removal of Quotas on Automobiles, Steel, Sugar, and Textiles

DAVID G. TARR AND MORRIS E. MORKRE

AGGREGATE COSTS TO THE UNITED STATES OF TARIFFS AND QUOTAS ON IMPORTS: General Tariff Cuts and Removal of Quotas on Automobiles, Steel, Sugar, and Textiles

An Economic Policy Analysis

by

David G. Tarr and Morris E. Morkre

Bureau of Economics Staff Report
to the Federal Trade Commission
December 1984

FEDERAL TRADE COMMISSION

JAMES C. MILLER III, Chairman
PATRICIA P. BAILEY, Commissioner
GEORGE W. DOUGLAS, Commissioner
TERRY CALVANI, Commissioner
MARY L. AZCUENAGA, Commissioner

BUREAU OF ECONOMICS

WENDY GRAMM, Director
JOHN L. PETERMAN, Associate Director for Special Projects
RONALD S. BOND, Deputy Director for Operations and Research
RICHARD S. HIGGINS, Deputy Director for Consumer Protection and Regulatory Analysis
DAVID T. SCHEFFMAN, Deputy Director for Competition Analysis and Antitrust
KEITH B. ANDERSON, Assistant Director for Regulatory Analysis
ROBERT D. BROGAN, Assistant Director for Competition Analysis
JAMES M. FERGUSON, Assistant Director for Antitrust
PAULINE M. IPPOLITO, Assistant Director for Industry Analysis
WILLIAM F. LONG, Manager for Line of Business
PAUL H. RUBIN, Assistant Director for Consumer Protection

This report has been prepared by the Bureau of Economics of the Federal Trade Commission and represents the views of the Commission's Bureaus of Consumer Protection and Competition in addition to those of the Bureau of Economics. It does not necessarily reflect the views of the Federal Trade Commission or any of its individual members. The Federal Trade Commission has, however, voted to authorize its release.

PREFACE

Four years ago we prepared a report estimating the welfare effects of U.S. import restrictions on five different products: tariffs on CB radios, sugar, textiles, and quotas on color TV's and nonrubber footwear. The scope of the present report is considerably broader than our earlier effort as we now attempt to estimate the aggregate costs of all tariffs and quotas as of 1984. In view of the increased concern about examining the costs and benefits of government regulations, we and FTC Chairman James C. Miller III, thought it would be useful to have an estimate of the aggregate costs and benefits of all tariffs and quotas on imports.

In the following report we estimate the benefits to the U.S. of multilateral removal of all tariffs and elimination of quotas on automobiles, carbon and alloy steel, sugar, and textiles. While we do consider the effects of removing all tariffs, we only consider quotas on four products. We have not, for example, studied import quotas on stainless steel or beef. Furthermore, the procedures employed also tend to understate the costs. Therefore our estimates should properly be viewed as lower bound estimates of the true costs of all tariffs and quotas.

The report begins with a Summary chapter that gives the results for chapters two through six and also aggregates these results. Chapter one discusses methodology issues. Chapters two through six explain how we obtain estimates of the effects of general tariff cuts and each of the quotas; these chapters stand alone and can be read independently.

This report is essentially a combined effort. Tarr was responsible for the Summary chapter and chapters one, three (automobiles), and six (steel). Morkre was responsible for chapters two (tariffs), four (sugar), five (textiles), and a portion of the Summary chapter. Both authors read, commented on, and in some instances rewrote parts of early drafts.

We wish to acknowledge our gratitude to a number of people who have helped in preparation of this report. Within the FTC we are indebted to Keith Anderson, the Assistant Director for Regulatory Analysis, and Richard Higgins, the Deputy Director for Consumer Protection and Regulatory Analysis, both of the Bureau of Economics. Their extensive and helpful comments and suggestions on various drafts had a significant influence on the final form taken by the report. We also thank Benjamin Cohen, David Haarmeyer, Fred Johnson, Jon Ogur, Alain Sheer, and Walter Vandaele for reading and commenting on the manuscript.

Outside the Commission, we benefitted from the assistance of Robert Baldwin and J. David Richardson (University of Wisconsin), Alan Deardorff (University of Michigan), Robert Feenstra (Columbia University), James Riedel (Johns Hopkins University), John Whalley (University of Western Ontario), Robert Barry, Peter Buzzanell, Fred Hoff, and John Nuttall (U. S. Department of Agriculture), James Bennett (U.S. Department of Commerce), John Boyd (International Trade Commission), Ronald Duncan and Donald Keesing (World Bank), and James Fry (Landell Mills Commodities Studies).

We are especially grateful for the work of the support staff at the FTC. This includes: the secretaries in our Division, Vera Chase, Annette Shanklin, and Tracy Pinckney; Nancy Cole and Kathleen McChesney for statistical assistance; Adora de Los Santos for editorial assistance; Peggy Holland, Dianne Jones, Angela Newsome, and Betsy Zichterman in the Word Processing Center; Carl Fuehrer in the Printing and Reproduction Department; and Don Cox in the Graphics Department.

Finally, the usual disclaimer applies. None of the organizations or individuals listed above are responsible for the views, interpretations, or results presented in this report.

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

TABLE OF CONTENTS (Cont.)

LIST OF FIGURES AND TABLES

Introduction

How much would the United States economy gain from removing tariffs and quotas imposed on imports? To answer this question, this study estimates the aggregate costs to the economy resulting from currently imposed tariffs and also the costs of quotas on imports in four significant industries -- automobiles, textiles, steel, and sugar. These costs represent the amount by which tariffs and these particular quotas lower real national income. They thus represent the benefits to the U.S. economy that would result from removal of these restrictons. Since there are other current quotas which impose costs not included in these figures, the combination of the costs of tariffs and of these quotas provide a conservative estimate of the costs of current trade restrictions.

The aggregate benefits from removing all existing tariffs and the existing quotas studied here are estimated to be $12.70 billion per year. The benefits over four years have a present value of $46.07 billion. These estimates, as well as the separate estimates of the costs of tariffs and of the four individual quotas, are summarized in Table 1. (See the last section of this summary for the details.)

The adjustment costs that would be borne by domestic resources if the tariffs and quotas were removed are also estimated. The estimated adjustment costs are compared with the aggregate benefits of removing the restrictions; benefit-adjustment cost comparisons are also made in three of the four industries in which quotas are analyzed and in the context of the multilateral removal of all tariffs.[1]

In chapter one, the methodology employed for arriving at an estimate of the aggregate cost of all the restraints is described. In particular, how the potential problems of interrelatedness and terms-of-trade effects have been met is explained.

Chapter two presents estimates, derived from general equilibrium models, of the costs and benefits to the United States of a multilateral elimination of all tariffs.

Chapters three, four, five and six are case studies of a quota's effects in particular industries. Specifically, they are partial equilibrium analyses of the effects of removing quotas in the automobile, sugar and textile industries and of imposing a new quota on the importation of steel. These studies rely on the

---

[1] In the analysis of the sugar industry, it is assumed that when the quota is removed, it is replaced by a direct subsidy scheme or by a purchase-resale arrangement such that domestic growers continue to be guaranteed the minimum level of receipts available under the current domestic price-support program. As a result, there are no adjustment costs borne by domestic resources. See chapter 4 for a discussion of this issue.

TABLE 1

Summary Table

Aggregate Costs to the Economy of the Restraints Considered: Annual Costs and Cumulative Costs over Four Years*

(in billions of 1983 dollars)**

	Annual Costs	Present Value of Costs over Four Years
Total costs of all tariffs and quotas examined	$12.70	$46.07
All tariffs	10.52	38.13
Quotas, Net cost of all estimated	2.18	7.94
Automobile "VRA"	0.99	3.60
Sugar Quota	0.25	0.91
Textile Quota on Hong Kong	0.37	1.35
Steel Quota	0.78	2.83
Less: maximum estimated terms-of-trade welfare loss from quota removal	-0.21	-0.75

* Although an aggregate costs to consumers estimate is not presented, costs to consumers are greater than the costs to the economy. Thus the costs to the economy estimate may be used as a lower bound estimate of the costs to consumers.

** Due to rounding, the totals may differ from the sum of the entries in the columns relevant to the total.

Source: Authors' calculations from estimates in the text.

methodology of our 1980 study.[2] For the reader with a particular interest in any one of these industries, each of these studies has been written so that it can be read independently of the rest of the study, as an examination of the costs and benefits of removing quotas on the industry in question. In some places this has involved repetition.

Throughout this study the expressions "costs to consumers" and "costs to the economy" are employed. These terms are explained in more detail in the individual chapters (and especially in Morkre-Tarr (1980, chapter 2)), but it is useful to have an understanding of these concepts for the purpose of reading this summary.

The costs to United States consumers is a measure of the degree to which consumers are made worse off by the specific policy being analyzed. It is composed of two elements. First, consumers who continue to purchase a product even after an import restraint is imposed will pay a higher price for the product, and consumers are made worse off by the amount of the increase in payments that must be made to obtain the product. In addition, some consumers, who would be willing to purchase the product at the price charged before imports are restricted, will not be willing to pay the artificially inflated price that results from the restriction and instead buy alternate products that they value less highly than their former purchases. For these consumers the difference between what they would have been willing to pay and the price they would have to pay without import restraint is also a loss. The sum of these quantities is the amount by which consumers incur costs as a result of the particular restraint analyzed.

The costs to the economy is a measure of the net losses to our economy. Thus, it subtracts from losses to consumers the gains to other sectors of our economy--specifically the gains to domestic producers and the United States government. The costs to the economy, therefore, are less than the costs to consumers to the extent that the United States government obtains additional tariff revenue or proceeds from auctioning quotas and to the extent that domestic producers earn additional profits. The costs to the economy figures (known technically as deadweight losses) represent the degree to which the United States economy as a whole is made worse off by the imposition of the policy being analyzed.[3]

Chapters two through six will now be summarized. The summary will then conclude with a discussion of the aggregate costs and benefits to the economy of the import restraints that are examined.

---

[2] Although the present study is primarily self-contained, we occasionally refer the reader to our earlier study for a fuller explanation of particular points. See Morris E. Morkre and David G. Tarr (1980), Effects of Restrictions on United States Imports: Five Case Studies and Theory, a Bureau of Economics Staff Report to the Federal Trade Commission, U.S. Government Printing Office (hereafter USGPO).

[3] See chapter 6, section III below and especially Morkre-Tarr (1980, chapter 2) for a fuller explanation of losses to consumers and the economy.

Multilateral Elimination of all Tariffs

Chapter two reports estimates of the welfare effects for the U.S. from general multilateral removal of all tariffs. The importance of tariffs as a barrier to international trade has declined during the post-war period as a result of several rounds of Multilateral Tariff Negotiations (MTN). Between 1946 and 1983 the average tariff rate for the U.S. declined from 10.3 percent to 3.7 percent. The most recent MTN, the Tokyo Round, was concluded in 1979 and called for further cuts in tariff rates phased in over an eight year period beginning in 1980.

We develop estimates of the welfare effects that would accrue to the U.S. if all tariffs that remain after the Tokyo Round are reduced to zero. The starting point for these estimates is the work of two teams of economists.[4] Both teams adopt a methodology based on multilateral as opposed to unilateral tariff reductions.[5] Full multilateral removal of all tariffs is found to generate a gain in real income for the U.S. economy of at least $10.52 billion per year in 1983 dollars (Table 2).

---

[4] Fred Brown and John Whalley (1980), "General Equilibrium Evaluations of Tariff-Cutting Proposals in the Tokyo Round and Comparisons with More Extensive Liberalisation of World Trade," Economic Journal, 90, pp. 838-866; Robert E. Baldwin and Wayne E. Lewis (1978), "U.S. Tariff Effects on Trade and Employment in Detailed SIC Industries," in William G. Dewald (ed.), The Impact of International Trade and Investment on Employment, A Conference on the Department of Labor Research Results, pp. 241-264, USGPO. See also Robert E. Baldwin, John H. Mutti, and J. David Richardson (1980), "Welfare Effects on the United States of a Significant Multilateral Tariff Reduction," Journal of International Economics, 10, pp. 405-423.

More recently, Whalley has estimated the increase in U.S. national income from multilateral abolition of all tariff and non-tariff barriers. Adjusting his 1977 results to 1983 by the increase in nominal GNP, the gain in U.S. income would be $16.91 billion, which exceeds our estimate of the gain from multilateral removal of all tariffs plus the unilateral removal by the U.S. of quotas on automobiles, steel, sugar, and textiles, $12.70 billion (Table 1). This result is consistent with our view that the possible gains to the U.S. from the removal of all import barriers is underestated by the results presented in this report. See John Whalley (1984), "The North-South Debate and the Terms of Trade: An applied General Equilibrium Approach, Review of Economics and Statistics, 66(2), pp. 224-234.

[5] There is a question of whether unilateral removal of all U.S. tariffs will improve U.S. real income. Because U.S. imports and exports account for a significant proportion of total world trade, slightly more than 10 percent in 1983, such an action may cause an adverse movement in the terms of trade, the ratio of price of exports to the price of imports. Theoretical analysis of this policy does not provide a clear indication of the effects on real income. But some empirical results suggest U.S. real income would decline from such an action. In contrast, recent empirical studies of multilateral tariff reductions indicate that U.S. welfare would improve. Moreover, multilateral action is expected to improve U.S. real income, since a fundamental proposition of international trade theory states that elimination of all trade barriers maximizes world income. These issues are considered further in chapter 2, section II.

TABLE 2

Tariffs

Benefits to the U.S. of Multilateral Elimination of all Tariffs: Annual Benefits and Cumulative Benefits over Four and Twenty Years

(in billions of 1983 dollars)

	Annual Benefits	in Present Value: Four Years of Benefits	in Present Value: Twenty Years of Benefits
Gain in National Income	10.52	38.13	119.25

Notes: The annual stream of gains is assumed to be $10.52 billion per year. Cumulative present value is calculated using a discount rate of 7 percent.

Source: Text, Table 2.5.

It is determined from results of a study based on 1973 data, which we have adjusted upward for the growth in nominal GNP.[6]

Cancelling all tariffs will also affect the pattern of domestic output and employment, and available results indicate that there would be a net adverse effect on domestic firms and workers. Since imports would be cheaper, domestic industries that compete with imports suffer a contraction and this will cause unemployment. Part of this increase in unemployment is offset by new employment opportunities in export industries. Since foreign tariffs are also eliminated domestic export industries would expand and demand additional workers. The net adverse effect on employment was found to be small, at most $0.36 billion of adjustment costs in 1983 dollars, which is obtained by adjusting the results of a study using 1967 data (Table 3).[7] Thus, considering only the benefits that occur in a single year, the benefit-cost ratio is at least 29 ($10.52/$0.36). For each dollar of adjustment costs the U.S. stands to gain $29 in real income when all tariffs are eliminated.

A full evaluation of the gains needs to consider the increases in real income in future years. For the first four years after all tariffs are cancelled, the present value of the gain in real income is at least $38.13 billion. However, since the adjustment to a zero tariff policy involves a single adaptation by domestic resources, adjustment costs remain at $0.36 billion. Therefore, the present value of the net improvement in real income over four years is $37.77 billion.

Automobiles: Quotas on Japanese Imports

In the Spring of 1981, the Japanese government announced, after negotiations with United States government officials, that it would voluntarily restrain its exports of automobiles to the United States. The action of the Japanese government was taken against a background of falling domestic production and employment in autos and a number of legislative attempts to curb Japanese imports.

The automobile chapter estimates the costs to the United States economy and the costs to United States consumers of this restraint. Estimates are also provided for the gains to United States producers of automobiles and the "quota rents" obtained by Japanese producers.

The estimates are summarized in Table 4. It can be seen that losses to United States consumers exceed one billion dollars annually. Losses to the United States economy are almost one billion dollars annually. Taken over four years, these numbers are about $4 billion and $3.6 billion, in present value, respectively. The quota rents obtained by the Japanese are $824.4 million annually, and United States automobile producers are estimated to gain $115.3 million annually. (All these numbers are in 1983 dollars.)

---

[6] Brown and Whalley (1980), supra. This is a conservative benchmark for the true magnitude of the gain because it is based on a model that includes aggregation bias and uses import demand elasticities that we believe are too low. These points are discussed in chapter 2, section III.

[7] Baldwin and Lewis (1978), supra.

TABLE 3

Tariffs

Adjustment Costs and Annual Gains to Adjustment Costs Ratio from Multilateral Elimination of all Tariffs

	(in 1983 dollars)
Adjustment Costs (billions)	0.36
Annual Gains per dollar of Adjustment Costs	29.22

Source: Text, Table 2.5.

TABLE 4

Automobiles

Estimate of the Losses to the U.S. Economy ("Deadweight Losses"), Costs to Consumers, Gains to Producers, and Quota Rents Captured by Japanese Producers as a Result of the Voluntary Restraint Agreement on Japanese Automobiles.

(in millions of 1983 U.S. dollars)

		in Present Value	
	Annual Costs	Four Years of Costs	Twenty Years of Costs
Losses to the U.S. Economy	993.8	3,603.3	11,265.7
Consumers' Losses	1,109.2	4,021.6	12,573.9
U.S. Producers' Gains	115.3	418.0	1,307.0
Quota Rents to Japanese	824.4	2,989.0	9,345.4

Source: Text, Table 3.2.

There are several reasons to believe that the reported estimates of the costs to consumers and losses to the economy are conservative. First, 1981 -- a recession year -- proved to be the best year to use in estimating the costs of the restrictions. Second, because of a lack of data the apparent markups above list price charged by United States dealers of Japanese cars were ignored. Finally, the exchange rate adjustments of the base year were taken as representative of the whole restraint experience.[8] As a result, the estimates, such as the estimate of $1.109 billion in annual costs to consumers, can be thought of as conservative estimates. That is, the true costs are at least as large as the numbers in Table 4.

In addition to these estimates, the number of jobs created by the "voluntary restraint agreement" (VRA) is estimated. Using these latter estimates enables calculation of the costs to consumers and to the United States economy for each job created by the VRA. The annual costs to consumers and to the economy per job created are $241,235 and $216,137 respectively;[9] these results are summarized in Table 5.

A final set of estimates are the cost-benefit ratios. These estimates, which are summarized in Table 6, reveal that for each dollar of earnings losses (by domestic auto workers) saved by the VRA, consumers and the economy would gain over twenty dollars in benefits from its removal.

Sugar

In May 1982 the United States imposed country-by-country quotas on sugar imports. This action was taken to maintain the price of domestic sugar at a level that would eliminate the need for federal government outlays to acquire domestically grown sugar under the sugar price-support program. The world sugar price had fallen sharply in early 1982, because of an increase in world sugar supply, and statutory ceilings on sugar duties and import fees prevented the Administration from relying on these instruments to achieve a domestic price that would be high enough to avoid purchases by the government.

In chapter four we estimate the long-run welfare effects of the sugar quota. In making these estimates, we assume the continuation of a domestic price-support program that guarantees minimum receipts to domestic growers. However, we assume that either a direct subsidy scheme or a purchase-resale arrangement is permitted. While neither of these programs is currently authorized, if trade restrictions were not used to support the domestic price, it seems likely that one or the other would be utilized in order to avoid the heavy costs that would result from the current sugar program, which requires the government to purchase sugar and limits the conditions under which that sugar can be resold.

---

[8] In addition, the analysis was performed under the assumption that producers priced competitively after imports were constrained. If this assumption was not correct -- an issue on which we have no evidence one way or the other -- there would be additional costs and fewer benefits from retention of the quota. See chapter 3 for a discussion of these issues.

[9] These costs are excess costs to consumers and the economy because they do not include the private costs to the firms involved of producing the output. An analogous argument applies to the textile and steel industries considered in this study.

TABLE 5

Automobiles

Annual Costs Per Job Created by the VRA on Automobiles

	(in 1983 dollars)
Costs to Consumers	241,235
Losses to the Economy ("Deadweight Losses") per job	216,137

Source: Text, Table 3.3.

TABLE 6

Automobiles

Cost-Benefit Ratios: Costs to Consumers and Losses to the Economy for Each Dollar of Earnings Losses Saved by the VRA

Costs to Consumers	$23.90
Losses to Economy	$21.41

Source: Text, Table 3.4.

The results also depend on our estimate of the long-run import supply price. We estimated the long-run supply price rather than rely on current prices because, as suggested above, the world sugar price is currently depressed by unusually large world sugar supply. The supply price estimate is 15 cents per pound of raw sugar which substantially exceeds the world price for 1983, 7.9 cents. Therefore, for 1983 and a few years beyond, our welfare cost estimates are expected to err on the side of understating the true costs.

We estimate that the quota imposes annual costs on consumers of $735.2 million and annual deadweight losses of $251.6 million (Table 7). The deadweight losses are dominated by quota rents of $238.4 million. The countries that have large quotas, the Dominican Republic, Brazil, Australia, and the Philippines, therefore capture sizeable windfalls as a result of the U.S. quota.

We also estimate the effect on taxpayers of using a quota rather than a price-support program and determine the total costs of the quota to consumers including the change in taxes paid. Under a quota growers receive the minimum level of receipts called for by the price-support program by means of the higher domestic price caused by the quota. We assume that, absent the quota, the government makes payments to growers to assure they receive the same minimum level of receipts. The government payments impose a burden on taxpayers, who are substantially the same people as sugar consumers since sugar is consumed so widely. Therefore, the introduction of a quota eliminates the need for the government to make payments to growers and results in lower taxes, and the costs of the quota to consumers can be adjusted downward to reflect a reduction in taxes when the quota is imposed. We estimate that the net costs of the quota to consumers and taxpayers combined, or the costs to consumers/taxpayers, is $251.6 million in 1983.

Removing the quota does not reduce domestic sugar output or cause unemployment. The price-support program is assumed to operate to maintain output and employment.

The costs of the sugar quota increase the longer the quota remains in effect. Over four years the present value of the deadweight losses and costs to consumers/taxpayers is $911.8 million; the present value of the consumer costs is $2.7 billion.

Textiles: Quotas on Hong Kong

The United States has imposed quotas on imports of textile and clothing products for more than 25 years. Quotas were first applied in 1957 on imports of Japanese cotton textile products and have since expanded to other textile products and to many other countries. In 1983, the U.S. imposed import quotas on cotton, man-made fiber, and wool textile products that involved about two dozen exporter countries. The current U.S. restrictions are part of the Multi-Fiber Arrangement (MFA). Under the MFA, the U.S. has negotiated bilateral agreements that establish individual textile quotas for each restrained country.

Because of the lack of appropriate empirical data, it is not possible to estimate the welfare effects of all of the textile import quotas the U.S. has imposed. However, data have been obtained that allow us to evaluate the welfare effects in 1980 of the quotas on nine apparel products made in Hong Kong. While Hong Kong is the largest foreign supplier of textile products to the U.S., accounting for 22 percent of total U.S. textile

TABLE 7

Sugar

Estimates of Inefficiency Losses to U.S. Economy ("Deadweight Losses"), Costs to Consumers and Consumers/Taxpayers, and Quota Rents Captured by Foreigners as a Result of Sugar Import Quota

(in millions of 1983 dollars)

	Annual Costs	in Present Value: Four Years of Costs	in Present Value: Twenty Years of Costs
Losses to U.S. Economy and Costs to Consumers/Taxpayers	251.6	911.8	2,852.1
Consumers' Losses	735.2	2,664.6	8,334.2
Quota Rents to Foreigners	238.4	864.0	2,702.5

Notes: The annual losses and rents are based on conditions for fiscal year 1983. These conditions are assumed to prevail in future years. Cumulative present value is calculated using a discount rate of 7 percent.

Source: Text, Tables 4.4 and 4.5.

imports (in 1980), our estimates of the welfare effects of the Hong Kong quotas are only a part of the total cost to the U.S. of all quotas on textiles.

In chapter five we estimate that the annual deadweight losses due to the quotas on the nine Hong Kong clothing products are at least $372 million (Table 8).[10] The major portion of the losses is quota rents, which are $264 million. The costs of the Hong Kong quotas to consumers are $384 million.

While the deadweight losses could be estimated only for the quotas on imports from Hong Kong, we were able to estimate the domestic unemployment effects assuming quotas on the three major foreign suppliers are eliminated (Hong Kong, South Korea, and Taiwan). In other words, we only estimate part of the benefits of removing the quotas on Hong Kong, South Korea, and Taiwan but we calculate domestic unemployment costs assuming the quotas on all three exporters are lifted. We estimate that 8,900 workers would lose their jobs in domestic apparel factories and textile mills if these quotas were removed. Thus the costs to the U.S. economy per job saved is at least $41,800 (Table 9). The costs of adjustment for 8,900 unemployed textile industry workers is estimated to be $20 million. Therefore the ratio of benefits from removing quotas to adjustment costs is at least 18 (Table 10).

Removing the quotas also increases real income in future years. Over four years the present value of the net benefit (deadweight losses eliminated minus labor adjustment costs) to the U.S. economy is $1,329 million.

Carbon and Alloy Steel Quotas

The chapter on steel explains that the domestic steel industry has received some special form of trade protection for 11 out of the past 15 years.[11] In 1984, the United Steelworkers of America and Bethlehem Steel Corporation petitioned the United States International Trade Commission (USITC or ITC) for relief from imports under section 201 of the Trade Act of 1974. In that "Petition" they asked for quotas on imports of carbon and alloy steel products so that imports would be at most 15 percent of

---

10 This estimate is based on one of two sets of import demand elasticities. For the alternative set of elasticities, larger deadweight losses are predicted. For a discussion of these elasticities see Morris E. Morkre (1984), Import Quotas on Textiles: The Welfare Effects of United States Restrictions on Hong Kong, A Bureau of Economics staff Report to the Federal Trade Commission, USGPO, pp. 60-71.

11 This is in addition to tariff protection which in 1984, was about 5.3 percent on steel products.

TABLE 8

Textiles

Estimates of Inefficiency Losses to U.S. Economy ("Deadweight Losses"), Costs to Consumers, and Quota Rents Captured by Hong Kong Firms as a Result of Import Quotas on Hong Kong Textiles

(in millions of 1983 dollars)

		in Present Value	
	Annual Costs	Four Years of Costs	Twenty Years of Costs
Losses to U.S. Economy	372.3	1,349.5	4,220.4
Consumers' Losses	384.4	1,393.2	4,357.6
Quota Rents to Hong Kong Textile Firms	263.9	956.5	2,991.6

Notes: The estimates are based on 1980 conditions and adjusted for inflation to obtain 1983 values. Cumulative present value is calculated using a discount rate of 7 percent.

Source: Text, Tables 5.6 and 5.7.

TABLE 9

Textiles

Annual Costs Per Job Saved by the Import Quotas on Hong Kong

	(in 1983 dollars)
Costs to Consumers	43,235
Losses to the Economy ("Deadweight Losses per job)	41,874

Source: Text, Table 5.6 and chapter 5, section V.

TABLE 10

Textiles

Cost-Benefit Ratios: Annual Costs to Consumers and Losses to the Economy for Each Dollar of Unemployment Costs Saved by the Import Quotas on Hong Kong

	(in 1983 dollars)
Costs to Consumers	18.93
Losses to Economy	18.33

Source: Text, Table 5.6.

domestic apparent consumption.[12] Also in 1984 there was legislation before Congress (The Fair Trade in Steel Act of 1984) that would utilize quotas to limit imports to 15 percent of domestic apparent consumption.[13]

The President, in response to the affirmative decision by the ITC on the Petition formally rejected protection through the 201 process. However, he directed the United States Trade Representative (USTR) to negotiate voluntary restraint agreements with foreign governments to reduce imports to 18.5 percent of domestic apparent consumption, where semi-finished steel is excluded from the calculation.[14]

After the President's program was announced, Congress passed, in the Trade and Tariff Act of 1984, a nonbinding "sense of the Congress" that imports should be reduced to between 17 and 20.2 percent of U.S. domestic apparent consumption and authorized the President to negotiate agreements to achieve that goal.[15] The bill also provides that continuation of the import relief in any year is contingent on the major steel companies committing "substantially all of their net cash flow from steel operations to reinvestment and modernization of their steel industry."[16] These provisions appear to be the Congressional substitute for the Fair Trade in Steel Act of 1984, but the Trade and Tariff Act of 1984 indicates that if the President's program fails to achieve its goals, Congress will consider appropriate action.

---

[12] On June 12, 1984, the ITC (in a 3-2 decision) voted that "industries" representing about 74 percent of domestic shipments were injured. See "Official Transcript of the Proceedings before the USITC," June 12, 1984, in carbon and certain alloy steel products. On July 11, 1984, the ITC recommended to the President that quotas be imposed on almost all of these products (over 97 percent by tonnage). See statement by Commissioner David B. Rohr, "Remedy: Carbon Steel," July 11, 1984.

[13] Domestic apparent consumption is defined as domestic shipments plus imports minus exports. If there were no change in domestic inventories, it would equal actual domestic consumption. See Congressional Budget Office (1984), The Effect of Import Quotas on the Steel Industry, U.S. Congress, for an analysis of the effects of this legislation.

[14] 49, Federal Register, 36814, Sept. 20, 1984.

[15] See New York Times, "Steel Rule's Effect May Be Limited," Oct. 15, 1984, pp. D1, D6. The 20.2 percent figure is what the President's goal is for imports when semi-finished products are included.

[16] Since most firms are already exceeding this requirement, the latter restraint is not considered onerous. Id.

In announcing the new program, the USTR indicated that negotiations to limit imports would be conducted with Brazil, Spain, South Korea, and Japan.[17] In December, the Administration announced that agreements had been reached with Japan, Brazil, South Korea, and Spain, and also with South Africa, Mexico, and Australia.[18] The agreement with the European community[19] will remain in effect and Canada is expected not to increase its current market penetration.

The exact level of imports permitted under the new agreements is not known. However, the Administration has not changed its goal of restraining imports to 18.5 percent of domestic apparent consumption (excluding semi-finished).[20] Thus, this level of restriction is taken as indicative of the level of restraint likely to be achieved, and the costs and benefits of this level of restriction are estimated in the steel chapter.

In 1983 dollars, the annual costs to United States consumers of the quota are estimated to be $1.10 billion. The annual inefficiency costs to the economy are estimated to be $779 million. The cumulative costs over four years, in present value, of the costs to consumers and the economy are $3.98 billion and $2.83 billion, respectively. Part of what U.S. consumers lose is transferred to domestic and foreign producers. United States producers gain $428 million per year and foreigners extract $557 million per year in quota rents. These estimates are summarized in Table 11.

In order to obtain some perspective on the quantitative importance of the benefits of the quota in relation to the costs, cost-benefit ratios are provided as well as estimates of the costs of the quota per job created. For each job saved by this restriction the annual cost to consumers is $113,622; the annual cost to the economy for each job created by the quota is $80,682. These estimates are presented in Table 12. Since Congress has authorized the Administration program for at most five years, the benefits of the quota are measured by the present value of the deferral of the earnings losses of workers who will be displaced in five years but, without the quota, would otherwise have been displaced immediately. For the purposes of this comparison, the present value of the costs to consumers and losses to the economy are taken over five years. It is found that for every

---

[17] See William Brock, "Press Briefing," The White House, September 18, 1984; New York Times, "Reagan Seeks Cut in Steel Imports through Accords," September 19, 1984, pp. A1, D5; Wall Street Journal, "Reagan Vows to Seek Voluntary Steel Import Curbs...," September 19, 1984, pp. 3, 26; "President Rules out Steel Quotas; Washington Post, September 19, 1984, pp. A1, A9; New York Times, "Voluntary Import Restraint: Effect Similar to Quotas," September 20, 1984, pp. D1, D19.

[18] See Wall Street Journal, "U.S. Sets Pacts to Curb Imports of Finished Steel," Dec. 20, 1984, p. 31; and Washington Post, "Steel Imports to be Cut 30 percent White House Announces," Dec. 20, 1984, pp. D1, D6.

[19] Prior to the announcement of the new restrictions, some formal and possibly some informal quantitative restraints on steel imports were already in place. The European Community, Mexico, South Africa, and possibly Japan were already limiting their exports to the United States. The estimates in this report are for the additional effects of an 18.5 percent quota, given that these quantitative restraints are already in effect.

TABLE 11

Steel

Estimates of the Losses to Consumers, Costs to the United States Economy, Gains to Producers, and Quota Rents to Foreign Producers as a Result of a 18.5 Percent Quota on Carbon and Alloy Steel Products (Excluding Semi-Finished Products)

(in millions of 1983 dollars)

		in Present Value
	Annual Losses	Four Years of Losses
Consumers' Losses	1,097.866	3,980.533
Losses to the U.S. Economy	779.582	2,826.527
Gains to U.S. Producers	428.106	1,522.184
Quota Rents to Foreign Producers	556.708	2,018.456

Source: Text, Table 6.1.

TABLE 12

Steel

Annual Costs to Consumers and to the United States Economy for Each Job Saved by the Quota on Steel Products

(in base year* dollars)

Losses to Consumers	113,622
Losses to Economy	80,682

*The base year is Sept. 1983 through August 1984.

Source: Text, Table 6.2.

dollar of earnings losses saved by otherwise displaced workers, consumers lose $34.60 and the United States economy loses $24.57. The estimates are summarized in Table 13.

Aggregate Costs of All Restraints Examined

The question of what are the aggregate costs (or deadweight losses) to the United States economy of all import restraints appeared to us to be in need of further research. Thus we have attempted to obtain a conservative estimate of these costs. This has been accomplished by first obtaining an estimate of the aggregate costs to the United States economy of all tariffs and by adding to this the costs of quotas on three significant industries. Methodological issues, addressing why the approach we have adopted is appropriate, are discussed in chapter one.

The annual costs of all the tariffs is $10.52 billion. Simply aggregating the estimates of the costs of the four quotas would yield an estimate of $2.39 billion in annual costs. We deduct $.21 billion from this estimate and obtain $2.18 billion as our estimate of the annual net cost to the economy of the four quotas. $.21 billion is our upper bound estimate of the welfare loss from a terms-of-trade shift attributable to the removal of the quotas. (This terms-of-trade adjustment is explained further in chapter one where it is emphasized that we believe the true welfare loss from the terms-of-trade shift is less than $.21 billion and possibly zero.)

Summing the estimate of the annual net cost of the quotas with the estimate of the annual net cost of the tariffs yields the result that all the import restraints analyzed in this report cost the economy $12.70 billion annually. Since, in the cases we have examined in this summary, the costs to consumers are greater than the costs to the economy, this value may be taken as a lower bound estimate of the costs to consumers. Moreover, restraints impose ongoing costs on consumers and the economy. That is, these costs will be incurred each year the restraints are in effect. Thus over a four year period, say, these annual costs will be incurred each year the restraints are in effect. If we add to the first-year costs the discounted value of these costs in the next three years, we obtain the present value of these costs over four years. Performing this calculation, with a seven percent discount rate, the present value of the costs to the economy of maintaining these restraints is found to be $46.07 billion. Clearly if the restraints last beyond four years, then the present value of the costs would be still higher. These results, as well as the results of the individual studies are summarized in Table 1 above.

Aggregate adjustment costs total $760 million in 1983 dollars.[21] Thus, for each dollar of adjustment costs saved by the restraints in the aggregate, $61 are lost to the economy. Adjustment costs are a one time cost. The benefits to consumers and the economy continue year after year, however. Therefore cost-benefit calculation beyond four years would result in higher cost-benefit ratios.

---

[21] This derives from $236.7 million in automobiles, $143.3 million in steel, $20.3 million in textiles, and $360 million from multilateral elimination of tariffs.

TABLE 13

Steel

Cost-Benefit Ratios: Costs to Consumers and Losses to the Economy for Each Dollar of Earnings Losses Saved by the 18.5 Percent Quota

Costs to Consumers	$34.60
Losses to the Economy	$24.57

The estimate of the aggregate costs to the economy is a conservative one, i.e., the true costs are at least as great as those indicated. The methodology chapter explains some of the most important reasons why the estimate is conservative. For example: the losses to the economy from "rent-seeking" are ignored; not all quotas have been quantified; and a maximum estimate for the terms-of-trade loss has been utilized. Moreover, a reading of the chapters themselves will reveal the many cases in which parameter choices (such as elasticity estimates) and methodological decisions were made that resulted in lower estimates of the costs. For this reason the reader should regard the estimates of the costs of the trade restraints, such as $46 billion in costs to the economy over four years, as conservative estimates.

CHAPTER ONE

METHODOLOGY

This study provides estimates of the costs and benefits of multilateral elimination of all tariffs and of the selective unilateral elimination of quotas on four products. In arriving at an estimate of the effects of removing all tariffs, we decided that, because of interrelatedness and "terms-of-trade" effects, it was necessary to utilize general equilibrium models.

By the interrelatedness effect we mean that many industries in the economy are related. For example, the output of one industry might be an input into another. If this occurs, then removing a tariff on either of the industries will have an impact on the other. Separate partial equilibrium analyses of tariff removal in the two industries will ignore the impact of tariff removal on the related industry. Depending on how the industries are related, this could either increase or decrease the aggregate costs;[1] but unless it is done through a model in a systematic fashion, calculating these interrelated effects for a large number of industries is impossible.

By the "terms-of-trade" we mean the (weighted average) price of a country's exports divided by the (weighted average) price of its imports. A lowering of this ratio is called an adverse terms-of-trade effect; because more would have to be paid for imports but less would be received for exports, the country would expect to lose real income.[2] When a tariff on an industry is removed, it is possible that the value of the imports entering the country that removed the tariff will increase relative to the value of its exports. (We shall call this a negative trade

---

[1] One example where summing the results of separate partial equilibrium studies into an aggregate cost estimate would probably overestimate the true aggregate costs is the following. One might estimate the effects of "Jones Act" restrictions on prohibiting foreign flag vessels to transport cargo between U.S. ports. Separately one might estimate the effects of restricting exports of Alaskan oil. The sum of the two separate estimates will exceed the costs of both restrictions to the U.S., because a significant portion of the costs of the Alaskan oil export ban likely derives from additional shipping costs between U.S. ports, rather than between Alaska and Japan. Hence, there may be double counting in the partial equilibrium approach.

[2] See Takayama (1972, p. 231); Sodersten (1970, pp. 356-358); and see Ethier (1983, pp. 520, 521) for a more precise definition of a terms-of-trade improvement in a many product world.

balance effect.) This in turn could, but not necessarily,[3] lower the value of (depreciate) the country's currency. A depreciation of the country's currency would result in an adverse terms-of trade effect and expected loss of real income. Any loss in real income from a terms-of-trade effect would have to be subtracted from any estimated gains in real income from partial equilibrium studies which ignore the terms-of-trade effect. (This argument is explained in more detail in the next chapter.)

For these reasons, our analysis employs general equilibrium models, which incorporate interrelatedness and terms-of-trade effects, to estimate the employment and welfare effects of the multilateral reduction of all tariffs. The general equilibrium model estimates of the effects of multilateral tariff removal have been supplemented by selecting four significant industries in which quotas are employed. Partial equilibrium studies of these industries were performed and the results were added to the tariff estimates to arrive at the total costs to the economy of the import restrictions considered. The partial equilibrium studies were undertaken because we are aware of no acceptable general equilibrium model of quota removal; we believe, as discussed below however, that we have appropriately accounted for the terms-of-trade and interrelatedness effects. For the reader with a particular interest in any one of these industries, each of these studies has been written so that it may be read independently of the remainder of the report as an examination of the costs and benefits of removing quotas on the industry in question. In some case this has involved repetition.

There is a question of whether the welfare estimates for the costs of the quotas should be adjusted for terms-of-trade effects. In order to assess the magnitude of the terms-of-trade effect we employ a model that estimates the terms-of-trade

---

[3] A tariff reduction may not affect the country's exchange rate, in part, because we do not know, a priori, that a tariff reduction leads to an increase in the value of imports less exports, i.e., we do not know how the current account is affected. For one thing if a tariff is removed and countries receive more of the liberalizing country's currency, they may import more from the liberalizing country. This is especially relevant with a product such as textiles where many of the exporting nations experience severe foreign currency constraints. See Takayama (1972, pp. 348, 349) for a discussion of this point. Second, if removing a trade restriction lowers the price of a product which is an input into other products, the liberalizing country may import less final products and export more final products because the cost of producing final products has been reduced. Lage and Ozzello (1975) have found that a substantial portion of the foreign currency that is sent abroad due to tariff reductions in steel would be regained due to these secondary effects. Finally, retaliation by foreign countries (or reciprocal trade concessions) can lead to an elimination of the initial trade balance effect.

Moreover, a negative trade balance effect would depreciate a country's currency employing a "current account" approach to exchange rate determination. Other models, however, such as monetary or portfolio theory models, would give a more ambiguous result. See the symposium volume by Cooper et al. (1984).

Thus the scenario described in this main text paragraph is a "worst case" scenario for the welfare calculations.

welfare costs from a change in the trade balance.[4] That is, the model develops a formula from which one can calculate the welfare costs once the change in the trade balance and certain elasticities are known.

One can calculate, through the partial equilibrium studies in this report, the initial effect on the trade balance of removing the quotas on the four industries considered. This value is $5.428 billion,[5] i.e., if the quotas are removed on all four industries, the initial effect will be a negative effect on the trade balance (a loss of U.S. dollars) of $5.428 billion. There will be subsequent effects on the trade balance, as discussed in footnote 3, that will mitigate or possibly eliminate the initial effect on the trade balance. Unfortunately these subsequent effects evolve throughout the economy and are difficult to calculate. We can, however, obtain an upper bound estimate of the welfare loss due to the terms of trade effect of removing the quotas by taking the initial effect, which is a $5.428 billion loss of U.S. dollars, as the final effect on the trade balance.

Taking the initial trade balance change as the final change, utilizing the formula derived from the model mentioned above, and employing estimates of demand elasticities which are discussed in the appendix to this chapter, the terms-of-trade costs of the removal of the quotas are estimated to be $206 million. (The appendix explains this process further.) It should be emphasized that this is a maximum estimate of the terms-of-trade costs because the subsequent effects on the trade balance of removing a quota will mitigate or possibly eliminate the initial negative trade balance effect. For example, removing a quota on steel will lower its price; then we would expect to import less of products that use steel as an input and export more of products that use steel as an input. With a smaller trade balance effect, there will be a smaller estimate of the welfare loss from a terms-of-trade shift. Despite the fact that the $206 million estimate is an upper bound estimate of the welfare loss attributable to terms-of-trade shifts, we have subtracted the entire $206 million from our estimate of the aggregate annual cost of all tariffs and quotas. That is, in Table 1, $2.397 is the aggregate annual cost to the economy of all four estimated quotas without consideration of terms-of-trade effects. We have, however, made an adjustment of $206 million, so that only $2.191 billion ($2.397 billion-$206 million) for quotas was added to the estimated cost of all the tariffs of $10.52 billion. Thus the overall estimate is $12.71 billion in annual costs. Since these costs are incurred on a continuing basis, the costs to the economy over four years is (with a seven percent discount rate) $46.07 billion.

---

[4] See H.R. Heller (1974, pp. 98-104), for a description of the model. The model is the best, of those we are aware, that accounts for the welfare costs of terms of trade shifts. It is based on the models of Charles Biderdike (1920), Lloyd Metzler (1948), and Joan Robinson (1947, 1950). Although the model is not a general equilibrium one, Dornbusch (1975) has established conditions under which the model would be valid; see chapter 2, footnote 9 below for the Dornbusch argument.

[5] The loss of currency (in 1983 dollars) by industry is as follows: automobiles, $3.106 billion; steel, $1.913 billion; sugar, $.443 billion; and a gain to textiles of $.034 billion.

We believe that the total cost estimate should be considered a conservative estimate for a number of reasons. First, as just mentioned, we have taken a maximum estimate of the welfare costs of terms-of-trade shifts. The true costs are less than $206 million and may be zero. Second, we have not provided estimates of the costs of all quotas;[6] rather a selected list of four important products with quotas was chosen.

Third, regarding interrelatedness, the analysis of quotas estimates the marginal impact of removing quotas assuming any tariffs in place remain; thus there are triangles of deadweight loss attributable to tariffs that remain after the quota is removed. These deadweight losses, attributable to tariffs in industries where quotas are the binding restraints, have not been estimated in the analysis of quotas. This has not been captured in the general equilibrium analysis of tariff removal either; since the analysis of tariff reduction has been conducted under the assumption that existing quotas remain in place. Therefore our estimates are conservative on this account.[7] Also, footnote 44 of chapter 6 explains that the methodology has underestimated the costs to the economy due to any interrelatedness effects of steel and automobiles.

Fourth, a quota or tariff induces a price rise. Domestic suppliers who were willing to supply at the former lower price are able to obtain a higher price. The additional amount that they obtain over and above the amount necessary to induce them to supply the product is termed a "rent."[8] Some rents may have existed prior to the price increase, but the price increase induced by the import restraint is expected to lead to additional rents. Domestic producers, however, will utilize resources to acquire these rents, i.e., there is "rent-seeking." These expenditures (such as more firms or capacity in the industry than otherwise and expenses associated with lobbying or petitioning the government), which have alternative uses, partially dissipate or eliminate the rents.[9] The inefficient expenditures associated with rent-seeking are deadweight losses to the economy and would have to be added to the estimates of the losses to the economy. Since the estimates do not include these rent-seeking losses they are conservative in this regard.

Finally, in performing the partial equilibrium analyses we have separately made methodological or parameter choice assumptions that have led to lower estimates of the costs to consumers and the economy. For these reasons we believe that the overall estimates in Table 10 are conservative.

---

[6] For example, estimates of the costs of quotas on stainless steel or meat are not provided. See William J. Martin (1982) for an analysis of the effects of meat quotas; and New York Times, "The Fight Over Steel Quotas," August 22, 1984, for a discussion of quotas on selected stainless steel products.

[7] If the quota is binding, and since the tariff analysis assumed the U.S. captures the quota rents, this implies tariff removal conveys zero benefits to the U.S. See Morkre and Tarr (1980, chapter 3) for details.

[8] "Economic rent" is defined as a surplus earned by a factor of production over and above the minimum necessary to induce that factor to remain employed in its current use. See Joan Robinson (1969, pp. 102-119), and Tibor Scitovsky (1971, p. 108).

[9] See Gordon Tullock (1967) and Ann Krueger (1974).

APPENDIX 1

THE UPPER BOUND ESTIMATE OF THE WELFARE LOSS FROM A TERMS-OF-TRADE ADJUSTMENT

The text indicated that the upper bound estimate for the welfare loss resulting from a terms-of-trade shift attributable to removing the four quotas is $206 million. This appendix will explain that result.

The starting point is a model found in H.R. Heller's (1974) International Monetary Economics. Utilizing that model, Heller presents a formula for the welfare loss attributable to a trade deficit of an amount B, if the country devalues to eliminate the trade deficit. That formula is:[10]

$$\frac{dTOT}{dB} = \frac{\sigma_x \sigma_m - \delta_x \delta_m}{\delta_m \delta_x \sigma_m + \delta_m \delta_x \sigma_x + \delta_m \sigma_m \sigma_x + \delta_x \sigma_m \sigma_x + \delta_m \delta_x - \sigma_m \sigma_x}$$

where dB = the balance of trade change

dTOT = the welfare loss from the terms of trade shift

δ_m = the elasticity of demand for aggregate imports (in absolute value),

δ_x = the elasticity of demand for aggregate exports (in absolute value),

σ_x = the elasticity of supply for aggregate exports and

σ_m = the elasticity of supply for aggregate imports.

Thus if dB = $-1, $\sigma_x = \sigma_m = 10$ and $\delta_m = \delta_x = 5$, then dTOT = $-75/1425 = $-.053. That is, a $1 deficit caused a welfare loss of about five cents because of the terms-of-trade shift.

In chapter two, section III below, we present a discussion, based on the classic work by Guy Orcutt (1950), that maintains that most estimates of price elasticities in world trade are biased downward. Based on that discussion, we take the estimate of J. David Richardson (1976) for the aggregate U.S. elasticity of import demand. Richardson estimated δ_m at between 4 and 10.5. We take $\delta_m = 5$, which is in the low end of Richardson's estimate (and therefore conservative for our purpose).[11]

Regarding the aggregate elasticity of demand for U.S. exports, Magee has indicated that most studies find that the demand for U.S. exports is more price elastic than U.S. demand for imports. In particular, the "LINK" (Basevi, 1973) study had $\sigma_x = (2.76)(\delta_m)$; Houthakker and Magee (1969) estimated $\delta_x = (2.79)(\delta_m)$; and the Taplin (1973) Hickman and Lau (1973)

---

10 Heller (1974, p. 102).

11 For example, if $\delta_m = \delta_x = 9$, but $\sigma_x = \sigma_m = 10$ as in the above example, than $\frac{dTOT}{dB} = .006$. Then a $1 deficit would yield a terms-of-trade welfare loss of less than one cent.

combined studies had $\delta_x = (1.31)(\delta_m)$.[12] We take the aggregate elasticity of demand for exports to be the most conservative (for our purposes) of these three multiples of the aggregate elasticity of demand for U.S. imports; then $\delta_x = (1.31)(\delta_m) = 6.5$.

For the aggregate elasticity of supply estimates, we utilize those of Magee.[13] In particular, Magee estimates $\sigma_x = 11.5$ and $\sigma_m = 8.5$.

Summarizing we take $\delta_m = 5$, $\delta_x = 6.5$, $\sigma_x = 11.5$ and $\sigma_m = 8.5$. Substituting these values into the formula for $\frac{dTOT}{dB}$ yields: $\frac{dTOT}{dB} = .038$

If quotas are removed on the four industries studied, there will be an initial negative effect on the balance of trade (in aggregate) that can be calculated from our models. This amount is \$5.428 billion in 1983 dollars; it derives from a loss of \$3.106 billion, \$1.913 billion, and \$.443 billion in automobiles, steel, and sugar, respectively; and a gain of \$.034 billion in textiles. As explained in footnote 3, the subsequent effects on the trade balance mitigate or possibly eliminate the initial effect. Thus we do not know, without a general equilibrium model that estimates these effects, whether there is an ultimate negative trade balance effect and hence whether there is any welfare loss from a terms-of-trade shift. Assuming the worst, we take the full \$5.428 billion as the <u>final</u> trade balance effect and calculate an upper bound estimate of the welfare loss from the terms of trade shift. That is, take dB = \$-5.428 billion; then

dTOT = (\$-5.428 billion) .038 = \$-206 million.

Thus \$-206 million is the upper bound estimate of the welfare loss attributable to the terms of trade shift emanating from the removal of the four quotas.

---

12 These numbers are derived from table 1 in Magee (1975).

13 Magee (1975, p. 204) reports these numbers. They are taken from Stephan Magee (1970). Theoretical work implies that a simultaneous estimation of the parameters σ_x and δ_m, which incorporates their interrelatedness, would be best. See, for example, Ethier (1983, p. 61). Lacking such a study we have relied on those estimates available to us.

Basevi, Giorgio (1973), "Commodity Trade Equations in Project LINK," in The International Linkage of National Economic Models, edited by R.J. Ball, North-Holland, pp. 227-281.

Bickerdike, C.F. (1920), "The Instability of Foreign Exchange," Economic Journal, 30, March, pp. 118-122.

Cooper, Richard, Stanley Black, Rudiger Dornbusch, Jeffrey Frankel and Jacob Frenkel (1984), Floating Exchange Rates in an Interdependent World, U.S. Government Accounting Office.

Dornbusch, Rudiger (1975), "Exchange Rates and Fiscal Policy in a Popular Model of International Trade," American Economic Review, 65(5), pp. 859-871.

Ethier, Wilfred (1983), Modern International Economics, W.W. Norton.

Heller, H. Robert (1974), International Monetary Economics, Prentice-Hall.

Hickman, Bert and Lawrence Lau (1973), "Elasticities of Substitution and Export Demands in a World Trade Model," European Economic Review, 4(4), December, pp. 347-380.

Houthakker, H.S. and Stephen Magee (1969), "Income and Price Elasticities in World Trade," Review of Economics and Statistics, 51(2), May, pp. 111-125.

Krueger, Ann (1974), "The Political Economy of the Rent-Seeking Society," American Economic Review, 64(3), pp. 291-303. Reprinted in Toward a Theory of the Rent-Seeking Society, edited by J.M. Buchanan, R.D. Tollison, and G. Tullock, Texas A&M University Press, 1980, pp. 51-70.

Lage, G. and J. Ozzello (1985), "The Economic Impact of U.S. Restrictions on Steel Imports," (mimeo.)

Magee, Stephen (1975), "Prices, Incomes, and Foreign Trade," in International Trade and Finance, edited by P. Kenen, Cambridge University Press, pp. 175-252.

_____ (1970), "A Theoretical and Empirical Examination of Supply and Demand Relationships in U.S. International Trade," Unpublished study for the Council of Economic Advisors.

Martin, J. (1982), "U.S. Agricultural Policy and the Demand for Imported Beef," Unpublished Ph.D. Dissertation, Iowa State University.

Metzler, Lloyd (1948), "The Theory of International Trade", in A Survey of Contemporary Economics, edited by H.S. Ellis, Irwin.

Morkre, Morris E. and David G. Tarr (1980), Effects of Restrictions on United States Imports: Five Case Studies and Theory, A Bureau of Economics Staff Report to the Federal Trade Commission, USGPO.

Orcutt, Guy (1950), "Measurement of Price Elasticities in International Trade," Review of Economics and Statistics, 32(2), pp. 117-132. Reprinted in A.E.A. Readings in International Economics, R.E. Caves and H.G. Johnson selection committee, Irwin, 1968, pp. 528-552.

Richardson, J. David (1976), "Some Issues in the Structural Determination of International Price Responsiveness," in Quantitative Studies of International Economic Relations, edited by H. Glejser, North-Holland, pp. 179-208.

Robinson, Joan (1947), "The Theory of Foreign Exchanges," in Essays in the Theory of Employment, 2nd edition, chapter 1, Basil Backwell. Reprinted in A.E.A. Readings in the Theory of International Trade, H.S. Ellis and L. Metzler selection committee, Irwin, 1950, pp. 83-103.

_____ (1950), "Beggar-My-Neighbor Remedies," Essays in the Theory of Employment, 2nd edition, part III, chapter 2, Basil Blackwell. Reprinted in A.E.A. Readings in the Theory of International Trade edited by H.S. Ellis and L. Metzler, Irwin, 1950, pp. 393-407.

_____ (1969), The Economics of Imperfect Competition, 2nd edition, Macmillan.

Scitovsky, Tibor (1971), Welfare and Competition, revised edition, Irwin.

Sodersten, Bo (1970), International Economics, Harper and Row.

Takayama, Akira (1972), International Trade, Holt, Rinehart and Winston.

Taplin, Grant (1973), "A Model of World Trade," in The International Linkage of National Economic Models, edited by R.J. Ball, North-Holland, pp. 177-223.

Tullock, Gordon (1967), "The Welfare Costs of Tariffs, Monopolies and Theft," Western Economic Journal (now Economic Inquiry) 5, pp. 224-232. Reprinted in Toward a Theory of the Rent-Seeking Society, edited by J.M. Buchanan, R.D. Tollison and G. Tullock, Texas A&M University Press, 1980, pp. 39-50.

CHAPTER TWO

MULTILATERAL ELIMINATION OF ALL TARIFFS

I. INTRODUCTION

This chapter reports estimates for the gains in U.S. real income from multilateral removal of all tariffs. Eliminating tariffs will not affect imports of those products that face effective quotas. The welfare effects of quotas are discussed separately, in subsequent chapters of this Report.

The estimates presented in this chapter rely on the work of two teams of economists. We use the results of a general equilibrium model developed by Brown and Whalley (1980) and find that real income of the U.S. would have increased by at least $10.5 billion in 1983 if all tariffs were terminated.[1]

Removing all existing tariffs is expected to affect output and employment in many domestic industries. Brown and Whalley do not evaluate these effects. However, another general model, developed by Baldwin and Lewis (1978), estimates the consequences for output and employment in 367 domestic industries if all tariff rates are reduced by 50 percent. We summarize the results of this model since these findings provide an indication of the pattern of the effects that would follow from full elimination of tariffs. This model also suggests that adjustment costs from cutting tariffs are very small relative to the benefits of increased real national income. A rough calculation suggests that if all tariffs were removed the ratio of annual benefits to adjustment costs would be about 29.

Finally, we also estimate the present value of future gains and adjustment costs from removing all tariffs. We find that the present value of net benefits (gains less adjustment costs) for the first four years is $38 billion. The present value of future net gains over twenty years is $119 billion.

II. APPROACHES TO THE ESTIMATION OF WELFARE EFFECTS OF GENERAL CUTS IN TARIFFS

Several economic models have recently been developed to estimate the welfare effects of general reductions in tariff rates.[2] One of these models, by Brown and Whalley, appears to be the most relevant for present purposes since it is a general

---

[1] While the size of the gain in real income from removing all tariffs is significant, compared to aggregate income the gain is relatively small, only three-tenths of one percent of U.S. GNP in 1983 which was $3,309.5 billion. That the gain is relatively small is not surprising. In 1983 the average tariff rate was 3.7 percent while total imports were 10.5 percent of GNP.

[2] These models have generally been developed in order to analyze the effects of the Tokyo Round of Multilateral Trade Negotiations. The Tokyo Round was concluded in April 1979 and calls for tariff reductions to be phased in over an eight year period beginning in 1980. Deardorff and Stern (1983).

equilibrium model and they alone estimate the effects of a complete multilateral removal of all tariffs.[3] The Brown and Whalley (BW) model is discussed below, in section III. We first consider two general methodology issues.

General Equilibrium vs. Partial Equilibrium Models

First, we rely on the results of a general equilibrium model to assess the effects of general cuts in tariffs as opposed to using a partial equilibrium model. A partial equilibrium model focuses on a particular market in isolation from other markets in the economy. While this method can be adopted to assess the direct effects of general cuts in tariffs,[4] it does not consider interrelationships between individual markets and will accordingly ignore possibly significant indirect effects. In contrast, a general equilibrium model explicitly recognizes interrelationships between individual markets, for both intermediate and final goods.

General or across-the-board reductions in tariff rates lower prices of all imports and influence demand and supply conditions in many sectors of the economy. These influences operate through the substitution of cheaper foreign-made products for domestically made products. The range of these influences can be very extensive. For example, lower prices for imported intermediate products encourage domestic firms to employ more foreign goods as inputs which leads to lower prices of finished products and encourages consumers to substitute away from domestic products that use few foreign inputs (e.g., particularly service goods). This suggests that a general equilibrium model is preferable to a partial equilibrium approach to assess the effects of a general cut in tariffs.

Multilateral vs. Unilateral Tariff Reductions

Second, we consider multilateral as opposed to unilateral tariff reductions. Thus all countries, not just the U.S. alone, are assumed to remove all tariff barriers to international trade. It is important to distinguish between multilateral and unilateral tariff cuts. While the U.S. social welfare is expected to increase if all countries terminate tariffs, it is possible that real income of the U.S. would fall if it reduced all tariffs unilaterally. This contrast is based on the following arguments.

One of the central propositions of international trade theory is that complete elimination of all restrictions on trade promotes efficient use of all resources on a world-wide basis, maximizes world output and increases the potential welfare of all trading countries.[5] However, if the U.S. alone reduces its restraints on imports, real income in the U.S. may fall because

---

[3] Alternative models were developed by Deardorff and Stern (1983); Baldwin and Lewis (1978); and William R. Cline et al. (1977).

[4] Examples of attempts to estimate the effects of general cuts in tariff rates using partial equilibrium models include Magee (1972) and Mutti (1979).

[5] Kindleberger (1973, chapter 12), and Chacholiades (1978, chapter 16).

of the terms-of-trade effect.[6] As illustrated below, this effect results in a cost to the economy when tariffs are removed. The terms-of-trade effect arises when a country can influence the price it pays for imports or the price it receives for exports; that is the country has monopsony power in imports or monopoly power in exports.[7] Since the U.S. is a significant importer and exporter in world trade, the U.S. may possess monopsony or monopoly power over at least some of the products it trades.[8]

The impact on U.S. welfare from a unilateral elimination of all tariffs is illustrated in Figure 2.1, which is based on a partial equilibrium model developed by Mutti.[9] Mutti assumes

---

[6] The terms of trade is defined as the price of exports divided by the price of imports, where both prices are expressed in the same currency. The terms of trade is said to improve if this relative price increases.

[7] This is related to the optimal tariff argument which states that if import supply is an increasing function of price then an "optimal tariff" is needed to maximize real income of the economy. Applying the optimal tariff results in a decrease in the price of imports and a improvement in the terms of trade (compared to a zero tariff policy). See Kindleberger (1973, chapter 12), and Chacholiades (1978, chapters 19 and 20).

[8] In 1983, U.S. imports were $268.4 billion and 13.2 percent of total imports by all countries. U.S. exports were $198.8 billion and 10.3 percent of exports by all countries. Economic Report of the President, 1984, p. 338.

[9] Mutti (1979). We consider terms-of-trade effects using Mutti's model for two reasons. First, it is possible to illustrate the effects using a familiar demand-supply diagram. Second, because Mutti assumes import supply elasticities are infinite (so that export supply prices are constant in terms of each supplying country's currency) while import demand elasticities are finite, a country's terms of trade is implicitly determined simultaneously with its exchange rate. These elasticity assumptions are also adopted in the Brown-Whalley general equilibrium model, which therefore also links terms of trade to the exchange rate. (The Brown-Whalley model is discussed in section III).

The partial equilibrium approach to balance of payments analysis, the so-called "elasticities approach," (see Dornbusch (1975)) has come under criticism for several reasons. For example: (1) it analyzes just two goods (imports and exports) and assumes that the demands and supplies of the two goods are independent (and therefore ignores the budget constraint which connects the two goods) and (2) it is based on a barter trade model but study of the balance of payments (and exchange rates) are viewed as involving money.

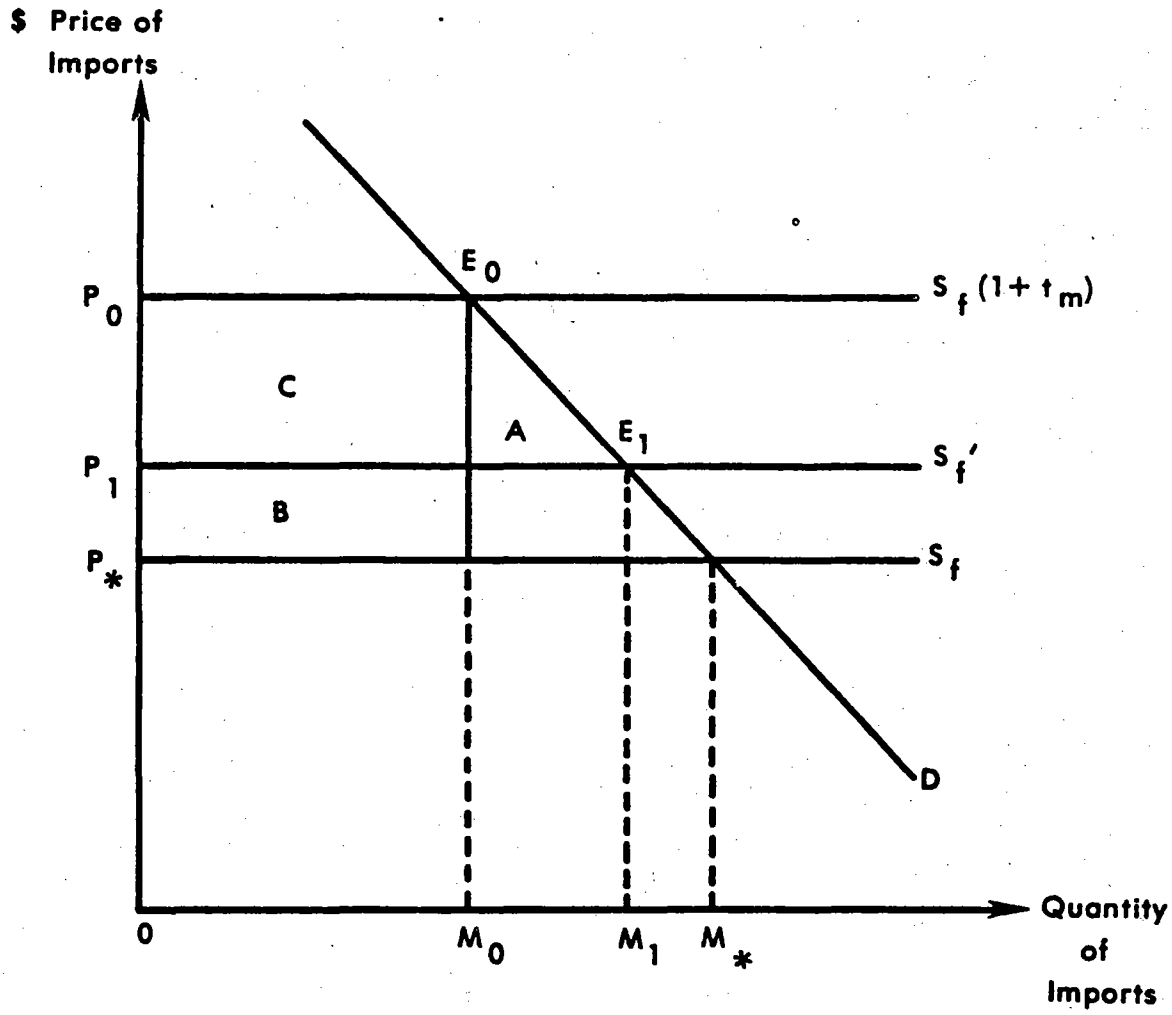
Several contributions have responded to these deficiencies by constructing general equilibrium models which add a third good, either a nontraded good or money. The prevailing view appears to be that in order to analyze the effects of devaluation on the terms of trade, at a minimum, a three good model is required. For example, this point is emphasized by Corden (1981).

In a significant paper, Dornbusch (1975) presents a three good model (exports, imports, and a nontradeable good) and gives (sufficient) conditions under which the traditional partial equilibrium approach is valid. The conditions are: (1) the

(footnote continued)

FIGURE 2.1

The Welfare Effects of an Import Tariff



that import supply is perfectly elastic while foreign demand for U.S. exports has finite elasticity, i.e., the U.S. has monopoly power in exports but no monopsony power in imports. Mutti also assumes that the exchange rate adjusts to maintain equality between the value of imports and the value of exports (that is an equilibrium in the balance of payments is maintained).

Under these conditions the U.S. may wish to apply an export tax to exploit monopoly power in exports. However, a tariff produces the same result as a tax on exports.[10] Intuitively, this is because while a tariff directly restricts imports, there is an indirect effect that operates through the balance of payments which also restricts exports and results in a higher price earned for exports.[11] The welfare effects are revealed by examining the U.S. demand and supply for imports, before and after the U.S. unilaterally removes tariffs.

Initially, the U.S. imposes a general ad valorem tariff of t_m percent on imports. S_f is initial import supply curve exclusive of the tariff and indicates the price (in U.S. dollars) received by foreigners for each unit of imports bought by the U.S. The relevant supply curve for U.S. consumers is $S_f(1 + t_m)$, which incorporates the tariff. Import demand by the U.S. is D. Initial equilibrium with the tariff is point E_0. U.S. consumers pay P_0 for each unit of imports while the cost of imports to the U.S. economy is P_*. The initial quantity of imports is M_0.

(footnote continues)

nominal price of nontraded goods is constant, (2) the marginal propensity to spend on the nontraded good is unity (and therefore the propensity to spend on traded goods is zero), and (3) there are zero cross-price effects (substitution effects) between exports and imports. When these conditions hold, Dornbusch shows that the effect of devaluation of a country's currency on its balance of trade is the same as that obtained in the partial equilibrium approach, e.g. as derived by Heller (1974).

Finally, note that the effects of devaluation are considerably more complex when money is added to the analysis. For example, Anderson and Takayama (1977) construct a general equilibrium model with imports, exports, and money. Under one specification of their model (in which the utility function is separable in money so that the marginal rate of substitution of goods is independent of money) they find that when money supply of each country is constant, the effect of a devaluation on terms of trade depends not only on the demand elasticities for imports but also the propensities to spend on imports. However, under long run (steady state) conditions where balance of trade deficits (or surpluses) change the supply of money (i.e., there are no exchange sterilization policies) they demontrate that a devaluation does not affect the terms of trade (or the welfare of a devaluating country), which illustrates the neoclassical doctrine of the neutrality of money.

See Corden (1981, chapter 1), Dornbusch (1975), Heller (1974, chapter 6), and Anderson and Takayama (1977).

10 For a discussion of the symmetry between tariffs and export taxes see Corden (1974, chapter 7).

11 This is demonstrated in appendix 2.

Removal of the tariff has the temporary effect of reducing import price paid by U.S. consumers to P_* and increasing imports to M_*. However, the resulting increase in value of imports affects balance of payments. The value of imports exceeds the value of exports. This causes the exchange rate to depreciate to reestablish equilibrium in the balance of payments. The lower value of the U.S. dollar increases the U.S. dollar cost of imports and causes the import supply curve to shift upward to S_f. Final equilibrium is at point E_1. The new price is P_1 and the quantity of imports is M_1.

Unilateral elimination by the U.S. of tariffs produces two opposing effects on U.S. welfare. First, triangle A is a gain to the U.S. and represents elimination of the deadweight loss of tariffs on U.S. consumption. But second, rectangle B is a cost to the U.S. economy resulting from the depreciation of the U.S. dollar and adverse movement in the terms of trade. The net effect on U.S. welfare is the difference between triangle A and rectangle B. A priori the net effect is unknown. This depends on the price elasticities of U.S. import demand and foreign demand for U.S. exports.

Some empirical studies, including Brown and Whalley, find that the U.S. would suffer such a large an adverse terms-of-trade movement from unilateral reduction of all tariffs that U.S. welfare would fall.[12] In contrast, recent empirical studies of multilateral tariff reductions discover that terms-of-trade effects are insignificant.[13] The increase in value of U.S. imports that would follow from scrapping U.S. tariffs is nearly matched by an expansion in value of U.S. exports when foreign countries eliminate their tariffs on U.S. products. Thus the net effect on the exchange rate and terms of trade is very small.

In sum, the above considerations imply that the U.S. will probably gain with multilateral tariff reductions but may suffer a loss of social welfare with unilateral aggregate tariff cuts. In this chapter we provide estimates of the gain in U.S. real income from elimination of all tariffs multilaterally.

III. ESTIMATED BENEFITS FROM MULTILATERAL REMOVAL OF TARIFFS

This section first gives a brief overview of the Brown-Whalley model. Then we discuss the relevant results.

The Brown-Whalley Model

Level of Aggregation. Due to the high computational cost of solving a general equilibrium model, Brown and Whalley specify a model with a limited number of product sectors and trading blocks. Specifically, their model has five product groups and four geographic trading areas. The five groups are: (1)

---

12 Basevi (1968).

13 Brown and Whalley (1980); Deardorff and Stern (1983); Cline et al. (1977). The terms-of-trade effects in the Baldwin-Lewis model are reported in Baldwin, Mutti, and Richardson (1980). However an exception is Mutti (1979), who estimated that the U.S. suffered a net loss of real income from the Kennedy Round of multilateral tariff cuts.

agriculture and food, (2) raw materials and extractive products, (3) non-durable manufacturers, (4) durable manufacturers, and (5) services. The four geographic areas are: (1) the United States, (2) Japan, (3) the EEC, and (4) the Rest of the World. It is important to isolate the U.S., the EEC, and Japan since together they account for about 60 percent of world production.

Demand Conditions. The demand side of the model includes separate demands for consumption, investment, and government spending for each product group in each geographic area. Brown and Whalley adopt an Armington (1969) type model which considers each product from each area as a differentiated product. Thus Japanese food and EEC food are close but not perfect substitutes.

Brown and Whalley assume a specific form for the utility function of a representative consumer in each area.[14] Within a given product group (e.g., food) consumers have the same degree of substitutability (i.e., constant elasticity of substitution) between the products from any pair of areas. Moreover, consumers also have a different degree of substitutability (different from elasticity between areas) between any two product groups (e.g., all food and all services).

The substitution elasticities are key parameters of the model. Values for these parameters incorporate available econometric estimates of import demand elasticities. As explained below (in section IV), this procedure is expected to underestimate the gains from removing tariffs.

Supply Conditions. The supply side of the model assumes competitive conditions and constant returns to scale. The production function for each product is viewed as a long-run relationship which allows substitution between capital services and labor as well as substitution among intermediate inputs from each area. This means that all long-run supply curves are horizontal but the supply curves can shift. For example, supply curves can shift downward when prices of intermediate inputs from foreign areas decline.

Estimated Gains from Removing Tariffs

Brown and Whalley calculate their results based on data for 1973. For our summary of their findings, in Table 2.1 below, we adjust their figures by the growth in nominal GNP between 1973 and 1983 (which gives an adjustment factor of 4.139).[15]

Gains In Real Income from Multilateral Removal of Tariffs.

For 1983, we estimate that the gain in real U.S. income from multilateral removal of all tariffs is between $10.52 billion and

---

[14] Brown and Whalley adopt a model with a single household consumer group in each area which has a "nested" constant elasticity of substitution (CES) utility function. That is, utility is a CES function of product groups (e.g., food and clothing) and each product group is a CES function of the quantities from each geographic area.

[15] We do not however adjust for the change in trade patterns between 1973 and 1983. The effect of this is unknown.

TABLE 2.1

Gains to U.S. from Multilateral Elimination of Tariffs

	Increase in Real National Income Measured by:	
	Compensating Variation*	Equivalent Variation*
	(------billions of dollars-----)	
1. Estimated Gain from Tariff Cuts in 1983 [Based on Import Elasticities = -3 (= 1.33 times line 5)] (1983 Dollars)	10.91	10.52
2. Multilateral Abolition of Tariffs (1973)	2.77	2.69
3. Swiss Proposal for MTN Tariff-Cutting Formula (1973)	0.79	0.78
4. Balance of Tariff cuts after Swiss Proposal (= line 2 minus line 3) (1973)	1.98	1.91
5. Balance of Tariff Cuts (Adjusted to 1983) (= line 4 times 4.139)	8.20	7.91

Source: For lines 2 and 3, Fred Brown and John Whalley (1980), "General Equilibrium Evaluations of Tariff-Cutting Proposals in the Tokyo Round and Comparisons with More Extensive of World Trade," Economic Journal 90 (December), p. 859.

* These concepts are discussed in footnote 16.

$10.91 billion, as shown in Table 2.1, line 1.[16] This is determined from two results presented by Brown and Whalley for their "central case" and our modification of these results. Brown and Whalley's estimate of the gain to the U.S. from multilateral removal of all tariffs based on the tariffs in effect in 1973 is given in line 2 of Table 2.1. However, the recently concluded Tokyo Round lowered tariff rates from the 1973 levels. The estimated gains reported by Brown and Whalley for the U.S. from the Tokyo Round are given in line 3. This is based on the "Swiss Formula" used by Brown and Whalley which is approximately equal to the tariff concessions agreed upon at the Tokyo Round.[17] The gains available to the U.S. from reducing to zero the tariff rates established by the Tokyo Round are given on line 4, which is the difference between lines 2 and 3. Finally, adjusting for the growth in nominal GNP between 1973 and 1983, i.e., multiplying line 4 times 4.139, gives estimated gains in 1983, on line 5.

Qualifications of the Brown-Whalley Results

Two considerations suggest that the gains estimated by Brown and Whalley for tariff removal are biased downward. These points concern the high level of aggregation in their model and the import demand elasticities they rely on.

Aggregation Bias. As discussed above Brown and Whalley use a five sector model. They use weighted average ad valorem tariff rates for each of these product groups where the weights are value of imports. However, actual tariff rates for individual products within each product group vary, in some cases substantially. For example, while the post-Multilateral Tariff Negotiations (MTN) tariff rate for nondurables is approximately 7.7 percent,[18] the 1983 tariff rates for certain types of rubber footwear and benzyl chemicals exceed 35 percent.[19] For products

---

16 The two estimates differ because different measures of the effect of a price change on consumer welfare are employed. The two approaches are known as the compensating variation and the equivalent variation. Formal definitions for the two concepts are in Varian (1978, pp. 207-215). For a discussion of the application of the concepts see the important article by Willig (1976). The compensating and equivalent variations are the correct measures of welfare change. Usually these measures cannot be determined. However, since Brown and Whalley adopt a particular form for the utility function of a representative household and can derive the values of its parameters they are able to calculate the compensating and equivalent variations resulting from tariff reductions.

17 Deardorff and Stern (1983, p. 606, note 2). According to Brown and Whalley the Swiss Formula is equal to: $T_N = AT_0/(A + T_0)$, where T_N is the post-MTN rate, T_0 is the initial tariff rate, and $A = 0.14$.

18 The 7.7 percent for the post MTN tariff rate is based on applying the "Swiss Formula" to the 1971 rate of 16.9 percent reported by Brown and Whalley.

19 The trade items involved, defined by their five digit TSUSA code numbers, are: 700.53, 700.57, and 700.64 (for rubber footwear) and 412.80 and 412.84 (for benzyl chemicals). (TSUSA is Tariff Schedule of the United States Annotated.) A complete listing of all tariff rates appear in U.S. International Trade Commission (1982), Tariff Schedules of the United States Annotated (1983), USITC Publication No. 1317.

where tariff rates are very high the value of imports tend to be small (in the extreme case, zero), which gives a relatively low weight to high tariff rates when calculating a weighted average tariff rate. This causes a downward bias in the average tariff rate, which means that Brown and Whalley underestimate the expansion in imports if tariffs are removed.

The importance of the dispersion of individual tariff rates for the magnitude of the gains calculated by Brown and Whalley is not known. However, earlier work by Magee based on 1971 data (although using a different methodology than Brown and Whalley) found that the calculated gains based on average tariff rates needed to be adjusted upward by a factor of 2.87 to correct for dispersion.[20] While the adjustment factor is smaller in 1983 than in 1971 (because the Tokyo Round reduced the degree of dispersion) it may still be significant. Therefore the gains estimated by Brown and Whalley probably require more than a marginal adjustment upward to correct for aggregation bias, but we are not able to make such an adjustment here.

Import Demand Elasticities. Values of import demand elasticities are critical parameters in the Brown-Whalley model. Brown and Whalley's estimates are expected to understate the gains from tariff cuts because they use import demand elastiticities that are probably too small.

In their central case, which generated the results reported in Table 2.1 above (lines 2 and 3), Brown and Whalley adopt elasticities which are close to the values reported as "best guess" estimates in the literature survey by Stern, Francis, and Schumacher (SFS).[21] They use the following values: -1.63 for the U.S., -0.91 for the EEC, and -0.77 for Japan. However, the econometric literature surveyed by SFS typically involves three problems which tend to understate the import elasticities for our purpose. First, there is a downward bias that results from using time series data.[22] Second, the "best guess" estimates by SFS are based largely on works that estimate short-run elasticities. However, since we are interested in long-run gains, the appropriate elasticities to use are long-run elasticities. There is evidence that elasticities increase as more time is allowed for countries to respond to price changes.[23] Third, there is the inadequacy of available data on import prices. Usually, unit values of imports are used as proxy measures for import prices and the proxies also introduce a bias. Work by Richardson (1976) suggests price elasticity estimates reported in the literature (and summarized by SFS) are biased downward.

Thus, the estimates of Brown and Whalley's central case are probably underestimates of the true benefits from removing all tariffs. However, Brown and Whalley perform a limited sensitivity analysis of their results.[24] Their analysis indicates that

---

20 Magee (1972, pp. 680-84).

21 Stern, Francis, and Schumacher (1976).

22 The classic reference is Orcutt (1950).

23 This is suggested, for example, by the empirical study of Junz and Rhomberg (1973).

24 Brown and Whalley (1980, pp. 861 and 863). They only perform a sensitivity analysis for the "Swiss Formula" proposal for tariff reductions (line 3 of Table 2.1).

the gains to the U.S. are 33 percent higher when import elasticities for all areas are increased to -3.0 and 53 percent higher when import elasticities are increased to -6.0. From Table 2.1 (line 5), an increase of U.S. gains by 33 percent is roughly $2.7 billion.[25]

In sum, we believe that a better estimate of the gains to the U.S. from removing tariffs is obtained by using the case where all import elasticities are -3. This assumption is supported by Richardson who estimated the price elasticity for aggregate manufacturing imports into the U.S. using a method that did not rely on unit values to measure import prices.[26] Richardson's results suggest that the import price elasticity is very high, at least -4.0, and possibly as high as -10.5. Therefore by assuming the import elasticity is -3, we probably understate the true elasticity and therefore still understate the gains from removing tariffs. As shown in line 1 of Table 2.1, the estimated gains to the U.S. range between $10.52 billion and $10.91 billion for this case.

IV. ADJUSTMENT TO GENERAL TARIFF CUTS

Multilateral removal of all tariffs will increase both U.S. imports and U.S. exports. In domestic industries that compete with imports, output and employment will decline. Output and employment in domestic export industries will increase. Brown and Whalley do not consider the impact on employment when tariffs are reduced. However, based on a disaggregated model with 367 industry sectors Baldwin and Lewis calculate the output and employment effects resulting from a general 50 percent reduction in tariffs.[27]

While Baldwin and Lewis thus understate the magnitude of the output and employment effects that would follow from complete elimination of all tariffs their results are important because they reveal differential impacts across a large number of

---

[25] This estimate is rough because, as suggested in the previous note, Brown and Whalley do not report sensitivity results for the case where all tariff rates are reduced to zero. We assume that such an analysis would yield similar results to their reported findings for the "Swiss Formula" case.

[26] Richardson (1976, p. 201).

[27] Baldwin and Lewis (1978). Additional results from the same model appear in Baldwin, Mutti, Richardson (1980).

industries and geographic areas.[28] The pattern of these differential impacts also suggests the relative effects of a 100 percent cut in tariffs. Below we summarize some of the results of the Baldwin and Lewis model.

Overall Effects on Trade and Employment

The overall effects on U.S. exports, imports, and employment from a 50 percent multilateral tariff reduction are summarized in Table 2.2. The results are based on 1967 data. Dollar values have been adjusted for inflation and are expressed in 1983 dollars; the employment effects are adjusted for size of labor force and also expressed in 1983 conditions. However, as explained in note 28, we have not adjusted for the change in tariff rates resulting from the Tokyo Round of multilateral tariff reductions. Since tariff rates in 1983 are lower than the rates in effect in 1971 (which are used by Baldwin and Lewis) the estimates in Table 2.2 overstate the effects that are relevant to 1983.

The tariff reduction leads to balanced increases in exports and imports and causes a minor net impact on domestic employment. U.S. exports and imports both increase by about $4.8 billion whether the foreign exchange rate is fixed or flexible. If the exchange rate is flexible the effect on the terms of trade is negligible: the terms of trade improves by +0.003 percent.

The net effect on domestic employment is a small decline, 22,000 work-years. The expansion in exports creates new jobs and increases domestic employment by 196,000. But the rise in imports causes employment in import-related industries to fall by 218,000 workers.

Adjustment Costs

Baldwin, Mutti, and Richardson also estimate the adjustment costs caused by cutting tariffs by 50 percent.[29] Their findings, revised upward to 1983 dollars, are in Table 2.2. Their adjustment costs include separate estimates for labor unemployment

---

[28] The results reported by Baldwin-Lewis are for a 50 percent multilateral cut in tariffs. However, based on their model the effects they report for employment are approximately one-half the consequences of complete removal of all tariffs. There are two major qualifications for a simple doubling of their findings to obtain the employment effects in 1983 from cancelling all tariffs. First, post-MTN tariff rates are lower than the rates in effect in 1971 (the year they base their tariff rates on) and the reductions in tariffs have not been by a simple proportion since the MTN accepted the "Swiss Formula". (The Swiss Formula is given above, note 17). Second, the Baldwin-Lewis model uses 1967 data for the supply of labor and the labor force has increased between 1967 and 1983.

Finally, note that the Baldwin-Lewis results also depend on the import and export demand elasticities assumed for the 367 sectors of their model. We believe their assumed elasticities are too low but make no adjustment since higher elasticities would increase both imports and exports, and it is the net effect on domestic employment that is relevant for adjustment costs.

[29] We assume that adjustment costs impose social costs on the U.S. economy. For a discussion of this issue see Morkre and Tarr (1980, chapter 2).

TABLE 2.2

Trade and Employment Effects, Adjustment Costs of a 50 Percent Multilateral Tariff Reduction

	Exchange Rate	
	Fixed	Flexible
Trade changes (in millions of 1983 dollars)		
Exports	+4,772	+4,764
Imports	-4,761	-4,764
Net trade effect	+11	0
Employment changes (in work-years, 1983 conditions)		
Export-related	+196,000	+195,900
Import-related	-218,100	-218,100
Net employment effect	-21,900	-22,200
Terms-of-trade change (in percent)		+0.003
Adjustment costs (in millions of 1983 dollars)		
Labor adjustment costs	110	
Capital adjustment costs	15	
Total adjustment costs	125	

Source: Robert E. Baldwin, John H. Mutti, and J. David Richardson (1980), "Welfare Effects on the United States of a Significant Multilateral Tariff Reduction," Journal of International Economics 10, p. 417.

Note: Baldwin, Mutti and Richardson report data for 1967. See the discussion in the text for the adjustments made to revise for inflation and size of labor force.

costs and costs of idled capital equipment,[30] but 88 percent of the total adjustment cost is attributable to labor unemployment. In 1983 dollars this estimate is $125 million.

A rough indication of the magnitude of the adjustment costs for complete removal of all tariffs is obtained by doubling their estimate to adjust for a 100 percent versus 50 percent cut in tariffs and also multiplying by 1.4422, to adjust for the larger work force in 1983 versus 1967 (111,550,000 compared to 77,347,000 workers).[31] Making these modifications the adjustment costs resulting from terminating tariffs are approximately $361 million. However, as explained above, since Baldwin and Lewis base their calculations on 1971 tariff rates (as opposed to the lower post-MTN rates) this suggests that $361 million is an over-estimate of the adjustment costs relevant for the post-MTN tariffs.

Employment Effects by Industry

The differential impacts of the uniform cut in tariffs on employment by industry are highlighted in Table 2.3. This table reports the results of a 50 percent cut of all tariffs in 1967. For most industries the employment changes are very small. In 328 of the 367 industries the employment changes are less than 1 percent of the industry's workforce. The remaining 39 industries have more significant employment effects and are listed in Table 2.3.

Of the 39 industries, 32 suffer a decline in employment of more than one percent. The most severe contractions occur in food utensils and pottery (-20.6 percent), furniture and fixtures (-14.6 percent), rubber footwear (-13.1 percent), motorcycle and bicycle parts (-12.0 percent), and artificial flowers (-11.3 percent).

On the other hand, in 7 industries employment increases by more than one percent. The leading gainers are semiconductors (+6.3 percent), computing machines (+3.2 percent) and tobacco (+3.0 percent).

Employment Effects by State

The regional effects on employment resulting from a 50 percent cut in all tariffs in 1967 are shown in Table 2.4, which gives increases and decreases in employment by state. Each state has export related as well as import related industries. The employment increases for the former and employment reductions for the latter are listed in the table.

On an overall basis, subtracting employment reductions from employment gains, net employment declines in 34 states. The contractions are largest in the major manufacturing centers, the states of Pennsylvania, Ohio, New York, Massachusetts, Illinois, and Michigan. These 6 states account for about two-thirds of the total decline in net employment reported in Table 2.2.

---

30 Baldwin, Mutti, and Richardson assume capital is largely industry specific, in which case capital has no alternative uses. They also assume the returns to capital are rigid. Their position is that displaced capital incurs a real loss until it wears out and they calculate the loss based on depreciation (using a ten year life).

31 Economic Report to the President, 1984, p. 254.

TABLE 2.3

Changes in Employment in Selected Industries for a 50 Percent Linear Tariff Cut, Based on 1967 Conditions

A. Industries Losing 1.0 Percent or More of Their Labor Force

Industry	Loss in Employment (work-years)	Percentage of Industry's 1967 Labor Force
Other nonferrous mining	281	1.03
Sugar refining	421	1.23
Vegetable oil mills	19	1.06
Lace goods	111	2.09
Scour, combing plants	242	4.57
Veneer and plywood	1,330	1.70
Furniture, fixtures	1,663	14.59
Rubber footwear	3,838	13.14
Industrial leather tanning	1,021	3.09
Footwear, nonrubber	6,104	2.67
Other leather products	3,046	3.98
Ceramic wall, floortile	310	2.70
Food utensils, pottery	2,883	20.59
Pottery products	832	9.67
Primary lead	40	1.33
Primary zinc	102	1.15
Cutlery	297	2.36
Textile machinery	741	1.86
Sewing machines	171	2.59
Radio, TV sets	2,979	2.51
Electronic tubes	858	1.36
Electrical equipment	206	1.42
Motorcycle, bicycle parts	1,487	11.99
Watches, clocks, parts	1,018	2.45
Optical instruments, lenses	434	1.90
Jewelry	2,772	2.69
Musical instruments, parts	444	1.91
Games, toys	1,598	3.10
Sport, athletic goods	1,063	2.51
Artificial flowers	552	11.27
Buttons, needles, pins and fasteners	501	2.23
Miscellaneous manufactures	1,468	1.64

B. Industries Gaining 1.0 Percent or More of Their Labor Force

Industry	Gain in Employment (work-years)	Percentage of Industry's 1967 Labor Force
Tobacco	10,229	3.05
Computing machines	5,826	3.22
Office machines	526	2.34
Semiconductors	5,138	6.30
Electronic components	3,242	1.35
X-ray apparatus, tubes	92	1.10
Mechanical measuring device	1,276	1.48

Source: Robert E. Baldwin and Wayne E. Lewis (1978), "U.S. Tariff Effects on Trade and Employment in Detailed SIC Industries," in William G. Dewald, ed., The Impact of International Trade and Investment on Employment, USGPO, pp. 255 and 256.

TABLE 2.4

Changes in Employment by State for a 50 Percent Linear Tariff Cut, Based on 1967 Conditions
(work-years)

State	All Industries			Manufacturing		
	Export-Related	Import-Related	Net	Export-Related	Imported-Related	Net
Alabama	1,749	-2,135	-386	1,411	-2,085	-674
Alaska	100	-114	-14	85	-110	-25
Arizona	1,186	-1,062	124	1,032	-1,003	29
Arkansas	1,275	-1,493	-218	877	-1,437	-560
California	14,420	-13,551	869	12,767	-13,301	-534
Colorado	1,328	-1,394	-66	1,065	-1,345	-280
Connecticut	3,202	-2,974	228	3,066	-2,952	114
Delaware	435	-462	-27	395	-456	-61
D.C.	206	-242	-36	187	-239	-52
Florida	3,464	-3,642	-178	2,824	-3,546	-722
Georgia	2,456	-2,905	-449	1,949	-2,830	-881
Hawaii	289	-298	-9	205	-286	-81
Idaho	466	-423	43	259	-386	-127
Illinois	8,343	-9,710	-1,367	7,448	-9,574	-2,126
Indiana	4,219	-5,035	-816	3,755	-4,967	-1,212
Iowa	1,947	-1,698	249	1,183	-1,595	-412
Kansas	1,516	-1,236	280	1,094	-1,179	-85
Kentucky	1,925	-1,993	-68	1,480	-1,931	-451
Louisiana	1,543	-1,600	-57	1,211	-1,550	-339
Maine	601	-1,392	-791	493	-1,376	-883
Maryland	2,006	-2,549	-543	1,804	-2,517	-713
Massachusetts	4,669	-6,169	-1,500	4,446	-6,131	-1,685
Michigan	5,307	-6,559	-1,252	4,788	-6,464	-1,676
Minnesota	3,277	-2,703	574	2,609	-2,584	25
Mississippi	1,212	-1,291	-79	783	-1,233	-450
Missouri	3,000	-3,758	-758	2,391	-3,663	-1,272
Montana	412	-361	51	223	-328	-105
Nebraska	1,011	-813	198	569	-754	-185
Nevada	186	-223	-37	155	-211	-56
New Hampshire	592	-1,080	-488	555	-1,074	-519
New Jersey	5,344	-6,250	-906	5,045	-6,199	-1,154
New Mexico	403	-430	-27	312	-404	-92
New York	12,257	-13,902	-1,645	11,376	-13,754	-2,378
North Carolina	2,971	-3,421	-450	2,162	-3,310	-1,148
North Dakota	415	-234	181	154	-200	-46
Ohio	8,736	-10,441	-1,705	8,082	-10,338	-2,256
Oklahoma	1,339	-1,302	37	1,022	-1,257	-235
Oregon	1,353	-1,464	-111	1,011	-1,415	-404
Pennsylvania	8,597	-11,063	-2,466	7,957	-10,955	-2,998
Rhode Island	698	-1,282	-584	669	-1,277	-608
South Carolina	1,449	-1,645	-196	1,179	-1,607	-428
South Dakota	459	-209	169	198	-252	-54
Tennessee	2,401	-3,165	-764	1,976	-3,102	-1,126
Texas	6,587	-6,111	476	5,309	-5,927	-618
Utah	567	-599	-32	466	-569	-103
Vermont	390	-399	51	326	-330	-4
Virginia	2,317	-2,766	-449	1,932	-2,708	-776
Washington	2,487	-2,217	270	2,067	-2,155	-88
West Virginia	933	-1,159	-226	827	-1,143	-316
Wisconsin	3,512	-3,729	-217	2,860	-3,637	-777
Wyoming	177	-156	21	103	-140	-37

Source: Same as Table 2.3, p. 254.

The net employment situation improves in only 16 states. The largest net gains occur in California, Minnesota, and Texas.

V. PRESENT VALUES OF GAINS AND COSTS

Table 2.5 summarizes the estimated welfare gains and adjustment costs to the U.S. from multilateral removal of all tariffs. The discounted gains and costs are given for each of the first four years, with year 1 being 1983. In addition, the cumulative present value of gains and costs are also calculated over twenty years.

The gains and costs reported for year 1 are expressed in 1983 dollars and are from Table 2.1 and incorporate our modifications of the basic results reported by Brown and Whalley. As discussed in section III, we adjust (upward) for the low import demand elasticities they adopt in their central case. The adjustment costs are based on Baldwin, Mutti, and Richardson. Section IV discussed how we adjusted (upward) their results to apply to a general 100 percent tariff cut and to the size of the labor force in 1983.

In year 1 the gains are $10.52 billion while the adjustment costs are $0.36 billion. The ratio of gains to costs, or the benefit/cost ratio of removing tariffs, is 29. Thus, in year 1 alone, real U.S. income increases $29 for each dollar of adjustment costs incurred by domestic resources forced to seek new employment as a result of eliminating all tariffs.

Removing all tariffs also generates gains in future years. Each year that tariffs stay at zero will yield a higher level of real income compared to the level that would result if tariffs remain in effect. We assume that for a permanent elimination of all tariffs the dollar magnitude of the gain estimated for 1983 will also apply to each future year. However, future gains need to be discounted by an appropriate discount factor to make them comparable with dollar sums in our benchmark year, which is 1983. As discussed in the note below, we use a discount rate of 7 percent.[32] Finally, adjustment costs are only reported on a

---

32 Throughout this report we use an interest rate of 7 percent to discount future benefits and costs of removing restrictions on imports. There is disagreement among economists as to the correct approach to derive the social rate of capitalization. The differing points of view are discussed in Tresch (1981, chapter 24). We take the view in this report that future benefits and costs represent amounts of real income which are available for (or reduce) consumption and that the appropriate discount rate is consumer's marginal rate of substitution (MRS) between present and future consumption. As explained (for example) in Henderson and Quandt (1971, chapter 8) consumers adjust the time pattern of their consumption to equate the MRS with the market rate of interest. The relevant rate is the risk-free, net of taxes, real interest rate, where the real interest rate is defined as the nominal rate minus the anticipated rate of inflation. For 1983, this is approximated by the annual yield on high-grade municipal bonds (9.47 percent) minus the actual rate of inflation measured by the CPI (3.22 percent), or 6.25 percent; we round up and use a 7 percent discount factor.

There is an important qualification to this approximation in that the actual inflation rate may well understate the

(footnote continued)

TABLE 2.5

The Present Value of Benefits and Costs to the U.S. of Multilateral Elimination of All Tariffs

Year	Gains to U.S. (Equivalent Variation)	Adjustment Costs	Net Gain
	(----------Billions of 1983 Dollars----------		)
1	10.52	0.36	10.16
2	9.83	0	9.83
3	9.19	0	9.19
4	8.59	0	8.59
Sum over four years	38.13	0.36	37.77
Sum over twenty years	119.25	0.36	118.89

Notes: The annual stream of gains is assumed to be $10.52 billion per year. Future gains are discounted using a discount rate of 7 percent.

Sources: Table 2.1, line 1 for gains and the text for adjustment costs.

present value basis; information by year is not available. In Table 2.5, the entire present value is assigned to year one because the bulk of adjustment costs are expected to occur within one year after all tariffs are removed.[33] This assignment overstates adjustment costs for the first year (and understates them for later years), which means that the ratio of gains to costs for year one are too low. However, there is no distortion when comparisons are made between the present values of gains and costs over several years.

Considering just the first four years, the present value of the gains to the U.S. from multilateral removal of all tariffs is $38.13 billion. Adjustment costs are comparatively small, $0.36 billion, so that net gains for years one through four are $37.77 billion. Looking beyond the first four years, the present value of the stream of gains over twenty years, for both total gain and net gain, is approximately $119 billion.

VI. CONCLUSION

Multilateral removal of all tariffs is estimated to increase U.S. real income by $10.5 billion dollars per year. This estimate is based on a general equilibrium model developed by Fred Brown and John Whalley.

Eliminating all tariffs will not lead to important effects on total domestic output or employment. However, adopting a zero tariff policy will cause differential impacts on domestic industries. These are the implications of a 367 sector model presented by Robert Baldwin and Wayne Lewis to estimate the effects of a general cut in tariffs by 50 percent.

(footnote continues)

anticipated rate in 1983, given that expectations are governed by past inflation rates or changes in money supply (see Dornbusch and Fischer (1978, chapter 13), and Meyer (1980, chapter 18)). For example, annual percent changes for the three years prior to 1983 were: for the CPI, 6.13 percent (1982/81), 10.37 percent (1981/80), and 13.52 percent (1980/79); for money supply (M1), 8.5 percent (1982/81), 6.4 percent (1981/80), and 6.5 percent (1980/79). However, this qualification merely means that the discount rate we use, 7 percent, is conservative. Adopting a lower discount rate would increase the present value of the net gains from removing import restrictions. Economic Report of the President, 1984, pp. 279, 291, and 298.

[33] As explained in section IV, 88 percent of the adjustment costs estimated by Baldwin, Mutti, and Richardson are labor unemployment costs. We expect that most of the workers displaced by additional imports will find new positions within one year. This is supported by data collected by the U.S. Department of Labor on duration of unemployment, which indicates that more than half of the unemployed workers find new jobs within five months. The average (mean) duration of unemployment in 1983 was 20 weeks. Economic Report of the President, 1984, p. 257. Note that the Labor Department data may be dominated by normal frictional unemployment experiences, which can give an average duration of unemployment that is lower than the average length of unemployment resulting from a permanent retrenchment by an import-competing industry. However, even if the reported average duration is doubled (to 40 weeks), most of the adjustment costs would still occur in year one.

Employment expands in export related industries because exports increase. But these increases are offset by employment declines in industries that compete with increased imports. The sharpest declines occur in five industries which suffer employment contractions exceeding 10 percent of the workforce. They are: food utensils and pottery, furniture and fixtures, rubber footwear, motorcycle and bicycle parts, and artificial flowers. Finally, the net employment declines are heavily concentrated in 6 states. The reductions in net employment in Pennsylvania, Ohio, New York, Massachusetts, Illinois, and Michigan account for two-thirds of the total fall in net domestic employment.

Baldwin, Mutti, and Richardson, based on the Baldwin-Lewis model, estimate the adjustment costs for 1967 caused by lowering tariff rates. Revision of their estimate, for inflation, for an increase in the workforce, and for a 100 percent cut in tariffs (vs. the 50 percent cut they use), suggests that in 1983 dollars the adjustment costs are roughly $360 million. Compared to the estimated social benefits from eliminating all tariffs, $10.5 billion, adjustment costs appear to be very small. The ratio of benefits to adjustment costs is 29.

Finally, if all tariffs are eliminated the U.S. can also realize higher real incomes in future years. We estimate that the present value of the net benefits (total gain less adjustment costs) over four years is $38 billion. Therefore the U.S. economy can realize a substantial gain in real income if all tariffs are scrapped.

APPENDIX 2

THE SYMMETRY BETWEEN A TARIFF ON IMPORTS AND A TAX ON EXPORTS

This appendix demonstrates the formal equivalence or symmetry between an import tariff and a tax on exports for the type of model developed by Mutti (1979). The algebraic model given below extends the geometrical analysis presented by Mutti, which is discussed in the text. Note that while there are numerous discussions of the symmetry between import tariffs and export taxes in the international trade literature they are typically based on the traditional two good, barter economy framework. The analysis of the symmetry issue requires modification for the type of model used by Mutti, which includes domestic and foreign money and a foreign exchange rate. A particularly useful discussion of symmetry which goes beyond the traditional framework is given by Corden (1974, chapter 7).

As implied by the Mutti model, we consider three relations. (Prices in U.S. dollars are denoted by P, foreign currency prices by p.)

$M = f(P_m)$ [U.S. demand for imports]

$X = g(p_x)$ [foreign demand for U.S. exports]

$\hat{p}_m RM = \hat{P}_x(1 + t_x)X$ [balance of payments equilibrium]

where:

M = the quantity of U.S. imports,

X = the quantity of U.S. exports,

P_m = the U.S. dollar price of imports,

p_x = the foreign currency price of U.S. exports,

$\hat{p}_m$ = the constant supply price, in foreign currency, for foreign goods imported by the U.S.,

R = the foreign exchange rate (i.e., U.S. dollars per unit of foreign currency),

$\hat{P}_x$ = the constant supply price, in U.S. dollars, for U.S. exported goods,

t_x = the ad valorem tax on U.S. exports,

and $f(\ )$ and $g(\ )$ are assumed to be elastic in the relevant region.

When the U.S. imposes an ad valorem tariff on imports, t_m, the price paid by U.S. consumers for imports is $P_m = \hat{p}_m R(1 + t_m)$. Similarly, if the U.S. applies a tax on exports, foreigners pay a price of $p_x = (\hat{P}_x/R)(1 + t_x)$.

We compare two cases. First, suppose there is a tariff on imports but no tax on exports. We assume the three equations can be solved for M_o, X_o, and R_o. The solution can be expressed as follows:

$$M_o = f[\hat{p}_m R_o(1 + t_m)]$$

$$X_o = g[\hat{P}_x/R_o]$$

$$\hat{p}_m R_o M_o = \hat{P}_x X_o.$$

For imports, the solution is depicted in Figure 2.1 of the text.

For case two we replace the import tariff with an export tax. To compare the two types of taxes we require the quantity of imports to be the same for both cases. Note that imports are reduced with an export tax because the dollar depreciates making foreign goods more expensive. That is, starting from an initial equilibrium in the balance of payments, imposing an export tax leads to a decline in the demand for dollars: a fall in the value of the dollar (or higher value of R) is needed to reestablish equilibrium. Suppose an export tax rate is selected so that the new exchange rate is $R_2 = R_o(1 + t_m)$. Then the quantity of imports under this export tax is the same as the quantity with the original import tariff, i.e., $M_o = f[\hat{p}_m R_2]$.

To find the export tax rate that will generate this exchange rate, first notice that since the quantity of imports remains unchanged the quantity of exports must also be unchanged. This follows because earnings by foreigners (expressed in foreign currency) from shipments to the U.S. stays at $\hat{p}_m M_o$ so that foreign spending on U.S. goods (also in foreign currency) must be the same under a tariff and export tax. As specified above, we assume foreign demand for U.S. goods is elastic. Thus there is only one quantity for U.S. exports consistent with a given level of foreign currency outlay.

To solve for the export tax rate, we know that under the tariff:

$$X_o = g[\hat{P}_x/R_o];$$

while with the export tax:

$$X_o = g[\hat{P}_x(1 + t_x)/R_o(1 + t_m)].$$

These two expressions are equal only if $t_m = t_x$. This establishes the result that a given ad valorem tariff rate has the same restrictionary effect on imports as does an identical percent tax rate on exports.

Finally, the effect on social welfare of the two trade restriction policies are also identical. As explained in the text, cancelling the tariff involves a comparison of a gain from additional imports, triangle A in Figure 2.1 in the text, with a terms-of-trade loss, rectangle B. If instead of the tariff there was an export tax set at the same percent rate as the import tariff, then removing the export tax would produce the same welfare effects as removing the import tariff. With an equivalent export tax, tax revenue equals rectangles B plus C. Therefore, by removing the export tax the government loses revenue equal to rectangles B plus C. However, consumers gain area C, because they pay a lower price for imports, so only area B remains as a cost to the economy. Lastly, consumers increase imports and the social value of the gain is triangle A.

Anderson, Richard K. and Akira Takayama (1977), "Devaluation, the Specie flow Mechanism and the Steady State," Review of Economic Studies, 44 (June), pp. 347-361.

Armington, Paul S. (1969), "A Theory of Demand for Products Distinguished by Place of Production," IMF Staff Papers, 61(1), pp. 159-178.

Baldwin, Robert E. and Wayne E. Lewis (1978), "U.S. Tariff Effects on Trade and Employment in Detailed SIC Industries," in William G. Dewald (ed.) The Impact of International Trade and Investment on Employment, A Conference on the Department of Labor Research Results, USGPO, pp. 241-264.

_____, John H. Mutti and J. David Richardson (1980), "Welfare Effects on the United States of a Significant Multilateral Tariff Reduction," Journal of International Economics, 10, pp. 405-423.

Basevi, Giorgio (1968), "The Restrictive Effect of the U.S. Tariff and its Welfare Value," American Economic Review, 58 (4), pp. 840-852.

Brown, Fred and John Whalley (1980), "General Equilibrium Evaluations of Tariff-Cutting Proposals in the Tokyo Round and Comparisons with More Extensive Liberalisation of World Trade," Economic Journal, 90 (December), pp. 838-866.

Chacholiades, Miltiades (1978), International Trade Theory and Policy, McGraw-Hill.

Cline, William R. et al. (1977), Trade Negotiations in the Tokyo Round: A Quantitative Assessment, Brookings.

Corden, W.M. (1974), Trade Policy and Economic Welfare, Oxford University Press.

_____, (1981), Inflation, Exchange Rates, and the World Economy, University of Chicago Press.

Deardorff, Alan V. and Robert M. Stern (1983), "Economic Effects of the Tokyo Round," Southern Economic Journal, 49(3), pp. 605-624.

Dornbusch, Rudiger (1975), "Exchange Rates and Fiscal Policy in a Popular Model of International Trade," American Economic Review, 65(5), pp. 859-871.

Dornbusch, Rudiger and Stanley Fischer (1978), Macroeconomics, McGraw-Hill.

Heller, H. Robert (1974), International Monetary Economics, Prentice-Hall.

Henderson, James M. and Richard E. Quandt (1971), Microeconomic Theory, 2nd ed., McGraw-Hill.

Junz, Helen B. and Rudolf R. Rhomberg (1973), "Price Competitiveness in Export Trade Among Industrial Countries," American Economic Review, 63(2), pp. 412-418.

Kindleberger, Charles P. (1973), International Economics, Irwin.

Magee, Stephen P. (1972), "The Welfare Effects of Restrictions on U.S. Trade," Brookings Papers on Economic Activity, 3, pp. 645-707.

Meyer, Lawrence H. (1980), Macroeconomics, South-Western.

Morkre, Morris E. and David G. Tarr (1980), Effects of Restrictions on United States Imports: Five Case Studies and Theory, Staff Report of the Bureau of Economics to the Federal Trade Commission, USGPO.

Mutti, John H. (1979), "Welfare Effects of Multilateral Tariff Reductions," Southern Economic Journal, 45(3), pp. 760-772.

Orcutt, Guy H. (1950), "Measurement of Price Elasticities in International Trade," Review of Economics and Statistics, 32(2), pp. 117-132. Reprinted in Caves, Richard E. and Harry G. Johnson (Selection Committee) (1968), A.E.A. Readings in International Economics, Irwin, pp. 528-552.

Richardson, J. David (1976), "Some Issues in the Structural Determination of International Price Responsiveness," in Herbert Glejser (ed.), Quantitative Studies of International Economic Relations, North-Holland, pp. 179-208.

Stern, Robert M., Jonathan Francis and Bruce Schumacher (1976), Price Elasticities in International Trade, Macmillan.

Tresch, Richard W. (1981), Public Finance: A Normative Theory, Business Publications.

Varian, Hal R. (1978), Microeconomic Analysis, Norton.

Willig, Robert D. (1976), "Consumer's Surplus Without Apology," American Economic Review, 66(4), pp. 589-597.

CHAPTER THREE

THE COSTS OF THE VOLUNTARY RESTRAINT AGREEMENT ON JAPANESE AUTOMOBILES

I. INTRODUCTION AND SUMMARY OF RESULTS

In the Spring of 1981, the Japanese government announced after negotiations with United States government officials, that it would voluntarily restrain its exports of automobiles to the United States. The action of the Japanese government was taken against a background of falling production and employment in autos and a number of legislative attempts to curb Japanese imports.[1]

The purpose of this chapter is to estimate the benefits to the United States economy and the benefits to United States consumers of removing this restraint. Estimates are also provided for the losses to United States producers of automobiles that would result from removing the restraint and the "quota rents" obtained by Japanese producers.[2]

The estimates are summarized in Table 3.2. It can be seen that losses to United States consumers exceed one billion dollars annually. Losses to the United States economy (known technically as deadweight losses) are those costs imposed on consumers which are not redistributed or captured by other sectors of the economy. These losses are $994 million annually in 1983 dollars and their cumulative value over four years is about $3.6 billion (in present value). The quota rents obtained by the Japanese producers are $824 million annually (in 1983 dollars). United States automobile producers are estimated to gain $115 million annually (in 1983 dollars).

There are several reasons to believe that the reported estimates of the costs to consumers and losses to the economy are conservative. These will also be explained somewhat further below. First, 1981 -- a recession year -- proved to be the best year to use in estimating the costs of the restriction. Second, because of a lack of data we have ignored the markups above list price apparently being received by United States dealers of Japanese cars. Finally, the exchange rate adjustments of the base year were taken as representative of the whole VRA

---

[1] See Table 3.1 for the details of the quantitative restraints. See Feenstra (1984, pp. 5, 6) for a description of the legislative efforts.

[2] The exercise we are conducting is estimating the benefits and gains to the economy and consumers of removing the VRA and the costs and losses to producers and workers of its removal. For ease of expression, however, we adopt the convention of referring to the costs to consumers and the economy of the VRA and the benefits and gains to producers and workers of the VRA. That is, the costs to consumers to which we refer are the benefits they would receive if the VRA were removed.

TABLE 3.1

The Number of Japanese Automobiles and Vans Allowed to be Imported into the United States and Puerto Rico Under the VRA

(in number of vehicles)

	United States		Puerto Rico
	Automobiles	Vans	Automobiles
April 1, 1981 - March 31, 1982	1,680,000	70,000	82,500
April 1, 1982 - March 31, 1983	1,680,000	70,000	82,500
April 1, 1983 - March 31, 1984	1,680,000	70,000	82,500
April 1, 1984 - March 31, 1985	1,850,000	77,080	90,850

Source: Japanese Embassy, Washington, DC; statements by the Minister of International Trade and Industry on May 1, 1981, February 15, 1983 and November 1, 1983.

TABLE 3.2

Estimate of the Losses to the U.S. Economy ("Deadweight Losses"), Costs to Consumers, Gains to Producers and Quota Rents Captured by the Japanese as a Result of the Voluntary Restraint Agreement on Japanese Automobiles

(in millions of 1983 U.S. dollars)

	Annual[a] (Estimates in 1981 dollars in Parentheses)	in Present Value	
		Four Years	Twenty Years
Losses to the U.S. Economy	993.8 (907.6)	3,603.3	11,265.7
Consumers' Losses	1,109.2 (1,013.0)	4,021.6	12,573.9
U.S. Producers Gains	115.3 (105.3)	418.0	1,307.0
Quota Rents to Japanese	824.4 (752.9)	2,989.0	9,345.4

[a] The 1983 numbers are equal to 1.095 times the 1981 estimates, reflecting a 9.5 percent increase in the consumer price index from 1981 to 1983. See the Economic Report of the President, 1984, p. 279.

Source: Bureau of Economics, Federal Trade Commission.

experience.[3] Thus by choosing a methodology that may err on the low side, the estimates, such as the $1 billion annual costs to consumers estimate, can be thought of as conservative, i.e., the true costs are at least as large as the numbers in Table 3.2.

In addition to these estimates, the number of jobs created by the "voluntary restraint agreement" (VRA) is estimated. Using these latter estimates enables calculation of the costs to consumers and to the United States economy for each job created by the VRA. The annual costs to consumers and the economy per job created are about $200,000.

A final set of estimates are cost-benefit ratios. The cost benefit ratios, both in terms of costs to the economy or consumers, exceed twenty. This means that for each dollar of benefits from retaining the quota, there are over twenty dollars of costs. The costs per job and cost-benefit estimates are summarized in Tables 3.3 and 3.4, respectively.

II. MODEL AND ASSUMPTIONS

Differentiated Product

The first issue one must decide is whether to treat Japanese made automobiles as homogeneous with or differentiated from domestic automobiles. The most reasonable assumption is to treat Japanese automobiles as differentiated from domestic automobiles.[4] The Japanese product mix is much more oriented toward small or economy cars than is the product mix of United States producers. This partly explains why Japanese cars, unlike European cars, sell, on average, for a lower price than United States cars. Moreover, the econometric estimates of Eric Toder (1978) and Charles Rivers Associates (1976) argue for the acceptance of a differentiated model.[5]

In view of the data in Table 3.5, it seems reasonable to treat Japanese and other imports as differentiated. Thus it is assumed that United States consumers have aggregate demand functions for Japanese imports, other imports and domestic cars. For simplicity and without loss of generality the cross elasticity of demand between non-Japanese imports and others is taken to be

---

[3] In addition, the analysis was performed under the assumption that producers priced competitively after imports were constrained. If this assumption was not correct -- an issue on which we have no evidence one way or the other -- there would be additional costs and fewer benefits from retention of the quota.

[4] What is meant by this assumption is simply that U.S. and Japanese automobiles are not perfect substitutes and that we obtain more accuracy, for the limited purpose of estimating the effects of the VRA, by employing a set of estimating equations that incorporates that lack of perfect homogeneity. Nothing is implied by this, however, regarding the characterization of the "relevant market" from an antitrust perspective.

[5] The econometic estimates of James Langenfeld (1982) also suggest that it may be reasonable to use separate demand functions for large and small cars.

TABLE 3.3

Annual Costs Per Job Created by the VRA on Automobiles

	(in 1983 dollars)
Costs to Consumers per job	241,235
Losses to the Economy ("Deadweight Losses") per job	216,137

Source: Bureau of Economics, Federal Trade Commission.

TABLE 3.4

Cost-Benefit Ratios: Costs to Consumers and Losses to the Economy for Each Dollar of Earnings Losses Saved by the VRA

Costs to Consumers	$23.90
Losses to Economy	$21.41

Source: Bureau of Economics, Federal Trade Commission.

TABLE 3.5

Average Selling Price of New Cars

	(in dollars per car)		
	domestic	all foreign	Japanese*
1980	$7,630	$7,493	$4,881
1981	$8,940	$8,894	$5,950

* The data for Japan are an average of the manufacturer's suggested retail prices for all models.

Source: Bureau of Economic Analysis, Department of Commerce for domestic and all foreign; Feenstra, Table 2, for Japanese data.

zero.[6] This assumption allows us to ignore the effect on non-Japanese imports of the VRA and concentrate on Japanese imports and United States sales. There is some empirical justification for this in that in the first year after the VRA went into effect there was, by recent standards, a large increase in Japanese prices.[7] If other imports were a good substitute, their share of the import market would have increased. The Japanese share of U.S. imports, however, increased from 64 to 67 percent.[8]

Model Specification

The model is depicted graphically in Figure 3.1. Panel A is the market for the domestic product and panel B is the market for the imported product.

Since the products are related, the demand curves depend on the price of the competing good as well as the usual own price dependence. That is, the price of the competing import good is a parameter in the demand curve for the domestic good and conversely.

The dynamic adjustment to a new equilibrium after the imposition of a tariff may be intuitively explained as follows. (Throughout this chapter we employ upper case letters for the price and quantity of the domestic good and lower case letters for the price and quantity of the Japanese good.) With the VRA, Japanese imports are limited to an amount q_o, depicted by the vertical line, above p_1, in Panel B, where p_1 is the price of Japanese automobiles that is expected to prevail in the absence of the VRA. The initial equilibrium in the Japanese market is at (p_o, q_o) where the fixed quantity q_o intersects the initial demand curve d_o. (P_o, Q_o) is the initial equilibrium in the market for domestic automobiles. If the VRA is removed, the price and quantity of Japanese automobiles is then determined by the intersection of the Japanese supply curve s and the relevant demand curve. With a flat supply curve, in the relevant range, the price of Japanese automobiles will fall to p_1. This results in a downward shift in the demand for domestic automobiles to D_1 and a lower price and quantity, (P_1, Q_1), for them. The lower price of domestic automobiles causes the demand for Japanese automobiles to shift down to d_1, resulting in a new equilibrium (p_1, q_1). No further adjustments occur because the price of Japanese automobiles, p_1, has not changed further. Thus (P_1, Q_1) and (p_1, q_1) are the equilibria points after the removal of the VRA.[9]

---

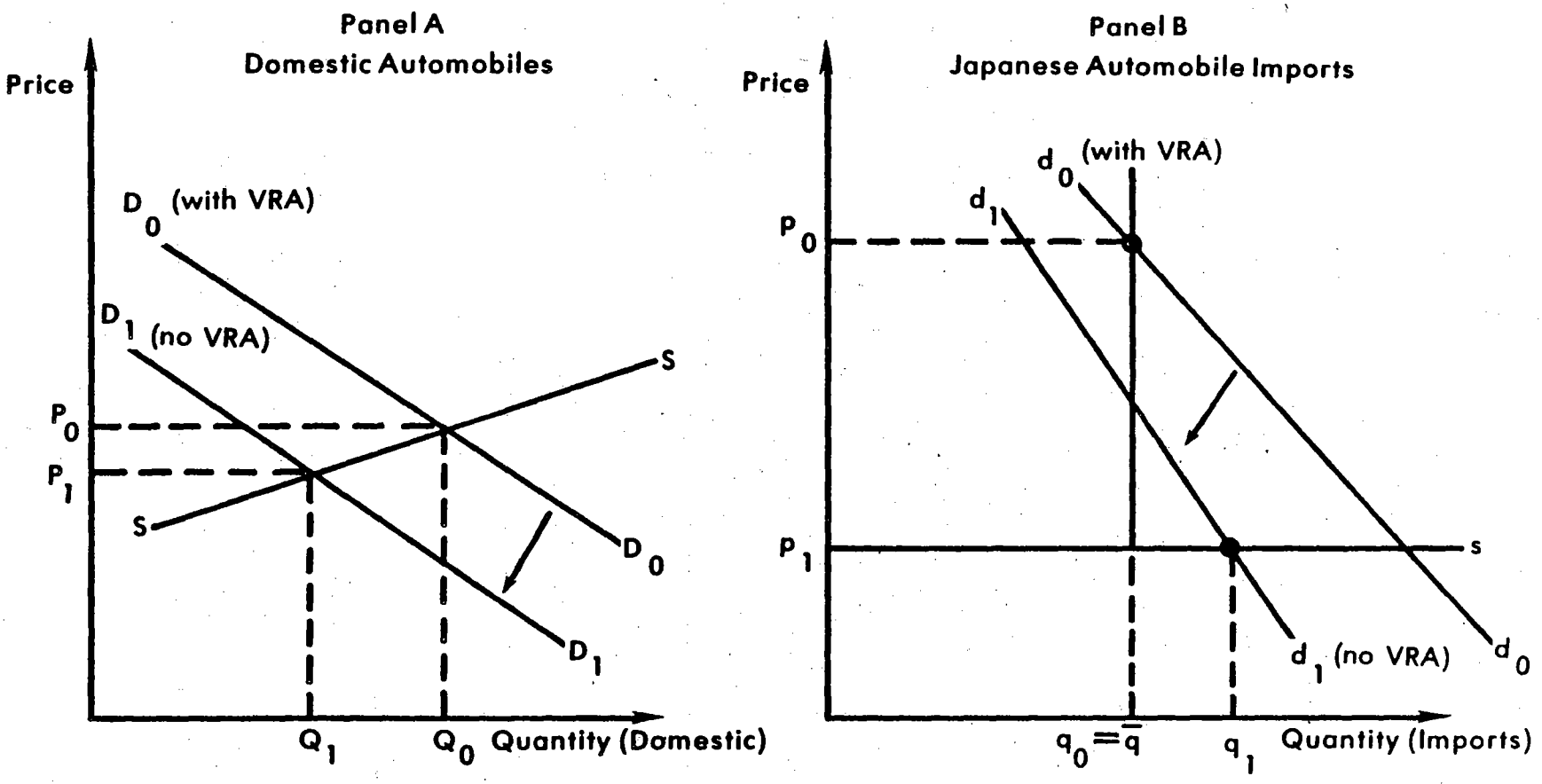
[6] If we drop this assumption and treat the "other imports" supply curve as flat in the relevant range (as we do for the Japanese) then the costs to consumers estimate should be approximately the same and the loss to the economy estimate should increase slightly. The most significant change would be in the estimate of jobs created: fewer jobs would be created in the United States since other imports would capture part of the void created by the VRA.

[7] See below.

[8] USITC (1983, p. 6).

[9] This discussion is for explanatory purposes only. No assumptions are made regarding the dynamic adjustment path to a new equilibrium. The analysis below is "comparative statics," and the model is specified by equations (1)-(4).

FIGURE 3.1
Effects of a Removal of a Quota on a Differentiated Imported Product
With a Rising Domestic Supply Curve



To explicitly model these interactive effects requires specification of demand equations for both goods, a supply equation for the domestic good and the supply relation for Japanese imports with and without the VRA. The demand equations must incorporate the cross elasticity effect of the other good's price. Thus the following specification is assumed:

(1) $Q = a_o + a_1 P + a_2 p$ (demand for domestic automobiles)

(2) $q = b_o + b_1 P + b_2 p$ (demand for Japanese automobiles)

(3) $Q = c_o + c_1 P$ (domestic supply)

(4) $f(p) = q_o \quad p > p_1$ (Japanese supply under the VRA)

$= 0 \quad p < p_1$

(4*) $s(q) = p_1$ (Japanese supply price with no VRA)

Equations (1) and (2) are the demand curves for domestic and imported goods, respectively. Equation (3) is the supply curve for the domestic product. Equation (4) states that the Japanese will supply no automobiles at a price less than p_1, but will supply only the amount negotiated under the VRA (denoted q_o) regardless of the price above p_1. Equation (4*) states that without the VRA, the Japanese will supply any quantity of automobiles (in the relevant range) at the price p_1.

Clearly, there are other variables affecting the equilibrium prices and quantities other than those explicitly modeled in equations (1)-(4). The exercise we are conducting, however, is one of comparative statics, in which all other variables are held constant. Thus, the other variables which influence the equilibria are subsumed in the specified constants of the equations.

Elasticity Assumptions

The best estimates available for the coefficients in equations (1)-(4) are from Eric Toder (1978) and from the work he and his colleagues did in their Charles River Associates (1976) report. Utilizing what they assess to be a consensus of estimates that the overall elasticity of demand for automobiles is unity, their model reduces the four elasticity dependent coefficients in equations (1) and (2) to one coefficient. This coefficient, denoted e, is defined by:

$$e = \frac{d \ln q/Q}{d \ln p/P}$$

It is an "elasticity of substitution."[10] If it is -2, for example, it says that a ten percent increase in the relative price of Japanese cars results in a twenty percent decrease in the relative share of Japanese car sales in the United States. Toder and Charles Rivers Associates estimate e utilizing many

10 Toder calls it a relative elasticity.

different models. We take e = -2 as the value most representative of their estimates of e. With e = -2, their model implies $a_1 = -888.04$, $a_2 = b_1 = 342.8$ and $b_2 = -2{,}008$.[11]

Our estimate of c_1 is 7,143. It is calculated from data available in the Charles River Associates (1976) report.[12]

Substituting these estimated values into equations (1)-(4) yields:

$$(1') \quad Q = a_o - 888.04\ P + 342.8p$$

$$(2') \quad q = b_o + 342.8\ P - 2{,}008p$$

$$(3') \quad Q = c_o + 7143\ P$$

$$(4') \quad f(p) = q_o \quad p > p1 \quad \text{with the VRA}$$

$$(4^{*}') \quad s(q) = p_1 \quad \text{no VRA}$$

Selection of Base Year Prices and Quantities

As Table 3.1 indicates, the VRA was imposed on Japanese imports entering after April 1, 1981. Thus we take 1981 as the base year of our estimates. That is, we take the 1981 price and quantity data which are available and assume they are generated by equations (1)-(4), not (4*). Since the VRA was not actually in effect during the first quarter of 1981, more Japanese automobiles were imported for calendar year 1981 (1.911 million),[13] than were allowed in the first year of the VRA (1.680 million). This should result in our somewhat underestimating the costs to consumers and losses to the economy of retaining the VRA, because with more Japanese cars we would expect to see lower prices for them.

Moreover, we take 1981 as the base year because it is necessary to estimate what the Japanese supply curve (4*) would have been were it not for the VRA. In the last unrestrained calendar year, 1980, we can observe the Japanese supply price. The process of estimating the supply price in the hypothetical case of no VRA, when the VRA was actually in effect, involves some errors of estimation; these errors are reduced by selecting a base year as close as possible to the last unrestrained year of imports.

Thus we take 1981 as a representative VRA year. That is, estimates of the effects of the VRA in 1981 are considered typical of its effects in other years. Since 1981 was a recession

---

[11] They derive the following relationships between the elasticity coefficients in (1) and (2) and e: $a_1 = -62.64 + (412.7)e$; $a_2 = b_1 = -335.6 - (339.2)e$; and $b_2 = -1797 + (105.5)e$. Substituting $e = -2$ in these relationships will yield the values for a_1, a_2, b_1 and b_2 that are in equations (1')-(2').

[12] It is based on equation 4-1-6 on page 198, which can be interpreted to imply an elasticity of supply equal to approximately 10.

[13] ITC (1983, p. 4). This is the source of all price and quantity data employed in this chapter, unless another source is cited.

year of automobile demand,[14] this is likely to result in an underestimate of the costs to consumers and to the economy of the VRA. In a normal or boom demand year the Japanese and United States automobile prices would be higher under the VRA than in a recession. Thus the VRA removal would be expected to cause a greater drop in prices and greater gains to consumers and the economy than is predicted by our model.

In 1981, 1,911,525 new Japanese automobiles were imported and 6,255,340 new automobiles were sold by United States factories. For price data, a choice had to be made between using manufacturers suggested retail price or some measure of average price, such as unit value (with adjustments being made for quality changes). Unit values were selected for two reasons. First, since we will be adjusting for quality and mix changes below, the major objections to the use of unit values are removed. Second, suggested retail price is the price that includes dealer profits and other costs which do not go to the Japanese manufacturer, and this was in 1981 about $1,000 per automobile higher than what the manufacturer received.[15] Utilizing the higher valued suggested retail price would result in an overestimate of the losses to the economy, since part of what would be attributed, in the welfare calculations, to Japanese manufacturers as quota rents would actually be captured by others such as United States retailers.

For 1981 the unit value of Japanese automobile imports was $4,967. The average selling price of U.S. manufactured automobiles was $8,940.[16]

Estimating the Japanese Supply Price, p_1, in 1981

A key step in the analysis is the estimation of the Japanese supply price p_1 in equation (4*). This is the hypothetical price that would have prevailed in 1981 were there no VRA in effect. In 1980 the unit value of imported Japanese automobiles was $4,131. The rise in the unit value of twenty percent from $4,131 to the 1981 unit value of $4,967 was large by recent historical standards.[17] It would be incorrect, however, to attribute the entire rise in the unit value to the VRA, and to assume therefore that the Japanese would have supplied automobiles in 1981 at p_1 = $4,131. A number of factors might have caused an increase in the Japanese supply price independent of the VRA. In particular, the Japanese supply price might have increased because of: (1) inflation in the price of the inputs used in making Japanese

---

[14] The Federal Reserve Board index of automobile production rose from 137.9 in 1981 to 158.2 in 1983 and 178.1 in December 1983, See Economic Report of the President, 1984, p. 269.

[15] The average suggested retail price of a Japanese import in 1981 was $5,950 (Feenstra, 1984, p. 18) and the unit price was $4,967 (ITC, 1983, p. 4).

[16] The U.S. average selling price is only available in mimeograph form through the Department of Commerce, Bureau of Economic Analysis, NIWD. It is like a unit value of the retail sales price.

[17] There were, however, four years, within the 1971-1982 period, with comparable increases in unit values. See ITC (1983, p. 4).

cars; (2) a shift in the exchange rate of the Japanese yen against the United States dollar; and (3) a shift in the quality mix of Japanese cars toward more expensive vehicles.

In the case of Japanese input prices, the Bank of Japan publishes Price Indexes Annual, in which input and output price indices of manufacturing industries by sector are available. Input prices in the transport equipment industry rose by 1.7 percent from 1980 to 1981. This compares with an overall increase in the wholesale price index for Japan of 1.4 percent for the same time period. Thus we conclude that Japanese automobile prices would have risen 1.7 percent as a result of an increase in the cost of automobile industry inputs.

Since the Japanese supply price is denominated in yen and converted to U.S. dollars under the prevailing exchange rate, a change in the exchange rate would shift the supply price in U.S. dollars. Contrary to the 1980 to 1983 trend, the Japanese yen rose against the U.S. dollar by 2.7 percent between 1980 and 1981.[18] Thus we assume that the Japanese supply price rose by 2.7 percent because of exchange rate considerations. As was indicated in the introduction, however, using 1981 as a representative year will tend to underestimate the costs to consumers and losses to the economy estimates in latter years to the extent that the yen has depreciated against the U.S. dollar in later years.

A third reason to adjust the Japanese supply price upward is the fact that the Japanese, in response to the VRA, shifted their product mix toward higher valued vehicles. Theoretical work by Rodriguez (1979) and Falvey (1979) has shown that it is profit maximizing for such a shift to occur. More importantly, Feenstra (1984) has documented that the Japanese increased the share of their higher priced vehicles, namely the Toyota Cressida, the Datsun 810 Maxima and, on a percentage increase basis, the Toyota Supra. In addition, other models began to appear with more equipment as standard features rather than as options. Thus the average car supplied by the Japanese in 1981 was of higher quality and a more costly to produce vehicle than the average 1980 car. Following Griliches (1971), Feenstra ran hedonic regressions which allowed him to conclude that there was a six percent increase in product quality between 1980 and 1981. Utilizing this estimate we conclude that the Japanese supply price would have risen by six percent because of the additional costs required to produce the higher quality vehicles. Ignoring the quality shift would result in an overestimate of the welfare costs.

Summarizing this discussion, then, our estimated Japanese supply price for 1981 is $4,573 where:

$$(5)\quad p_1 = \$4{,}573 = s(q) = \$4{,}131(1.017)(1.027)(1.06).$$

The Estimated New Equilibrium

From the previous discussion we have that the 1981 domestic price and quantity (in thousands) are: (P = $8,940, Q = 6,255); the price and quantity (in thousands) of imports in 1981 are: (p = $4,963, q = 1,911). Assuming that our model, described by equations (1')-(4'), accurately depicts the process of price and

---

18 Federal Reserve Bulletin, various issues.

quantity determination, then the price and quantity solutions for 1981 are a particular solution to equations (1')-(4'). One may substitute these particular price and quantity values into (1')-(3'), leaving three independent equations in three unknowns: a_o, b_o, c_o. Solving them, implies that (in thousands): a_o = 12,491, b_0 = 8,820 and c_0 = 57,603. Then equations (1')-(4*') become (1")-(4*"):

$$(1") \quad Q = 12{,}491{,}000 - 888.04\ P + 342.8\ p$$
$$(2") \quad q = 8{,}820{,}000 + 342.8\ P - 2{,}008\ p$$
$$(3") \quad Q = -57{,}603{,}000 + 7{,}143P$$
$$(4*") \quad s(q) = \$4{,}573 = p_1$$

where $4,573 has been substituted for p_1 in equation (4*') on the basis of the discussion of the estimated Japanese supply price.

In order to obtain the solution for the new equilibrium without the quota, we substitute p = $4,573, which is the estimated Japanese supply price without the VRA, into (1")-(3"). This yields three equations in three unknowns which may be solved to yield: P = $8,923, Q = 6,134 and q = 2,696. These solutions are depicted in Figure 3.2, where D_o and d_o are the initial demand curves, and D_1 and d_1 are the demand curves that prevail in the new equilibrium.

III. THE GAINS AND LOSSES FROM REMOVING THE VRA

How to estimate the change in U.S. consumers' surplus is not immediately obvious since two markets, not just one, are involved and the demand curves in both markets have changed. An American Economic Review article by Burns (1973), however, applies precisely to this situation.[19] The lost consumers' surplus is equal to the sum of rectangle I and triangle II in panel A plus the rectangle R and triangle DW in panel B. The four areas together sum to $1.013 billion in 1981 dollars.

Define deadweight losses to the economy as the amount lost by consumers which is not captured or redistributed to other sectors of the domestic economy. It is lost to the economy and is in that sense a "deadweight" loss imposed by the VRA. Since tariffs are sufficiently small that we have abstracted from them, dead weight losses are:[20]

$$(6) \quad DWL = \Delta CS + \Delta PS$$

where ΔCS = change in consumers' surplus
ΔPS = change in producers' surplus.

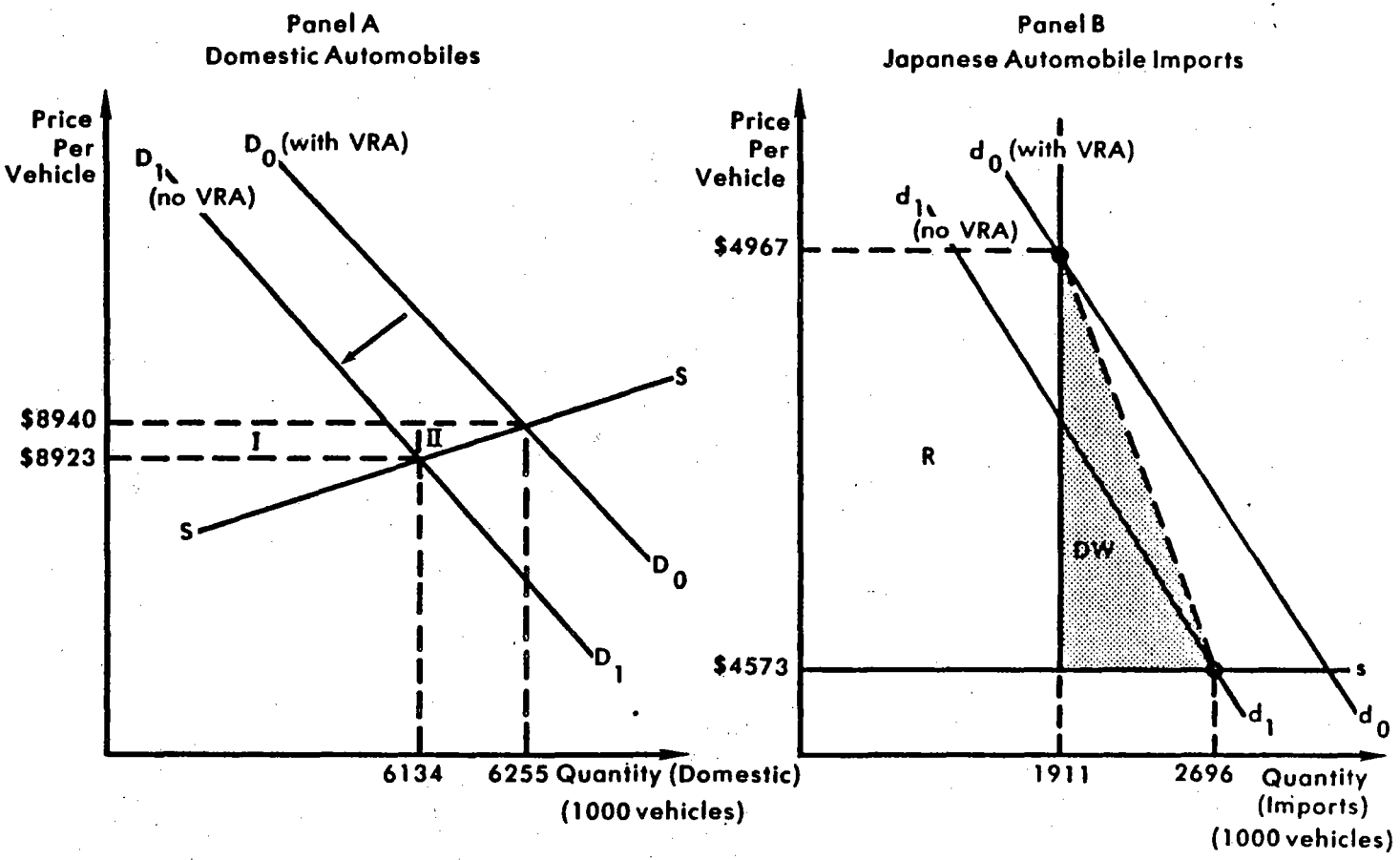
---

[19] The Burns analysis was explained in the report by Morkre-Tarr (1980, pp. 25-27), and Robert Willig (1976) has shown that consumers' surlus is a good measure of welfare change.

[20] Tariff rates on passenger automobiles and vans are as follows:

Effective Date	Rate
1/1/80	2.9%
1/1/82	2.8%
1/1/84	2.7%
1/1/85	2.6%
1/1/87	2.5%

FIGURE 3.2
Estimated Effects of Removal of the Japanese VRA
on Automobiles a/



a/ Figures are not drawn to scale.

Source: Bureau of Economics, Federal Trade Commission

The areas I & II, bounded by the solid lines in Panel A and equal to $105 million together, are equal to the gain in producers' surplus from the VRA. Quantitatively it is calculated as $17(6,134,000) + (1/2)($17)(121,000) = $105 million. Producers are willing to supply at a price read off of the supply curve but are able to receive $8,940 instead. Following the Burns (1973) analysis, mentioned above, this is equal to the lost consumers' surplus in the domestic market, so there are no deadweight losses attributed to the domestic market resource shifts.[21]

The rectangle R in panel B represents rents captured by the Japanese manufacturers. They are willing to supply at an estimated price of $4,573, but receive $4,967 for all 1,911 thousand units. Thus the Japanese manufacturers earn $753 million in rents from the VRA. If the VRA is removed, United States consumers reap the benefits of the price drop to $4,573, and Japanese manufacturers lose the rents.

The new equilibrium for Japanese automobiles is determined by the intersection of d_1 and s. Connecting the new equilibrium point with the old forms the triangle DW . The triangle DW is equal to (1/2)[$4,967 - $4,573][2,696,000 - 1,911,000] = $155 million. Following Burns, it represents deadweight losses to the economy because with the VRA in place, it is lost consumers' surplus that is not captured by anyone else in the economy. (It is also deadweight loss to the world economy.) The results are summarized in Table 3.2.

As mentioned in the introduction, the approach we have used underestimates the costs to consumers and, to a lesser extent, the costs to the economy to the extent that United States dealers of Japanese automobiles have increased their dealer markups in response to the VRA.[22] We have used a price for Japanese cars that only reflects the increase in revenue received by the Japanese manufacturer as a result of the VRA. It does not reflect any additional increased costs to consumers resulting from increased dealer markups on Japanese cars. In addition, the higher price for foreign cars will mean an additional increase in the price of domestic vehicles which also increases costs to consumers. Thus, consumer costs are clearly understated. Costs to the economy are also understated although the increased payments to dealers are transfers from consumers to dealers and are therefore not themselves costs to the economy. However, the higher price resulting from the higher dealer markup will cause some consumers not to purchase foreign vehicles. Thus the removal of the VRA will result in a greater increase in the

---

21 This is the traditional method of estimating these quantities and is in the spirit of Harberger's analysis since there is no difference between the price and what any producer is willing to supply at the margin. See Harberger (1971).

22 Consumers Union, for example, has reported that since the quota was implemented many dealers are charging in excess of the sticker price, using such devices as charging high prices for decal stripes, rustproofing and undercoating. Its readers indicate that this has been especially common among Toyota, Honda and Mazda dealers. Consumer Reports, August 1983, p. 391. See also the statement by Senator Chafee, Congressional Record, February 29, 1984, S.1996; Fortune, "Can Detroit Live without Quotas," June 25, 1984, p. 20; and Washington Post, "Car Dealer Markups Raise Questions," Washington Business, November 19, 1984, pp. 1, 34, 35.

purchase of foreign vehicles than we have estimated. This will result in additional deadweight loss. (In terms of Figure 3.2, it means that the triangle DW is larger than we have estimated.)

Costs Per Job Created and Cost-Benefit Ratios

Cost Per Job Created. Removing the VRA is expected to cause domestic production to fall to 6,134 thousand units. How many jobs in motor vehicles and motor vehicle parts will be lost as a result of this reduced output?[23] In 1981, there were 7,947,210 cars and trucks produced in the United States.[24] These cars and trucks were produced by 716,000 employees.[25] This implies that on average it required .090 employees to produce one motor vehicle in 1981.

Following the analysis of the Congressional Budget Office (CBO), this .090 number must be adjusted for a number of factors to arrive at a figure appropriate for an estimate of job loss from the VRA removal. In particular, the Bureau of Labor Statistics (BLS) data on employment is an average number that includes many jobs that would not vary proportionately with output. Thus the marginal fall in employment from an output reduction would be less than .09 which is average employment. Second, the .09 number includes many jobs producing parts for used rather than new cars. These jobs would not be reduced. Third, the .09 number includes all automotive workers, including those making heavy trucks, buses and large cars. Since there is more labor content in these vehicles and these workers would be much less affected than those making sub-compact cars, employment would fall less than the .09 number would reflect.

---

[23] It should be noted that we only consider direct employment in the industry at issue as a benefit of the protection (not indirect employment in supplying industries). This is because, at full employment, protective trade measures will increase the relative prices and employment in protected industries, but overall employment will remain unchanged. At less than full employment, protective trade measures may, barring foreign retaliation, increase demand in the protected industries. It is important to recognize, however, that tariffs are likely to induce employment reductions in export and import competing industries. Moreover, aggregate monetary and fiscal policies are utilized by Congress, the Administration and the Federal Reserve Board to stimulate aggregate demand when these authorities believe that the benefits of such stimulation exceed the costs in terms of generating inflation and jeopardizing the achievement of full employment in the long run.

When protective trade measures are adopted, it reflects a decision by the authorities that dislocations in the directly affected industry are such that special weight must be given to employment in that particular industry. Because of the above arguments, however, the indirect effects of tariffs, quotas or other trade protective devices on employment in other industries are uncertain, i.e., we do not know either if employment will increase in unprotected sectors or if any possible increase in demand is beneficial to the economy. See Morkre and Tarr (1980, pp. 2, 3) for further elaboration and references on this issue.

[24] Ward's Automotive Reports, Vol. 59, No. 1, January 2, 1984.

[25] This includes 352,400 in motor vehicles and car bodies (SIC 3711) and 363,700 in motor vehicle parts and accessories (SIC 3714). See Congressional Budget Office (1982, p. 37).

From the data available to the CBO from a variety of sources, they have estimated that the combination of all of these factors implies an adjustment factor of 2.32,[26] i.e., .090/2.32 = 0.038. That is, for every unit of motor vehicle production lost due to the VRA, we can expect to lose .038 jobs in the motor vehicle industry.

Thus (.038)(121,000) = 4,598 is the number of workers who would be displaced in automobile vehicles and parts production by the removal of the VRA. This number should be compared with indefinite lay-offs in the automobile industry of over 200,000 in early 1982.[27] That is, the employment effect of the VRA was 2.3 percent of the existing lay-offs in the first year of the VRA.

Utilizing the data in Table 3.2, it is then possible to calculate the costs per job created. The costs to consumers and to the economy per job created are $241,235 and $216,137, respectively. These estimates are presented in Table 3.3. It should be understood, however, that these costs per job estimates do not include the costs of attracting additional resources to the industry to produce the additional automobiles, i.e., the additional wages, capital, and raw materials expenses that must be incurred to produce these additional vehicles are costs society incurs to produce these vehicles in addition to the costs per job mentioned in Table 3.3. Thus the costs per job in Table 3.3 may be thought of as excess costs per job, i.e., they are costs per job in excess of the amount necessary to attract resources to the industry to produce the vehicles.

It was mentioned in the introduction that one possible source of underestimation of losses to consumers and the economy is the assumption that United States producers price competitively during the quota period. We have not attempted to determine empirically whether or not U.S. producers have charged prices above the competitive level while the VRA has been in effect.[28] However, if the domestic industry, recognizing that imports cannot increase due to the quota, did increase its price above the competitive level, then additional costs to consumers

---

[26] See CBO (1982, pp. 37-41). The CBO adjustments were as follows:

Reason for Adjustment	Adjustment Factor
1. Marginal labor requirements are less than average.	1.6
2. Some auto workers make replacement parts.	1.2
3. Some auto workers make trucks and buses.	1.1
4. U.S. plants make some intermediate and large cars.	1.1
Total effect (1.6x1.2x1.1x1.1)	2.32

[27] Feenstra (1984, p. 29).

[28] During the decade of the 1970's, the average selling prices of U.S. automobiles increased by 8.7 percent or less in all years except for a 12.4 percent increase in 1975. The increase for 1981 was 17.2 percent. (Calculated from Department of Commerce, Bureau of Economic Analysis, NIWD mimeographed data.) This by itself does not imply domestic monopolistic pricing, however, as a competitive industry, with an upsloping supply curve, would be expected to raise prices in response to a quota on imports.

and losses to the economy would ensue.[29] Possibly even more important, however, is the fact that prices above the competitive level result from monopoly restriction of output. Restricted output in turn implies less employment. It is possible, in fact, for employment not to increase or to decline when a quota is imposed if the monopoly output restriction is sufficient.[30] In this case the costs per job created numbers would be enormous:[31] there would be large costs and no jobs.

Cost-Benefit Ratios. Having estimated the costs of the VRA, it is now necessary to estimate the benefits in order to calculate cost-benefit ratios. Following the compensation approach methodology to estimate benefits, explained in Morkre-Tarr (1980, pp. 16-19), benefits are taken to be the adjustment costs of workers who would be displaced. These adjustment costs are measured by the earnings losses of displaced workers.

Jacobson (1978) has estimated the earnings losses of workers displaced from a number of manufacturing industries, including automobiles. For most industries the substantial losses occur in the first two years after displacement; for many industries losses continue in the subsequent four years. Thereafter earning losses have usually vanished.

In automobiles, Jacobson estimates that displaced workers lose 43.4 percent of their earnings in the first two years and 15.8 percent in the subsequent four years of displacement. According to the Bureau of Labor Statistics, total hourly compensation for production workers in the manufacturing of motor vehicles and motor vehicle equipment was $17.55 per hour in 1981.[32] Assuming 2,000 hours of work per year, total compensation per worker is $35,100 per year. Taking a discount rate of 7 percent[33] yields a present value of $47,026 of lost earnings per

---

29 Similarly, costs would be higher if one or more of the factors that are used to produce automobiles were to earn supercompetitive returns as a result of the VRA.

30 In fact, as is shown by Corden (1971, pp. 203-206), if the quota is equal to the original imports, then output and employment will necessarily fall if domestic producers price monopolistically after the quota is imposed. This is because there is only the monopoly restriction effect and no import substitution effect.

31 In a strict mathematical sense, costs per job are said to be undefined if there are no jobs created. As the number of jobs created approaches zero, the costs per job estimate increases without bound.

32 U.S. Department of Labor, Bureau of Labor Statistics, Office of Productivity and Technology, unpublished data. Average hourly earnings were $10.93.

33 Some may think of seven percent as a high real rate of discount. A high discount rate will, because of declining adjustment costs with constant costs to consumers, lower the cost-benefit ratios. Thus again the estimate is conservative. See chapter 2, footnote 32 for a discussion of the appropriate discount rate.

worker over a six year period. Thus there are $47,026 (4598) = $216.2 million in benefits to the economy, over a six year period, from having the VRA.[34]

The present value over six years of the costs to consumers and the economy are $5,167 million and $4,629 million, respectively, measured in 1981 dollars. Taking the ratio of costs to benefits yields the numbers summarized in Table 3.4.

Since virtually all adjustment occurs within six years of displacement, taking the present value of costs and benefits for more than six years would, ceterus paribus, increase the cost-benefit ratios. Thus again the estimate is a conservative one of the effects of a VRA maintained in the long run.

IV. CONCLUSIONS

This chapter has estimated that the costs to consumers of maintaining the VRA on Japanese automobiles are $1109 million in 1983 dollars. The analogous costs to the economy are $994 million. Despite these rather large estimates of the costs to consumers and to the economy, they were obtained while making many assumptions which resulted in lower estimates of the costs to consumers and the economy. Most important among these assumptions was taking a year of low demand for automobiles, 1981, as the base year. The costs to consumers of a given quota are higher with high demand than with low demand. Recently United States automakers were earning record profits[35] as the demand for automobiles recovered. Because of this and the many other assumptions that have been explained in the chapter, the estimates of the costs to consumers and the economy can be thought of as conservative.

---

34 Since the VRA is not likely to remain in effect permanently, this analysis overestimates the costs of adjusting to the removal of the VRA. This is because if the VRA is removed in some year in the future, say 1986, the adjustment costs, measured here as earnings losses, would have to be incurred beginning in 1986. The benefits of retaining the VRA from 1981 to 1986 would only be the deferral of the adjustment costs for five years, rather than the full value of the adjustment costs as assumed here.

In an "escape clause" or "section 201" (of the 1974 Trade Act) investigation, where the statute stipulates the termination of the protection after five years, the deferral method would be the clearly preferred methodology. See chapter 6 below, on the steel industry, for an example of calculating adjustment costs via the deferral method.

35 The Washington Post, "Import Quotas put Cars out of Reach," Washington Business, p. 1, Feb. 27, 1984.

Burns, Michael E. (1973), "A Note on the Concept and Measure of Consumers' Surplus," American Economic Review, 63(3), pp. 335-344.

Charles Rivers Associates (1976), Impact of Trade Policies on the U.S. Automobile Market, Report prepared for the Department of Labor, Bureau of International Labor Affairs.

Congressional Budget Office (1982), "The Fair Practices in Automotive Products Act (H.R. 5133): An Economic Assessment," in Domestic Content Legislation and the U.S. Automobile Industry," for the Subcommittee on Trade of the Committee on Ways and Means, U.S. House of Representatives, USGPO, August 16.

Corden, W. M. (1971), The Theory of Protection, Oxford University Press.

Dewald, William, et al. (1978), The Impact of International Trade and Investment on Employment, Proceedings of a Conference on Department of Labor Research Results, USGPO.

Falvey, Rodney E. (1979), "The Composition of Trade Within Import Restricted Product Categories," Journal of Political Economy, 87(5), pp. 1105-1114.

Feenstra, Robert C. (1984), "Voluntary Export Restraint in U.S. Autos, 1980-81: Quality, Employment, and Welfare Effects," in The Structure and Evaluation of Recent U.S. Trade Policy, edited by Robert Baldwin and Anne Krueger, University of Chicago Press for N.B.E.R., forthcoming.

Griliches, Zvi (1971), "Hedonic Price Indexes for Automobiles: An Econometric Analysis of Quality Change," in Price Indexes and Quality Change, edited by Zvi Griliches, Harvard University Press.

Harberger, Arnold (1971), "Three Basic Postulates for Applied Welfare Economics: An Interpretive Essay," Journal of Economics Literature, 9(3), pp. 785-797.

International Trade Commission (1983), The U.S. Auto Industry: U.S. Factory Sales, Imports, Exports, Apparent Consumption, Suggested Retail Prices, and Trade Balances with Selected Countries for Motor Vehicles, 1964-82, USITC publication 1419, Washington, D.C.

Jacobson, Louis S. (1978), "Earnings Losses of Workers Displaced from Manufacturing Industries," in Dewald et al. (cited above), pp. 87-98.

Langenfeld, James (1982), "Federal Automobile Regulations," Unpublished Ph.D. Dissertation, Washington University.

Morkre, Morris E. and David G. Tarr (1980), Effects of Restrictions on United States Imports: Five Case Studies and Theory, Bureau of Economics Staff Report to the Federal Trade Commission, USGPO.

Rodriguez, Carlos A. (1979), "The Quality of Imports and the Differential Welfare Effects of Tariffs, Quota, and Quality Controls as Protective Devices," Canadian Journal of Economics, 12(3), pp. 439-449.

Toder, Eric with N. Scott Cardell (1978), "Effects of Trade Barriers on the U.S. Automobile Market," in Dewald et al. (cited above), pp. 33-52.

Willig, Robert D. (1976), "Consumers Surplus Without Apology," American Economic Review 66(4), pp. 589-597.

CHAPTER FOUR

SUGAR

I. INTRODUCTION

In May 1982 the United States announced a major change in sugar import policy with the imposition of a global import quota.[1] The quota is related to the domestic price-support program for sugar. Without the quota the domestic price of sugar would have fallen below the so-called "market stabilization price" (MSP) set by the U.S. Department of Agriculture,[2] and processors would have surrendered significant quantities of domestically-grown sugar to the Commodity Credit Corporation. To prevent this from happening, which would have involved a substantial expense to the federal government,[3] the quota was introduced to restrict the supply of foreign sugar and boost the U.S. price.[4]

---

[1] Presidential Proclamation 4941 established the import quota. Federal Register, 47(89), May 7, 1982, pp. 19661 - 19664. The Administration initially imposed a quota for the period May 11 to June 30, 1982; subsequently, a quota was announced for the third quarter of 1982; since October 1, 1982, annual quotas have been in effect for each fiscal year (FY). The annual quota for FY 1983 was 2.889 million short tons and clearly restricted imports. From 1976 through 1981, imports were never below 4 million short tons, and ranged between 4.364 and 5.419 million short tons.

Note that an annual global quota of 6.9 million short tons had been in effect since November 30, 1978. However, this quota was not binding since actual imports were below 6.9 million tons. U.S. International Trade Commission (1982, pp. A-11, A-22). (Subsequently this source is referenced as USITC (1982)). U.S. Dept. of Agriculture, Economic Research Service, Sugar and Sweetener: Outlook and Situation, December 1983, p. 6. (Subsequently the various quarterly issues of this publication are cited as Sugar and Sweetener).

[2] The MSP is the sum of the support price and additional expenses, primarily transportation costs, e.g., to ship raw sugar from processing plants to refiners. This price is the USDA estimate of what is necessary to induce domestic processors and refiners to sell domestic sugar to the open market (as opposed to forfeiting domestic sugar to the Commodity Credit Corporation under the price-support program). USITC (1982, pp. A-6 and A-48).

[3] In the absence of the quota it was estimated that potential expenditures by the Commodity Credit Corportation under the domestic sugar support program would exceed $300 million as of May 12, 1982. U.S. Court of International Trade, United States Cane Sugar Refiners' Association v. John R. Block et al. Court No. 82-5-00643, p. 18.

[4] Prior to the introduction on the quota, imports were restricted by duties and fees on foreign-produced sugar. The world price of sugar was declining in early 1982, and by May the maximum possible duty and fee (the statutory ceilings) were unable to boost the domestic price above the MSP. If the world price of sugar recovers, it is possible that the quota would be replaced by duties and fees. However, under current regulations

(footnote continued)

While the quota was imposed because of the existing price-support program, we argue that the price-support program does not require a quota and we assume that a price-support program would continue if the quota were removed. Thus, we evaluate the additional welfare effects attributable to the quota alone.

The U.S. has considerable experience with sugar import quotas. For nearly 40 years, until the end of 1974, sugar imports were restricted by quotas. The effects of the old sugar quota program were studied by several economists. For example, D. Gale Johnson and Ilse Mintz[5] found that the quotas were a very costly way to restrict sugar imports. Therefore the recent action by the U.S. represents a failure to learn from past experience since it is a return to a form of trade policy that has been found to be both very costly for American consumers and for the economy as a whole.

We determine the costs of the present sugar import quota for fiscal year (FY) 1983 (i.e., October 1982 through September 1983). The cost to the U.S. economy, or social cost, is estimated at $251.6 million. The dominant portion of this cost is accounted for by quota rents captured by foreign countries, $238.4 million. The quota also imposes a cost on consumers. Real income of sugar consumers is estimated to fall by $735.2 million.

We also consider the effect of the quota on taxpayers and estimate the cost of the quota on consumers and taxpayers combined. Under a quota, growers receive the minimum level of receipts called for by the price-support program by means of the higher domestic price caused by the quota. We assume that, absent the quota, the government makes payments to growers to ensure they receive the same minimum level of receipts. The government payments impose a burden on taxpayers, who are substantially the same people as sugar consumers since sugar is consumed so widely. Therefore, the introduction of a quota eliminates the need for the government to make payments to growers and results in lower taxes. In other words, the cost of the quota to consumers can be adjusted downward to reflect a reduction in taxes when the quota is imposed. We estimate that the net cost of the quota to consumers and taxpayers combined, or the cost to consumers/taxpayers, is $251.6 million in 1983.

The quota has already been in effect for more than two and one-half years and it is likely it will continue for some time to come. If the quota remains in effect for four more years, the present value of the stream of future costs to consumers is $2.7 billion while the sum of discounted future social losses and costs to consumers/taxpayers is $912 million. This suggests that the potential benefits of doing away with sugar import quotas would represent a substantial gain to consumers and the U.S. economy.

Finally, it should be stressed that our estimates of the costs of the quota for FY 1983 are conservative estimates of the actual costs incurred. As explained below, in sections II-IV, our estimates are based on a long run analysis where the world

---

(footnote continues)

we do not expect this will happen. For a discussion of these issues see appendix 4.

[5] D. Gale Johnson (1974), Mintz (1973, chapter 4).

price is 15 cents a pound, which is substantially higher than the level that would have been observed in the absence of the quota. The actual world price in 1983 was only 9.4 cents. The true costs of the sugar quota are directly associated with the difference between domestic price and world price and therefore are expected to exceed the estimated costs presented in this chapter.

II. SUGAR QUOTAS AND THE PRICE-SUPPORT PROGRAM

To determine the welfare effects of the sugar quota it is first necessary to consider the relationship between sugar import restrictions and the domestic sugar price-support program.[6] We will estimate the effects of the quota assuming the essential feature of the price-support system is preserved. That is, we assume a certain level of domestic production and employment are ensured by guaranteeing growers a minimum price for their product.

Sugar appears to be distinctive among major domestic agricultural products in that the U.S. does not have an international comparative advantage in this commodity. As a result, the domestic sugar price-support program provides domestic producers with a higher price than the price of sugar on the world market.

To implement the price-support program the Administration has relied on import restrictions (tariffs and quotas) to keep the domestic price high enough to ensure that growers obtain a price at least as high as the support price. Under current law if we did not use import restrictions, payments to sugar farmers could only be maintained if the government purchased and stored the bulk of the domestic crop. (Existing statutes prevent the government from reselling the sugar domestically at prices below the support price.) However, such an approach would be so costly that we assume changes would be made either to permit the government to resell, without restriction, the sugar it purchases or to arrange a direct subsidy program. Except for transactions costs, which we do not consider in our analysis, the two approaches are identical.

III. A MODEL TO ANALYZE THE SUGAR IMPORT QUOTA

Figure 4.1 presents the model used to analyze the cost to consumers and the cost to the U.S. economy caused by the sugar import quota.[7] The model applies to the long run so that sufficient time is allowed for domestic and foreign producers to respond fully to market prices. This involves a period of two to four years to allow time for the planting and maturing of sugar

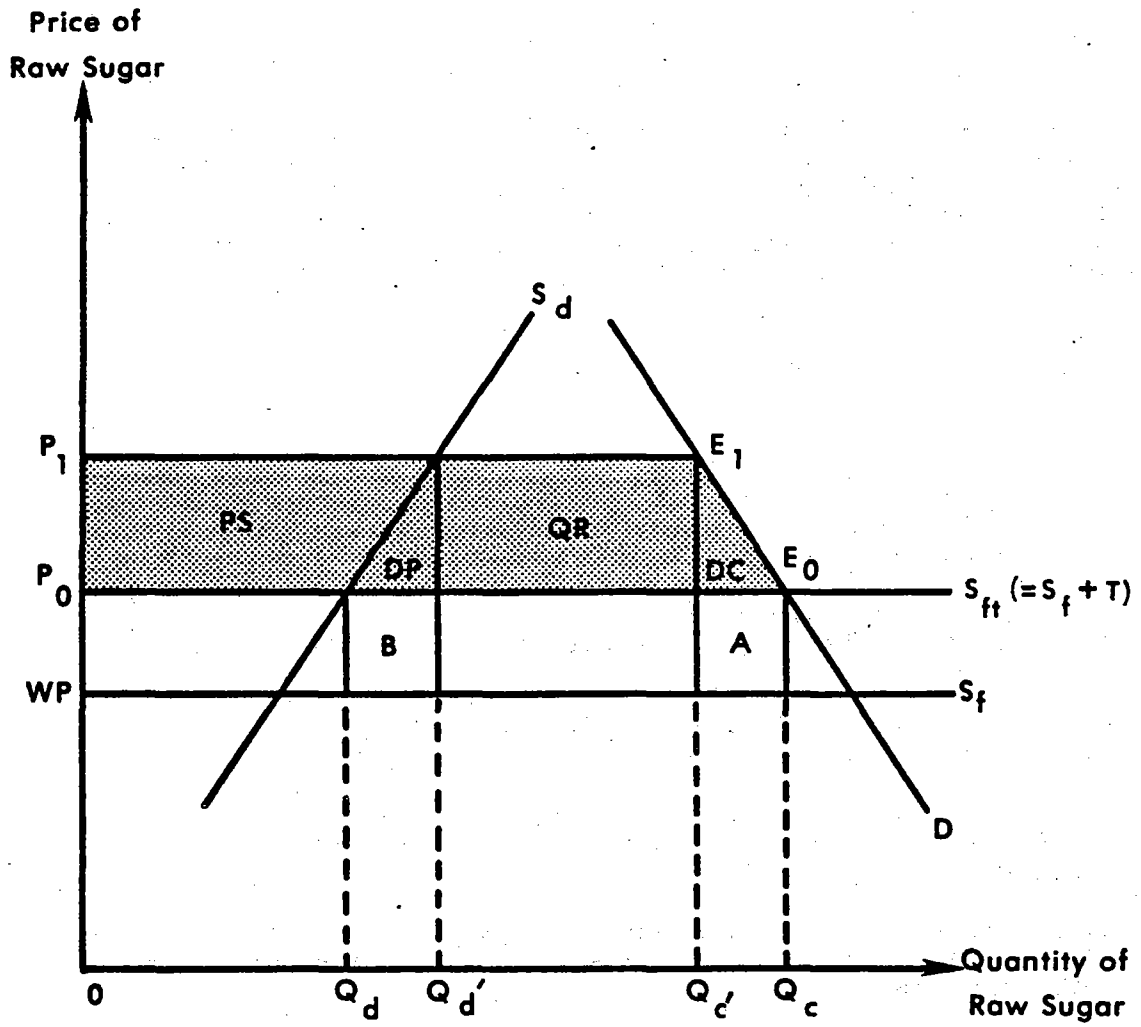
---

[6] This section draws on two reports by the U.S. International Trade Commission. USITC (1982, pp. A-56 to A-61) and USITC (1983, pp. A-3 to A-10. (Subsequently USITC (1983)).

[7] The general methodology underlying an analysis of import restrictions, including import quotas, is discussed in Morkre and Tarr (1980, chapters 2 and 3).

FIGURE 4.1

The Effects of a Quota on Sugar Imports



cane, and the possible construction of processing facilities.[8] It should be emphasized that the analysis does not apply to the short-run effects of the quota. In the short run (i.e., within a year) sugar supply is expected to be highly inelastic[9] so that the imposition or removal of a quota may cause the world price of sugar to change. In contrast, in the long run we expect that a U.S. quota will not affect the world price, which, as explained in section V, is based on costs of production.

There are three basic schedules in Figure 4.1: domestic demand (D), domestic supply (S_d), and the import supply curve (S_{ft}). The import supply curve is horizontal assuming that changes in the quantity of imports do not affect the world price (WP) of sugar. The basis for this crucial assumption is discussed in section IV. The import supply curve S_{ft} is the sum of the world price (indicated by line S_f in the diagram) and a unit tariff (T). The import duty is treated as a constant since our concern is with the effects of a quota.[10] Freight and handling charges for imports are included in the import supply curve, S_f, so that world price is the price of imported sugar delivered to the U.S.

As explained in the previous section, we assume that a domestic price-support program remains in effect if the quota is removed. To determine the incremental costs of the quota we need to explain what would happen with a price-support program based on a unit subsidy.[11]

A key feature of a unit subsidy is that it does not affect the domestic market price, which would be determined by the height of the import supply curve S_{ft} and would be equal to P_0. Domestic consumption at price P_0 is Q_c. However, because producers receive a unit subsidy of $P_1 - P_0$ the total price obtained by domestic producers is P_1.[12] Domestic production

---

[8] The supply response for sugarbeets is faster than for sugarcane. Sugarbeets are planted and harvested during the same crop year. However, sugarcane starts from shoots which grow from one to two years before harvesting starts. Harvesting then continues every one to two years until the yield declines sufficiently to warrant replanting (involving a period of from three to as much as 30 years after planting). Gemmill (1976, pp. 46 and 162).

[9] This is because planting decisions have been made for sugarbeets, and as explained in the previous note, sugarcane involves a longer lead time to increase production.

[10] As explained in chapter 1, because we do not estimate the welfare costs of the duty we underestimate the combined costs of the quota and duty.

[11] Alternatively, as noted earlier in section II, a price-support program based on a purchase and resale arrangement would yield the same result.

[12] That is, price P_1 is the delivered price of raw sugar including handling charges. We assume that internal transportation and handling charges are constant per unit so that the difference between domestic price levels shown on the vertical axis of Figure 4.1 (e.g., $P_1 - P_0$) equals the difference between prices received by growers.

would be Q_d'. Imports would equal the difference between consumption and domestic production, $Q_c - Q_d'$.[13]

A quota that restricts imports to $Q_c' - Q_d'$ causes the domestic market price to increase from P_0 to P_1. The higher price for sugar in the U.S. would reduce consumption to Q_c'.

The cost to consumers of the quota is the shaded area shown in Figure 4.1, quadrilateral $P_0P_1E_1E_0$. This area is the reduction in consumers surplus caused by the price increase and measures the loss in real income to sugar consumers.[14] In other words, sugar consumers lose real income because they must pay more for the sugar they continue to buy at the higher price and in addition consumers lose real income because of the reduction in quantity consumed.

The cost to the economy of the import quota is shown by two areas in the diagram. First, there is a consumption distortion effect, area DC. This measures the social value of the change in consumption from Q_c to Q_c'.[15] Second, the quota creates a quota rent, area QR. The quota rent is captured by foreign countries because of the way sugar import quotas are administered. The U.S. Department of Agriculture announced fixed country-by-country

---

13 If a purchase-resale arrangement were used instead of a unit subsidy, then the government would purchase all domestically-grown sugar at the support price corresponding to P_1, incur the internal transportation and handling charges (see note above)--so that total unit cost to the government is P_1--and resell it at the market price P_0. The effect on the quantity of domestic output is the same in both cases: domestic growers would obtain a price of P_1 and produce Q_d'.

14 The concept of consumer surplus is discussed in Varian (1978, pp. 207-215) and its usefulness in measuring changes in real income is analyzed by Willig (1976).

15 The consumption distortion shown in Figure 4.1 incorporates an adjustment for the U.S. Generalized System of Preferences (GSP) and the Caribbean Basin Initiative. The GSP gives duty-free treatment to some sugar imports from certain developing countries. In 1981, 26 percent of all sugar imports qualified for GSP. Sugar and Sweetener, May 1982, p. 26. The recently enacted Caribbean Basin Initiative gives duty free treatment to sugar imported from several countries in the Caribbean and Central American region (in particular, the Dominican Republic, Guatamala, and Panama). Sugar and Sweetener, September 1983, p. 7 and June 1983, pp. 10-11.

If duty were paid on all sugar imports, rectangle A in Figure 4.1 would also be part of the social gain from the increase in consumption resulting from the removal of a quota. It would represent part of the increase in tariff revenues from removal of the quota. On sugar receiving duty-free treatment, the would-be tariff revenue is transferred to the country from which the sugar is imported and represents a transfer of U.S. real income abroad. It is thus comparable to a quota premium in terms of the welfare effects and represents a social loss to the U.S. economy. As a result, if the reduction in sugar imports resulting from a quota is a reduction in duty-free sugar, there is no loss to the U.S. because of lost tariff revenues. Since we do not know what portion of a decrease in imports would have been subject to duties, we ignore this component of the consumption distortion entirely. This procedure will result in an underestimate of the consumption distortion from the quota.

import quota allocations for 24 countries.[16] Each of these countries is permitted to administer its shipments to the U.S. As a result, each of the countries has a monopoly on its quota allocation and obtains the quota rents.[17] Because these quota rents are transferred abroad, they represent a loss to the U.S. economy. The sum of consumption distortion and quota rents are the social cost to the U.S. of the import quota.

The diagram also identifies two other areas, PS and DP. These areas are not additional costs of the quota: they are costs of the program to maintain payments to sugar producers. The first cost is the production distortion effect, area DP. The production distortion reflects an inefficient use of domestic resources to produce additional sugar in amount of $Q_d' - Q_d$.[18] This is the production deadweight loss of the program. The second cost is the producers surplus, area PS. This reflects the increase in receipts to domestic producers in excess of the amount needed to attract more resources to supply the additional production of $Q_d' - Q_d$. The producers surplus involves a redistribution of income from taxpayers to domestic producers. Assuming the distribution effect is neutral, i.e., that the value of the loss of PS in income by taxpayers is matched by the value of the gain in receipts to domestic producers, it does not impose a social cost on the economy.

IV. THE IMPORT SUPPLY CURVE

An analysis of the effects of the sugar import quota depends crucially on the elasticity of the long-run import supply curve. If the elasticity of import supply is less than infinite, a restriction of imports will lower the cost of imports and can improve the welfare of the importing country.[19] However, we estimate that the long-run elasticity is at least 18 so that the

---

16 Sugar and Sweetener, May 1982, pp. 7 and 8.

17 Several economists have recognized the relationship between administrative control of a quota and the capture of quota rents (e.g., Mintz (1973, p. 17)). Note that foreign capture of all of the quota rents also requires the absence of monopsony power by U.S. importers. In 1983 there were 14 cane sugar refining companies in the U.S. The leading four firms accounted for 61 percent of industry refining capacity. Given this concentration ratio, number of companies, and the possibility that foreign countries (such as Brazil) could fill their quotas by shipping refined sugar instead of raw sugar, it is unlikely that domestic refiners possess significant monopsony power. Schnittker Associates (1983, p. A-14). (Subsequently Sugar Users Group Report)

18 Part of rectangle B should also be included as a social cost of a price-support program. However, by analogy to the reasons given in footnote 15, we ignore this element of social cost.

19 This is the terms-of-trade argument for tariffs and involves determining the "optimal" tariff. See for example Corden (1974, chapter 7). The same analysis can be applied to a quota with one significant caveat concerning the distribution of quota rents. If the quota rents are transferred to foreign countries (as we expect happens under the U.S. sugar quota--see section III), then the U.S. is worse off with the quota than with no quota. In (footnote continues)

U.S. is not expected to exert a significant influence on world price.[20]

Our import supply elasticity is based on econometric estimates of long-run supply elasticities for many foreign sugar producers, reported in Table 4.1. The note below explains the calculations, which give an elasticity value of 18.12.[21]

Moreover, our calculation understates the long-run import supply elasticity. As explained in footnote 21 the U.S. import elasticity depends on the supply elasticities of all foreign

---

(footnote continues)

contrast, if the quota rents were retained in the U.S. the optimal tariff argument is valid. Note that if the U.S. government auctioned the import quotas the quota rents would be retained by the U.S. (and also increase government revenue).

[20] Note that in the short run the import supply elasticity is expected to be low. Without a quota the U.S. would buy sugar on the so-called "free market" and pay the world price for sugar. Over a short period of time (e.g. less than one year) the supply of sugar for each producing country is highly inelastic [see notes 8 and 9, supra]. Similarly, the demand for sugar is also highly inelastic [evidence about demand elasticities is discussed in section V of the text]. Given a relatively fixed short-run world supply of sugar, if the U.S. expands imports, then the world price must increase to induce foreigners to curtail consumption and make sugar available to the U.S.

Morover, the short-run response by some countries to changes in the world price is limited by internal policies designed to subsidize sugar consumption or to support domestic producers. For example, Brazil has set domestic prices below the world price. See Johnson (1983). The governments of Australia, the Dominican Republic, and the Philippines have also set domestic sugar prices at the wholesale level (and also retail prices in the Philippines). This is reported in U.S. General Accounting Office (1979, p. 3). (Subsequently GAO (1979)).

[21] It is possible to derive a formula for the long-run import supply elasticity, $e_{m,s}$, which equals:

$$e_{m,s} = \sum_{i=1}^{n} [(e_{i,s})(Q_{i,s}) + (e_{i,d})(Q_{i,d})]/M_{us}$$

where: $e_{i,s}$ = long-run elasticity of supply in country i,

$e_{i,d}$ = long-run elasticity of demand in country i,

$Q_{i,s}$ = total sugar production of country i,

$Q_{i,d}$ = total sugar consumption of country i,

M_{us} = total quantity of imports by the U.S.

n = number of all countries, excluding the U.S., that produce or consume sugar.

The formula is based on an extension of a formula derived for the case of one exporter country by Landes and Posner (1981, p. 987).

(footnote continued)

TABLE 4.1

Long-Run Sugar Supply Elasticities for
Countries that Export Sugar to the United States

Country	(1) Average Annual Production 1975 to 1981 (thousands of short tons)	(2) Long-Run Elasticity of Domestic Supply
Argentina	1,671	1.48
Australia	3,453	0.96
Barbados	122	0.44(a)
Belize	103	0.44(b)
Bolivia	294	1.56(c)
Brazil	8,360	4.89
Canada	139	0.44(b)
Colombia	1,117	**
Congo	61	0.41(d)
Costa Rica	206	0.44(b)
Dominican Republic	1,258	**
Ecuador	348	1.56(c)
El Salvador	272	0.44(b)
Fiji	400	0.41(d)
Guatemala	481	0.44(b)
Guyana	354	0.44(a)
Haiti	59	0.44(b)
Honduras	153	0.44(b)
India	6,960	0.61
Ivory Coast	n.a.	0.41(d)
Jamaica	324	0.44(a)
Malagasy Republic	127	0.41(d)
Malawi	n.a.	0.41(d)
Mauritius	718	0.41(d)
Mexico	3,058	4.36
Mozambique	235	0.41(d)
Nicaragua	230	0.44(b)
Panama	197	0.44(b)
Paraguay	75	1.56(c)
Peru	866	0.27
Philippines	2,756	1.23
St. Christopher-Nevis	40	0.44(b)
South Africa	2,229	1.84
Swaziland	291	0.41(d)
Taiwan	342	0.97(e)
Thailand	1,748	2.48
Trinidad-Tobago	164	0.44(a)
Uruguay	107	1.56(c)
Zimbabwe	320	0.41(d)

TABLE 4.1--(Continued)

Notes: ** Assumed to be zero because estimated supply elasticity was not meaningful.

(a) Estimate for a group of countries in the West Indies.

(b) Estimate for a group of countries in Central and North America.

(c) Estimate for a group of countries in South America.

(d) Estimate for a group of countries in Africa and Oceania.

(e) Estimate for a group of countries in Asia.

Sources: (1) For foreign production, U.S. Department of Agriculture, Foreign Agricultural Service (1983) Reference Tables on Sugar Supply/Distribution for Individual Countries 1973/74-1982/83. The data are on a crop year basis, generally September to August. The production data are reported in metric tons and were converted to short tons.

(2) For long-run domestic supply elasticities in foreign countries, Ezriel M. Brook and Danuta Nowicki (1981) "An Econometric Forecasting Model of the World Sugar Economy," A report prepared for the World Bank, pp. 11-25.

producers. However, because of data limitations several nations that produce sugar are ignored in our calculation so that the true import elasticity exceeds 18.[22] For example, the potential influences of Angola, China (PRC), Columbia, Cuba, the Dominican Republic, Indonesia, and Kenya, are not considered. Note also that all these countries, except Cuba, can export to the U.S. While the U.S. has placed an embargo on Cuban sugar, Cuba is the world's largest sugar exporter and approximately one third of its exports (2.5 million tons) are to the free market. Thus Cuba is expected to have an important direct influence in the free market, and, as a consequence, Cuba also has an important indirect influence on U.S. import supply.

In conclusion, the long-run import supply of sugar is highly elastic so that changes in the quantity of U.S. sugar imports would not have a significant effect on the world price of sugar. Accordingly, the analysis of the U.S. import quota will assume that the import supply curve is horizontal.

V. THE LEVEL OF WORLD PRICE

With a horizontal long-run import supply curve the welfare effects of the import quota depend on the magnitude of the quota premium, which equals the difference between domestic and world prices of raw sugar, adjusted for the sugar duty and ocean

---

(footnote continues)

See also Tarr (1981, p. 5 of appendix C). The formula is obtained from the identity

$$Mus = \sum_{i=1}^{n} (Q_{i,s} - Q_{i,d})$$

by taking the partial derivative with respect to the world price (P_w) and multiplying the resulting equation by P_w/M_{us}.

This formula assumes that in the long run both producers and consumers in foreign countries respond to changes in the world price. However, many of these countries set internal prices to subsidize domestic consumption so that the second term in the brackets of the formula [i.e., $(e_{i,d})(Q_{i,d})$] does not apply to some countries (see the previous note.) Moreover, these terms are expected to be small because sugar demand is highly inelastic. For convenience we drop this term from the formula for all countries. However, we assume that production in all foreign countries is responsive, in the long run, to the world price. This means, for example, that where a country has long-term export contracts there is sufficient time for such contracts to expire (or to renegotiate the contracts).

Table 4.1 gives the data needed to apply the formula. The data are, however, limited to the 39 producing countries that are the leading exporters to the U.S. Each foreign country's contribution to the U.S. import supply elasticity equals column (2) times column (1) divided by the average annual U.S. imports during 1975 to 1981, 4.5 million short tons. [From U.S. Department of Agriculture, Foreign Agricultural Service (1983). (Supplement 2-83). (Subsequently FAS (1983))]. Contributions for all countries gives an estimated long-run import elasticity of 18.12.

22 FAS(1983, p. 13).

freight and handling.[23] For fiscal year (FY) 1983 the actual difference was 9.6 cents a pound. This is based on data from Table 4.2, which shows that in FY 1983 the domestic price was 21.8 cents while the world price was 7.9 cents. The sugar duty was 2.8 cents and ocean freight and handling were about 1.5 cents.[24] Thus, the delivered price of imported sugar was 12.2 cents. However, adopting a quota premium based on the 9.6 cent figure overstates the quota premium appropriate to our analysis. This is because short-run factors have depressed the world price during the past two years.[25]

The approach taken here is to estimate a world price based on long-run import supply conditions in order to estimate future costs of the quota and to be consistent with our discussion of the horizontal import supply curve, in section IV.

We estimate long-run world sugar price from FY 1983 information about production costs in four major sugar exporting countries. The four countries are Australia, Brazil, the Dominican Republic, and the Philippines. Collectively they accounted for about 54 percent of U.S. sugar imports between 1975 and 1981.[26]

The estimate is 15 cents and Table 4.3 presents the results. Column (4) gives the estimated production cost per pound of raw sugar for FY 1983. This column draws on production cost data for 1979 prepared by Landell Mills Commodities Studies, Ltd. The figures for FY 1983 were obtained by adjusting each country's

---

23 The quota premium is domestic price of raw sugar minus the sum of the world price, the sugar duty, and the ocean freight and handling charges.

24 The cost for ocean freight and handling was furnished by the U.S. Department of Agriculture.

25 Two short-run factors have contributed to the recent decline in world sugar prices. First, the imposition of the U.S. quota is expected to cause a short-term decline in the world sugar price. The quota, which became effective on May 11, 1982, reduced U.S. purchases from the world market. Table 4.2 shows that sugar imports dropped 28 percent between FY 1981 and FY 1982, from 4.881 to 3.525 million short tons. For FY 1983, imports of 3.158 million short tons were 35 percent below the FY 1981 level. Since sugar demand and supply are highly inelastic in the short run, the reduction in U.S. imports is expected to exert a negative impact on the world price.

Second, and more important, the surge in world sugar production in 1981 and 1982 is probably the principal reason for the recent decline in world sugar price. Table 4.2 indicates that there was a significant increase (14 percent) in world sugar production during the 1981 crop year, and the high 1981 production rate was sustained in 1982. [The crop year is from September to August]. Because sugar demand is highly inelastic there was a significant decline in sugar price, from 22.8 cents a pound in FY 1981 to 10.0 cents in FY 1982. Note also that the ratio of sugar stocks (at year end) to annual sugar consumption rose sharply, from 28 percent in 1980 to 41 percent in 1981, and to 49 percent for both 1982 and 1983. Stock/consumption ratios in excess of 40 percent are unusually high by historical standards. The world stock/consumption ratios for 1982 and 1983 are the highest ever achieved, based on available U.S. Department of Agriculture data, which go back to 1957.

26 Sugar and Sweetener, May 1982, p. 8.

TABLE 4.2

Sugar Prices, U.S. Sugar Imports and Exports, and World Production, Consumption, and Stock-Consumption Ratio

Fiscal Year	Price of Raw Sugar		U.S. Imports	U.S. Exports	World Production	World Consumption	End of Year World Stocks as Percent World Consumption
	Domestic Price	World Price					
	(---cents per pound---)		(thousands of short tons, raw sugar basis)				
1982/83	21.8	7.9	3,158	197	104,170	103,290	49.1
1981/82	18.8	10.0	3,525	300	111,100	101,200	49.3
1980/81	24.9	22.8	4,881	1,263	110,660	98,340	40.7
1979/80	25.0	23.4	4,717	440	97,350	97,350	28.5

Note: Both the domestic and world prices are quoted on the New York Coffee, Sugar, and Cocoa Exchange.

Note: The domestic price is the New York spot price (contract No. 12), c.i.f, duty and fee paid. The world price is f.o.b. Caribbean ports, including Brazil (contract No. 11).

Source: U.S. Department of Agriculture.

TABLE 4.3

Raw Sugar Production Costs in Four Countries

Country	(1) Raw Sugar Production Cost in 1979 (U.S. cents per lb.)	(2) Domestic Inflation Factor (from 1979	(3) Exchange Rate Depreciation Factor to Fiscal Year 1983)	(4) Estimated Raw Sugar Production Cost in Fiscal Year 1983 = (1)x(2)x(3) (------U.S.	(5) Ocean Freight and Handling Changes in 1982 cents per pound------)	(6) Estimated Production Cost plus Ocean Freight to the U.S. = (4)+(5)
Australia	11.02	1.448	0.8164	13.03	1.04	14.07
Brazil	12.25	13.932	0.0645	11.01	1.61	12.62
Dominican Republic	10.06	1.391	1.00	13.99	0.87	14.86
Philippines	11.14	1.558	0.7482	12.99	1.09	14.08

Notes: (1) It is assumed that the production cost increase in each country equals the increase in general prices, measured by the CPI, or the domestic inflation factor. The domestic inflation factor is the ratio of the CPI in fiscal year 1983 to the CPI in 1979.

(2) The exchange rate depreciation factor adjusts for the change in value of foreign currency relative to the U.S. dollar and equals the ratio of the U.S. dollar value of foreign currency in fiscal year 1983 to the U.S. dollar value of foreign currency in 1979.

Sources: 1979 raw sugar cost is from Landell Mills Commodities, Ltd.; the domestic inflation factor and exchange rate factor use data for the CPI and market foreign exchange rate reported in the International Monetary Fund, International Financial Statistics (various monthly issues); ocean freight and handling charges were calculated from data in U.S. Bureau of the Census, U.S. Imports for Consumption and General Imports, 1982, FT 246.

1979 unit cost for internal inflation and change in foreign exchange rate. Freight and handling charges are given in column (5) and are based on Bureau of Census data for imports in 1982. Column (6), which is the sum of columns (4) and (5), gives the estimated delivered cost of sugar imports to the U.S. before duty and in the absence of a quota. The delivered cost estimates range from 12.6 cents for Brazil to 14.9 cents for the Dominican Republic. We use the upper estimate and round up to 15 cents.

VI. THE COSTS OF THE SUGAR QUOTA

Figure 4.2 illustrates long-run demand and supply conditions for sugar in FY 1983. Based on this diagram we calculate the costs of the sugar import quota. The results appear in Table 4.4.

The import supply curve in Figure 4.2 (S_f) is horizontal at a level of 15 cents a pound (from section V above) where the 15 cent figure includes freight and handling charges to the U.S. The duty on sugar imports was 2.8 cents in FY 1983. Therefore, as explained in section III, in the absence of an import quota the domestic market price would be 17.8 cents. The actual domestic price in FY 1983 was 21.8 cents. Accordingly, the quota premium is 4 cents (= 21.8 - 17.8).

To determine the effect of the quota on domestic consumption we need to know the price elasticity of domestic demand. Previous studies have found that sugar demand is highly inelastic; econometric estimates suggest the price elasticity of demand is in the range -0.03 to -0.5.[27] We adopt, with qualification, a mid-value of -0.2, the same value chosen by Johnson (1974) in his earlier study of import quotas under the old sugar program. The qualification relates to the recent emergence of close substitutes for sugar, i.e., high fructose corn syrup (HFCS) in the 1970's and aspartame beginning in 1981.[28] However, we are not aware of any econometric studies that have been able to determine the impact of these relatively new substitutes on

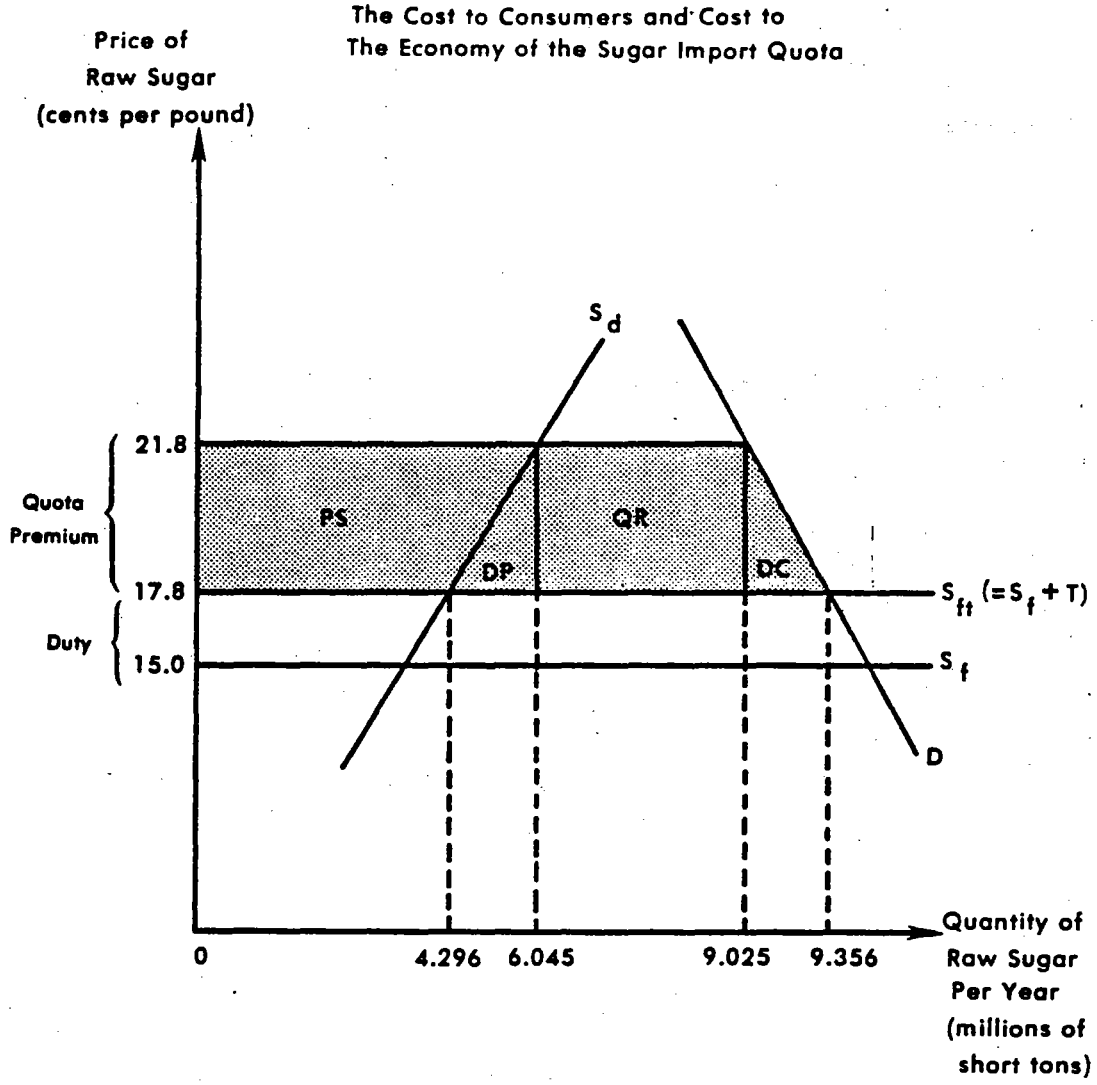
---

[27] Information obtained from Fred Hoff, Economic Research Service, U.S. Department of Agriculture.

[28] During the past decade, U.S. per capita consumption of all caloric sweeteners held steady, at about 122 pounds per person, but per capita consumption of HFCS increased from 0.7 pounds to 26.7 pounds. Most of the decline in per capita consumption of sugar over this period, from 102 pounds to 74 pounds per person, is explained by the increasing importance of HFCS. Aspartame is a new low-calorie sweetener that is about 200 times as sweet as sugar. Initially, aspartame is expected to substitute for saccharin, another low-calorie sweetener, but later also substitute for sugar. Sugar and Sweetener, September 1983, pp. 6,7, and 29.

FIGURE 4.2

The Cost to Consumers and Cost to The Economy of the Sugar Import Quota



Source: Bureau of Economics, Federal Trade Commission

TABLE 4.4

Estimated Annual Cost to Consumers and
Cost to U.S. Economy
of Import Quota on Sugar
(millions of 1983 dollars)

Cost to Consumers	735.2
Cost to Consumers/Taxpayers	251.6
Cost to U.S. Economy	
Consumption Distortion	13.2
Quota Rents	238.4
Total	251.6

Source: Bureau of Economics, Federal Trade Commission.

the long-run demand elasticity of sugar.[29] Available empirical estimates therefore probably understate demand elasticity. This implies that our calculation of the costs of the import quota will be too small because we underestimate the effect of removing the quota on sugar consumption.

Based on a price elasticity of -0.2 we calculate the impact on domestic consumption if the import quota is removed. Removing the quota eliminates the quota premium and domestic market price declines from 21.8 cents to 17.8 cents. The fall in domestic price increases domestic consumption slightly, by 331 thousand short tons, from 9.025 million to 9.356 million short tons.

Table 4.4 summarizes the annual welfare effects of the import quota in FY 1983. The cost to consumers is $735.2 million per year (the shaded area in Figure 4.2). In other words, annual income of sugar consumers would increase by $735 million if the quota is dropped. However, as explained below, the cost to consumers is subject to qualification because in our approach the introduction of a quota is accompanied by a reduction in taxes.

The cost to the economy has two components. The consumption deadweight loss is $13.2 million (triangle DC). The largest component of the deadweight losses is the quota rent, $238.4 million (area QR). The sum of both deadweight losses is $251.6 million. Thus, relaxing the import quota on sugar would increase national income by a quarter of a billion dollars per year.

Note that in our long-run case the import quota could be replaced by an "equivalent" tariff, that is, a tariff that yields the same domestic price and consumption produced by the quota. With the long-run world price at 15 cents, the U.S. would be able, under existing trade statutes, to impose a tariff (equal to the sum of a sugar duty and a sugar import fee) of 6.8 cents, which is the equivalent tariff in this case. For a discussion of this issue see appendix 4.

The estimated costs of the quota presented above are in addition to the costs due to a price-support program. Recall, from section II, we assume that the government's price-support program would take the form of a unit subsidy to domestic producers (or equivalently, that the government operates a purchase-resale program). The costs of such programs are comparatively small.

The cost to sugar consumers is zero because a unit subsidy does not affect the market price. The annual cost to the economy is $70.0 million. This is shown by area DP, which represents the

---

[29] We have learned of only two attempts to estimate the effect of corn syrups on the demand elasticity of sugar, but both efforts were confined to short-run effects: USITC (1983, pp. A-104, A-105) and Johnson (1980). The ITC attempted to estimate sugar demand including the price of HFCS, but because of multicollinearity did not obtain (and report) meaningful results. Johnson included the price of glucose corn syrup in his estimation of sugar demand. Glucose corn syrup is not as close a substitute to sugar as HFCS. However, Johnson found that the price elasticity of sugar was higher when he included glucose corn syrup price in his regression equation (-0.25 to -0.35) than when it was excluded (-0.10 to -0.28). This supports our view that the price elasticity we use (-0.2) is too low which means that our estimates of the costs of the quota are understated.

deadweight loss due to inefficient employment of domestic resources in expanding sugar production by 1.749 million short tons (= 6.045 - 4.296).[30]

In contrast to a quota, a unit subsidy imposes costs on taxpayers. With a subsidy the government pays sugar farmers 4 cents a pound [the difference between 21.8 cents 17.8 cents] for each pound of sugar grown. The resulting cost to taxpayers corresponds to the sum of areas PS and DP, which is $483.6 million per year. Area PS, $413.65 million, is producers surplus or the amount of excess receipts obtained by U.S. sugar farmers.[31]

Since sugar is so widely consumed and taxes are collected from so many people, it is likely there is a considerable degree of overlap between sugar consumers and taxpayers. If sugar consumers and taxpayers are substantially the same group of people, then the cost to consumers caused by an import quota (as discussed earlier) requires qualification. From the standpoint of what we will term consumers/taxpayers, the simultaneous introduction of a quota and elimination of a unit subsidy produces opposite effects. On the one hand, the quota raises price and imposes a cost to consumers of $735.2 million. But cancelling the subsidy reduces government outlay and saves taxpayers $483.6 million. The net effect is a cost to consumers/taxpayers of $251.2 million, which is shown in Table 4.4. Note also that the cost of the quota to consumers/taxpayers is exactly the same as the cost of the quota to the economy. This result follows from inspection of Figure 4.2 since cost to consumers (areas PS + DP + QR + DC) less cost to taxpayers (areas PS + DP) leaves a net cost (areas QR + DC) which, as explained earlier, is the social cost of the quota. Intuitively, the cost to consumers/taxpayers adjusts for transfers of income resulting from the price increase caused by the quota and yields a net cost which is the cost to the economy.

Finally, the estimated costs of the quota, presented in Table 4.4, are expected to be less than the actual costs that were incurred in FY 1983. This is because the estimates in Table 4.4 are based on a long-run world price of 15 cents per pound, but the world price relevant to determinnig the actual costs in FY 1983 is considerably lower. To calculate the actual costs we need to know what the world sugar price would have been in the absence of the quota. The actual world price was 9.4 cents per pound, but this level includes the negative short-run impact of the quota. In the short-run, before foreign producers can fully respond, the import supply curve facing the U.S. is expected to

---

30 The calculation of the production deadweight loss requires an elasticity of domestic supply. In contrast to a number of studies of demand elasticity there is limited information about domestic supply elasticity. We rely on an important study, by Gemmill (1977), who estimated separate long-run supply elasticities for domestic sugarbeets (+1.74) and domestic sugarcane (+1.57). These two estimates are used here because they reflect differences between the technology and production conditions for sugarbeets and sugarcane, differences which suggest that the long-run supply elasticities for the two crops are not the same. Gordon Gemmill (1977, pp. 609-618).

31 Area PS in Figure 4.2 includes the addition to domestic supply from a decline in sugar stock of 230,000 short tons for FY 1983. That is, producers surplus for FY 1983 domestic production of 5,815,000 short tons is $395.2 million.

be upward sloping so that changes in U.S. purchases from the free market will affect world price. The quota reduced U.S. imports and therefore lowered the world price. However, it is unlikely that the world price in FY 1983 would have been as high as 15 cents per pound in the absence of the quota. Before the quota was introduced, in the last three months of 1981, the average world price was 13.9 cents.[32] Moreover, there was strong downward pressure on the world price in 1981 and continuing into 1982 owing to excess world supply (see Table 4.2). Therefore the world price relevant to the calculation of the quota's costs in FY 1983 was substantially below 15 cents and, as a consequence, our cost estimates for that year are conservative estimates.

VII. THE PRESENT VALUE OF THE COSTS OF THE QUOTA

The present value of the costs of the sugar import quota are summarized in Table 4.5. The results are based on a quota premium of 4 cents a pound.

The longer the import quota is retained the greater are the costs to consumers and the waste to the U.S. economy. If conditions depicted for year one prevail in future years the costs of the quota continue into the future. The present values of these costs for future years are shown in Table 4.5 (based on a social rate of discount of 7 percent).

If the quota remains in effect for four years, the present value of the cost to consumers is $2.66 billion. If the quota remains in effect for twenty years the present value of the cost is $8.33 billion.

The sum of the discounted cost to the U.S. economy and the cost to consumers/taxpayers for the first four years is $912 million. Thus, if the import quota is kept in place for four years the present value of lost real national income approaches $1 billion. If the quota is retained for twenty years, the present value of the loss in real national income is $2.85 billion.

VIII. CONCLUSION

The U.S. import quota on sugar was imposed during a period of declining world prices to forestall an increase in federal government outlays to defend the sugar price-support program. To evaluate the cost to consumers and the cost to the U.S. economy of the quota it is necessary to consider the constraint imposed by the domestic price-support program. We assume the essential feature of the price-support system is preserved -- a minimum payment to sugar growers -- but believe that the system would be changed to either a unit subsidy scheme or to a government purchase program that allows resales at market price. The basis for this assumption is that if there were no quota, then under current statutes, the government would be required to operate a

---

[32] We use world price data for the fourth quarter of 1981 because the sugar duty and fee were unchanged for virtually the entire three month period. A change in the duty or fee change is expected to cause an inverse short-run impact on the world price. Between December 23, 1981 and April 21, 1982, duties and fees were increased on four occasions. USITC (1982, pp. A-63 to A-68) and USITC (1983, p. A-50).

TABLE 4.5

Present Value of Estimated Current and Future Costs of the Sugar Quota

Year	Cost to Consumers	Cost to U.S. Economy and Cost to Consumers/Taxpayers
	(----------millions of 1983 dollars----------)	
1	735.2	251.6
2	687.1	235.1
3	642.2	219.8
4	600.1	205.4
Sum over four years	2,664.6	911.8
Sum over twenty years	8,334.2	2,852.1

Note: The costs shown for year 1 are based on conditions for fiscal year 1983. These conditions are assumed to prevail in all future years. After year 1 the costs were discounted by 7 percent to find present values of future costs.

Source: Bureau of Economics, Federal Trade Commission.

purchase-stockpiling arrangement whose costs would be so great that the government would opt for a much cheaper subsidy scheme or a purchase-resale program.

Under this assumption we estimate that in FY 1983 the cost of the quota to consumers was $735.2 million while the cost to the U.S. economy and to consumers/taxpayers was $251.6 million. A major component of both of these costs is quota rent, which equals $238.4 million. The quota rent represents a transfer of real income from the U.S. to foreign countries that export sugar to the U.S.

A conservative approach is used to estimate the costs of protecting the domestic sugar industry. We have, for example, adjusted upward the world price to reflect a long-run level of the world price. The world price used in our analysis is 15 cents per pound of raw sugar while the actual level of the world price in FY 1983 was 9.4 cents. While this approach understates the social cost of the quota in FY 1983, it provides a more plausible benchmark to assess the future costs of the quota.

If the quota remains in effect for four years the present value of the cost to consumers is $2.66 billion and the present value of the cost to the economy and to consumers/taxpayers amounts to $912 million. Over twenty years, the present value of the cost to consumers is $8.33 billion while the discounted value of the social cost and the cost to consumers/taxpayers increases to $2.85 billion.

These calculations indicate that the costs of the present quota program are a high price to pay for assisting the domestic sugar industry. Assuming that the industry is deserving of a price-support program it is possible to cancel the quota and shift to a subsidy arrangement or a purchase-resale program to assist sugar producers and save $251.6 million per year in real national income.

Moreover, even if a quota must be imposed the present quota program imposes unnecessary costs on the U.S. economy. The principal component of the social cost of the quota is quota rents. A different quota system is possible which achieves the same domestic price and production as the current quota system but which avoids the quota rent loss to the U.S. This is a system that gives import quota rights to domestic firms, either directly or by means of an auction mechanism. In the latter case the U.S. government obtains additional revenue. With a direct allocation to U.S. firms they obtain the quota rents. While the auction mechanism may be preferable on several grounds (e.g., administrative convenience, avoidance of wasteful rent-seeking activities as individuals attempt to influence government officials and legislators), in either case the cost to the economy of the import quota declines by $238.4 million per year. The consequence of adopting such a policy would be a decline in the real cost of a sugar quota from $251.6 million per year to $13.2 million. While no effective quota is costless to the economy, the present quota system is distinctive in that it is probably the most costly import restriction system possible.

APPENDIX 4

A QUOTA VERSUS AN EQUIVALENT TARIFF
ON SUGAR IMPORTS IN THE LONG RUN

The estimates for the cost of the sugar quota presented in this chapter are based on a long-run analysis where the world price of raw sugar is 15 cents per pound. However, if the world price were at this level it would be possible, under existing statutes, for a tariff to be levied (called the "equivalent tariff") that would yield the same domestic price and quantity of imports produced by the quota. The cost to the economy of an "equivalent tariff" is much smaller than that of a quota since the tariff recaptures for the U.S. the scarcity rents lost to foreign countries under the quota. This appendix considers the role tariffs have played in restricting sugar imports and examines why an equivalent tariff could not replace the quota with current regulations, given that the world price is 15 cents per pound.

Prior to the introduction of the sugar import quota, in May 1982, the Administration relied on a policy of setting sugar duties and fees to maintain domestic prices above the "market stabilization price" (MSP).[33] When the domestic price is above the MSP, growers earn more by selling sugar to the market as opposed to surrendering sugar to the Commodity Credit Corporation at the support price.

This policy was successful as long as the world price was not too low. There are statutory limits on the duty and fee. The maximum duty permitted under the Trade Expansion Act of 1962 is 2.8125 cents per pound. Under section 22 of the Agricultural Adjustment Act, the fee cannot exceed 50 percent ad valorem.

In early 1982, world price declined to such an extent that the statutory ceilings for the duty and fee were insufficient to raise the domestic price above the MSP. After April 23, 1982, the domestic price dropped below the MSP. Since there was an excess supply of world sugar, so that a recovery in world sugar prices was not imminent, the government was faced with the prospect of a substantial outlay to acquire domestic sugar surrendered to the CCC. To forestall this drain on federal revenues, the Administration adopted a global import quota to boost the domestic price.

It may appear that this quota is a temporary reaction to a temporarily low level in the world price of sugar and that the quota will be eliminated as the world price rises enough to permit the domestic price to be held up to the MSP level with the duty and the fee. For example, this is view of James Truran, former Head of the Sugar Group, U.S. Department of Agriculture.[34] However, as explained below, as long as the fee on imported sugar

---

33 MSP is described in note 2 supra.

34 Statement by Truran on November 1, 1983 at the follow up session on Sugar and Sweeteners of the 1984 Agricultural Outlook Conference. Note also that when the old sugar quota was created in 1934 (by the Jones-Costigan Act) it appears there was widespread belief that the quota would be temporary. However, that quota persisted until 1975. See Gerber (1976, p. 110).

is determined according to current regulations the quota will persist for some time to come.

When the quota was announced, the Administration also revised the procedure to determine the section 22 fee.[35] Before May 5, 1982, the fee was based on the difference between the MSP and the sum of (1) the world price (f.o.b. Greater Caribbean ports)[36], (2) the duty on sugar, and (3) the cost of importing sugar from the Caribbean to North Atlantic ports (e.g., including freight and insurance costs). Thus, if the world price were below the MSP by an amount that exceeded the duty plus the cost of importing, then the fee would be positive.

However, since May 5, 1982 the fee has been based on the difference between the MSP and the domestic price of sugar. This is a major change and implies that the quota will remain necessary in our long-run case, discussed in the text, where the world price (including freight and charges to the U.S.) is 15 cents. This occurs because the current procedure to determine the fee implies that the fee will be zero when the quota is in place. And, as long as the fee is zero, the world price of sugar plus the duty and the fee will be below the MSP, so that the quota remains necessary to avoid government purchases of large quantities of sugar.

The reason that the fee is expected to equal zero under current regulations and in the presence of the quota is that the quota determines the domestic price. Assuming the Administration selects the correct level of imports to avoid forfeitures of sugar to the CCC, the domestic price will equal or exceed the MSP. When the domestic price equals or exceeds the MSP, the regulations call for a fee of zero. Indeed, the fee declined after May 1982, and has remained zero since October 1982.

---

35 The USITC (1982, pp. A-8 to A-10, A-72, A-73, and A-78 to A-82) discusses the change in the procedure to calculate the fee and contains the Presidential Proclamations that announced and defined the old and new procedures.

36 This is the world spot price, or Number 11 price.

Brook, Ezriel M. and Danuta Nowicki (1981), "An Econometric Forecasting Model of the World Sugar Economy," A Report prepared for the World Bank, mimeo.

Corden, W.M. (1974), Trade Policy and Economic Welfare, Oxford University Press.

Gemmill, Gordon (1977), "An Equilibrium Analysis of U.S. Sugar Policy," American Journal of Agricultural Economics, 59(4), pp. 609-618.

_____ (1976), "The World Sugar Economy: An Econometric Analysis of Production and Policies," Doctoral Dissertation, Michigan State University.

Gerber, David J. (1976), "The United States Sugar Quota Program: A Study in the Direct Congressional Control of Imports," Journal of Law and Economics, 19(1), pp. 103-147.

Johnson, D. Gale (1974), The Sugar Program: Large Costs and Small Benefits, American Enterprise Institute.

Johnson, Frederick I. (1983), "Sugar in Brazil: Policy and Production," Journal of Developing Areas, 17, pp. 243-256.

_____ (1980), "Confidence Bounds on Equivalent Variation: The Consumption Cost of U.S. Sugar Policy 1975-1979," mimeo.

Landes, William M. and Richard A. Posner (1981), "Market Power in Antitrust Cases," Harvard Law Review, 94(5), pp. 937-996.

Mintz, Ilse (1973), U.S. Import Quotas: Costs and Consequences, American Enterprise Institute.

Morkre, Morris E. and David G. Tarr (1980), Effects of Restrictions on United States Imports: Five Case Studies and Theory, A Bureau of Economics Staff Report to the Federal Trade Commission, USGPO.

Schnittker Associates (1983), Sweetner Markets and Policies--The 80's: An Analysis and Compendium of Facts, A Report prepared for the Sugar Users Group.

Tarr, David G. (1981), "Assessing Anticompetitive Impacts in International Antitrust Cases," mimeo.

U.S. Court of International Trade, United States Cane Sugar Refiners' Association v. John R. Block et. al. Court No. 82-5-006-00643.

U.S. Department of Agriculture, Economic Research Service, Sugar and Sweetner, Outlook and Situation (Quarterly).

U.S. Department of Agriculture, Foreign Agricultural Service (1983), Reference Tables on Sugar Supply/Distribution for Individual Countries 1973/74- 1982/83, Supplement 2-83.

U.S. General Accounting Office (1979), Sugar and Other Sweetners: An Industry Assessment, A Report to the Congress by the Comptroller General of the United States.

U.S. International Trade Commission (1983), Certain Articles Containing Sugar: Report to the President on Investigation No. 22-46 Under Section 22 of the Agricultural Adjustment Act, USITC publication 1462.

U.S. International Trade Commission (1982), Sugar: Report to the President on Investigation No. 22-45 Under Section 22 of the Agricultural Adjustment Act, USITC publication 1253.

Varian, Hal R. (1978), Microeconomic Analysis, Norton.

Willig, Robert D. (1976), "Consumer's Surplus Without Apology," American Economic Review, 66(4), pp. 589-597.

CHAPTER FIVE

TEXTILES

I. INTRODUCTION

The United States has imposed quotas on imports of textile and clothing products for more than 25 years. The import quotas have kept American consumers from obtaining "textiles" (including textile and clothing products) from the lowest cost sources and have artificially inflated prices in the U.S. The size of the consequent costs to the United States has been difficult to assess because quotas usually mask the extent to which prices of imports would fall if they were eliminated. However, new data have recently become available which make it possible to estimate the costs to the U.S. economy and to consumers of the quotas imposed on one large foreign supplier, Hong Kong.[1]

Several earlier studies have attempted to estimate the welfare costs resulting from all import quotas on textiles (for all countries).[2] However these efforts were unable to obtain all the necessary data and therefore the resulting estimates of costs are best regarded as rough approximations. The essential problem is that an effective quota creates a difference or gap between foreign unit cost and price paid by importers and, hitherto, information about the size of the gap has been scanty.[3] The size of this price-cost gap provides the key element to estimate the costs of a quota.

The central feature of the methodology adopted in this chapter is that the price of rights to export textiles from Hong Kong (also called quota prices) measures the gap between import price and unit cost in Hong Kong. This can be assumed since textile quotas are openly traded in Hong Kong so that the market

---

[1] The present chapter is based on a 1984 report by Morkre, Import Quotas on Textiles: The Welfare Effects of United States Restrictions on Hong Kong, a Bureau of Economics Staff Report to the Federal Trade Commission, USGPO. Subsequently, this work is referenced as Import Quotas on Textiles.

[2] Ilse Mintz (1973), U.S. General Accounting Office (1974), and U.S. Council on Wage and Price Stability (1978).

[3] The estimation of the costs of textile quotas in the present chapter depends crucially on two recently released data sets for prices of quota rights in 1980, one by the Hong Kong Government and the other by a group of U.S. importers and retailers. As far as can be determined this is the first time a large number of observations for prices of quota rights for export of textiles to the U.S. has been available.

price for transfers is expected to reflect the value of the price-cost difference.[4]

The results obtained in this chapter are for the year 1980 and concentrate on nine clothing product categories from Hong Kong.[5] The nine products are listed in Table 5.1, which also gives average quota prices and other data for the products. The relative significance of quota prices is given in column 3, which reports quota price (in U.S. dollars) as a percent of import price. The import price is the amount paid by U.S. importers and includes the quota price. For four products quota prices exceed 20 percent of import price. This suggests the quota has a significant effect on prices paid by U.S. importers and, subsequently, U.S. consumers.

Import quotas for these products are estimated to impose an annual social cost on the U.S. economy of between $308 and $488 million in 1980. A major component of the social cost is the economic rent created by the quotas that represents a transfer of real income from the United States to Hong Kong. Quota rents are $218 million. The cost to consumers of the quota is estimated to range between $318 million and $420 million.

The range for costs is based on two estimates for the elasticity of substitution between Hong Kong and United States textiles, 1.41 and 4.39. The costs of the quotas are positively related to the elasticity of substitution: for higher elasticities more imports would enter the U.S. if the quotas are eliminated.

The effects of the quotas on U.S. employment in the domestic clothing and textile industries are comparatively small. If the quotas were removed, we estimate that additional imports would reduce domestic employment in these industries by 8,900 to 32,400 workers and involve a cost of unemployment ranging from $17 million to $61 million.

There is an important difference between the benefits and costs of terminating the quotas. If the quotas were eliminated the benefits, representing increased national income and reduction in costs to consumers, would continue year after year, indefinitely. However, most of the unemployment costs would

---

[4] The use of prices for quota rights as a measure of the import price-foreign unit cost gap is not new. Jenkins (1980) adopted this approach in his study of the welfare effects of Canada's import quotas on textiles, and the Consumers' Association (1979) in the United Kingdom used quota prices in their survey of the effects of the U.K.'s textile import quotas. The present paper therefore extends the use of quota-rights prices to assess the effects of U.S. quotas.

[5] While the U.S. imposes import quotas on 22 countries it is important to single out Hong Kong because it is the largest foreign supplier of textile products to the U.S. In 1980, imports from Hong Kong accounted for 22.1 percent of total textile imports. Textile exports from this Far East supplier are restrained by a bilateral agreement concluded under the umbrella of the Multifiber Arrangement (MFA). The MFA dates from 1974 and is an international arrangement among major textile exporting and importing countries. Initially established for a four year term, the MFA has been twice renewed, most recently at the end of 1981, for a four year and seven month term. Under the MFA the United States has concluded a succession of multi-year bilateral agreements with Hong Kong. The current six-year agreement was ratified in July, 1982 and expires on December 31, 1987.

TABLE 5.1

Quota Price, Import Price and Total Value of Imports for Textile Import Products from Hong Kong that Faced Effective Quotas in 1980

Quota Category		(1) Average Quota Price	(2) Import Price (unit value) of imports	(3) Average Quota Price as Percent of Import Price	(4) Value of Imports
		(U.S. dollars per piece)			(millions)
333/334:	Cotton Coats	$1.30	$10.68	12.2%	$18.2
335:	Cotton Coats, Mens and Boys (MB)	3.34	12.33	27.1	46.7
338/339:	Cotton Knit Shirts and Blouses	0.26	2.80	9.3	124.0
340:	Cotton Shirts, not Knit, Mens and Boys (MB)	0.42	3.66	11.5	109.9
341:	Cotton Blouses	0.06	3.44	1.7	77.5
345:	Cotton Sweaters	1.67	6.11	27.3	22.6
347/348:	Cotton Trousers	1.73	5.26	32.9	391.0
445/446:	Wool Sweaters	3.34	7.22	46.3	115.1
641:	Man-Made Fiber (MMF) Blouses, not Knit, Womens, Girls and Infants (WGI)	0.85	5.41	15.7	48.3
Total Value of Imports Subject to Effective Quotas					$953.3

Note: Quota categories are defined by the U.S. Dept. of Commerce, Office of Textiles.

Sources: (1) Average quota prices are from Import Quotas on Textiles, appendix D, Table D-2.

(2) Value of imports are from U.S. General Imports of Cotton Manufacturers, Agreement Category by Country of Origin and TSUSA Number by Country of Origin, and U.S. General Imports of Textile Manufacturers, Except Cotton, Agreement Category by Country of Origin and TSUSA Number by Country of Origin, U.S. Dept. of Commerce, Office of Textiles (Nov. 1981).

(3) Import price or unit value of imports derived from (2) and Major Shippers Report, Category and Country, U.S. Cotton, Wool and Man-made Fiber Textile and Apparel General Imports, U.S. Dept. of Commerce, Office of Textiles.

occur over a short period, less than a year, and would end once the workers displaced by the additional imports found new jobs. If 1980 conditions continue over twenty years the present values of the net benefits to the economy would range from $3.5 to $5.5 billion while net benefits to consumers would be between $3.6 and $4.7 billion. Since the quotas have been in effect for many years the present value calculations suggest that these import restrictions have been very costly to the U.S., much more costly than the cost estimates for one year alone.

II. THE MODEL TO ESTIMATE THE COSTS OF THE TEXTILE QUOTAS

The model used to estimate the costs of the import quotas on Hong Kong's textiles is illustrated in Figure 5.1. Before explaining the details of the model it should be mentioned that textile imports from Hong Kong are restricted by tariffs in addition to quotas. However, the focus in this study is on the additional costs due to the quotas, and it is thus important to distinguish between the effects of tariffs and quotas.[6]

In Figure 5.1 the U.S. import demand curve (D) for a particular textile product is assumed to have an inverse relationship between price and quantity. Even though there may be a high degree of substitutability between a Hong Kong product and similar products produced by other countries, the demand curve D is not completely elastic. Moreover, the magnitude of the costs caused by a quota is directly related to the elasticity of import demand. Given the artificial increase in price caused by the quota, the greater the elasticity the larger is the increase in imports if the quota is removed.

The supply curve S is horizontal in the relevant range based on the assumption that firms in Hong Kong can readily expand textile exports to the United States. Entry into textiles, particularly clothing manufacturing, is relatively easy. The physical requirements -- some sewing machines and factory space -- are modest and further, since there are more than eleven thousand textile and apparel establishments in Hong Kong, economies of scale would not appear to be significant.[7] Given easy entry into an industry that does not appear to have any important specific

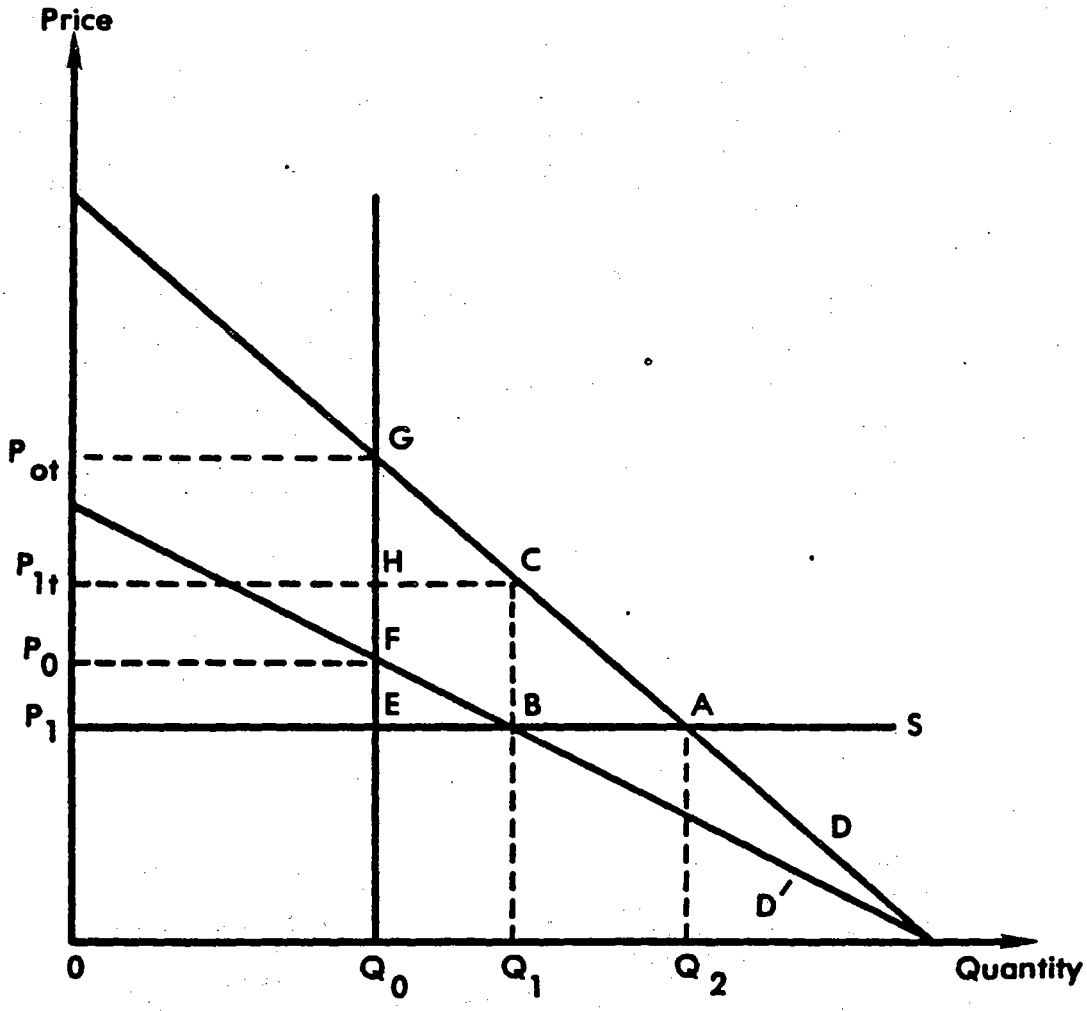
---

[6] While this chapter is concerned with the effects of quotas it should be emphasized that tariffs on apparel are significant and have been found to impose substantial costs. As explained in chapter 1, the benefits of removing the tariffs on textiles are not included in the results given in chapter 2. In an earlier Staff Report it was found that the average tariff on apparel is very high, 27 percent ad valorem, and the consumption deadweight losses that tariffs cause were estimated at $406 million in 1977. See Morkre and Tarr (1980, chapter 8).

[7] In 1977 there were 11,671 textile and clothing establishments. Hong Kong Monthly Digest of Statistics, May 1979.

FIGURE 5.1

The Welfare Costs of Textile Import Quotas



factors, the industry's total supply curve would be virtually horizontal.[8]

Under conditions of free trade, equilibrium occurs at point A. Price paid by importers equals Hong Kong's supply price (ignoring transportation costs) and import quantity is Q_2.

It is convenient next to introduce a tariff. The effect of an ad valorem tariff can be depicted by rotating, counter-clockwise, the import demand from D to D'. At any quantity, the vertical distance between the two demand curves divided by price shown on demand curve D' equals the percent tariff rate. Curve D' is the net import demand (allowing for the tariff) facing Hong Kong. With the tariff, equilibrium on curve D shifts to point C. The tariff raises the total price per unit paid by importers to P_{1t}: P_1 to Hong Kong suppliers and $P_{1t} - P_1$ to the U.S. government for the tariff. The quantity of imports falls to Q_1.

The reduction in imports as a result of imposing the tariff and the increase in price paid for imports (tariff inclusive) imposes a cost on consumers shown by quadrilateral CAP_1P_{1t} and causes a deadweight social loss shown by triangle ABC. The cost to consumers equals the reduction in consumers' surplus and represents the loss in real income suffered by textile consumers.[9] Consumers lose income because they pay more for the units they continue to purchase after the tariff is levied and, in addition, they also incur a loss equal to the difference between the value they place on textile products they do not purchase after the price is increased by the tariff and the pre-tariff price of these textiles.

The deadweight loss, or cost to the U.S. economy, of the tariff equals the cost to consumers less the increase in government revenue yielded by the tariff,[10] because the tariff involves a distribution effect in the amount of the tariff revenue collected, rectangle CBP_1P_{1t}. Assuming the distribution effect is neutral -- the decline in welfare of textile consumers (who pay the duties to the government) equals the gain in welfare of the individuals who benefit from the government's additional revenue -- then there is no net loss to the economy from the

---

[8] There is a further qualification about the supply curve with a quota. For the supply curve to be horizontal it is also necessary for quota to be transferable among firms. Otherwise, if quotas are assigned to a given number of Hong Kong firms and not transferable, then when each of the firms has a "U-shaped" cost curve the market supply curve will be positively sloped. With transferability of quota, competitive forces will induce quotas to be reallocated among firms (including firms without quota) with the result that all firms produce at minimum average cost and giving a horizontal market supply curve. For an elaboration of this point see Corden (1971, p. 201f).

[9] Robert Willig (1976) has shown that the change in consumer surplus is a valid measure of the change in real income.

[10] The deadweight loss does not need to be adjusted for a change in producers surplus. As explained in section V below, the supply curve of the domestic industry is horizontal in which case there is no change in producers surplus.

redistribution of income.[11] The net cost to the economy is triangle ABC.

Given the tariff, when a quota is imposed there may be additional adverse welfare effects. This depends on whether the quota is effective, that is, whether the quota would reduce imports further. The tariff already reduces imports from Q_2 to Q_1. A quota larger than Q_1 is redundant. However, a quota smaller than Q_1 (e.g., Q_0) is effective because imports are restricted to a lower level than would occur with the tariff.

If a quota in the amount Q_0 is imposed in addition to the tariff, equilibrium shifts to point G. Price increases from P_{1t} to P_{ot}. This quota therefore causes additional costs.

The quota causes an additional cost to consumers shown by quadrilateral $CGP_{ot}P_{1t}$ in Figure 5.1. This is the additional loss in consumers' surplus. Following the procedure explained above for a tariff, the additional deadweight loss equals cost to consumers less the change in government revenue. The new tariff receipts with the quota is based on price P_0, which is found on the net import demand curve D' for quantity Q_0. The price received by Hong Kong exporters increases from P_1 to P_0 because Hong Kong administers the quota and a large number of U.S. firms compete to import textiles. Accordingly, the change in government revenue equals new tariff receipts, rectangle $FGP_{ot}P_0$, minus old tariff receipts, rectangle $BCP_{1t}P_1$.

Note that since the ad valorem tariff rate is a constant percentage the change in government revenue can be positive or negative depending on the elasticity of import demand. If import demand is elastic (inelastic) the imposition of the quota leads to a fall (increase) in spending on imports and in tariff receipts. Therefore, the social cost of the quota is greater than the cost to consumers when import demand is elastic.

The deadweight loss of the quota can be shown to equal the sum of rectangle EFP_0P_1 plus area BCGE.[12] These areas can be explained as follows.

The economic rents created by the quota are shown by rectangle EFP_0P_1. The rents are transferred from the U.S. to Hong Kong and, therefore, are a deadweight loss to the U.S. Individuals in Hong Kong obtain the rents because, as noted above, Hong Kong administers the quotas. The price obtained by Hong Kong exporters is P_0 while unit cost remains P_1 since the Hong Kong supply curve is horizontal. The rents equal the product of the quota quantity, Q_0, times the unit rent obtained by Hong Kong firms, $P_0 - P_1$.

Quadrilateral BCGE is also a loss in real U.S. income and represents the additional consumption inefficiency or value of

---

[11] This ignores the administrative costs incurred by the government in collecting the tariff and redistributing the revenues. It also ignores resources used for rent seeking to capture the benefits of the added government revenue. The possible effects of rent seeking are analyzed in Bhagwati and Srinivasan (1980). Also see Tullock (1967).

[12] This follows from inspection of Figure 5.1. That is, social cost equals additional cost to consumers minus change in tariff revenue, or $CGP_{ot}P_{1t} - (FGP_{ot}P_0 - BCP_{1t}P_1)$. This is the same as $BCGP_{ot}P_1 - FTP_{ot}P_0$ which equals $EFP_0P_1 + BCGE$.

the consumption distortion caused by the quota. The total social value (which equals the maximal amount consumers would be willing to pay) for the quantity of imports between Q_1 and Q_0 is area CGQ_0Q_1 while the opportunity cost to the U.S. economy of this quantity is area BEQ_0Q_1. The difference between total value and opportunity cost is a decline in real national income because of the quota.

III. QUOTA RENTS

The estimates for the quota rents created in 1980 by the import quotas on Hong Kong's textiles (area EFP_0P_1 in Figure 5.1) are reported in Table 5.2. The total rent for each product category is obtained by multiplying quantity of imports times the average quota price.[13]

The total quota rent for all nine product categories is $218 million. If the quota had been cancelled, quota rents would not have been paid by U.S. importers to Hong Kong firms and 1980 real national income in the U.S. would have increased by $218 million. The quota rents are neither small in absolute terms nor in relation to the value of imports. Total 1980 imports (customs value) of the nine products was $953 million (from Table 5.1). The quota rent therefore equals 23 percent of the expenditure by U.S. firms to acquire title to these products.[14]

The nine products do not contribute equally to the total quota rent. The quota rents range from $1.65 million for cotton blouses to over $119 million for cotton jeans (or trousers). Moreover, over three-fourths of the total rent, 77 percent, is accounted for by just two product categories, cotton jeans and wool sweaters. The quota rent for cotton jeans alone is more than half, 54 percent, of total quota rent.

Cotton jeans and wool sweaters have large quota rents because for both products the volume of imports was large and the average quota price was high. Imports of cotton jeans were 5.7 million dozen pairs while the quantity for wool sweaters was 1.3 million dozen. The average quota prices were $20.81 per dozen for cotton jeans and $40.03 per dozen for wool sweaters.

---

[13] In Import Quotas on Textiles chapter IV, three sets of values for quota rents were provided based on three different methods used to calculate weighted average quota prices. More than one method was used to calculate average quota prices for 1980 because of missing observations for some monthly quota prices. The three methods used different assumptions for the missing observations. As explained in appendix D of the Import Quotas on Textiles method II is expected to provide more accurate values for average quota prices than method I, which may be biased upward, while method III gives lower bound values. The differences in total quota rents for the three methods were not very great. Total quota rent for method I was $254 million while for method III total quota rent was $179 million. In this chapter we use the results from the method II estimates.

[14] This assumes that title to the goods passes to U.S. firms when the goods are ready at the dock (or airport) for shipment from Hong Kong. Duties, freight charges, and insurance costs are not included in the customs tabulation of imports.

TABLE 5.2

Quota Rents Created by U.S. Import Quotas on Hong Kong Made Textile Products

Quota Category		Quantity of Imports (dozens)	Average Quota Prices (U.S. dollars per dozen)	Quota Rent (millions of dollars)
333/334:	Cotton Coats, MB	123,657	15.63	1.93
335:	Cotton Coats, WGI	283,581	40.09	11.37
338/339:	Cotton Knit Shirts and Blouses	2,614,943	3.12	8.16
340:	Cotton Shirts, not knit, MB	2,405,058	5.06	12.17
341:	Cotton Blouses, not Knit, WGI	2,117,432	0.78	1.65
345:	Cotton Sweaters	297,130	20.00	5.94
347/348:	Cotton Trousers	5,736,827	20.81	119.38
445/446:	Wool Sweaters	1,256,781	40.03	50.31
641:	MMF Blouses, not Knit, WGI	723,713	10.21	7.39
	Total Quota Rent for all Categories			218.30

Notes: MB = mens and boys
WGI = womens, girls and infants
MMF = man-made fiber

Source for Quantities: U.S. Dept. of Commerce, Office of Textiles "1980 Performance Report for Textile and Apparel, Bilateral Agreements and Unilateral Import Restraints: Hong Kong."

Source for average quota prices: Morkre (1984, appendix d).

IV. CONSUMPTION DISTORTION EFFECT

The consumption distortion effect (area BCGE in Figure 5.1) is estimated in two stages for each product. First, the tariff rate and the quota price for the product are needed to calculate the price-cost margins both with the quota and without -- vertical segments GE and CB respectively, in Figure 5.1. Second, it is necessary to determine the amount by which the quantity of imports would increase if the quota were eliminated (quantity Q_0Q_1 in Figure 5.1). Information required for the first stage is readily available -- average quota prices from section III above and tariff rates from Customs Bureau data. However, the estimation of the change in import quantity is more complex.

The problem is that we do not have information about the elasticity of the import demand curve for a particular clothing product (e.g., cotton jeans) made in Hong Kong. There do not appear to be any econometric studies that have estimated the price elasticities of import demand at this level of detail.[15] It is, however, possible to derive estimates of point elasticities by adopting a model developed by Paul Armington (1969).

In our application of the Armington model, the textile product (e.g., cotton jeans) of each country is differentiated from the same product produced in any other country and a key parameter is the elasticity of substitution (σ) between the products of each pair of countries. We derive two values for σ, 1.41 and 4.39, and obtain two sets of import demand elasticities for the nine Hong Kong textile products.[16] The demand elasticities based on $\sigma = 4.39$ are greater than for $\sigma = 1.41$ because the degree of substitutability between Hong Kong and U.S. textiles is higher when $\sigma = 4.39$. This means that eliminating the import quota results in larger estimated increases in imports and removes a larger consumption distortion. Thus, a conservative, or lower bound, estimate of the consumption distortion is given by the case where $\sigma = 1.41$.

An important feature of the Armington model is that it is possible to adjust for the effects of the binding textile import quotas the U.S. has imposed on other countries. In particular, the quotas on South Korea and Taiwan were probably effective in 1980. The procedure employed here considers the case where all textile quotas are terminated, not just those on Hong Kong's exports. We assume that prices for textile products from all three suppliers would fall by the same percentage.[17] Therefore the predicted increase in imports from Hong Kong is moderated by

---

[15] There is an extensive literature on the estimation of price elasticities of imports and exports but none of these contributions appear to deal with specific clothing products from particular countries. A valuable bibliography of this literature (covering works to mid-1975) is given in Stern, Francis, and Schumacher (1976).

[16] The details of the Armington model and the derivation of σ and the import demand elasticities are given in appendix F of Import Quotas on Textiles. The two values of σ are derived from two different econometric estimates of the import demand elasticity for apparel.

[17] This is based on a comparison of reported quota prices for several textile categories in Hong Kong, South Korea, and Taiwan. See Import Quotas on Textiles, appendix F.

the elimination of the quantitative restraints on South Korea and Taiwan. However the consumption distortion effect is estimated only for Hong Kong. We lack sufficient information about South Korea and Taiwan to provide comparable estimates for those countries.

The percent change in quantity of Hong Kong imports following removal of all textile import quotas and the consumption distortion effect of the quotas on Hong Kong are given in Table 5.3. For all nine product categories the total consumption effect of the import quotas on Hong Kong's clothing products was $90 million for $\sigma = 1.41$ and $269 million for $\sigma = 4.39$. As with the rent losses the total consumption distortion is dominated by two product categories: cotton jeans (347/348) and wool sweaters (445/446). In the case of $\sigma = 1.41$, the consumption distortion for these two products is $74 million. For the high elasticity of substitution case, they represent $223 million of the total distortion. In both cases, cotton jeans and wool sweaters account for 82 percent of total consumption distortion.

The consumption distortion of the quotas may also have a different impact on different groups of U.S. consumers. While we are not able to estimate the distributional effects of the textile quotas it is likely that the quotas impose a more severe burden on low-income consumers.[18]

Since the quotas limit physical quantities but do not restrict quality, it is possible that the quotas lead to an upgrading in the quality of Hong Kong's textile exports.[19] Indeed, there are several reports that the quotas have caused upgrading.[20] One form of upgrading occurs when the quota alters

---

[18] An adverse impact of textile import quotas on low-income consumers has been suggested in several earlier studies. For example, the issue is discussed in Bergsten (1972, p.1) and Mintz (1973, p. 65).

[19] While several economists have analyzed the relationship between product quality and quantitative restrictions it appears that, a priori, the effect of a quota on quality is indeterminate. In particular, in a recent article Leffler finds that a quantitative restriction can either increase or decrease quality. The result depends on the relationship between quantity and quality in both consumption and production (specifically it depends on an interaction between the degree of substitutability in consumption and the extent of economies of joint production). Since Leffler does not specify the precise form of the interaction and since we do not have information to resolve this problem, we cannot conclude that a quota on Hong Kong textiles causes their quality to improve. However, as we note in the text, the relevant empirical outcome appears to be that quality increases. See Leffler (1982, pp. 956-967). For two earlier works that argue that a quota leads to increases in quality, see Rodriguez (1979), and Santoni and Van Cott (1980).

[20] Before the U.S. imposed quotas on Hong Kong, Hong Kong (in the 1950's) shipped primarily low-quality knitware to the U.S. After the first quotas were imposed, in 1961, there was a steady shift to higher quality garments. This was reported by James Riedel (1974, p. 28). However, the observation of improved quality over time does not necessarily imply that quotas are the cause. Over time quality may improve, i.e., as technology advances and labor skills increase, in the absence of the quotas.

TABLE 5.3

Consumption Distortion Effect of the Import Quotas on Hong Kong Textiles

Quota Category	Elasticity of Substitution $\sigma = 1.41$	Elasticity of Substitution $\sigma = 4.39$
	Consumption Distortion Effect in Millions of Dollars (Percent Increase in Imports Shown in Parentheses)	
333/334: Cotton Coats, MB	$ 0.39 (16.17)	$ 1.16 (48.52)
335: Cotton Coats, WGI	2.91 (31.74)	8.60 (93.80)
338/339: Cotton Knit Shirts	2.74 (11.66)	8.41 (35.79)
340: Cotton Shirts, not knit, MB	3.44 (12.68)	10.17 (37.46)
341: Cotton Blouses, not Knit, WGI	0.36 (2.13)	1.10 (6.33)
345: Cotton Sweaters	2.25 (31.64)	6.63 (93.90)
347/348: Cotton Trousers	54.35 (41.57)	166.09 (127.04)
445/446: Wool Sweaters	19.78 (43.76)	56.67 (126.51)
641: Blouses, not Knit, MMF, WGI	3.46 (20.04)	10.55 (61.07)
Total Consumption Distortion for all Categories	$ 89.68	$269.38

Notes: MB = mens and boys
WGI = womens, girls, infants
MMF = man-made fiber

The formulas and data sources are given in Import Quotas on Textiles, appendix G.

the mix of imports within each quota category against low-priced articles and in favor of high-priced items. Each quota category encompasses a variety of products that vary in price. For example, the quota category cotton jeans includes expensive as well as inexpensive cotton trousers. The introduction of a quota leads to a quota price that is the same for all items in the quota category. This raises the price of all items by the same absolute amount and means that the relative price of inexpensive items increases. If demand elasticities for all items in the category are similar, then the mix of imports changes in favor of the more expensive items. Assuming that low-income consumers are the principal buyers of inexpensive products, the quota would impose a relatively greater adverse effect on these consumers.[21]

V. LABOR ADJUSTMENT COSTS

In the previous section, it was shown that removal of the import quotas on textiles will reduce prices of quota-restrained imports made in Hong Kong, South Korea, and Taiwan. This will encourage consumers to buy more of the now less expensive foreign clothing. As a result, other, non-restrained suppliers, domestic and foreign, will face a decline in demand for their products. The consequent contraction in U.S. clothing production will lower employment in the domestic industry and lead to temporary unemployment.[22] Ultimately the unemployed workers will shift to their next best employment opportunities. The cost to the economy of transitional unemployment can be viewed as the value of the real output that is lost because of this unemployment. To measure this cost we calculate the wages lost by import-displaced production workers during the period they are unemployed.[23]

The cost of unemployment is calculated in three steps. First, the fall in value of domestic shipments is determined.

---

[21] An import quota for a collection of articles can therefore produce a comparable effect on the composition of trade (i.e., a shift in the mix to higher-priced products) as does a common transportation charge for a number of articles (known as the Alchian and Allen proposition). A model analyzing the Alchian and Allen proposition for a quota on imports is given by Falvey (1979). See also Borcherding and Silberberg (1978).

[22] We do not consider the impact of import liberalization on owners of capital on the assumption that while textile machinery is industry specific the input price of capital is flexible. We regard the social cost of unemployment as the value of the output in the next best employments that is foregone during the period of transitional unemployment. If capital equipment has no alternative uses but its price can fall when demand declines, then an increase in imports will not involve a social cost of unemployment.

[23] Baldwin, Mutti, and Richardson (1978, pp. 11-16) argue that two conditions are necessary for import-displaced workers to impose a social cost on the economy. (1) The displaced workers incur adjustment expenses (e.g., foregone income, moving expenses, training costs). (2) Wage rates are not flexible (downward). If wages decline our procedure overestimates the social cost of adjustment since lower wages cause the supply curve of domestic apparel to fall, which lowers the price and increases consumer surplus. This increase in consumer surplus needs to be balanced against the cost of unemployment to determine the social cost of adjustment.

This fall is evaluated under the assumption that imports from all three of the major Asian suppliers -- Hong Kong, South Korea, and Taiwan -- will increase. In contrast therefore to the estimation of the quota rents and consumption distortion -- which focused only on Hong Kong -- the determination of the unemployment effects of eliminating the quotas considers the impact of additional imports from all three countries. Second, the direct cost of unemployment is found by converting the fall in total domestic clothing shipments into the cost of unemployment of clothing industry workers. Third, the indirect cost of unemployment is the cost of unemployment in the domestic textile mill products industry. A decline in clothing production will curb shipments of textile mill products.[24] The total cost of unemployment is the sum of the direct and indirect costs.

The fall in value of domestic shipments is calculated for each product category using a method based on the Armington model.[25] A decline in prices of foreign substitutes causes the demand for domestic output to contract. We assume that the domestic industry supply is perfectly elastic in the relevant range.[26] Thus a decline in demand for domestic clothing leads to

---

[24] There are close links between the apparel and textile mill products industries. The U.S. has imposed import quotas covering a wide array of apparel and textile mill products, and about 38 percent of domestic yarn and fabric output is purchased by apparel factories. Indeed, one can argue that for purposes of analyzing the unemployment costs caused by removing quotas the two industries should be regarded as one industry.

We do not consider other possible indirect unemployment effects of other industries that supply intermediate products to apparel factories because, except for textile mills, no other domestic industry relies on apparel factories as a major purchasor of their output. Among all other industries, only the leather tanning and finishing industry depended on apparel for more than 10 percent of its sales. Apparel factories purchased 13 percent of all leather and tanning products. U.S. Dept. of Commerce (1979), Survey of Current Business (February), p. 47.

Note that eliminating textile quotas is not likely to cause a significant increase in exports of textile mill products. That is, even though formerly restrained exporters such as Hong Kong, South Korea, and Taiwan increase apparel production, they will probably not purchase much additional textile mill products from the U.S. While the U.S. does achieve some success in exporting these products (approximately $4.4 billion in 1980 when total U.S. shipments to all buyers was $36.6 billion) most of the U.S. exports are to other developed countries (i.e., Canada, Japan, and the European Community countries) so the U.S. may lack a comparative advantage in relation to the less developed countries in the Far East. Furthermore, several of the exporters (particularly South Korea and Taiwan) impose significant tariff and nontariff barriers on textile mill products. U.S. Dept. of Commerce (1981), Foreign Regulations Affecting U.S. Textile/Apparel Exports.

[25] An explanation of the procedure is given in Import Quotas on Textiles, appendix F, section 5.

[26] An extensive survey of econometric results suggests that constant cost conditions are appropriate for a variety of manufacturing industries. See Walters (1963). Additionally, the U.S. Council on Wage and Price Stability (1978) found that economies of scale and barriers to entry were not significant for apparel and textiles. This is consistent with the proposition that the industry supply curve is horizontal.

a fall in output but the price of domestic clothing is unchanged.

The estimated decline in domestic clothing shipments is given in Table 5.4. If import quotas had been relaxed in 1980, domestic products in all nine product categories would have suffered a drop in sales by $285 million for $\sigma = 1.41$ and by $1,036 million for $\sigma = 4.39$.

We explain in detail the procedures used to calculate the cost of unemployment for the case where $\sigma = 1.41$. The results for the high elasticity of substitution case are summarized following this discussion. The estimated direct cost of the resulting unemployment is $11.6 million and equals the product of the number of production workers that are displaced in the clothing industry times the wages they lose while they are unemployed. The estimated number of displaced workers is 7,052 which equals the decline in clothing industry shipments, $284.5 million (from Table 5.4) divided by the shipments per worker for clothing, $40,344.[27] The wages lost per worker is $1,640 which equals the product of the annual wage per worker, $7,574,[28] times the fraction of the year that unemployed workers remain unemployed, 0.217.[29]

The indirect cost of unemployment is $5.2 million which reflects wages lost by workers displaced from the textile mill products industry when clothing industry shipments fall. The latest U.S. Department of Commerce input-output table gives 0.39978 as the total requirement coefficient for clothing industry purchases of textile mill products.[30] In other words,

---

[27] From the Annual Survey of Manufacturers, 1980, pages 10 and 12. The definition of the clothing industry follows the convention of the U.S. Dept. of Commerce. The clothing industry consists of the following three-digit SIC industries: 225 (knitting mills), 231 (mens and boys suits and coats), 232 (mens and boys furnishings), 233 (womens and misses outwear), 234 (womens and childrens undergarments), 235 (hats, caps, and millinery), 236 (childrens outerwear), 238 (miscellaneous apparel and accessories), and 237 (fur goods).

We use the average product of labor (rather than the marginal product) because the industry supply is taken to be perfectly elastic, i.e., constant cost conditions are assumed to hold.

[28] Ibid.

[29] The average duration of unemployment in 1980 for apparel workers was 11.3 weeks, or 21.7 percent of the year. Unpublished data from the U.S. Dept. of Labor, Bureau of Labor Statistics. The estimated unemployment due to quota relaxation (7,052) is small enough relative to total apparel industry unemployment in 1980 (approximately 150,000) so we assume that average duration is not affected by dropping the quota. The actual number of unemployed clothing workers was derived from information furnished by the Bureau of Labor Statistics.

[30] U.S. Dept. of Commerce, Bureau of Economic Analysis (1981), "Summary Input-Output Tables of the U.S. Economy: 1973, 1974, and 1975", Staff Paper, Oct. 1981, Table 5, p. 89. The textile mill products industry is defined to consist of the following three-digit SIC industries: 221 (cotton weaving mills), 222 (man-made fiber weaving mills), 223 (wool weaving mills, finishing mills), 224 (narrow fabric mills), 226 (textile finishing, except wool), and 228 (yarn and thread mills).

TABLE 5.4

Estimated Absolute and Percent Decline in Value of Annual Domestic Shipments if Import Quotas on Textiles are Eliminated

Quota Category		Elasticity of Substitution $\sigma = 1.41$	Elasticity of Substitution $\sigma = 4.39$
		(millions of dollars) (percent decline in parenthesis)	
333/334:	Cotton Coats, MB	$ 4.72 (1.3)	$17.21 (4.8)
335:	Cotton Coats, WGI	11.34 (6.9)	41.31 25.2)
338/339:	Cotton Knit Shirts and Blouses	13.18 (1.4)	48.06 (5.0)
340:	Cotton Shirts, Not Knit, MB	15.69 (3.6)	57.11 (13.2)
341:	Cotton Blouses, Not Knit, WGI	1.38 (0.5)	5.01 (2.0)
345:	Cotton Sweaters	2.35 (7.0)	8.55 (25.4)
347/348:	Cotton Trousers	187.64 (4.9)	683.18 (17.9)
445/446:	Wool Sweaters	22.84 (21.0)	83.16 (76.4)
641:	MMF Blouses, Not Knit, WGI	25.36 (2.2)	92.10 (8.1)
Total Decline in U.S. Shipments		$284.50	$1,035.69

Notes: MB = mens and boys
WGI = womens, girls and infants
MMF = man-made fiber

Sources: Import Quotas on Textiles, appendix H.

each $1,000 in clothing industry shipments requires $399.78 in textile mill product materials. Therefore the fall in clothing industry shipments of $284.5 million (Table 5.4) times 0.39978 gives the decline in textile product shipments, $114 million. The number of displaced textile mill production workers is 1,839 which equals $114 million divided by shipments per worker for textiles, $61,842.[31] Each unemployed textile mill worker loses $2,800, which is equal to average annual wages, $10,664,[32] times the fraction of the year the displaced worker is unemployed, .263.[33] The product of number of displaced workers (1,839) times wages lost per worker ($2,800) equals $5.2 million.

The total estimated cost of unemployment in the textile industry caused by removing the quotas is $16.8 million, the sum of the direct ($11.6 million) and indirect ($5.2 million) costs. This cost is due to an increase of transitional unemployment of 8,891 production workers: 7,052 workers from clothing factories and 1,839 workers from textile mills. Note that the added unemployment expected from lifting the quotas is relatively small compared to the total number of unemployed workers in these industries. In 1980, approximately 150,000 clothing workers were out of work while the corresponding number of unemployed textile mill workers was 38,000.[34]

The total unemployment costs are summarized in Table 5.5 for both the low and high elasticity of substitution cases. The total cost of unemployment for the case $\sigma = 4.39$ is $60.9 million. For this case the number of import-displaced workers is 32,400. The wide range for unemployment costs for the two cases is explained by different estimates for the increase in imports if the quotas are cancelled. A relatively large rise in imports is expected when $\sigma = 4.39$ and this implies a comparatively large decline in domestic shipments and employment. Moreover, the unemployment costs need to be compared with the sizes of the quota rent and especially the consumption distortion effect for a given increase in imports. The size of the consumption distortion effect is positively associated with the cost of unemployment since both depend on the increase in imports.

VI. THE BENEFITS AND COSTS OF REMOVING TEXTILE IMPORT QUOTAS, ANNUAL ESTIMATES FOR 1980 AND 1983, AND PRESENT VALUES

The annual benefits and labor adjustment cost to the U.S. of eliminating the import quotas on textiles are summarized in Table 5.6. Also shown is the cost to consumers of the quota. The

---

31 Annual Survey of Manufactures, 1980, pages 10 and 12.

32 Ibid.

33 In 1980 the average duration of unemployment for textile workers was 13.7 weeks, or 26.3 percent of the year. Unpublished data from the U.S. Dept. of Labor, Bureau of Labor Statistics. The average duration of unemployment is not expected to be affected by removing the quota. We estimate that only 1,839 production workers would lose their jobs if the quota is dropped while in 1980. There were approximately 38,000 unemployed workers in textiles. Textile unemployment was derived from information supplied by the Bureau of Labor Statistics.

34 Based on unpublished data furnished by the U.S. Dept. of Labor, Bureau of Labor Statistics.

TABLE 5.5

Estimated Total Cost of Unemployment if Import Quotas on Textiles are Eliminated

	Elasticity of Substitution	
	σ = 1.41	σ = 4.39
	(--------Millions of dollars----------)	
Direct Cost of Unemployment	11.60	42.10
Indirect Cost of Unemployment	5.20	18.80
Total Cost of Unemployment	16.80	60.90

Source: Import Quotas on Textiles, appendix H.

TABLE 5.6

Summary of Benefits and Costs of Removing Import Quotas on Textiles from Hong Kong Based on 1980 Conditions

(Values in 1983 dollars in parentheses)

	Elasticity of Substitution	
	$\sigma = 1.41$	$\sigma = 4.39$
	(---Millions of dollars---)	
Benefits to Consumers (based on cost to consumers)	317.97 (384.43)	420.15 (507.96)
Total Benefits to Economy (based on Deadweight Losses)	307.98 (372.35)	487.68 (589.61)
Quota Rent	218.30 (263.92)	218.30 (263.92)
Consumption Distortion Effect	89.68 (108.42)	269.38 (325.68)
Labor Adjustment Cost		
Total Cost of Unemployment	16.80 (20.31)	60.90 (73.63)
Benefit-Adjustment Cost Ratio		
Benefits to Consumers/ Unemployment Costs	18.93	6.90
Benefits to Economy/ Unemployment Costs	18.33	8.01

Note: Values in 1983 dollars were obtained by adjusting 1980 values for the percent change in the CPI.

Source: Bureau of Economics, Federal Trade Commission.

benefits are the gain in social welfare and equal the sum of the quota rent and the consumption distortion effect. The adjustment cost is the total cost of the increase in unemployment.

Benefits and costs are based on 1980 conditions but two sets of values are given in Table 5.6. Values in 1980 dollars appear above corresponding values in 1983 dollars (in parentheses), which only adjust for inflation.

Estimated annual benefits to consumers range from $318 million to $420 million while the annual benefits to the economy are between $308 million and $488 million.[35] The benefits substantially exceed the total cost of unemployment, $17 million to $61 million.

Benefit/cost ratios indicate the gains from removing the quotas per dollar of unemployment cost incurred. The benefit/cost ratios based on benefits to consumers are at least 6.9 (for $\sigma = 4.39$) and may be as high as 18.9 (if $\sigma = 1.41$). Measuring benefits in terms of gains in national income, the benefit/cost ratios are 8.0 (for $\sigma = 4.39$) and 18.3 (if $\sigma = 1.41$). Therefore, for each dollar of unemployment cost caused by removing textile quotas the benefit to consumers are at least $6.90 while for the economy the gain in national income is at least $8.00.

Our results indicate that unemployment costs are small, at most 15 percent, compared to the benefits that can be realized if the quotas are lifted. It may be argued, however, that our estimates of unemployment costs are too small because they are based on BLS information on the duration of unemployment for workers actually experiencing unemployment in 1980, which may primarily reflect mobility of workers between apparel and textile factories and frictional unemployment (e.g., seasonal adjustments in the workforce, normal mobility, and turnover of workers). The duration of unemployment may be higher for a permanent reduction in the workforce as would occur if the quotas were dropped. However, even if the duration of unemployment for a permanent cut in workforce were two, or even three times higher than the BLS data we use, the resulting costs of unemployment would still be dominated by the benefits from removing the quotas.

Our estimates of the benefits and adjustment costs of removing the import quotas are for only one year and reflect conditions in 1980. The relationship between benefits and costs is even more one sided when we consider the benefits that accrue in future years. The benefits would continue year after year while the bulk of the costs of unemployment occur in the year the quotas are dropped. Based on the results shown in Table 5.7, if 1980 conditions prevail over twenty years and if future benefits are discounted at a rate of 7 percent (to reflect a social rate of discount), then the present values of the net benefits to consumers (i.e., benefits minus unemployment costs) from eliminating the quotas are $3.59 billion (for $\sigma = 1.41$) and $4.70 billion (for $\sigma = 4.39$). For the economy as a whole the present values of the net gain in national income are $3.47 billion (for $\sigma = 1.41$) and $5.47 billion (for $\sigma = 4.39$). Thus the benefit to cost ratio would be substantially larger than the figures reported for 1980 if future benefits were taken into account.

---

[35] Note that when $\sigma = 1.41$ cost to consumers exceeds social cost but the opposite is true when $\sigma = 4.39$. This is because estimated import demand was inelastic for $\sigma = 1.41$ but elastic for $\sigma = 4.39$. This point is discussed above, in section II.

TABLE 5.7

The Present Values of Benefits and Costs of Removing Textile Import Quotas

Year	Elasticity of Substitution (σ) = 1.41			Elasticity of Substitution (σ) = 4.39		
	Benefits to Consumers (from Cost to Consumers)	Benefits to Economy (from Deadweight Losses)	Labor Adjustment Costs	Benefits to Consumers (from Cost to Consumers)	Benefits to Economy (from Deadweight Losses)	Labor Adjustment Costs
	(millions of 1980 dollars)					
1	317.97	307.98	16.80	420.15	487.68	60.90
2	297.17	287.83	0	392.66	455.78	0
3	277.73	269.00	0	366.98	425.96	0
4	259.56	251.40	0	342.97	398.09	0
Sum over four years	1,152.42	1,116.21	16.80	1,522.76	1,767.51	60.90
Sum over twenty years	3,604.57	3,491.26	16.80	4,762.82	5,528.34	60.90

Note: The benefits and adjustment costs shown for year 1 are based on results for 1980. The present values for subsequent years are obtained by assuming these benefits continue into the future. A discount rate of 7 percent is used to calculate present values.

Source: Bureau of Economics, Federal Trade Commission.

VII. CONCLUSION

The quotas installed by the U.S. to limit imports of textiles currently apply to nearly two dozen countries and are a protectionist device that imposes substantial costs on the U.S. in terms of cost to consumers and lost real national income. In addition to quotas, the U.S. also curbs textile imports by levying high tariff rates, which averaged 27 percent ad valorem for all foreign-made apparel products in 1980. The costs to the U.S. of the tariffs have been estimated by several economists, but the consequences of the quotas have been harder to determine owing to deficiencies in the available empirical information. In this chapter we have been able to utilize a new set of data to evaluate the additional costs in 1980 of the import quotas imposed on one foreign supplier, Hong Kong, which is the largest source of foreign-made textiles to U.S. consumers.

The new data that have recently become available are Hong Kong quota prices for nine clothing product categories exported to the U.S. The prices of quota rights account for a significant portion of the price paid by U.S. importers in 1980. For seven of the nine product categories, average annual quota prices exceed 10 percent of annual unit values or product prices. Moreover, for two large product categories, cotton jeans and wool sweaters, quota prices account for more than 30 percent of product price.

The product of quota price times quantity of imports equals a rent created by the quota. The quota rent is captured by Hong Kong because the Hong Kong Government administers the quota and many U.S. firms compete to import Hong Kong textiles. Consequently the quota rent represents a transfer of real income from the U.S. to Hong Kong: it is a cost to the U.S. economy of the import quotas. The total value of quota rents for 1980 was $218 million, which was 23 percent of the total value paid by U.S. importers to purchase the nine Hong Kong clothing products.

The import quotas not only create a rent cost to the U.S. they also distort the pattern of consumption, in two ways. First, the quotas restrict the total amount of imports to a lower level than would occur in the absence of quotas. To evaluate the effects of this restriction on import quantity, we adopted a model based on the work of Paul Armington. This model was used to derive two sets of import demand elasticities based on two different estimates of the elasticity of substitution between Hong Kong and U.S. textile products. In the low elasticity of substitution case we find that the total social cost in 1980 of the consumption distortion was $90 million. In the high elasticity case the consumption distortion was $269 million.

Second, the quotas may also distort consumption by changing the composition of the clothing products that are imported. Quotas can lead to an increase in the quality of Hong Kong's exports. When this occurs the burden of the quotas is expected to fall most heavily on low-income consumers as opposed to middle or high-income groups.

The gross social cost to the U.S. economy of the import quotas consists of the sum of the rent and consumption distortion effects. In 1980 the gross social cost was between $308 million and $488 million, which represents the gross benefit to the U.S. of eliminating the quotas. The annual cost to U.S. consumers was estimated to range between $318 million and $420 million.

Against these estimated benefits of removing the quotas, there is a cost of cancelling the quotas that stems from the cost of transitional unemployment caused by additional imports that will displace some workers in the domestic clothing and textile mill products industries. However, we estimate this cost is between $17 million and $61 million. For the economy as a whole the benefit/cost ratios of cancelling the import quotas are 8 and 18 considering only the benefits that are generated in a single year, 1980. In other words, using the lower benefit/cost ratio, for each dollar of unemployment cost caused by dropping the quotas the U.S. economy would gain $8. For U.S. consumers the benefit/cost ratios are 7 and 19. Thus, per dollar of unemployment cost U.S. consumers would gain at least $7 if the quotas were eliminated.

The above results do not consider the consequences of the quota in subsequent years. Assuming 1980 conditions hold for later years the costs of the quota exceed, by a substantial margin, the costs for 1980 alone. Over a four year period the present value of lost real national income is between $1.1 billion and $1.7 billion while the present values of the cost to consumers range from $1.1 billion and $1.5 billion. Prolonging the quota means steadily mounting costs. Therefore the sooner the quota is terminated the smaller will be the loss of real national income and reduction in income of U.S. textile consumers.

Finally, because of data limitations, we have only been able to estimate the benefits to the U.S. from removing the quotas placed on Hong Kong. Other countries also face U.S. import quotas, in particular South Korea and Taiwan, so that the full benefit to the U.S. from cancelling all quotas will exceed our estimates. However, we are able to determine the unemployment costs resulting from the elimination of the quotas on Hong Kong, South Korea and Taiwan. Therefore our estimates of the net benefits and benefit/cost ratio are conservative estimates.

REFERENCES FOR CHAPTER FIVE

Armington, Paul S. (1969), "A Theory of Demand for Products Distinguished by Place of Production," IMF Staff Papers, 61(1), pp. 159-178.

Baldwin, Robert E., John H. Mutti and J. David Richardson (1978), "Welfare Effects on The United States of a Significant Multilateral Tariff Reduction," April, mimeo.

Bhagwati, Jagdish N. and T.N. Srinivasan (1980), "Revenue Seeking: A Generalization of the Theory of Tariffs," Journal of Political Economy 88(6), pp. 1069-1087.

Borcherding, Thomas E. and Eugene Silberburg (1978), "Shipping the Good Apples Out: The Alchian and Allen Theorem Reconsidered," Journal of Political Economy 86(1), pp. 131-138.

Consumers' Association (1979), The Price of Protection, London.

Corden, W.M. (1971), The Theory of Protection, Oxford University Press.

Falvey, Rodeny E. (1979), "The Composition of Trade within Import-restricted Product Categories," Journal of Political Economy, 87(5, pt. 1), pp. 1105-1114.

Francis, Jonathan, Bruce Schumacher and Robert M. Stern (1976), Price Elasticities in International Trade: An Annotated Bibliography, Macmillan.

Hong Kong Government, Census and Statistics Department, Hong Kong Monthly Digest of Statistics, (monthly).

Jenkins, Glen P. (1980), "Costs and Consequences of the New Protectionism," Harvard Institute for International Development, Harvard Univ.

Leffler, Keith B. (1982), "Ambiguous Changes in Product Quality," American Economic Review, 72(5), pp. 956-967.

Mintz, Ilse (1973), U.S. Import Quotas: Costs and Consequences, American Enterprise Institute.

Morkre, Morris E. (1984) Import Quotas on Textiles: The Welfare Effects of United States Restrictions on Hong Kong, A Bureau of Economics Staff Report to the Federal Trade Commission, USGPO.

_____ and David G. Tarr (1980), Effects of Restrictions on United States Imports, A Staff Report to the Federal Trade Commission, USGPO.

Riedel, James (1974), The Industrialization of Hong Kong, J.C.B. Mohr (Paul Siebeck) Tubingen.

Rodriguez, Carlos Alfredo (1979), "The Quality of Imports and the Differential Welfare Effects of Tariffs, Quotas, and Quality Controls and Protective Devices," Canadian Journal of Economics, 12(3), pp. 439-449.

Santoni, Gary J. and T. Norman Van Cott (1980), "Import Quotas on Textiles: The Quality Adjustment Problem," Southern Economic Journal, 46(4), pp. 1206-1211.

Tullock, Gordon (1967), "The Welfare Costs of Tariffs, Monopolies and Theft," Western Economic Journal (now Economic Inquiry) 5, pp. 224-232. Reprinted in Buchanan, J.M., R.D. Tollison and G. Tullock (eds.)(1980), Toward a Theory of the Rent-Seeking Society, Texas A&M Univ. Press, pp. 39-50.

U.S. Bureau of the Census (1980), Annual Survey of Manufacturers (1980), USGPO.

U.S. Council on Wage and Price Stability (1978), Textiles/Apparel: A Study of the Textile and Apparel Industries, USGPO.

U.S. Department of Commerce, Bureau of Economic Analysis (1981), "Summary Input-Output Tables of the U.S. Economy: 1973, 1974 and 1975," Staff Paper, Oct. 1981.

U.S. General Accounting Office (1974), "Economic and Foreign Policy Effects of Voluntary Restraint Agreements on Textiles and Steel."

Walters, Alan A. (1963), "Production and Cost Functions," Econometrica, 31, pp. 1-66.

Willig, Robert (1976), "Consumer's Surplus Without Apology," American Economic Review, 66(4), pp. 589-597.

CHAPTER SIX

QUOTAS ON STEEL

I. INTRODUCTION AND SUMMARY OF RESULTS

During the past fifteen years the United States steel industry has enjoyed a significant amount of special protection from imports.[1] During 1969-1974 Japan and the European Economic Community negotiated "voluntary restraint agreements" (VRA's) that limited their exports to the U.S.[2] In 1978 the Administration initiated the "trigger price mechanism" (TPM) as part of its program for the steel industry.[3] The TPM was, in princple, to have established a minimum price for imports below which imports could not enter without being subjected to an expedited antidumping investigation.[4] In 1982 a major effort was undertaken by the majority of the integrated U.S. steel producers to obtain tariff protection under the antidumping and countervailing duty laws.[5] Despite the fact that the Department of Commerce (DOC) made either a negative determination of subsidies or a "de minimus" or insignificant determination of subsidies for a significant portion of the European Economic Community[6] (possibly eliminating the ability of countervailing duties to restrain imports due to additional supply from unrestrained suppliers), the European Economic Community agreed to quotas on steel exports of specific products under the U.S. - E.C. Arrangement.

---

[1] This is in addition to tariff protection, which in 1983 was about 5.6 percent.

[2] For an analysis of the effects of the VRA see Jondrow (1978). He finds that the VRA was not binding after 1972; also see Crandall (1981, pp. 103-107).

[3] See the report of the Solomon (1977) task force.

[4] Crandall (1981, chapter 5) finds that the TPM induced an increase in import prices by approximately 9 percent. See the analysis of Tarr, in Duke et al. (1977) (the FTC steel report), for an evaluation of the distributional and efficiency consequences of the TPM compared with tariffs or quotas; and see Barnett and Schorsch (1983, pp. 239-242) for an evaluation of the TPM's role in the public policy debate on steel.

[5] The TPM was dropped when these cases were filed. See Exhibit 4 of the United Steelworkers-Bethlehem Petition to the ITC (1984) for a comprehensive list of the antidumping and countervailing duty cases that have been filed.

[6] The DOC made a negative determination of the existence of subsidies for six of the eight Federal Republic of Germany (FRG) producers and an affirmative but de minimus finding of a 0.235 percent subsidy rate for Peine-Salzgitter. The DOC also made negative determinations for the Netherlands firm and for 14 small British firms. In addition it found small subsidies for the last FRG producer (1.131 percent), for the two Luxembourg producers (.539 percent and 1.523 percent) and for two of the Belgian firms (2.165 percent and .348 percent). See the statement of Malcolm Baldrige, Secretary of Commerce, "Steel Countervailing Duties," August 25, 1982.

In early 1984, the United Steelworkers of America and Bethlehem Steel Corporation petitioned the United States International Trade Commission (USITC or ITC) for relief from imports under section 201 of the Trade Act of 1974. In that "Petition" they asked for quotas on imports of carbon and alloy steel products such that imports would be at most 15 percent of domestic apparent consumption.[7] Also in 1984, there was legislation before Congress (the Fair Trade in Steel Act of 1984) that would utilize quotas to limit imports of steel to 15 percent of domestic apparent consumption for five years.[8]

On June 12, 1984, the ITC (by a 3-2 decision) voted that "industries" representing 74 percent of domestic shipments were injured.[9] On July 11, 1984, the ITC recommended to the President that quotas be imposed on almost all of these products (over 97 percent by tonnage).[10]

The President, in response to the affirmative decision by the ITC on the petition rejected quotas through the 201 process; but he directed United States Trade Representative, William Brock, to negotiate with foreign governments. The object of the negotiations would be to get these governments to voluntarily restrain their exports.

After the President's program was announced, Congress passed, in the Trade and Tariff Act of 1984, a nonbinding "sense of the Congress" that imports should be reduced to between 17 and 20.2 percent of U.S. domestic apparent consumption and authorized the President to negotiate agreements to achieve that goal. The bill also provides that continuation of the import relief in any year is contingent on the major steel companies committing "substantially all of their net cash flow from steel operations to reinvestment and modernization of their steel industry."[11] These provisions appear to be the Congressional substitute for the Fair Trade in Steel Act of 1984, but the Trade and Tariff Act of 1984 indicates that if the President's program fails to achieve its goals, Congress will consider appropriate action.

---

[7] See the Petition at page ix.

[8] See Congressional Budget Office (1984) for an analysis of the effects of this legislation.

[9] See official transcript of the Proceeding before the USITC, June 12, 1984, in carbon and certain alloy steel products and see Tarr (1984) for an estimation of the costs and benefits of a 15 percent quota on these products.

[10] See the statement by Commissioner David B. Rohr, "Remedy: Carbon Steel," July 11, 1984.

[11] Since most firms are already exceeding this requirement, the latter restraint is not considered onerous. See New York Times, "Steel Rule's Effect May Be Limited," Oct. 15, 1984, pp. D1, D6. The 20.2 percent figure is what the President's goal is for imports when semi-finished products are included.

Prior to the announcement of the new restrictions, there were already in place some formal and possibly informal quantitative restraints on steel imports.[12] In October 1982, the United States and the European Community (EC) agreed to limit EC exports of certain carbon steel products to the United States to specified percentages of United States consumption, and the United States companies withdrew the antidumping and countervailing duty petitions they had filed against the companies in the EC.[13] South Africa and Mexico have also agreed to limit their exports of steel into the U.S.[14] In addition, the United Steelworkers-Bethlehem Petition alleges that the "level of exports presently flowing from Japan to the United States [are] based on informal undertakings by the Japanese to the U.S. government." Bethlehem provided details of these undertakings when it stated: In 1983, "The United States Trade Representative negotiated a voluntary restraint promise on steel exports with Japan. As a result, the American steelmakers withdrew their 301 case against Japan."[15] Japan is now said to provide a quarterly "weather forecast" to the U.S. government in which it provides its estimate of the next quarter's steel shipments to the U.S.[16] Thus, the European Community, Mexico, South Africa and possibly Japan were already limiting their exports to the United States.

In announcing the new program, USTR Brock indicated that negotiations to limit imports would be conducted with Brazil, Spain, South Korea, and Japan. It was also reported that an agreement with the European Community on pipe and tube exports would be sought and that Australia and Finland have offered to negotiate voluntary restraint agreements if unfair trade

---

12 The estimates in this paper are for the additional effects of an 18.5 percent quota, given that these quantitative restraints are already in effect. Although deadweight losses to the world economy are affected by the existing quantitative restraints, estimates of additional deadweight losses and consumer losses in the U.S., which are the focus of this paper, are unaffected by the existing quantitative restraints. See the appendix for an explanation.

13 47 Federal Register 49058, Oct. 29, 1982.

14 See New York Times, supra, Sept. 19, 1984; Wall Street Journal, supra, Sept. 19, 1984; and William Brock, "Press Briefing," The White House, Sept. 18, 1984, p. 6.

15 See Bethlehem Steel Corporation, "A Chronology of the Steel-Import Problem: 1959 through 1983," booklet 3902, 1984.

16 See "Steel Curb Consensus Forming," New York Times, August 27, 1984, pp. D1, D4. Japan, however, has made no formal announcement that it is restraining its steel exports to the U.S. as it has, for example, with automobiles. In fact, the data suggest that Japan may have ceased restraining its exports in 1984, possibly in anticipation of a formal restraint through the 201 process.

practices cases against them are dropped.[17] In December, the Administration announced that agreements had been reached with Japan, South Korea, Spain, Brazil, South Africa, Mexico, and Australia. The above mentioned agreement with the European Community will remain in effect and Canada is expected to not increase its current market penetration.[18] The goal of the program, however, is to limit imports to 18.5 percent of domestic apparent consumption, where semi-finished steel is excluded from the calculations.[19]

The exact level of imports permitted under the new agreements is not known. However, the Administration has not changed its goal of restraining imports to 18.5 percent of domestic apparent consumption (excluding semi-finished).[20] Thus, this level of restriction is taken as indicative of the level of restraint likely to be achieved and the costs and benefits of this level of restriction are estimated in this chapter.

The annual costs of such a quota to United States consumers is estimated to be $1,131 million. The annual inefficiency costs to the economy, under the usual method of quota allocation where the foreign countries receive the quota rights, is estimated to be $803 million. Part of what U.S. consumers lose is transferred to domestic and foreign producers. United States producers gain $441 million per year and foreigners extract $573 million per year in quota rents. These estimates are summarized in Table 6.1.

In order to obtain some perspective on the quantitative importance of the benefits of the quota in relation to the costs, cost-benefit ratios are provided as well as estimates for the costs of the quota per job created. For each job saved by the 18.5 percent quota, the annual costs to consumers is $113,622; the annual inefficiency costs to the economy for each job created by the quota is $80,682. These estimates are presented in Table 6.2. The benefits of the quota are measured by the present value of the saved earnings losses of workers who would otherwise have been displaced. For the purposes of this comparison the present value of the costs to consumers and losses to the economy are

---

17 See New York Times, "Reagan Seeks Cut in Steel Imports through Accords," Sept. 19, 1984, pp. A1, D5; Wall Street Journal, "Reagan Vows to Seek Voluntary Steel Import Curbs...," Sept. 19, 1984, pp. 3, 26; "President Rules out Steel Quotas; Washington Post, Sept. 19, 1984, pp. A1, A9; New York Times, "Voluntary Import Restraint: Effect Similar to Quotas," Sept. 20, 1984, pp. D1, D19; and William Brock, "Press Briefing," The White House, Sept. 18, 1984. The information regarding Australia and Finland derives from an interview with an official of the office of the United States Trade Representative.

18 See Wall Street Journal, "U.S. Sets Pacts to Curb Imports of Finished Steel," Dec. 20, 1984, p. 31; and Washington Post, "Steel Imports to be Cut 30 percent White House Announces," Dec. 20, 1984, pp. D1, D6.

19 49, Federal Register, 36814, Sept. 20, 1984.

20 See Brock, supra, p. 10; Wall Street Journal, supra, Dec. 20, 1984; and Washington Post, supra, Dec. 20, 1984.

TABLE 6.1

Estimates of the Losses to Consumers, Inefficiency Costs to the United States Economy, Gains to Producers and Quota Rents to Foreigners as a Result of an 18.5 Percent Quota on Carbon and Alloy Steel Products (Excluding Semi-Finished)

(in millions of dollars)

			in Present Value
	Annual Costs (base year* dollars)	Annual Costs (1983 dollars)	Four Years of Costs (1983 dollars)
Consumers' Losses	1,130.655	1,097.866	3,980.533
Losses to the U.S. Economy	802.864	779.581	2,826.527
Gains to U.S. Producers	440.892	428.106	1,552.184
Quota Rents to Foreigners	573.335	556.708	2,018.456

*The base year is Sept. 1983 through August 1984.

Source: Bureau of Economics, Federal Trade Commission.

TABLE 6.2

Annual Costs to Consumers and Inefficiency Costs to the United States Economy for Each Job Saved by the Quota

	(In base year* dollars)
Losses to Consumers	113,622
Losses to the Economy	80,682

*The base year is Sept. 1983 through August 1984.

Source: Bureau of Economics, Federal Trade Commission.

taken over five years.[21] It is found that the quota imposes $5 billion and $3.5 billion in costs to consumers and inefficiency costs to the economy over five years, respectively while $143 million in earnings losses are saved. Thus for every dollar of earnings losses saved by otherwise displaced workers, consumers lose $34.60 and the United States economy has excess or inefficiency losses of $24.57. These estimates are summarized in Table 6.3.[22]

II. MODEL AND ASSUMPTIONS

Differentiated Product

The first issue one must decide is whether to treat imported steel products as homogeneous with or differentiated from domestic steel products. The most reasonable assumption appears to be to treat imported and domestic steel products as differentiated. Jondrow et al. (1976) have observed that foreign steel appears to have to sell at a discount to be marketed in the U.S. In explaining this situation, they argue that foreign and domestic steel products are differentiated for a number of reasons. For example, one must order foreign steel further in advance and await delivery. Thus if one relies on foreign steel, a larger inventory must be held with higher associated warehousing and interest costs. Moreover, they argue that domestic suppliers implicitly offer greater security of supply. Additionally, the econometric estimates of Robert Crandall (1981) argue for the acceptance of a differentiated product model.[23]

Model Specification

The model is depicted graphically in Figure 6.1. Panel A is the market for the domestic product and panel B is the market for the imported product.

Since the products are related, the demand curves depend on the price of the competing good as well as having the usual own price dependence. That is, the price of the competing import good is a parameter in the demand curve for the domestic good and

---

21 Benefits are measured as the value of deferring the earnings losses. See pages 22-27 below for the details.

22 All of these estimates tend to underestimate the costs of the 18.5 percent limitation on imports. One reason for this is that no adjustment was made for the possibility of monopoly restriction of output if a quota was in place. While we have not investigated the likelihood that monopoly output restrictions would occur in the steel industry if a quota was imposed, we note that with a quota, the domestic industry could increase its profits if it could restrict its output below the competitive level. (See Corden, 1971.) If it does so, there are additional costs to consumers and to the economy. More dramatically, however, there would be fewer jobs created. This would substantially increase the costs per job created and the cost-benefit ratios. In fact, Corden (1971, pp. 203-206) has shown that if the quota is equal to the original imports, then doemstic output and employment will necessarily fall. This is because there is only the monopoly restriction effect and no import substitution effect.

23 See Crandall (1981, pp. 129-132).

TABLE 6.3

Costs, Benefits and Cost-Benefit Ratios: The Present Value Over Five Years of Costs to Consumers and Inefficiency Losses to the Economy for Each Dollar of Earnings Losses Saved by the 18.5 Percent Quota

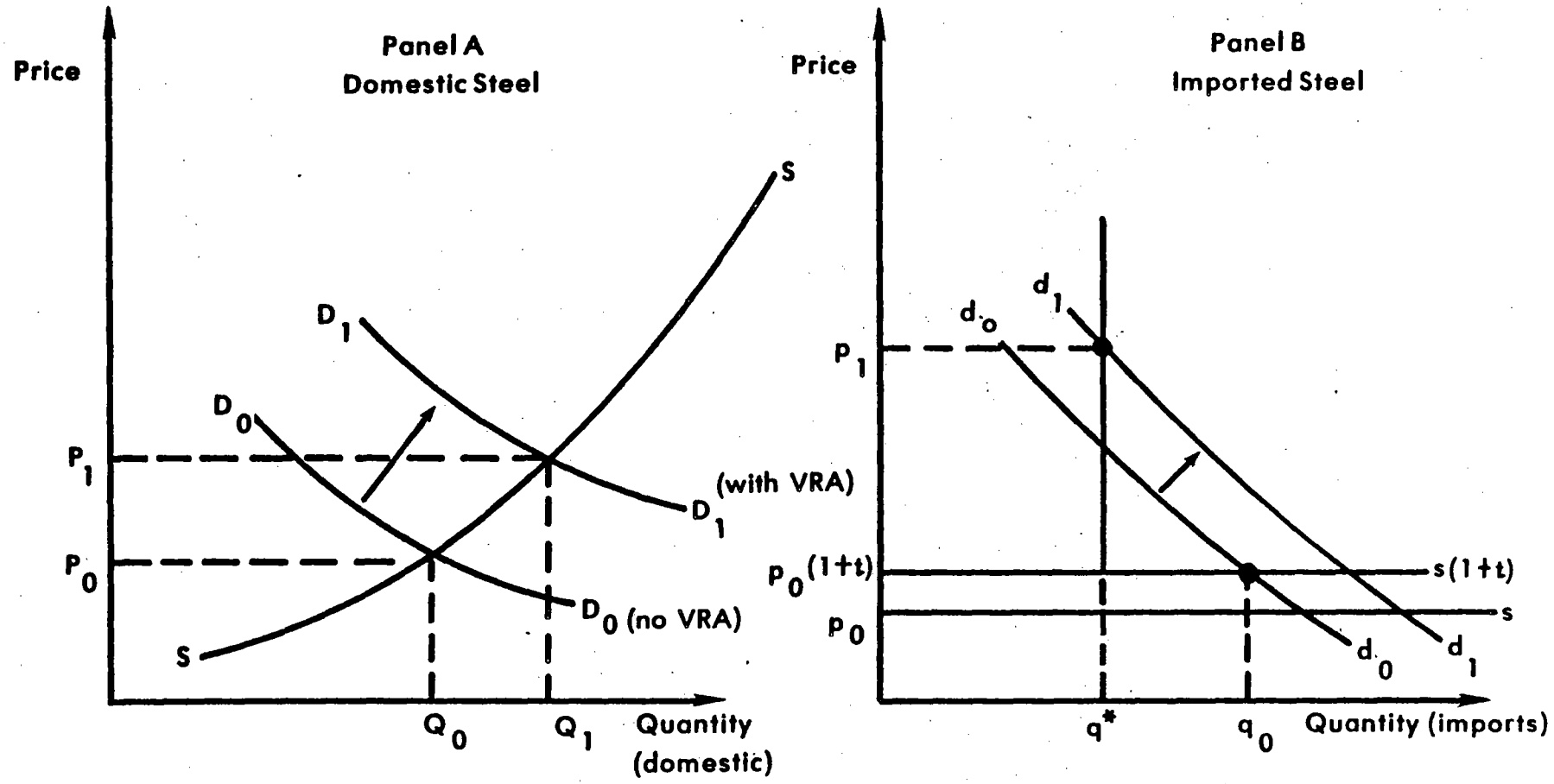
Costs (in millions of the base year dollars)*	Benefits (in millions of the base year dollars)*	Cost-Benefit Ratios
$4,960.422 (to consumers)	$143.334	$34.60
$3,522.334 (to the economy)	$143.334	$24.57

* The base year is Sept. 1983 through August 1984.

Source: Bureau of Economics, Federal Trade Commission.

FIGURE 6.1

Effects of Imposing a Quota on a Differentiated Import Product With a Rising Domestic Supply Curve



conversely. We have explained the basics of this model in our monograph on import restrictions.[24]

The dynamic adjustment to a new equilibrium after the imposition of a quota may be intuitively explained as follows. (Throughout this chapter we adopt the convention of using upper case letters for prices and quantities of the domestic good and lower case letters for the imported good.) Prior to the quota, equilibrium is at (P_o, Q_o) for the domestic good and (p_o, q_o) for the imported product, determined by the intersection of D_o and S for the domestic good and by d_o and s(1+t) for the imported good (where t is the existing tariff rate). With the imposition of a quota of $q = q^*$, the price of imports will rise to where quantity demanded equals quantity supplied. This is determined by the intersection of the supply relation at $q = q^*$ and the demand function for imports, d_o. The higher price for imports, however, induces an increase in demand for domestic steel, i.e., a shifting out and to the right of the D_o curve. This causes a higher price of domestic steel to result. This higher domestic price induces an increase in the demand for imported steel resulting in a new higher price for imports. The new higher import price is analogous to the higher import price induced by the imposition of the quota, so a new round of demand shifts and price increases ensues. If the new equilibrium is stable, the shifts in demand are progressively smaller and the process is convergent.[25]

To explicitly model these interactive effects requires specification of demand equations for both goods, a supply equation for the domestic good and the price at which the imported good is supplied. The demand equations must incorporate the cross elasticity effect of the other good's price. Thus the following specification is assumed:[26]

(1) $\ln Q = a + e_1 \ln P + e_2 \ln p$ (demand for domestic steel)

(2) $\ln q = b + e_3 \ln P + e_4 \ln p$ (demand for imported steel)

(3) $\ln Q = c + e_5 \ln P$ (supply of domestic steel)

(4) $s(q) = p_o (1 + t)$ (supply price for imported steel)

(4*) $f(p) = q^* \qquad p > p_o(1 + t)$ (supply relation under a quota)

Equations (1) and (2) are the demand curves for the domestic and imported goods respectively. Equation (3) is the supply

---

[24] See Morris Morkre and David Tarr (1980, chapter 2).

[25] The discussion of this paragraph is only for pedagogical purposes. No assumptions are made regarding the dynamic adjustment path to a new equilibrium. The analysis below is "comparative statics," and the model is specified by equations (1)-(4).

[26] We select a specification which is linear in the logs here, while a strictly linear specification was assumed in the automobile chapter. This is because the econometric estimates upon which we rely employed these respective specifications.

curve for the domestic product. The coefficients e_1 and e_4 are the own elasticities of demand, e_2 and e_3 are cross elasticities of demand and e_5 is elasticity of supply.[27] Equation (4) states that the price at which the imported good is supplied is $p_0(1+t)$, where p_0 is the delivered price of imports excluding tariffs and t is the existing tariff rate. Equation (4*) applies with a quota in effect, rather than equation (4). It states that if imports are limited to a quantity q*, then exactly q* will be supplied at any price provided price exceeds or equals the import supply price of $p_0(1 + t)$.

Clearly, there are variables affecting the equilibrium prices and quantities other than those explicitly modeled in equations (1)-(4). In the context of a comparative statics exercise, it is appropriate to hold these other variables constant. Thus the other variables which affect the equilibrium are subsumed in the specified constants of the equations.

Elasticity Assumptions

The best estimates available for own and cross price elasticities of demand are in Robert Crandall's book.[28] Utilizing Crandall's elasticity estimates means that equations (1)-(4) become:

(1') $\ln Q = a - 1.5 \ln P + 0.6 \ln p$

(2') $\ln q = b + 4 \ln P - 4.5 \ln p$

(3') $\ln Q = c + 3.5 \ln P$

(4') $s(q) = p_o (1 + t)$

(4*) $f(p) = q^* \quad p > p_o(1 + t)$

Selection of Base Year Prices and Quantities

We selected as a base year, the most recent 12 month period for which we had data. Thus, the base year is the 12 months ending in August 1984. The prices and quantities were chosen as follows.

The Petition asked for relief only on carbon and alloy steel mill products (excluding stainless and tool steel products). USTR Brock implied that it would be the products with which the Petition was concerned that would be the object of his negotiations,[29] so it is appropriate to limit the quantity data to carbon and alloy steel mill products. In addition, it would be appropriate to exclude semi-finished products, since the 18.5 percent goal for imports excludes semi-finished steel products.[30]

---

27 In a model in which the domestic industry has sufficient time to vary all inputs, one would assume that the industry could expand output at close to constant costs, i.e., e_5 would be very large. A shorter time period is assumed here.

28 See Crandall (1981, p. 131).

29 William Brock, "Press Briefing," Sept. 18, 1984, p. 7.

30 49, Federal Register, 36814, Sept. 20, 1984.

Monthly data on carbon, alloy and stainless domestic steel mill products shipments, exports, and imports (by product) were obtained from the American Iron and Steel Institute (AISI) for the months September 1983 through August 1984.[31] Subtracting exports from domestic shipments yields domestic shipments for domestic consumption, which is the desired Q in equations (1')-(4'). Domestic carbon and alloy shipments for domestic consumption, excluding semi-finished products, were 72,164 thousand short tons during the year September 1983 to August 1984. Thus, Q = 72,164 thousand short tons in equations (1')-(4'). Imports of carbon and alloy shipments excluding semi-finished products over the same period were 23,034 thousand short tons. Thus, q = 23,034 thousand short tons in equations (1')-(4').

The price data were based on data available in various 1984 issues of the Monthly Report on Steel Statistics by the USITC. The domestic price is a composite price of many steel products.[32] The value of $539 per short ton was taken as representative of the base year, i.e., we take P = $539 for the base year.

For the price of imports we start with the unit value of the 15 categories of products subject to the U.S.-E.C. arrangement. This customs value of $335 should be more representative of carbon and alloy steel products than all steel mill products (which includes the relatively expensive stainless steel products).[33] The customs value does not include transportation, insurance and some brokerage fees, which must be added to arrive at the delivered price, p, in equation (4). A survey of the estimates of these additional charges has been done in the FTC staff steel report.[34] The best estimate for these charges, taken from that survey, is 15.5 percent of the customs value. A recent report by the ITC on transportation costs, however, reveals that freight rates for iron and steel products have declined by about 1.5 percent since the publication of our FTC staff steel report.[35] Thus we adjust the customs value of $335 upwards by 14.0 percent to arrive at p = $382.

Tariff rates on carbon and alloy steel products were estimated by ITC staff at 5.6 percent in 1983. Due to Tokyo round cuts, however, they are expected to decline by roughly

---

[31] Although these data are not published in the Annual Statistical Report of the AISI, they are available in mimeo form.

[32] The ITC data on composite domestic steel prices are reproduced from Iron Age magazine. An Iron Age official stated, in a telephone interview, that the composite price excludes stainless steel. Thus the product mix should be representative of the products we are estimating.

[33] See USITC (1984, p. 7). Since data for the complete base year were unavailable, we used the customs value of these products for the first six months of 1984.

[34] See Duke et al. (1977, Appendix 3B).

[35] See USITC (1983b, p. 6). The USITC study does not include transportation costs from the plant to the port or from the port in the U.S. to the end user. For that reason, the total value of these charges exceeds that which the ITC was estimating.

0.3 percent per year over the next five years.[36] Thus we take 5 percent as a representative tariff rate which is expected to prevail over the next several years. Thus the delivered price of imports including tariff is p = $399.[37]

The Estimated New Equilibrium

The domestic price and quantity (in thousands of short tons) for the base year are: (P = $539, Q = 72,164); the price, including tariffs, and quantity (in thousands of short tons) of imports are: (p = $399, q = 23,034). Assuming that our model, described by equations (1')-(4') accurately depicts the process of price and quantity determination, then the price and quantity solutions for 1983 are a particular solution to equations (1')-(4'). One may substitute these particular price and quantity values into equation (1')-(3'), leaving three equations in three unknowns: a, b, and c. Solving them yields that a = 23.9362, b = 18.7428, and c = -3.9190.

With the imposition of a quota equation (4') would no longer apply; rather equation (4*), which states that imports are limited to a fixed quantity q^*, applies. To assess the effects of an 18.5 percent quota, we solve for that value of q which yields imports at 18.5 percent of apparent consumption.[38] This yields q^* = 16,381 thousand short tons. Substituting q = 16,381 thousand and the solutions for a, b and c into equations (1')-(3') and solving simultaneously yields the estimated new equilibrium after the imposition of the quota of: (P = $545, Q = 74,800); (p = $434, q = 16,381), where the quantities are in thousands of short tons. These solutions are depicted in Figure 6.2.

III. THE GAINS AND LOSSES FROM THE QUOTA AND COSTS TO CONSUMERS AND THE ECONOMY

Costs to Consumers and the Economy

The analysis of costs to consumers and to the economy begins with an estimate of the reduction in consumers' surplus as the measure of the value of consumers' losses from the imposition of the tariff.[39]

---

[36] These estimates were obtained from ITC staff.

[37] Since tariff rates are calculated on customs value only, we take (0.05)($335) = $16.75. This value added to the delivered price of $382 equals $399 when rounded to the nearest dollar.

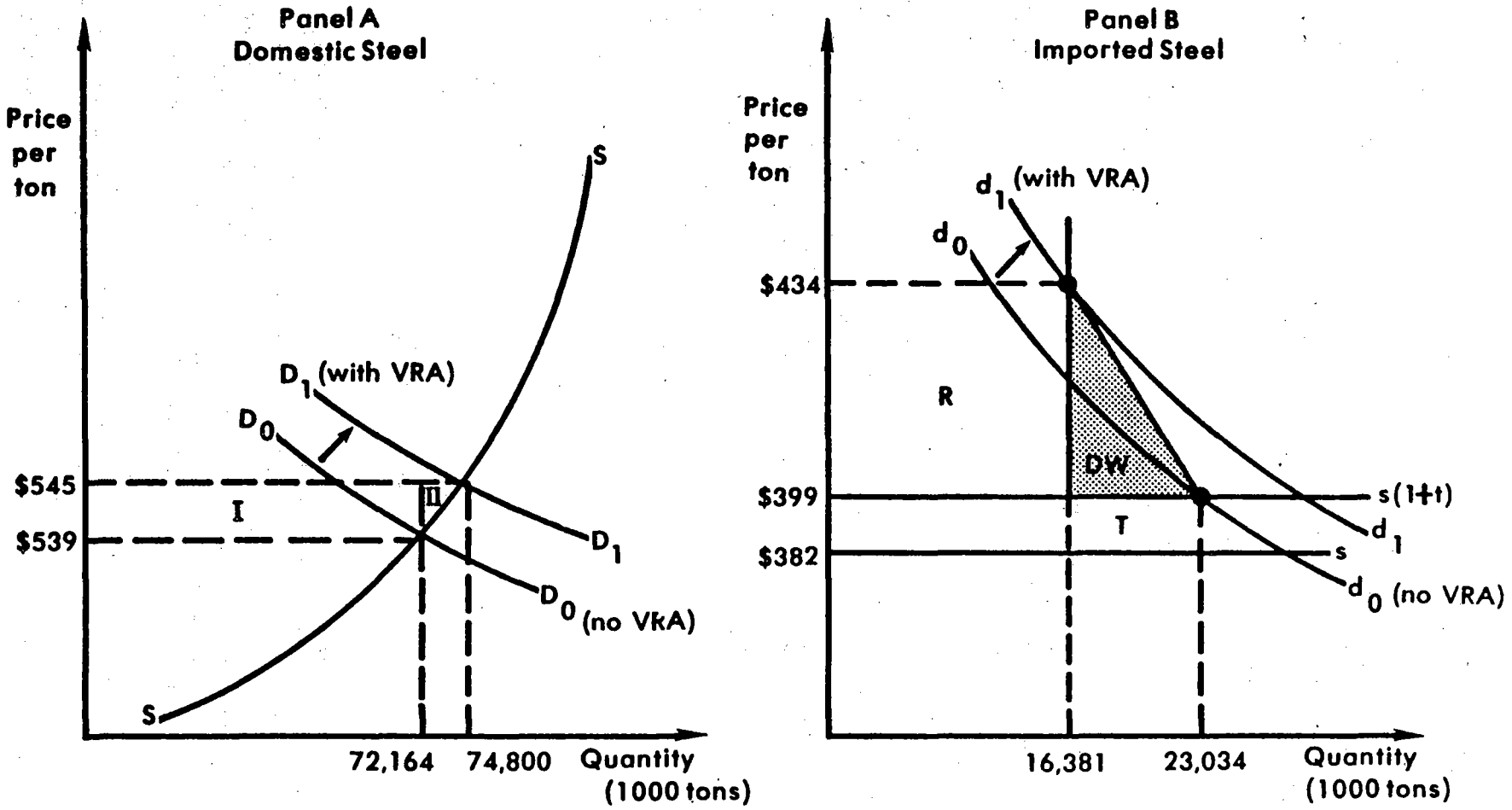
[38] This is accomplished by solving for q from: $q/(Q + q) = 0.185$

[39] Alfred Marshall (1920, p. 124) defined consumers' surplus as follows:

> ... [the consumer] derives from a purchase a surplus of satisfaction. The excess of the price which he would be willing to pay rather than go without the thing, over that which he actually does pay, is the economic measure of this surplus of satisfaction. It may be called consumers surplus.

FIGURE 6.2

Estimated Effects of an 18.5 Percent Quota on Carbon and Alloy Steel Mill Products (Excluding Semi-Finished) a/



a/ Figures are not drawn to scale.

Source: Bureau of Economics, Federal Trade Commission.

How to estimate the change in consumers' surplus is not immediately obvious since two markets, not just one, are involved and the demand curves in both markets have changed. An American Economic Review article by Burns (1973), however, applies precisely to this situation[40] and the Burns analysis is employed below. As a result of the quota, the lost consumers' surplus is equal to the rectangle I and triangle II in panel A plus the rectangle R and triangle DW in panel B. The four areas together sum to $1,130.7 million.

Define deadweight losses as:

$$(5) \quad DWL = \Delta CS + \Delta PS + \Delta T$$

where

ΔCS = change in consumers' surplus

ΔPS = change in producers' surplus and

ΔT = change in tariff

That is, the deadweight loss is the amount lost by consumers which is not captured or redistributed to other sectors of the domestic economy.[41] It is lost to the economy and is in that sense a "deadweight" loss imposed by the tariff.

The areas I & II, bounded by broken lines in panel A, are equal to the gain in producers' surplus from the quota.[42] Quantitatively it is calculated as $\$6 \times 72{,}164{,}000 + \$6(2{,}636{,}000)(1/2)$[43] and equals $440.892 million. Producers are willing to supply at a price read off the supply curve but are able to receive $545 instead. This is equal to the lost consumers'

---

[40] Willig (1976) has shown that this measure is a good measure of welfare changes.

[41] Dead-weight losses to the domestic economy may be decomposed into three parts: production distortions which are losses attributable to resources being used to produce the good in question that could be used more valuably elsewhere; consumption distortions which are losses attributable to consumers purchasing other goods that they value less highly than the good in question at the lower pre-quota price; and quota rents which are captured by foreigners. See Morkre-Tarr (1980, chapter 2) for details.

[42] Producers' surplus is defined entirely analogously to consumers' surplus. The difference between the price at which a producer would be willing to supply the product rather than not supply it and the price he actually receives is a measure of producer's surplus.

[43] We use 1/2 as a linear approximation.

surplus in the domestic market, so there are no deadweight losses attributed to the domestic market resource shifts.[44]

The rectangle R in panel B is equal to the value of the quota rents captured by the foreigners. The foreigners sell the quota amount of 16,381 thousand short tons. They are willing to supply this quantity at a price read off the tariff inclusive supply curve, i.e., at $399. Instead, under the usual method of quota allocation, where foreign countries receive the quota rights, they are able to receive $434 per short ton. The difference of $35 per ton is the rent they receive per ton of sales, which is attributable to the quota. This value equals $573.34 million.

The triangle DW (which is dotted in panel B of Figure 6.2) is equal to 1/2 x $35 x (23.034 - 16.381) million = $116.43 million. It represents deadweight loss because it is part of lost consumers' surplus, but is not redistributed to other sectors of the economy either as producers' surplus or as tariffs. It is pure inefficiency loss in that it is captured by no one.

An additional area of deadweight loss is the rectangle T which is equal to $17 x (6.653) million = $113.101 million. This area represents tariff revenue which was formerly collected by the United States Treasury, but is now captured by no one. It does not represent an additional loss to consumers as a result of

---

[44] This is the traditional method of estimating these quantities, and is in the spirit of Harberger's (1971) analysis, since there is no difference between the price and what any producer is willing to supply at the margin.

Wisecarver (1974) has established that the above analysis is not altered by the fact that steel is a derived demand. When steel VRA's are imposed, however, the costs of making automobiles will be changed. Since we ignored the effects of steel VRA's in the automobile chapter, we may have an estimate of the costs of the automobile VRA that is too low.

To see this, observe that in Figure 3.1, the imposition of a steel VRA will cause the domestic supply curve for automobiles to shift up and to the left. The new higher domestic price for automobiles will induce a shift out and to the right in the demand for Japanese automobiles, intersecting the vertical quota line for automobiles at a higher price. These new equilibria would be the initial equilibria from which we could conduct the exercise, analogous to that done in the automobile chapter, of removing the automobile VRA. Both the rent rectangle and the deadweight loss triangle will be larger with the ceterus paribus addition of the steel quota than was estimated in chapter three. Thus the costs to the economy of the automobile VRA are higher than we have estimated when the impact of imposing the steel VRA is considered.

On the other hand, removing the automobile VRA will change the demand for steel. But since no steel quota existed in the base year we used, any spillover effect that the automobile VRA has on the steel industry, will not result in a net welfare change in steel because price equalled marginal costs in steel during the base year. This is the Harberger result referred to in the first paragraph of this note. See also Wisecarver (1974, pp. 369-370).

Thus, on balance, the interrelatedness of steel and automobiles in our study has resulted in an underestimate of the total costs to the economy.

the quota, since consumers lost this amount under the tariff.[45] The results of these calculations are summarized in Table 6.1.

Benefits of the Quota

Costs Per Job Created. If a quota is imposed, a number of jobs in steelmaking would be created. An estimate of the number of jobs created can be based on the estimates in section II that the 18.5 percent quota will result in an increase in domestically produced steel shipments of 2.636 million short tons. Based on data from the American Iron and Steel Institute, an additional 3.775 employees would be required to produce an additional one thousand short tons of steel mill products. Assuming this ratio would be maintained implies that 2.636 million additional tons of steel produced will result in 9,951 additional jobs. This estimate is derived in the following manner.

If the average product of labor and the marginal product of labor differ, as would be expected to occur if the supply curve is not flat, the marginal product is superior to the average product for an estimate of the additional jobs required to produce additional output. This is true because the marginal product is defined as the additional output obtained from an additional unit (small) of labor.

In 1982, 61.567 million short tons of steel mill shipments required 289,437 employees; in 1981, 88.450 million short tons of steel mill shipments required 390,914 employees.[46] Thus the reduction in output of 26.883 million short tons from 1981 to 1982 resulted in the reduction of employment of 101,477 employees. This implies that, on average, an additional employee produced 264.9 tons of steel per year. We take this number as an approximation of the marginal product of labor, i.e., the change in output divided by the change in labor employment over the previous year is the proxy for the marginal product of labor. Taking the reciprocal yields 3.775 as the marginal amount of labor required for an additional one thousand tons of steel.

Utilizing the estimates of section II, this means that the costs to consumers for each job created is $113,622 per year; the costs to the economy for each job created is $80,682 per year. These estimates are summarized in Table 6.2.

Cost-Benefit Ratios. Following the methodology developed by Morkre-Tarr (1980, pp. 16-19) benefits are taken as the adjustment costs of workers who otherwise would have been displaced. These adjustment costs are measured by the earnings losses of displaced workers.

Jacobson (1978) has estimated the earnings losses of workers displaced from a number of manufacturing industries, including steel. For most industries the substantial losses occur in the first two years after displacement; for many industries losses continue in the subsequent four years. Thereafter earnings losses have usually vanished.

The introductory section to this chapter has revealed that protection has been afforded to the steel industry in episodes.

---

[45] For simplicity of analysis we take the tariff to be an equivalent specific tariff which raises the price to $399.

[46] American Iron and Steel Institute, 1982, Annual Statistical Report.

That is, unlike textiles which has a history of continuous protection since the imposition of the multifiber arrangement, carbon steel has had protection for a period of about five years, followed by free trade for a number of years, followed by protection for a number of years and so on. This is partly explained by the fact that the protection is usually justified on the basis of allowing the steel industry a period of time to "modernize" and adjust, after which it is hoped the industry will be able to compete effectively. Indeed, the President asked the USITC to annually report to him on the industry's modernization and adjustment efforts;[47] and the Trade and Tariff Act of 1984 requires industry reinvestment of cash flow (with possible termination of the program if the requirement is not met) and terminates authorization for the Administration's program after five years. This suggests that the new program of protection will last for a number of years and terminate. In what follows, we assume the restraints will be lifted after five years.[48]

In steel Jacobson estimates that displaced workers lose 46.6 percent of their earnings in the first two years after displacement and 12.6 percent in the subsequent four years. The average total compensation of a steel employee in 1983 was $38,574.[49] Suppose, as a result of imposing a quota, a steelworker is never displaced. Then, taking a discount rate of 7 percent[50] yields a present value of $499 million in cumulative saved earnings losses (benefits) from the quota. After termination of the quota, however, the marginal output of the domestic industry which, was induced by and produced jobs only because of the quota, would be eliminated. Thus those workers who are employed because of the quota would be expected to be displaced after the quota is terminated. This means the benefits of the quota are the deferral of the displacement costs for five years. That is, as a result of a quota the costs of adjustment will not be incurred in the first six years starting immediately, but rather in the six years following the five years of protection.

By taking the appropriate present values one can calculate that the present value of the cumulative earnings losses of 9,951 steelworkers who would be displaced after five years of protection is $356 million in 1983 dollars. If they were displaced immediately, i.e., no protection were granted, the

---

47 49, Federal Register, 36814, Sept. 20, 1984.

48 This assumption is also supported by the fact that the Fair Trade in Steel Act of 1984 proposed to remove quotas after five years and in a section 201 proceeding (which started the present policy debate on steel), a quota may only be requested for a maximum of five years. The protection may be extended for an additional three years upon further petition and affirmative rulings by the ITC and the President.

49 $38,574 = 52 x 33.4 x $22.21. Fifty two weeks times average number of hours worked per week in 1983 times total hourly compensation in 1983. The 1983 data were obtained from the American Iron and Steel Institute, Annual Statistical Report, 1983.

50 A relatively high real discount rate, such as this one, will lower the cost-benefit ratios. This is because the costs to consumers do not change over time, while the benefits, which are the adjustment costs saved, decline over time and eventually vanish. Thus the cost-benefit ratios may be thought of as conservative on this account.

losses would be $499 million. The difference of $143 million is the benefit of the protection, i.e., it is the value of deferring the earnings losses for five years.[51]

The present value of the losses to consumers from imposing the proposed quota over five years is $4,960.422 million and the present value of the losses to the United States economy over five years is $3,522.334 million. Comparing this with $143.334 million in benefits yields that for each dollar of earnings losses saved by the quota consumers lose $34.60 and the economy loses $24.57. These estimates are summarized in Table 6.3.

IV. CONCLUSION

This chapter has estimated the costs to consumers and to the economy of imposing a quota on imported carbon and alloy steel mill products at the 18.5 percent level. It was found that the costs to United States consumers exceed 1 billion dollars annually and the inefficiency costs to the United States economy exceed 0.8 of a billion dollars annually. Despite these rather significant amounts, a number of assumptions were made in the estimation process that imply that the estimates are conservative, i.e., the true costs to the economy and other relevant measures are higher than those indicated.

---

[51] If steel is an "infant" industry which needs a period of protection after which it will compete with foreign competition effectively, then the $499 million estimate is the appropriate one. Steel, however, has been produced in large amounts in the United States for many decades and is thus not a likely candidate as an infant industry.

If an adjustment assistance program is offered to workers, in lieu of a quota, the earnings losses may underestimate the full social costs if the labor benefits available have the effect of lowering the wage rate the industry needs to pay to attract workers. This arises when workers anticipate that their compensation includes their expected benefits under an adjustment assistance program. In this case domestic supply increases and the effect is similar to a unit subsidy given to the industry. There would be deadweight production inefficiencies caused by the increase in domestic production. In view of the actual benefits paid to displaced steelworkers under the trade adjustment assistance program, however, these effects are expected to be relatively small and are ignored in our analysis.

Finally, we will have overestimated the actual adjustment costs saved if the quota results in recalling workers who have been unemployed for some period of time. If they have been out of work for one year, or possibly in a new job and return to the steel industry, then they would already have incurred adjustment costs over that one year. Their, or their coworkers, subsequent displacement in five years will involve incurring the full adjustment costs at that time. The benefits of deferring the adjustment for five years is not the difference between adjustment today and adjustment in five years as was assumed above; rather it is the difference between the remaining adjustment costs of adjusting today and the full adjustment costs of five years from now. To the extent that this is significant, the true benefits of granting protection are lower than we have estimated.

APPENDIX 6

THE EFFECT OF THE PRE-EXISTING QUOTA ARRANGEMENT ON THE COST ESTIMATES

It was mentioned in the text that the United States and the European Community (EC) have negotiated quotas on the import of certain carbon steel products. Similar arrangements have been negotiated with Mexico and South Africa. In addition, it has been alleged that Japan has, without formal agreement or announcement, restrained its exports. These restraints, however, should not affect the estimates of this chapter.

The reason is as follows. Refer to the producers of products that are subject to pre-existing quotas as "restrained suppliers," and to other producers as non-restrained suppliers. We maintain consistency with the text and assume that both sets of suppliers have flat supply curves. Let the supply price of non-restrained and restrained suppliers be denoted p_o and p_r respectively, and let q' equal the quantity restraint of the restrained suppliers.

Case I: $p_o = p_r$

In this case, the pre-existing quota of $q = q'$ for the restrained suppliers does not affect the price of imported steel or the quantity demanded. The non-restrained suppliers are just as efficient as the restrained suppliers and they fill any void created by the quotas on the restrained suppliers.[52] Then the estimates of the effects of the proposed quota are unaffected since the initial supply price is unaffected by the pre-existing quota.

Case II: $p_o > p_r$

In Figure 6.3 we redraw panel B of Figure 6.1 to reflect the existence of the pre-existing quotas on the restrained suppliers. Initially, equilibrium is at e_o. The restrained suppliers who would be willing to supply at price p_r, but are able to obtain the market price p_o. The restrained suppliers are limited in the amount they may supply to q'. The marginal suppliers are the non-restrained suppliers who supply at the price $p_o > p_r$. The initial equilibrium is at a price of po and quantity q_o determined by the intersection of the demand curve d_o and the supply curve of the non-restrained suppliers.

As a result of the pre-existing quotas, the domestic economy and consumers lose an amount represented by three areas in Figure 6.3: pre-R plus pre-DW_p plus DW_c. The rectangle pre-R represents quota rents to the restrained suppliers. They are willing to supply at a price p_r but are able to obtain p_o on their quota allocation of q'. The area pre-DWc represents consumption distortion inefficiency as some consumers are squeezed into purchasing formerly less desirable products at the higher steel price. The area pre-DWp represents production inefficiency to the world, as less efficient more costly foreign producers supply the amount ($q_o - q'$) at their cost of p_o, where, absent a quota, it could have been purchased from the restrained suppliers at p_r.

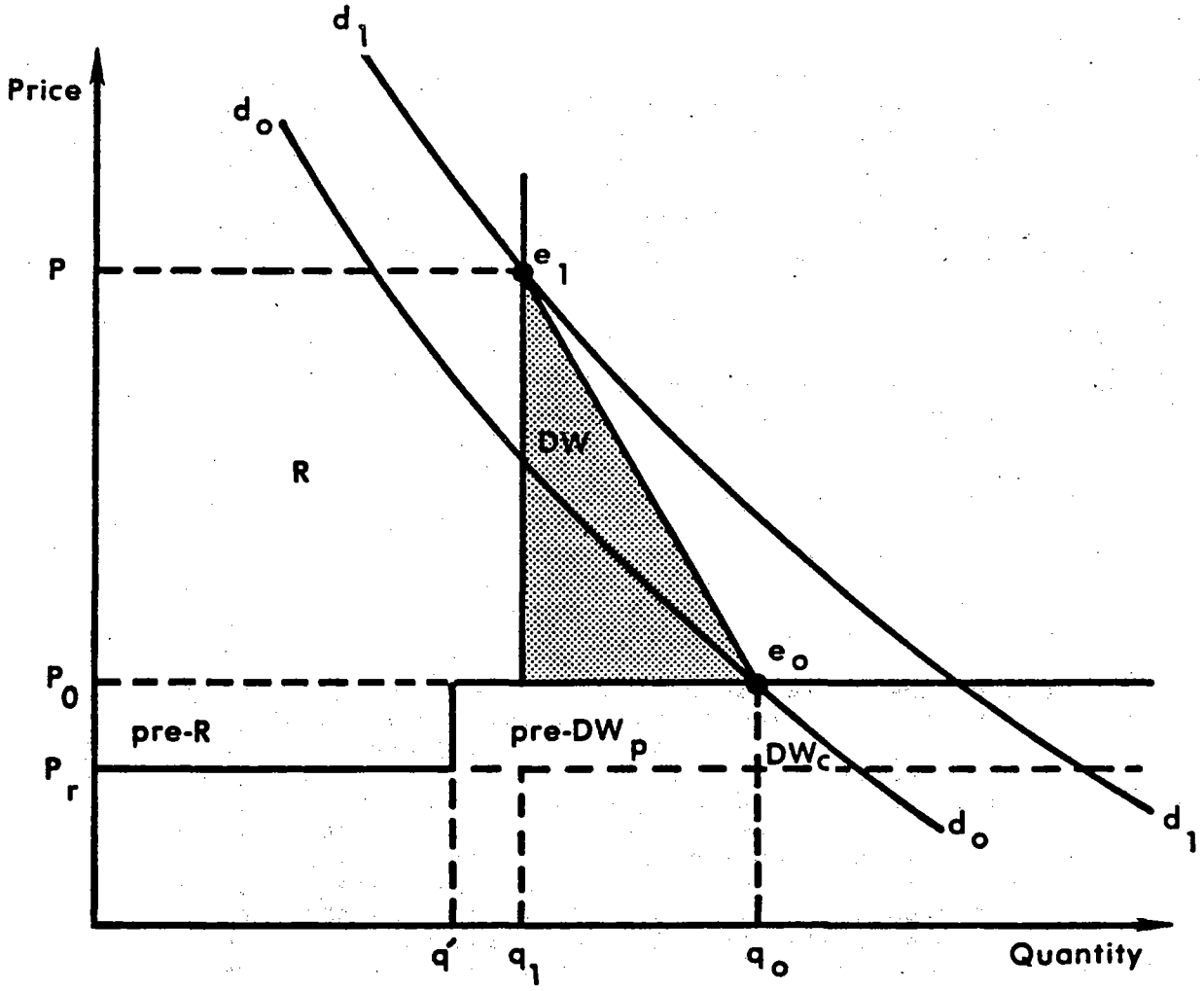
Now suppose a binding global quota of $q = q_1$ is imposed. For the reasons explained in the text, the new equilibrium will

---

52 This is what happened in response to quotas on imports of Japanese color televisions. See Morkre-Tarr (1980).

FIGURE 6:3

Effects of a Quota on Imported Steel With a Binding pre-Existing Quota on a Subset of the Suppliers



rise to e_1 with a market price of p_1. It was claimed in the text that the areas labeled R and DW in Figure 6.1, and similarly labeled in Figure 6.3, are the additional costs to the economy of imposing the quota $q = q_1$. The explanation depends on how the restrained suppliers fare under the new quota.

First suppose the restrained suppliers maintain the pre-existing quota allotment of $q = q'$. Then the amount $(p_1 - p_o)q'$ represents new additional quota rents to the restrained suppliers. The remainder of R, $(p_1 - p_o)(q_1 - q')$ represents rents to the formerly non-restrained suppliers. The area DW still represents new consumption distortion inefficiency loss. The area $(q_o - q)(p_o - p_r)$ changes in its interpretation. It becomes new consumption distortion inefficiency loss when it was formerly production inefficiency loss. It remains lost to the domestic economy and consumers so the change in losses to the economy and consumers is as indicated in the text.

If instead, the restrained suppliers receive a quota less than $q = q'$ in the new arrangements, then some of the pre-existing quota rents will be converted to production inefficiency losses to the world, and the rectangle R of rents will be allocated in larger measure to the formerly non-restrained suppliers. The areas R plus DW, however, remain equal to the new losses to the economy from the new quota $q = q_1$.

In the event that $q_1 < q'$ the explanation follows along the lines of this last scenario.

REFERENCES FOR CHAPTER SIX

American Iron and Steel Institute, Annual Statistical Report, Washington, D.C., various years.

Barnett, Donald and Louis Schorsch (1983), Steel: Upheavel in a Basic Industry, Ballinger.

Bhagwati, Jagdish (1965), "On the Equivalence of Tariffs and Quotas," in Trade, Growth and the Balance of Payments, edited by R. Baldwin et al., Rand McNally, pp. 53-67.

Burns, Michael E. (1973), "A Note on the Concept and Measure of Consumers' Surplus," American Economic Review, 63(3), pp. 335-344.

Congressional Budget Office (1984), The Effects of Import Quotas on the Steel Industry, U.S. Congress.

Corden, W. M. (1971), The Theory of Protection, Oxford University Press.

Crandall, Robert (1981), The U.S. Steel Industry in Recurrent Crisis, Brookings Institution.

Duke, R., R. Johnson, H. Mueller, P. D. Qualls, C. Roush and D. Tarr (1977), The United States Steel Industry and Its International Rivals..., Bureau of Economics Staff Report to the Federal Trade Commission, USGPO.

Harberger, Arnold (1981), "Three Basic Postulates for Applied Welfare Economics: An Interpretive Essay," Journal of Economic Literature, 9(3), pp. 785-797.

Jacobsen, Louis S. (1976), "Earnings Losses of Workers Displaced from Manufacturing Industries," in The Impact of International Trade and Investment on Employment, edited by William DeWald, Proceedings of a Conference on Department of Labor Research Results, USGPO.

Jondrow, James et al. (1976), "Forms of Competition in the Steel Industry," Public Research Institute of the Center for Naval Analysis, in mimeo.

Marshall, Alfred (1920), Principles of Economics, 8th edition, London.

Morkre, Morris E. and David G. Tarr (1980), The Effects of Restrictions on United States Imports: Five Case Studies and Theory, Bureau of Economics Staff Report to the Federal Trade Commission, USGPO.

Shibata, Hirofumi (1968), "A Note on the Equivalence of Tariffs and Quotas," American Economic Review, 58(1), pp. 137-142.

Solomon, Anthony (Chairman of the Task Force) (1977), "Report to the President [on] A Comprehensive Program for the Steel Industry," in The Administration's Comprehensive Program for the Steel Industry, Hearings before the Subcommittee on Trade of the Committee on Ways and Means, House of Representatives, USGPO, January 25 and 26, 1978.

Tarr, David (1982), "Estimation of the Costs to the U.S. Economy and Consumers of the Imposition of Countervailing Duties on Steel Products Under Investigation at the Department of Commerce," in Comments by the FTC's Bureaus submitted to the DOC, May.

_____ (1984), "Estimation of the Costs to the U.S. Economy and to Consumers of the Imposition of a Fifteen Percent Quota, Equivalent Tariff and Adjustment Assistance for Carbon and Alloy Steel Mill Products," Supplemental Filing by the Federal Trade Commission to the USITC on Investigation No. TA-201-51, June.

United States International Trade Commission (1982), "Certain Steel Products from Belgium, Brazil, France, Italy, Luxembourg, the Netherlands, Romania, the United Kingdom and West Germany," USITC publication 1221, February.

_____ (1983a), "Statistical Bulletin Number 1, Statistical Services Division, March, in mimeo.

_____ (1983b), "Transportation Costs of U.S. Imports," USITC publication 1375, April.

_____ (1984), "Monthly Report on Selected Steel Industry Data," USITC publication 1567, August.

United Steelworkers of America and Bethlehem Steel Corporation (1984), "Petition Under Section 201 of the Trade Act of 1974 and Subpart B of Part 206 of the rules of the USITC," submitted to the USITC in mimeo.

Willig, Robert D. (1976), "Consumers Surplus Without Apology," American Economic Review 66(4), pp. 589-597.

Wisecarver, Daniel (1974), "The Social Costs of Input-Market Distortions," American Economic Review, 64(3), pp. 359-372.

ERRATA

[new figures are shown by boldface type]

Page 1
2nd pp. 2nd line: replace $12.70 by $8.52
2nd pp. 4th line: replace $46.07 by $30.91

Page 2. Table 1
new table attached

Page 4
last line of text: replace $10.52 by $6.34
fn. 4, 2nd pp. 7th line: replace $12.70 by $8.52

Page 5. Table 2
replace $10.52 by $6.34
replace $38.13 by $22.99
replace $119.25 by $71.87

Page 6
1st pp. 3rd line from end: replace 29 by 18 and $10.52 by $6.34
1st pp. 2nd line from end: replace $29 by $18
2nd pp. 4th line: replace $38.13 by $22.99
2nd pp. last line: replace $37.77 by $22.63

Page 7. Table 1
replace 29.22 by 17.68

Page 19
2nd pp. 1st line: replace $10.52 by $6.34
3rd pp. 4th line: replace $12.70 by $8.52
3rd pp. 5th line from end: replace $46.07 by $30.91
4th pp. 3rd line: replace $61 by $41

Page 21
last sentence: replace $46 by $31

Page 30
2nd pp. last line: replace $10.5 by $6.3
3rd pp. last line: replace 29 by 18
4th pp. 4th line: replace $38 by $23
4th pp. last line: replace $119 by $72
fn. 1, 3rd line: replace three-tenths by two-tenths

Page 36
5th pp. last line: replace 4.139 by 2.495
last line of text: replace $10.52 by $6.34

Page 37. Table 2.1
entries in first row: replace 10.91 by 6.57 and 10.52 by 6.34
label of fifth row: replace 4.139 by 2.495
entries in fifth row: replace 8.20 by 4.94 and 7.91 by 4.77

Page 38
top line: replace $10.91 by $6.57
last line of carryover pp. from p. 36: replace 4.139 by 2.495

Page 40
4th line: replace $2.7 by $1.6
1st pp. last sentence: replace $10.52 by $6.34 and $10.91 by $6.57

Page 46
4th pp. 1st line: replace $10.52 by $6.34
4th pp. 3rd line: replace 29 by 18
4th pp. 4th line: replace $29 by $18

Page 47. Table 2.5
new table attached

Page 48
1st pp. 3rd line: replace $38.13 by $22.99
1st pp. 4th line: replace $37.77 by $22.63
1st pp. last line: replace $119 by $72
2nd pp. 2nd line: replace $10.5 by $6.3

Page 49
2nd pp. 3rd line from end: $10.5 by $6.3
2nd pp. last line: replace 29 by 18
3rd pp. 4th line: replace $38 by $23

TABLE 1

Summary Table

Aggregate Costs to the Economy of the Restraints Considered: Annual Costs and Cumulative Costs over Four Years*

(in billions of 1983 dollars)**

	Annual Costs	Present Value of Costs over Four Years
Total costs of all tariffs and quotas examined	$8.52	$30.91
All Tariffs	6.34	22.99
Quotas, Net cost of all estimated	2.18	7.94
Automobile "VRA"	0.99	3.60
Sugar Quota	0.25	0.91
Textile Quota on Hong Kong	0.37	1.35
Steel Quota	0.78	2.83
Less: maximum estimated terms-of-trade welfare loss from quota removal	-0.21	-0.75

* Although an aggregate costs to consumers estimate is not presented, costs to consumers are greater than the costs to the economy. Thus the costs to the economy estimate may be used as a lower bound estimate of the costs to consumers.

** Due to rounding, the totals may differ from the sum of the entries in the columns relevant to the total.

Source: Author's calculations from estimates in the text.

TABLE 2.5

The Present Value of Benefits and Costs to the U.S. of Multilateral Elimination of All Tariffs

Year	Gains to U.S. (Equivalent Variation)	Adjustment Costs	Net Gain
	(--------Billions of 1983 Dollars---------)		
1	6.34	0.36	5.98
2	5.93	0	5.93
3	5.54	0	5.54
4	5.18	0	5.18
Sum over four year	22.99	0.36	22.63
Sum over twenty year	71.87	0.36	71.51

Notes: The annual stream of gains is assumed to be $6.34 billion per year. Future gains are discounted using a discount rate of 7 percent.

Sources: Table 2.1, line 1 for gains and the text for adjustment costs.