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The Economic Effects of Significant U.S. Import Restraints

Ninth Update 2017

Special Topic: Effects of Tariffs and of Customs and Border Procedures on Global Supply Chains

Investigation No. 332-325

United States
International Trade
Commission

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United States International Trade Commission

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United States International Trade Commission

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Acronyms and Abbreviations

Terms	Definitions
3PL	third-party logistics
A&A	Armstrong & Associates
AFIP	Administración Federal de Ingresos Públicos (Argentina's Federal Administration of Public Revenues)
AMF	anhydrous milk fat
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
AVE	ad valorem equivalent
BEA	Bureau of Economic Analysis (U.S. Department of Commerce)
BLS	Bureau of Labor Statistics (U.S. Department of Labor)
CAFTA-DR	Dominican Republic-Central America-United States Free Trade Agreement
CES	consumer expenditure survey
CFIUS	Committee on Foreign Investment in the United States
CGE	computable general equilibrium
c.i.f.	cost, insurance, and freight
Commission	U.S. International Trade Commission
CPI	consumer price index
CQE	certificate of quota eligibility
CT	cumulative tariff
CY	calendar year
DHL	Deutsche Post DHL Group
DTI	Department of Trade and Industry (Philippines)
e2M	electronic-to-mobile
EDIS	Electronic Document Information System (USITC)
ERS	Economic Research Service (U.S. Department of Agriculture)
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FAS	Foreign Agricultural Service (U.S. Department of Agriculture)
FCA	Fiat Chrysler Automotive
FCC	Federal Communications Commission
FDRA	Footwear Distributors and Retailers of America
FMC	Federal Maritime Commission
FR	*Federal Register*
FTA	free trade agreement
GATS	General Agreement on Trade in Services
GDP	gross domestic product
GSC	global supply chain
GTA	Global Trade Atlas
HS	Harmonized Commodity Description and Coding System (Harmonized System) (global classification for traded goods)

Terms	Definitions
HTS	Harmonized Tariff System of the United States
ICT	information, communications, and technology
I-O	input-output
ITA	International Trade Administration (U.S. Department of Commerce)
ITI	Information Technology Industry Council
JIT	just-in-time manufacturing
LONIS	Law on Network Information Security (Vietnam)
LPI	Logistics Performance Index (World Bank)
M&A	mergers and acquisitions
MCC	Millennium Challenge Corporation (U.S.)
Mercosur/ Mercosul	Mercado Común del Sur/Mercado Comum do Sul (Common Market of the South)
MPC	milk protein concentrate
mt	metric ton(s)
mtrv	metric tons, raw value
MY	marketing year
NAFTA	North American Free Trade Agreement
NAICS	North American Industry Classification System
NASS	National Agricultural Statistics Service (U.S. Department of Agriculture)
NDM	nonfat dry milk
NTB	nontariff barrier
NTM	nontariff measure
OAQ	overall allotment quantity
OCE	Office of the Chief Economist (U.S. Department of Agriculture)
OECD	Organisation for Economic Co-operation and Development
OICA	Organisation Internationale des Constructeurs d'Automobiles (Organization of Motor Vehicle Manufacturers)
PEZA	Philippine Economic Zone Authority
PwC	PricewaterhouseCoopers
R&D	research and development
ROOs	rules of origin
SCP	sugar-containing product
SEMI	Semiconductors Equipment and Materials International
SIA	Semiconductor Industry Association
SSA	sub-Saharan Africa
STRI	Services Trade Restrictiveness Index
TFA	Trade Facilitation Agreement (WTO)
TPA	trade promotion agreement
TPL	tariff preference level
TPP	Trans-Pacific Partnership agreement
TRQ	tariff-rate quota
TSMC	Taiwan Semiconductor Manufacturing Company
UN	United Nations

Terms	Definitions
UNECA	United Nations Economic Commission for Africa
USAGE	U.S. Applied General Equilibrium (economic model)
USAID	U.S. Agency for International Development
USDA	U.S. Department of Agriculture
USDOC	U.S. Department of Commerce
USITC	U.S. International Trade Commission
USTR	U.S. Trade Representative
WAOB	World Agricultural Outlook Board (U.S. Department of Agriculture, Office of Chief Economist)
WEF	World Economic Forum
WTO	World Trade Organization

Executive Summary

This report is the ninth update of *The Economic Effects of Significant U.S. Import Restraints*. During the almost 25-year period since the USTR first requested this series of reports, U.S. tariff and nontariff measures on imports have fallen to the point that the United States is one of the world's most open economies. The average U.S. tariff on all goods was 1.5 percent (based on trade-weighted import values) in 2015. As tariffs fall and trade expands, households of all income levels benefit from lower-priced imports. A major part of the growth in global trade is due to the increased use of global supply chains, in which parts of the production process are completed in different countries. Nevertheless, restraints to trade still exist. The special-topic chapter in this report addresses the effects of tariffs and customs and border procedures on global supply chains.

Effects of Significant Import Restraints

Removing significant import restraints would affect U.S. firms and workers in both positive and negative ways. Their removal would lower the cost of goods to consumers and the cost of inputs for U.S. industries. However, U.S. firms in the liberalized sectors would face lower prices for their outputs, and some would likely go out of business, which would decrease U.S. shipments and U.S. employment in those sectors. The U.S. International Trade Commission (USITC or Commission) estimates that the net change to total U.S. economic welfare from removing significant U.S. import restraints would be a positive one—an average annual increase of about $3.3 billion during 2015–20. This estimate does not include restraints on services, which are assessed in this report but are not modeled quantitatively.[1]

As in previous updates, this report uses an economic model of the U.S. economy to analyze the effects of removing remaining significant U.S. import restraints. The Commission identified sectors with significant import restraints, such as high tariff rates and restrictive tariff-rate quotas (TRQs), based on 2015 data. The baseline projection to 2020 takes into account any expected changes during this time. Among agricultural products, the restraints that currently restrict trade the most are those applied to sugar. Among manufactured goods, the most restrictive restraints are in the textile and apparel industries and in leather and allied product manufacturing, which includes footwear (table ES.1).

[1] As stipulated in the original 1992 letter from the U.S. Trade Representative requesting these reports, the estimate does not take into consideration the removal of restraints resulting from countervailing duty and antidumping orders, section 337 or 406 investigations, or section 301 actions. However, duties resulting from U.S. fair trade laws, such as section 201 safeguard investigations, are included as stipulated in the 1992 letter.

Table ES.1: Restrictiveness of U.S. import restraints, percent increase in price of imports due to restraints, 2015–20, %

Sector	U.S. tariff[a]	U.S. TRQ[b]	Total
Food and agriculture			
Cheese	7.3	8	15.3
Butter	5.8	15[c]	20.8
Raw cane sugar	1.3	28[d]	29.3
Refined sugar	1.6	55[d]	56.6
Beef	1.0	0[e]	1.0
Canned tuna	12.3	0[f]	12.3
All textiles and apparel			
Textiles and apparel			
Fiber, yarn, and threads	5.2	0	5.2
Fabrics	5.0	0	5.0
Carpets and rugs	6.3	0	6.3
Other textile products	5.5	0	5.5
Apparel	12.8	0	12.8
Other manufacturing sectors			
Ball and roller bearings	5.8	0	5.8
Cellulosic organic fibers	4.7	0	4.7
Ceramic wall and floor tiles	6.2	0	6.2
China, fine earthenware, other pottery products	5.3	0	5.3
Cigarettes	6.7	0	6.7
Costume jewelry and novelties	7.5	0	7.5
Leather and allied product manufacturing	10.1	0	10.1
Other pressed and blown glass and glassware	5.3	0	5.3
Pens and mechanical pencils	5.2	0	5.2
Pesticides and agricultural chemicals (excluding fertilizers)	4.6	0	4.6
Residential electric lighting fixtures	5.0	0	5.0
Synthetic organic dyes and pigments	5.1	0	5.1

Source: USITC estimates based on tariff rates and tariff-rate quota (TRQ) commitments.
Note: The table gives projected 2020 tariff and TRQ values. Sectors are defined by the North American Industry Classification System (NAICS).
[a] Measured as an ad valorem equivalent share of the cost, insurance, and freight (c.i.f.) value of imports.
[b] Measured as an export tax equivalent—that is, the degree to which a TRQ increases the "export price" of a commodity (defined as the price before entry into the United States).
[c] The export tax equivalent of the dairy TRQ declines from 30 percent in 2015 to 15 percent in 2020.
[d] The export tax equivalents of the sugar TRQs are trade-weighted averages of source-specific measures.
[e] The export tax equivalent of the beef TRQ was 4 percent in 2015 and declines to zero thereafter in the baseline.
[f] Imports of canned tuna packed in water are subject to a TRQ. Because the quota allocation is small, most imports are subject to the over-quota duty rate. See chapter 2.

Removal of All Significant Restraints

As noted above, the Commission estimates that simultaneous liberalization of all significant import restraints quantified in this report would increase annual U.S. welfare by $3.3 billion per year by 2020 relative to the baseline calculated by the Commission.[2] The largest effects from the removal of significant import restraints are in the textiles and apparel sector, where consumers would benefit from lower-priced imports and where net U.S. welfare would increase by $2.4 billion.

When an import restraint is removed, the U.S. price of that import declines as import quantities rise. U.S. producers making similar products reduce their prices to compete better, and some may shut down, thus decreasing domestic supply and employment. Exports in most liberalized sectors would increase, although by a smaller proportion than the increase in imports. Most liberalized sectors show these expected trends in the Commission estimate (table ES.2). An exception is the yarn, thread, and fabric sector, where foreign apparel producers in countries with certain U.S. free trade agreements no longer have incentives to use U.S. yarn, thread, and fabric because they would no longer have to meet rule of origin (ROO) requirements to gain access to the U.S. market; thus U.S. exports of these products decrease. The decrease in yarn, thread, and fabric exports is fairly large and leads to a slight decrease in exports in all liberalized sectors of 0.3 percent.

[2] The effects of liberalization on welfare are measured by the change in net national expenditures between the baseline projection and the liberalization simulation.

Table ES.2: Simultaneous liberalization of all significant restraints: effects on liberalized sectors, 2020, %

Sector[a]	Employment	Shipments	Imports	Exports
Food and agriculture				
Sugar manufacturing	-4.2	-4.5	25.0	12.6
Butter	-0.8	-0.9	30.3	0.6
Cheese	-0.6	-0.4	16.5	0.4
Beef meat for processing	-0.2	-0.1	1.2	0.2
Canned tuna	-2.5	-2.5	8.5	6.8
All textiles and apparel				
Yarn, thread, fabric	-4.3	-4.0	2.1	-10.6
Textile products	-1.0	-1.0	2.6	3.1
Apparel	-4.5	-4.6	4.2	5.1
Other manufacturing sectors				
Ball and roller bearings	-1.6	-1.4	8.9	6.2
Cellulosic organic fibers	-1.6	-1.5	3.6	2.9
Ceramic wall and floor tiles	-2.5	-2.8	3.3	3.3
China, fine earthenware, other pottery products	-3.5	-4.0	2.2	3.4
Cigarettes	-0.1	-0.1	9.6	5.9
Costume jewelry and novelties	-1.2	-1.3	4.5	3.3
Leather and allied product manufacturing	1.8	1.8	3.4	6.4
Other pressed and blown glass and glassware	-1.3	-1.5	4.5	3.6
Pens and mechanical pencils	-1.6	-1.8	4.0	3.3
Pesticides and agricultural chemicals (excluding fertilizers)	([b])	([b])	3.3	1.9
Residential electric lighting fixtures	-0.4	-1.0	1.3	1.6
Synthetic organic dyes and pigments	-0.2	-0.3	4.2	2.8
Total	-2.1	-1.4	4.0	-0.3

Source: USITC estimates.
[a] Although greater sector detail is available, broad sectors consistent with previous reports are shown in some instances. For example, the different components of sugar growing and processing are aggregated into sugar manufacturing.
[b] Values are between -0.05 and zero.

Household Effects

The report divides all U.S. households into 10 groups, based on their income level, and estimates the effects of removing significant U.S. import restraints on each group. A typical annual household consumption basket would cost from $54 to $288 less each year if significant import restraints were removed, depending on the household group. Higher income groups benefit more than lower ones in dollar terms because they spend more; as a share of income, all income groups benefit by about the same percentage.

Effects of Sector-by-Sector Liberalization

The Commission report examines each individual sector with significant import restraints to estimate the economic effects of import liberalization on U.S. consumers, producers, and workers in the sector and on related sectors. A summary of the key results for each sector is shown below.[3] Liberalization effects are reported relative to the baseline projected to 2020. The welfare effects are yearly changes; other results are in terms of their effects by 2020.

Cheese: Liberalization of import restraints on cheese is estimated to increase U.S. welfare by $32.7 million. U.S. cheese shipments and employment are each expected to decline 0.4 percent and 0.4 percent, respectively. Imports of cheese would increase 16.5 percent, and exports would increase 0.4 percent.

Butter: Removing restraints on U.S. imports of butter is estimated to increase U.S. welfare by $27.7 million. U.S. butter shipments and employment are each expected to decline by 0.8 percent and 0.7 percent, respectively. Imports of butter would increase by 30.3 percent, and exports would increase by 0.5 percent.

Sugar: Removing restraints on imports of raw and refined sugar is estimated to increase welfare by $342.7 million.[4] This impact is primarily driven by increased access to imported raw cane sugar, which is estimated to rise by 12.7 percent relative to the baseline. In response, the total value of U.S. shipments of sugar is estimated to decrease by 4.5 percent, and employment in the sector would decrease by 4.2 percent relative to the baseline. As a result of liberalization, imports would grow by 25.0 percent, and exports would expand by 12.5 percent.

Canned tuna: Eliminating significant import restraints on canned tuna is estimated to increase welfare by $33.7 million. Removing trade restraints on canned tuna would slightly accelerate the decline in U.S. production, with shipments falling by an additional 2.9 percent and employment by an additional 2.5 percent relative to the baseline. Elimination of duties would result in imports rising by 8.5 percent and exports rising by 6.9 percent.

Beef: Liberalization of import restraints on beef is estimated to decrease U.S. welfare by $19.5 million. The U.S. cattle herd has recovered from a recent drought, and higher domestic production is anticipated. Eliminating the beef TRQ and tariffs is estimated to lead to negligible

[3] The effects of the sector-by-sector liberalizations are broadly consistent with the simultaneous removal of all significant restraints; however, modest differences may arise because of general equilibrium effects present in the simultaneous liberalization.

[4] U.S. import restraints on sugar are part of an overall program that stabilizes domestic sugar prices, as global sugar prices tend to be volatile. See the discussion in sugar section of chapter 2 for more details.

declines in U.S. shipments and employment, with each decreasing 0.1 percent. Imports are estimated to rise by 1.2 percent relative to the baseline, and exports would rise by 0.2 percent.

Textiles and apparel: The Commission estimates that removing tariffs in textiles and apparel would increase welfare by $2.4 billion. Liberalization would reduce domestic shipments in all textile and apparel industries by 3.1 percent and employment by 3.8 percent relative to the baseline. As a result of liberalization, imports of textiles and apparel would increase by 3.9 percent. Exports would decrease by 4.8 percent because foreign producers in certain countries with U.S. free trade agreements would no longer have to purchase U.S. yarn, thread, and fabric to gain preferential access to the U.S. market, with this specific sector experiencing a decline of 10.6 percent in exports.

Leather and allied products: Removing tariffs on imports of leather and allied products would boost U.S. welfare annually by $320.2 million during 2015–20. Relative to the baseline, liberalization would boost U.S. exports by 6.3 percent, contributing to increases in employment and shipments of 1.8 percent each. Imports supply over 95 percent of U.S. domestic demand for leather goods and footwear, which have some of the highest of all U.S. tariffs on consumer goods. The removal of tariffs is also projected to boost imports by 3.4 percent.

Other goods sectors: Eleven other goods sectors were identified as having significant import restraints based on high tariffs. The estimated welfare effects of eliminating these tariffs range from a gain of $100.8 million for other pressed and blown glass and glassware to a loss of $29.1 million for ball and roller bearings. As a resulted of liberalization, total shipments and total employment are estimated to decline for these sectors by 0.5 percent and 1.1 percent, respectively. Total imports and total exports for these sectors are estimated to increase by 4.8 percent and 3.7 percent, respectively.

Services Import Restraints

Although this report does not quantitatively estimate the effects of liberalizing U.S. restraints on services imports, it does summarize key impediments to services trade in the United States for a range of services sectors, including architecture and engineering services, legal services, telecommunications, commercial banking, insurance, retail distribution, and air and maritime transport. The description of nontariff measures draws from the Services Trade Restrictiveness Index (STRI) of the Organisation for Economic Co-operation and Development (OECD). This index quantifies information on laws and regulations affecting international trade in services across OECD members and in select non-OECD countries as of 2016. Services Trade Restrictiveness Index (STRI) scores for the United States tend to be lower than the sector average scores for most sectors across all countries (table ES.3). These low scores imply that the United States maintains fewer or less-intense restrictions for trade in these services than other

countries in the database. However, U.S. scores for air transport, maritime transport, and insurance services exceed their respective sector average scores for all countries, suggesting that the United States maintains additional or more-intense restrictions for trade in these services.

Table ES.3: U.S. and all-country averages and ranges under the OECD STRI for select services industries, 2016

	United States	All-Country Average	All-Country Score Range
Air transport	0.54	0.42	0.19-0.58
Maritime transport	0.37	0.26	0.12-0.57
Insurance	0.29	0.22	0.10-0.54
Commercial banking	0.21	0.24	0.12-0.49
Engineering	0.21	0.22	0.11-0.48
Legal	0.19	0.37	0.07-1.00
Architecture	0.18	0.25	0.10-0.62
Distribution	0.16	0.19	0.08-0.63
Telecommunications	0.12	0.24	0.12-0.53

Source: OECD Services Trade Restrictiveness Index (STRI), "Compare Your Country" (accessed February 15, 2017).
Note: This table lists the U.S. and average scores provided by the OECD, which reflect policies in place as of 2016.

Effects of Tariffs and of Customs and Border Procedures on Global Supply Chains

Since the 1980s, the manufacture of goods has increasingly used global supply chains (GSCs) in which intermediate inputs are used in making goods that cross borders multiple times before production is complete. Each time a good crosses a border, it faces numerous costs and restraints in the form of duties and other customs-related requirements, including inspections, certification procedures, and other nontariff measures.[5] For goods produced within a GSC, these trade frictions become especially burdensome for several reasons. First, the costs faced at each border crossing may be disproportionately high relative to the actual value added in the most recent stage of production. Second, tariffs and other costs are paid each time a border is crossed, and they quickly accumulate and compound as the frequency of these border crossings rises. Finally, each time a good traverses a border, it may be subject to long and often unpredictable delays that result in unnecessary costs such as storage fees, product depreciation, and disruptions to manufacturing schedules. Combined, these inefficiencies magnify the cost of trading and may offset the potential gains from using GSCs to produce goods.

[5] Some producers are able to use free trade zones and duty-drawback programs, which refund duties when certain conditions are met, to avoid some of these costs. Still, many tariffs and nontariff measures continue to impede the flow of goods in global supply chains. Quantitative estimates include goods processed in these special zones.

Quantitative Assessment of Tariffs on Global Supply Chains

This section presents estimates of the tariffs that accumulate when goods cross national borders. It provides estimates of the cumulative tariffs on GSCs, using multicountry data on production relationships and trade statistics for approximately 35 aggregated sectors and 60 countries (including a region that represents "the rest of the world"). A key concept in this section is the distinction between direct and indirect tariffs. A direct tariff is the tariff imposed on a good that crosses a border—for example, a semiconductor. Indirect tariffs are tariffs previously imposed on an upstream input when it crossed a border earlier in the process—for example, a blank silicon wafer that was used in fabricating the semiconductor. In many cases, the indirect tariff reflects accumulated tariffs on upstream inputs from multiple border crossings. The cumulative tariff is the sum of the direct tariff and the indirect tariffs.

Overall, the results show that average cumulative tariffs are fairly low. The world average is about 2.9 percent, with an average direct tariff of 2.4 percent and an average indirect tariff of 0.5 percent. Despite the low overall averages, there is considerable variation by sector. For example, the cumulative tariff faced by U.S. importers of textiles and apparel is almost 10 percent; it is over 90 percent on agricultural imports into South Korea.

Although services do not pay direct import tariffs, they are an important link in GSCs and do have indirect tariffs, which are tariffs on goods used by services sectors. For example, construction services, which uses some imported machinery, has the largest indirect tariff of any U.S. services sector; still, this indirect tariff, at slightly less than 1 percent, remains small. Of the goods sectors, computers and related products have fairly high indirect tariffs reflecting lengthy GSCs, although their direct tariffs are relatively low.

Case Studies

Vehicles and vehicle parts in Argentina and Brazil: Argentina's import licensing program for vehicles and vehicle parts has been a key factor in increasing trade costs between Argentina and Brazil and may have hindered the integration of the automotive supply chain between these two countries. Argentina's import licensing program has been nontransparent and lacking in uniformity regarding the approval process. As a result, the issuance of import licenses for auto-related goods has often been delayed, and the reasons for such delay have not been easily discerned. Recently, however, the Argentine government has reformed the country's import licensing program, decreasing the time and expense associated with importing parts used in vehicle manufacture. These reforms will likely lower the costs of producing vehicles in Argentina and lead to increased trade in intermediate parts between Argentina and Brazil.

Semiconductor manufacturing in the Philippines and Vietnam: The Philippines and Vietnam are among the top global exporters and importers of semiconductor products. The GSC for semiconductors is highly sensitive to tariffs and other border costs. Although signatories to the WTO's Information Technology Agreement, including the Philippines and Vietnam, have eliminated tariffs on most semiconductor products, unpredictable regulations and technical barriers continue to impose unnecessary risks and border costs to semiconductor trade in these two countries. For example, exporters assert that the Philippines maintains burdensome import restrictions on specialized chemical goods used in semiconductor manufacture, and Vietnam limits the import of civil cryptography goods and used equipment, also used for semiconductor production. Such restrictions result in burdensome and costly delays at customs checkpoints for semiconductor firms operating in the Philippines and Vietnam. However, exporters report that in recent years both countries have improved their respective customs practices and introduced government certification programs to speed customs processes for approved firms. While certain import restrictions remain in the Philippines and Vietnam, exporters indicate that these improvements have reduced clearance times for firms participating in semiconductor supply chains in the two countries.

Logistics services in sub-Saharan Africa (SSA): Historically, logistics infrastructure in SSA has been poor, limiting the region's trade performance and its participation in GSCs. Goods encounter repetitive and time-consuming delays at SSA's border checkpoints, decreasing efficiency and increasing costs to the region's supply chain participants. In SSA's landlocked countries, customs barriers and the poor quality of the region's road infrastructure result in even higher transport costs, further hampering the region's supply chain performance. However, a number of countries in SSA are taking measures to address the poor quality of their logistics services. For example, exporters state that they are focused on reducing pervasive customs delays in the region, both at the border and along trade routes, by increasing the use

of single customs windows. These windows enable customs offices to streamline paperwork and discourage officials from demanding bribes and imposing delays on trucks passing through customs checkpoints. Several large-scale port, road, and rail investments are also underway to achieve low-cost delivery service to SSA's landlocked countries, which will further improve the efficiency of the region's supply chain operations. International transport and logistics companies that have established operations in SSA now maintain a sizable footprint in the region and have helped SSA to integrate into GSCs. However, although many foreign 3PL firms operate successfully in SSA, market barriers limit opportunities for smaller, local firms in the region.

Chapter 1
Introduction

Overview

This is the ninth update in the series *The Economic Effects of Significant U.S. Import Restraints*, which was requested by the U.S. Trade Representative (USTR).[6] The U.S. International Trade Commission (Commission or USITC) published the first report in this series in 1993. Since that year, the U.S. import restraint picture has changed. The average U.S. import tariff dropped from 3.4 percent in the 1993 report to 1.4 percent for the 2007 report; since then it has been fairly stable (figure 1.1). This 2017 report shows that since the 2013 report, there has been a slight uptick in the average import tariff to almost 1.5 percent.[7]

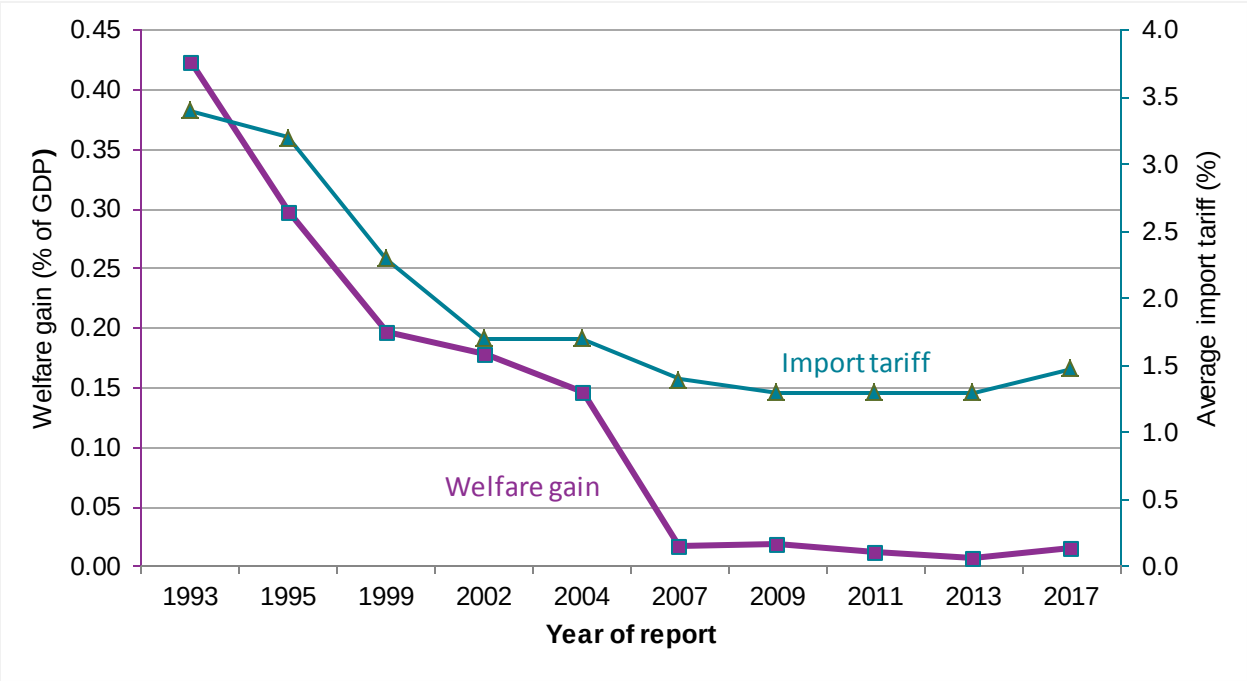
In general, as the average import tariff has decreased, so has the estimated welfare gain of removing these restraints. The welfare gain is now estimated at 0.02 percent of 2015 gross domestic product (GDP)—which is fairly similar to previous estimates, as shown in figure 1.1. The estimated welfare gain in this report indicates that if all significant U.S. import restraints were removed, national expenditures would increase by about $3.3 billion per year, which is higher than the welfare estimate in the previous report.[8] The report also finds that while all households benefit by being able to consume more products when import restraints are removed, wealthier households benefit more in dollar terms because they consume more.

[6] The U.S. Trade Representative (USTR) originally requested this series of reports in May 1992. Before this series of investigations, the Commission conducted a similar study in three phases for the U.S. Senate Committee on Finance during 1989–91.

[7] Some imports with tariff-rate quotas, such as dairy products, entered at higher over-quota tariff rates, as described in chapter 2, and contributed to the higher average tariff rate. As reflected in the model projections, the Commission believes that this was a temporary phenomenon and not a reversal of the trend.

[8] Two factors contribute to the higher estimate. First, the new version of the model used for these simulations captures productivity gains in the U.S. economy resulting from technological advances and previous shifts of some less efficient production to lower-cost overseas regions. Second, welfare measures have varied slightly in previous reports. Many reports have used public and private consumption as the welfare measure. The estimate of $1.1 billion in the last report was based only on the change in real private consumption. National expenditure comprises private consumption, public consumption, investment, and change in inventories and is thus a more complete measure. The estimated change in real private consumption from removing the import restraints in this report is $2.9 billion, the largest component of the real national expenditures estimate.

Figure 1.1: Average import tariff rates and estimated welfare gains from liberalization over the life of the report, 1993–2017



Source: USITC estimates.
Note: The average tariff is the import-weighted tariff across all imports. The year of the report does not represent the year modeled.

As in previous updates, the estimates of the effects on production, consumption, and trade are based on the removal of significant import restraints on agricultural and manufactured products, where well-defined procedures exist to measure the size of the import restraints. Quantifying restraints on services is more difficult and more subjective; therefore, restraints on services are not included in the economic model. Instead, restrictions on imports in important services sectors with significant import restraints are described in the report.

Like the United States, many countries have reduced or eliminated import tariffs (a process known as liberalization), and average tariff rates have fallen worldwide.[9] Nevertheless, tariffs as well as customs and border procedures can impose significant costs on goods produced in global supply chains (GSCs) because each time a border is crossed, both tariffs and the effort of complying with various customs and border procedures, particularly inefficient procedures, increase the cost of producing and distributing the final good. The special topic chapter in this report addresses these issues and gives an overview of the effects of these inefficiencies along

[9] For example, the World Bank calculates that the applied weighted-mean tariff on all products for all countries with data fell from 34.0 percent in 1996 to 2.7 percent in 2010. See the World Bank, "Tariff Rate, Applied, Weighted Mean, All Products," http://data.worldbank.org/indicator/TM.TAX.MRCH.WM.AR.ZS.

the supply chain. Case studies describe specific trade restrictions in selected supply chains, and a quantitative section assesses the overall effect of tariffs on GSCs.

Organization and Scope of the Report

This report, the ninth update, is organized according to the pattern introduced in the sixth update. Thus the assessment of the economic effects of significant import restraints appears in the second chapter, while the third chapter discusses a special topic of interest to the trade community, as requested by the USTR. The second chapter chiefly gives an overview of significant import restraints and examines the effects of simultaneously removing all of them. This discussion is followed by a section, new in this update, that shows the effects of import restraints on households with different incomes. Next, the chapter examines the effects of the significant restraints on individual sectors. The chapter concludes with an overview of import restrictions on services.

As in previous reports, quantitative estimates of the significant import restraints are based on tariffs and tariff-rate quotas (TRQs).[10] As requested in the original letter by the USTR, this report considers all U.S. import restraints except those originating from antidumping or countervailing duty investigations, section 337 or 406 investigations, or section 301 actions.[11] Restraints are deemed to be significant if they increase the price of imports or limit their quantity by large amounts.

Because tariffs have not changed greatly in recent years, many of the same sectors have appeared in previous updates, but changes among the significant sectors do occur from report to report. For example, butter is one of the most restrictive sectors analyzed in this update, based on the tariffs and TRQs applied to it (table 1.1), but it was not among the most restrictive sectors in the last report. Overall, there are more sectors with significant restraints in this report than in the last one.

[10] TRQs are a type of tariff where different rates are applied to different import quantities; quantities above a certain ceiling typically face higher rates.

[11] Appendix A contains a copy of the original 1992 request letter. Section 337 investigations conducted by the U.S. International Trade Commission involve claims regarding intellectual property rights, including allegations of patent infringement and trademark infringement by imported goods. Section 406 investigations involve determining if imports from a communist country are causing market disruption in the United States. Section 301 authorizes the United States to impose trade sanctions against countries that violate trade agreements or engage in other unfair trade practices

Table 1.1: Restrictiveness of U.S. import restraints: increase in the price of imports due to restraints, 2020, %

Sector	U.S. tariff[a]	U.S. TRQ[b]	Total
Food and agriculture			
Cheese	7.3	8	15.3
Butter	5.8	15[c]	20.8
Raw cane sugar	1.3	28[d]	29.3
Refined sugar	1.6	55[d]	56.6
Beef	1.0	0[e]	1.0
Canned tuna	12.3	0[f]	12.3
All textiles and apparel			
Textiles and apparel			
Fiber, yarn, and threads	5.2	0	5.2
Fabrics	5.0	0	5.0
Carpets and rugs	6.3	0	6.3
Other textile products	5.5	0	5.5
Apparel	12.8	0	12.8
Other manufacturing sectors			
Ball and roller bearings	5.8	0	5.8
Cellulosic organic fibers	4.7	0	4.7
Ceramic wall and floor tiles	6.2	0	6.2
China, fine earthenware, other pottery products	5.3	0	5.3
Cigarettes	6.7	0	6.7
Costume jewelry and novelties	7.5	0	7.5
Leather and allied product manufacturing	10.1	0	10.1
Other pressed and blown glass and glassware	5.3	0	5.3
Pens and mechanical pencils	5.2	0	5.2
Pesticides and agricultural chemicals (excluding fertilizers)	4.6	0	4.6
Residential electric lighting fixtures	5.0	0	5.0
Synthetic organic dyes and pigments	5.1	0	5.1

Source: USITC estimates based on tariff rates and tariff-rate quota (TRQ) commitments.
Note: The table provides projected 2020 tariff and TRQ values. Sectors are defined by the North American Industry Classification System (NAICS).
[a] Measured as an ad valorem equivalent (estimated as a percentage of the price) share of the cost, insurance, and freight (c.i.f.) value of imports.
[b] Measured as an export tax equivalent—that is, the degree to which a TRQ increases the "export price" of a commodity (defined as the price before entry into the United States).
[c] The export tax equivalent of the dairy TRQ declines from 30% in 2015 to 15% in 2020.
[d] The export tax equivalents of the sugar TRQs are trade-weighted averages of source-specific measures.
[e] The export tax equivalent of the beef TRQ was 4% in 2015 and declines to zero thereafter in the baseline.
[f] Imports of canned tuna packed in water are subject to a TRQ. Because the quota allocation is small, most imports are subject to the over-quota duty rate. See chapter 2.

Chapter 2 also assesses how significant U.S. import restraints affect households with different incomes, as stipulated in the letter from the USTR requesting this update.[12] This assessment uses estimates of price changes caused by removing the significant import restraints on goods, combined with other data on consumption patterns, to estimate the effects on households with different incomes.

Although the United States is very receptive to services trade, it still imposes restrictions on services imports, such as licensing and certification requirements on persons providing key services. The final section of this chapter examines measures restricting services trade and uses an index from the Organisation for Economic Co-operation and Development (OECD) to compare the magnitude of those measures. Based on their importance in overall trade and the presence of significant trade restraints, the following sectors are addressed in this section: architecture and engineering services; legal services; telecommunications; commercial banking; insurance; retail distribution; and air and maritime transport.

As requested by the USTR, chapter 3, the "special topic" chapter, provides an overview of the effects of tariffs and of customs and border procedures on GSCs.[13] The main parts of this chapter are an introduction and literature review, a quantitative estimate of the cumulative effects of tariffs, and three case studies. The case studies treat aspects of the supply chains for passenger vehicles, semiconductors, and logistics.

Approach

The approaches used here vary according to the topic under investigation. The analysis of significant U.S. import restraints in chapter 2 is largely based on an economic model that examines the effects of liberalizing significant import restraints. Chapter 3 is based on the relevant literature and qualitative industry research, but also contains some quantitative analysis. Both chapters benefit from testimony presented during the Commission's public hearing on February 9, 2017, and written submissions from interested parties.[14]

[12] The letter from the USTR dated September 13, 2016, requesting this update is included in appendix A.
[13] The letter from the USTR, dated September 13, 2016, requested this special topic chapter. This letter appears in appendix A.
[14] Appendix B shows the notice announcing the public hearing that appeared in the *Federal Register* on October 17, 2016. Appendix C presents the calendar of the hearing, which shows the witnesses who provided testimony. Some witnesses, and other organizations as well, submitted written statements. Appendix D lists those who filed written submissions and provides summaries of their views, if they submitted one.

Significant Import Restraints

To model the effects of the hypothetical trade policy liberalization in chapter 2, this update uses the U.S. Applied General Equilibrium (USAGE) model, versions of which have been used in previous updates.[15] USAGE is a single-country model of the U.S. economy that incorporates linkages among different producing sectors of the economy, consumers, the government, and foreign economies. These linkages enable the Commission to model the effects of changing trade policies on the entire U.S. economy. The version of the USAGE model used in this report relies on benchmark input-output data for the United States, which the U.S. Bureau of Economic Analysis estimates for every five-year period.[16] This version of the USAGE model incorporates a domestic industry structure in which firms have implemented some technological advances and some less efficient productive capacity has shifted out of the United States to low-cost regions overseas. When tariffs are liberalized in this type of economy, large efficiency gains can occur. Some sectors with significant import restraints are identified in greater detail than the sectors in the core USAGE model. In these cases, the USAGE sectors were split or disaggregated in order to analyze the import restraints more precisely. For example, sugarcane farming and sugar beet farming were split from the core usage category "other crop farming."[17] The analysis of U.S. import restraints proceeds in the following three steps:

- Identifying sectors with significant restraints;
- Projecting the U.S. economy from 2015 to 2020 to provide a baseline against which to measure the effects of liberalization; and
- Simulating the extent to which liberalizing the significant restraints will affect the trends present in the projected U.S. economy.

The presence of high tariff rates is the most basic way to identify sectors with significant restraints. For the analysis in chapter 2, as in previous reports, tariffs are considered significantly restrictive if they exceed the average U.S. tariff by one standard deviation. Using this criterion, sectors for which rates exceeded 4.49 percent for 2015 are considered to have significant tariff restraints. Most sectors shown in table 1.1 were identified because of their high tariffs.

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[15] For an overview of the USAGE framework, see appendix E and USITC, *Import Restraints*, 2009, appendix E. For a complete specification of the model see Dixon and Rimmer, "USAGE-ITC," 2002.

[16] Delays often occur in constructing and making these tables available. This version of USAGE is based on the 2007 benchmark table, which is the latest version available. For information about this updated version of the USAGE model, see Dixon, Rimmer, and Waschik, "Updating USAGE," August 2016, and Dixon and Rimmer, "Incorporation of Detailed Data in the Update of the USAGE Database from 2007 to 2015 and Re-computation of the 2015–20 Baseline," January 2017.

[17] For a full list of the sector splits, see table E.1 in appendix E.

In addition to high tariffs, selection is based on the restrictiveness of TRQs for sectors subject to them. A TRQ is a form of tariff measure for which rates of duty vary depending upon the quantity of goods entered into a country. Typically, quantities that are at or below a certain ceiling ("in-quota imports") enter at low tariffs or duty free, while quantities that are above the ceiling ("over-quota imports") enter at higher rates of duty. Although the administration of TRQs varies, in some cases specific countries receive an annual allocation, and imports beyond the annual allocation are subject to higher over-quota tariff rates. In the study, restrictiveness is measured by the amount that TRQs raise the prices of imported goods, which is largely determined by three factors: (1) the over-quota tariff rate, (2) the gap between U.S. and world prices, and (3) the "fill rates," or the extent to which imports from specific sources approach or exceed their quantity allotments. As with tariffs, not all sectors subject to TRQs were deemed to have significant restraints.

As noted above, the simulation analysis begins by generating a projection of the U.S. economy to 2020 in order to provide a baseline against which the effect of liberalizing significant import restraints can be compared. The projection uses the most up-to-date forecasts by other U.S. government agencies and international organizations to forecast the U.S. macroeconomy to 2020 and to project key U.S. macroeconomic variables such as consumption, investment, government spending, and imports and exports, as well as world gross domestic product. Using these macroeconomic projections, the model also generates baseline projections of output, employment, trade, and prices in each of the sectors of the model. These sectoral projections are further refined for the individual sectors that appear in this report, using forecasts from government and industry sources, as available, and observed industry trends.[18]

The baseline assumes that current U.S. import restraints will remain in place. At the same time, however, it incorporates known trade policy adjustments. Examples include changes to tariff rates and TRQ quantity allocations contained in tariff staging schedules in U.S. free trade agreements (FTAs) and other trade agreements,[19] as well as provisions of preferential trade arrangements. These agreements provide the projected values of trade policy variables (such as tariff rates and TRQ fill rates) through 2020.[20] For each product, the projected restrictiveness of the TRQs depends on the projected gap between U.S. and world prices as well as projected fill rates, which are specific to each exporting country. Table 1.1 summarizes the restrictiveness of import restraints in each sector in the model projection for 2020. The sugar, butter, cheese, and

[18] Appendix E describes the sources and values of key macroeconomic variables and the sectoral baseline projections.
[19] U.S. FTAs require tariffs for certain products to be reduced by stages in accordance with "staging schedules."
[20] For imports from countries without such agreements, future tariffs and TRQ allotments are based on their 2015 values.

apparel sectors have the most restrictive restraints in terms of their estimated ad valorem equivalents.[21]

After the baseline projection is developed, the simulation estimates the effects of liberalizing significant restraints, including tariffs and TRQs. The liberalization of these restraints is modeled by setting the relevant tariffs to zero and removing the TRQs. The model simulation solves for the new equilibrium with these changes in place. The simulation calculates new equilibrium prices and quantities that are consistent with supply and demand constraints for all model sectors. This report, however, lists estimates for only the sectors of interest, along with key "upstream" and "downstream" sectors.[22]

Estimates of the effects of liberalizing each sector are presented relative to the baseline changes expected to take place through 2020. For example, U.S. manufacturers' shipments of cheese are projected to grow 13.3 percent between 2015 and 2020 in the absence of policy liberalization. Liberalizing cheese restraints would lower the growth in U.S. cheese shipments by about 0.4 percentage points, for an overall increase in shipments of approximately 12.9 percent through 2020. As the focus of this section is the economic effect of liberalization on consumers, firms, and workers, the key variables of interest are changes in economic welfare (net national expenditures), shipments, and employment, in addition to imports and exports.

As previously stated, this report includes estimates of the effects of significant U.S. import restraints on households of different incomes. The approach for making these estimates begins by splitting all U.S. households into 10 groups based on their income level. Using data from the U.S. Bureau of Labor Statistics, a consumer price index and a consumption basket are created for each income group. The consumption basket is created in a way that links to the commodity categories in the USAGE model. Finally, the price changes estimated in the USAGE model from removing the significant import restraints affect the cost of each group's consumption basket. The changes in the cost of the consumption basket provide estimates of the effects of the import restraints on households of different income levels.

[21] Here the trade-weighted ad valorem equivalent tariffs (estimates of the tariffs as shares of the prices of the items) are estimated by dividing calculated duties by the cost, insurance, and freight (c.i.f.) value of all imports in a given sector.

[22] An "upstream" sector provides an output that a "downstream" sector uses as an input. For example, gold mining is an upstream sector to the production of gold rings.

Effects of Tariffs and of Customs and Border Procedures on Global Supply Chains

The Commission used a combination of approaches to develop chapter 3, which studies the effects of tariffs and of customs and border procedures on GSCs. The methods used include a thorough review of the literature; international fieldwork, which included meeting with industry representatives, trade associations, and government officials (including customs authorities) in Argentina, Brazil, the Philippines, and Vietnam; and analysis of data on trade flows, tariffs, and industry structure. The chapter also benefited from information obtained at the Commission's hearing, held on February 9, 2017.

The opening part of the chapter gives an overview of tariffs and customs and border procedures in GSCs and shows how they can create delays and add costs to goods produced in GSCs. This part of the chapter, which sets the stage for the quantitative section and the case studies, draws from literature by academic researchers, international organizations, and trade and industry associations on GSCs and on the effects of tariffs and border procedures on trade.

The quantitative analysis takes a broad approach; it estimates the cumulative effect of tariffs on GSCs at the level of approximately 30 aggregated sectors and more than 60 countries or regions, including "the rest of the world" considered as a region. The quantitative section on cumulative tariffs is based on techniques developed by OECD researchers and uses United Nations data on tariffs and trade flows, as well as information on industry structure from the OECD.[23]The three case studies identify and describe the inefficiencies caused by tariffs and customs and border procedures that firms within those industries face as they operate through GSCs.

The chapter also includes three case studies of GSCs, for passenger vehicles, semiconductors, and logistics services. The case studies illustrate how customs and border procedures affect the flow of goods produced in GSCs. The first case study examines customs and border issues in Argentina and Brazil, the two largest producers of passenger vehicles and auto parts in South America. The second case study focuses on the Philippines and Vietnam, two countries that not only have a significant presence in the global semiconductor supply chain but also have border frictions that impose extra costs on semiconductor firms. The third case study focuses on logistics services in sub-Saharan Africa. Logistics services firms facilitate trade in GSCs and, in many cases, deal directly with customs and border procedures.

[23] Miroudot, Rouzet, and Spinelli, "Trade Policy Implications of Global Value Chains," 2013.

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Chapter 2
Effects of Removing Significant Import Restraints

Overview

This chapter presents estimates of the degree to which removing, or "liberalizing," significant U.S. import restraints will affect U.S. consumers, firms, and workers. When an import restraint is removed, the U.S. price of that import declines. Producers making similar products reduce their prices to compete better, and some may shut down, thus decreasing domestically produced supply and displacing workers. Over the long run, displaced workers will likely move to jobs in other sectors, and business owners will likely invest in other, more profitable sectors. The costs to displaced workers include temporary job loss, possible lower wages in new jobs, and the costs of transitioning from one job to another. The most efficient firms will continue to produce, improving the overall efficiency of the industry, and those firms will likely increase exports. Consumers, including producers who use imports as inputs, gain from the lower prices on imports and competing U.S.-produced goods. In total, the gains typically outweigh the costs, although some households, sectors, and regions may be harmed.[24]

The chapter first presents the effects of simultaneously liberalizing all sectors with quantified import restraints. Estimates are produced using the U.S. Applied General Equilibrium (USAGE) model (discussed in chapter 1) and are assessed relative to a baseline of projected changes in industry conditions to 2020—that is, changes that would occur anyway without liberalization.[25] Next, for the first time in this series of reports, the effects of liberalizing significant import restraints on households with different incomes are shown. Then, the chapter presents the effects of isolated liberalization of specific sectors. These discussions include explanations of the import restraints and updates on market conditions. Not every sector with a significant restraint receives a detailed individual write-up; those are reserved for sectors with multiple or complex restraints or with large welfare effects from liberalization. Sectors affected chiefly by high tariffs are discussed together. As in previous updates, the modeling analysis does not

[24] Economists continue to investigate the precise effects of trade liberalization and generally find that the benefits are greater than the costs. Although trade liberalization may result in declines in specific industries and their accompanying workers, consumer gains tend to be widespread, as many households and purchasing firms benefit from lower prices.
[25] See chapter 1 and appendix E for more details about the analytical framework.

account for liberalization in the services sector; however, import restraints in key services sectors are assessed at the end of the chapter.

The estimated average annual cost of the significant U.S. import restraints in terms of national expenditures is about $3.3 billion (table 2.1).[26] As stated in chapter 1, this figure is higher than the annual cost estimated in the most recent updates of the Commission's import restraints reports, but still only constitutes a very small share of U.S. gross domestic product (GDP) (0.02 percent). The effects of individual sector liberalizations vary depending on the sector. The estimated welfare gains in the textiles and apparel sector are by far the largest. Note that the industry structure in the current USAGE model, which is based on more recent data, contributes to this result. As stated in chapter 1, this version of the USAGE model is based on the 2007 benchmark input-output table.[27] Thus, the interindustry linkages will reflect greater efficiency and fewer purchases of inputs from less efficient domestic producers than previous versions of the USAGE model; previous versions were based on earlier input-output tables, before many important technological improvements were made and when domestic production in some less efficient industries was greater. When liberalization occurs in these situations, the negative effects on purchases from the domestic industry are smaller, but consumer benefits can still be large.

[26] Real net national expenditures are measured here as the difference in private consumption, government consumption, investment, and inventory adjustments between the liberalization simulation and the baseline projection.

[27] Here "2007" refers to the year the survey data were collected. The BEA requires several years to process the data and develop the benchmark input-output tables after the data are collected. The version of USAGE used in the last report was based on annual input-output tables that do not have as much sectoral detail. USITC, *Import Restraints*, 2013, Appendix E.

Table 2.1: Average annual welfare gains from liberalizing significant import restraints relative to the model's baseline projection, 2015–20, million $

Type of liberalization or sector	Change in economic welfare
Simultaneous liberalization of all significant restraints	3,302.9
Isolated liberalizations in specific sectors	
Sugar	342.7
Butter	27.7
Cheese	32.7
Beef meat for processing	19.5
Canned tuna	33.7
Textiles and apparel	2,366.1
Leather and allied product manufacturing	320.2
Ball and roller bearings	-29.1
Cellulosic organic fibers	23.8
Ceramic wall and floor tiles	57.9
China, fine earthenware, and other pottery products	77.0
Cigarettes	70.3
Other pressed and blown glass and glassware	100.8
Residential electric lighting fixtures	82.9
Costume jewelry and novelties	-3.9
Pens and mechanical pencils	11.7
Synthetic organic dyes and pigments	36.6
Pesticides and other agricultural chemicals (excluding fertilizers)	83.9

Source: USITC estimates.

As was the case in the 2013 import restraints report, negative welfare effects follow liberalization in a few sectors: ball and roller bearings and costume jewelry and novelties.[28] Negative welfare effects after trade liberalization potentially occur when a country is a large importer of a particular good and when foreign suppliers, instead of domestic consumers, bear much of the burden of the tariff; in such a case, the prices paid by consumers reflect little or no tariff cost. Despite the presence of significant import restraints, the United States is the largest single-country importer of costume jewelry and novelties, and only China imports more ball and roller bearings than the United States.[29] When import restraints are removed on goods in these two sectors, consumers may benefit from slightly lower prices as they no longer pay their share of the tariff burden. However, prices received by foreign producers exporting to the United

[28] In the 2013 report, negative welfare effects occurred in four sectors: ball and roller bearings, pens and mechanical pencils, residential lighting fixtures, and synthetic organic dyes. USITC, *The Economic Effects of Significant U.S. Import Restraints*, *Eighth Update*, 2013, 2-2.

[29] U.S. shares of world imports for these items range from 15 percent for ball and roller bearings to 28 percent for costume jewelry and novelties, based on data downloaded July 7, 2017, from IHS Markit's Global Trade Atlas database for 2011–16.

States will rise as they no longer have to pay their share of the tariff burden, which will lower the U.S. terms of trade (the ratio of U.S. export prices to the U.S. import prices). For example, USAGE model results show that the prices paid by U.S. consumers of ball and roller bearings decline by only 0.4 percent after liberalization, but prices received by foreign producers rise by 1.7 percent and contribute to an overall deterioration in the U.S. terms of trade. A decline in the terms of trade will reduce domestic income and have negative effects on national expenditures.[30] Government revenue will also decline as tariffs are no longer collected on these items. Thus, in these cases, the negative effects on the U.S. terms of trade and government revenue can outweigh the positive effects on consumers, which is the case of these two sectors.

Effects of Removing All Significant Import Restraints

Effects of Liberalization on the Aggregate Economy Relative to Projected Trends

As previously stated, the chapter presents estimates of the effects of liberalizing the entire U.S. economy, as well as the effects of isolated sector liberalizations, relative to a baseline that shows changes expected to take place through 2020.[31] The model baseline projects an increase in gross domestic product (GDP) of 12.5 percent over 2015–20, or an average annual compound growth rate of 2.4 percent per year. Employment is projected to grow more slowly, at 6.0 percent over the period. Imports and exports are projected to grow more briskly (table 2.2).

Although the elimination of significant import restraints results in workers leaving the import-competing sector, research shows that workers tend to find other jobs in the long run, and the model assumes that the net equilibrium effect on employment in 2020 is zero. The elimination of the significant import restraints is estimated to raise U.S. GDP by 0.02 percent. Imports are estimated to rise 0.2 percent more than in the case without liberalization. Exports are estimated to rise by 23.4 percent in the baseline by 2020, and liberalization leads to an additional increase of 0.3 percent by 2020.

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[30] For more information on the effects of terms of trade and welfare, see Kawalczyk and Riezman, "Free Trade: What Are the Terms-of-Trade Effects?" 2009, and Reinsdorf, "Terms of Trade Effects: Theory and Measurement," 2009.

[31] A variety of sources were used in constructing the baseline, such the Congressional Budget Office for GDP projections, the Bureau of Labor Statistics for employment projections, and the U.S. Department of Agriculture (USDA) for projections concerning various agricultural goods. Details are in Dixon and Rimmer, "Incorporation of Detailed Data in the Update," 2017.

Table 2.2: U.S. national economy: Summary data 2012–15, baseline and liberalization simulation results

Indicator	2012	2013	2014	2015	Baseline change 2015–20	Effect of liberalization
	Million full-time equivalent workers				%	%
Employment[a]	134	136	139	142	6.0	no effect
	Billion $					
GDP	16,155	16,692	17,393	18,037	12.5	([c])
Imports[b]	2,756	2,755	2,869	2,762	26.8	0.2
Exports[b]	2,219	2,294	2,377	2,261	23.4	0.3

Sources: Dixon and Rimmer, "Incorporation of Detailed Data in the Update," 2017. USITC estimates for projection and liberalization.
Note: Effects of liberalization are results from simulating simultaneous liberalization for identified significant import restraints.
[a] Employees on nonfarm payrolls. Employment is measured in full-time equivalents, which is the workload performed by one employee working full time. Full-time equivalent work could also be performed by several people working part-time or several people working overtime.
[b] Including goods and services.
[c] Less than 0.05 percent.

Effects of Liberalization on Individual Sectors Relative to Projected Trends

According to the model results, when all significant U.S. import restraints are eliminated at once, most liberalized sectors show the expected patterns of declining domestic shipments and employment, with increases in both imports and exports (table 2.3).[32] An exception is the yarn, thread, and fabric sector, where foreign apparel producers in countries with certain U.S. FTAs no longer have incentives to use U.S. yarns and threads because they would no longer have to meet rule of origin requirements to gain access to the U.S. market, [33] and this decreases U.S. exports of these products. Leather and allied product manufacturing see employment and shipments rise in response to increased exports of skins, hides, and other inputs included in this sector. Among liberalized sectors, the largest percentage change in shipments is seen in apparel, which declines by 4.6 percent, and in sugar manufacturing, which declines by 4.5 percent. Employment and shipments contract for most liberalized sectors. Imports of butter, sugar, cigarettes, and canned tuna are all expected to respond strongly, due to the relatively high level of restraints removed from imports of these goods.

[32] The effects of liberalizing all significant import restraints at once are broadly consistent with the effects (shown in later tables) of liberalizing restraints one sector at a time. However, they differ slightly because of broader general equilibrium effects or linkages between liberalized sectors.

Table 2.3: Simultaneous liberalization of all significant restraints: Effects on liberalized sectors, 2020, %

Sector[a]	Employment	Shipments	Imports	Exports
Food and agriculture				
Sugar manufacturing	-4.2	-4.5	25.0	12.6
Butter	-0.8	-0.9	30.3	0.6
Cheese	-0.6	-0.4	16.5	0.4
Beef meat for processing	-0.2	-0.1	1.2	0.2
Canned tuna	-2.5	-2.5	8.5	6.8
All textiles and apparel				
Yarn, thread, fabric	-4.3	-4.0	2.1	-10.6
Textile products	-1.0	-1.0	2.6	3.1
Apparel	-4.5	-4.6	4.2	5.1
Other manufacturing sectors				
Ball and roller bearings	-1.6	-1.4	8.9	6.2
Cellulosic organic fibers	-1.6	-1.5	3.6	2.9
Ceramic wall and floor tiles	-2.5	-2.8	3.3	3.3
China, fine earthenware, and other pottery products	-3.5	-4.0	2.2	3.4
Cigarettes	-0.1	-0.1	9.6	5.9
Costume jewelry and novelties	-1.2	-1.3	4.5	3.3
Leather and allied product manufacturing	1.8	1.8	3.4	6.4
Other pressed and blown glass and glassware	-1.3	-1.5	4.5	3.6
Pens and mechanical pencils	-1.6	-1.8	4.0	3.3
Pesticides and agricultural chemicals (excluding fertilizers)	-0.0	-0.0	3.3	1.9
Residential electric lighting fixtures	-0.4	-1.0	1.3	1.6
Synthetic organic dyes and pigments	-0.2	-0.3	4.2	2.8
Total	-2.1	-1.4	4.0	-0.3

Source: USITC estimates.
[a] Although great sector detail is available, broad sectors consistent with previous reports are shown in some instances. For example, the different components of sugar growing and processing are aggregated into sugar manufacturing.

Household Effects

Background

Households with different-sized incomes usually have different consumption patterns. Households with less income spend more of their total expenditures on necessities, such as housing, food, and healthcare. Wealthier households tend to spend a larger share on nonessentials, such as luxury cars and entertainment.[34] Policies that lead to price changes, such as trade liberalization, could therefore affect households with different incomes differently. For example, households that spend a higher share of their income on beef will benefit more from a beef price decrease than households that spend a smaller share.

A common way to understand the effects of price changes on U.S. households is by using the Consumer Price Index (CPI).[35] The CPI shows the cost of a typical consumption basket purchased by households, measured relative to a base year. Changes in prices of goods and services lead to changes in the CPI, informing the public and policy makers about inflation in the economy.

For the purposes of this study, to calculate the effects of removing significant U.S. import restraints on households with different income levels, the U.S. population was split into 10 equal-sized groups based on their level of household income. The consumption expenditure data were split to create 10 different consumption baskets for the 10 income groups shown in table 2.4. Prices for the CPI calculation were obtained from the USAGE model (described in appendix E), which is used in this report to estimate prices and other economic variables for several scenarios.[36]

[34] Henry, "Income Inequality and Income-Class Consumption Patterns," 2014. Like other studies in the literature, this report excludes housing expenditures because they are not consistently measured across income deciles.
[35] More information about the CPI is available at the U.S. Bureau of Labor Statistics website, https://www.bls.gov/cpi/cpifaq.htm.
[36] Appendix F provides more details on construction and calculation of the CPI used in this report.

Table 2.4: Household income and expenditure, by decile ($)

Decile	Income bracket	Average income	Average expenditure
1	< 12,100	5,894	18,633
2	12,101–19,746	15,627	19,254
3	19,747–28,400	23,830	25,586
4	28,401–38,000	32,804	29,939
5	38,001–50,000	43,298	33,156
6	50,001–64,500	56,095	38,676
7	64,501–82,000	71,320	45,811
8	82,001–106,000	91,604	55,137
9	106,001–151,570	122,131	69,912
10	> 151,571	231,885	101,789

Source: USITC calculations using 2015 consumer expenditure survey (CES) data.
Note: CES data report only earned income. Average expenditures in the lowest three income deciles outpace average incomes because households in the lowest income deciles tend to receive government transfers and to accumulate debt. Expenditures on housing are not included.

The calculations begin by examining changes in product prices from 2015 to 2020 from the baseline simulation produced by the USAGE model. Then these changes in product prices are used to calculate 2015–20 changes in the cost of the household consumption baskets for the 10 different household income groups.

The next step is to take the product price changes from the model simulation, which removes all significant U.S. import restraints ("policy scenario"). Relative to the baseline scenario, under the policy scenario, prices of products that had significant import restraints decline. The effect of removing all significant U.S. import restraints is calculated as the difference between the cost of the household consumption baskets in the policy and baseline scenarios.

The advantage of using a general equilibrium model is twofold. First, it allows us to estimate the effects of trade liberalization on prices of both the imported goods that are subject to significant U.S. import restraints and their domestic substitutes. Further, it permits more precise estimates of the price changes on goods and services that are not directly affected by the tariffs.

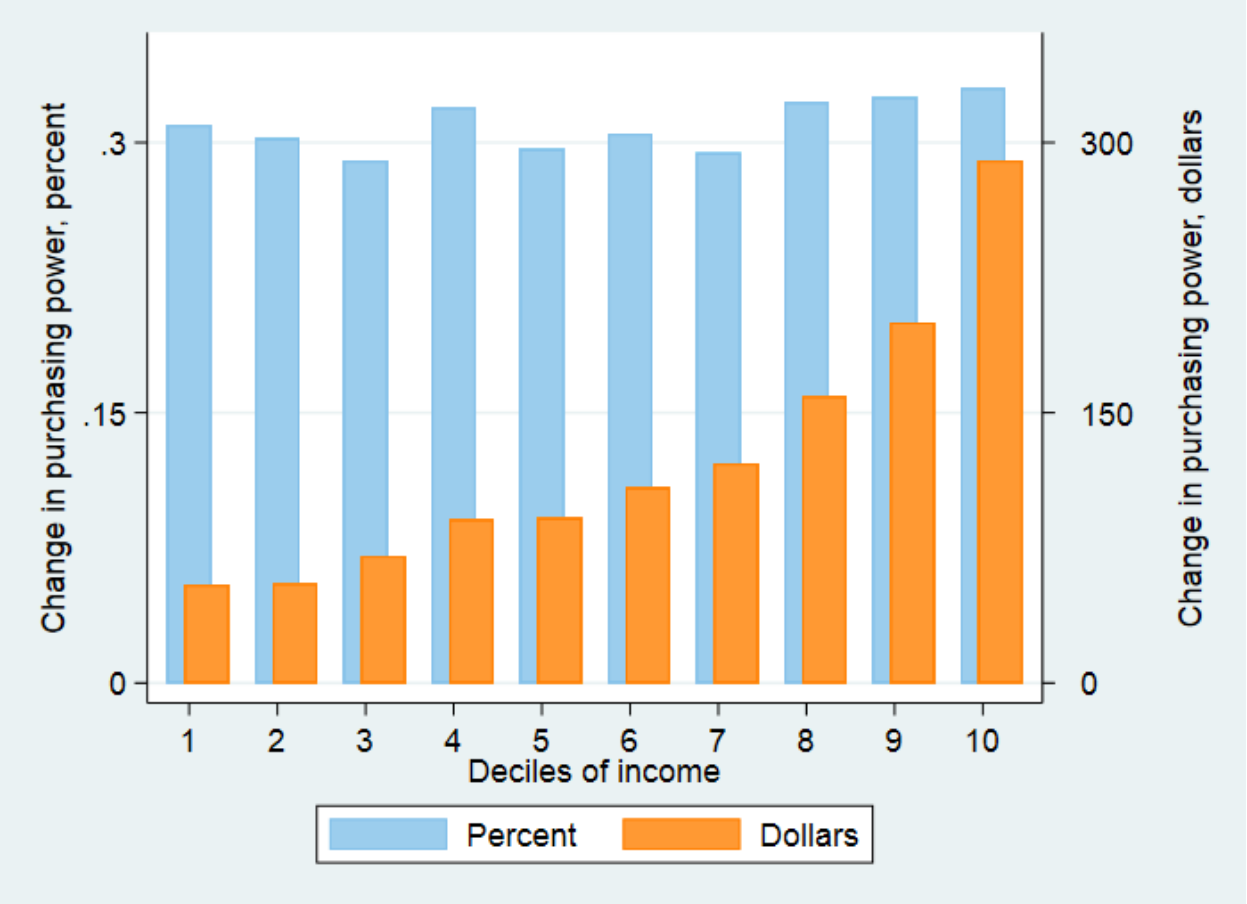
Overall Results

Figure 2.1 shows the effects of the removal of all significant U.S. import restraints on households with different incomes. All household groups benefit from this removal, although for all but the poorest households, the gains are negligible in terms of income and expenditure. The cost of the consumption basket for the poorest households is reduced by $54 per year, while the cost of the consumption basket for the richest households is reduced by $288 per year. The reduction is greater for richer households because their consumption baskets are

more expensive. In percentage terms, cost reductions range from 0.29 percent to 0.33 percent.[37]

There are two reasons why trade liberalization leads to small percent changes in expenditure. First, households spend small fractions of their total expenditure on the products affected by the significant import restraints. Second, the significant import restraints in the U.S. are relatively small, so removing the restraints leads to relatively small reductions in product prices. The two effects combined lead to small percentage changes in expenditures for all household groups.

Figure 2.1: Effects of removing all significant import restraints on the cost of the consumption basket for consumers with different income levels



Source: USITC estimates.

[37] Households in the lowest income decile see a 0.31 percent reduction in cost, while households in the highest income decile see a 0.33 percent reduction. The third income decile ($19,747–$28,400) has the smallest cost reduction, a 0.29 percent. Therefore, import restraints analyzed in this report are roughly equivalent to a 0.3 percent tax on spending for households in all income deciles. However, because poorer households spend a larger fraction of their income than richer households, the import restraints place a greater burden, as a share of income, on poorer households.

Sector-Specific Discussion

A similar analysis is performed to estimate the effects of removal of significant U.S. import restraints in individual sectors on households with different incomes. A brief summary of the results of this analysis is presented here, while the complete results are discussed in appendix F. Removal of trade restrictions in two sectors has comparatively large effects on the cost of the consumption basket, although it is still relatively small in terms of expenditure for all income groups. That is, removal of trade restrictions in the textiles and apparel sector leads to a $38 to $208 per year decline in the cost of the consumption basket, depending on the income decile. Removal of trade restrictions in the footwear and leather products sector leads to a $12 to $69 per year decline in the cost of the consumption basket.

In most sectors, the declines in CPI from the removal of trade restraints are similar across household income deciles. However, in the butter, canned tuna, cheese, and sugar sectors, the declines in CPI are significantly larger for the poorest households than for the richest households in percentage terms.

Dairy Products: Butter and Cheese

The United States is the world's second-largest milk producer after the European Union (EU), with production of 94.6 million metric tons (mt) in 2015.[38] The U.S. dairy industry is composed of farms that produce cow's milk and facilities that process the milk into fluid milk for human consumption and other products, including butter and butter products (predominantly anhydrous milkfat, or AMF) and cheese, the focus products of this case study.[39] The United States is the second-largest global market for cheese (after the EU) and the third-largest market for butter and butter products (after India and the EU).[40] Imports by value are roughly 3 percent of total U.S. consumption of cheese and 4 percent of consumption of butter and butter products (table 2.5). For the most part, U.S. imports of these goods are high-end consumer items, such as European specialty cheeses and butter made with milk from grass-fed cows.[41]

[38] Excluding buffalo milk from India. USDA, FAS, *Dairy: World Markets and Trade*, December 2016.
[39] Cheese includes liquid whey. Anhydrous milkfat (AMF) is clarified butter, often made directly from cream rather than from butter. Other products produced from milk include ice cream, yogurt, infant formula, and various intermediate inputs for processed foods, including nonfat dry milk, whole milk powder, lactose, and milk protein concentrates.
[40] USDA, FAS, *Dairy: World Markets and Trade*, December 2016.
[41] USITC DataWeb/USDOC (accessed May 24, 2017).

Table 2.5: Dairy products: summary data, 2012–15, baseline and liberalization simulation results

Indicator	2012	2013	2014	2015	Baseline change 2015–20	Effect of liberalization
Employment	*Full-time equivalent workers*				*%*	*%*
Butter[a]	1,883	1,771	1,951	2,729	3.9	-0.7
Cheese[b]	44,374	43,629	46,158	47,276	6.2	-0.4
Shipments	*Million $*					
Butter[a]	3,556	3,573	4,442	4,103	11.5	-0.8
Cheese[b]	37,377	39,735	44,414	40,208	13.3	-0.4
Imports						
Butter[a]	62	52	94	151	45.3	30.3
Cheese[b]	1,093	1,145	1,275	1,291	-4.0	16.5
Exports						
Butter[a]	173	353	280	82	5.0	0.5
Cheese[b]	1,112	1,353	1,702	1,388	0.0	0.4

Sources: U.S. Census, *Annual Survey of Manufactures 2010* (accessed May 12, 2017); trade data from USITC DataWeb/USDOC (accessed May 12, 2017); USITC estimates for projection and liberalization.
Notes: Projected changes are based on quantity trends. Effects of liberalization represent deviations from the projected changes. The North American Industry Classification System (NAICS) number for butter is 311512; for cheese, 311513.
[a] Butter includes butteroil/AMF.
[b] Cheese includes liquid whey.

Nature of Trade Restraints

Many dairy products, including butter and cheese, face tariffs and tariff-rate quotas (TRQs).[42] Of the 392 ten-digit subheadings in the Harmonized Tariff Schedule of the United States (HTS) that apply to dairy products, two-thirds (257) are subject to one of 27 dairy TRQs. Of these, 126 are subject to non-zero in-quota duty rates, and the remaining 131 are subject to over-quota rates.[43] Most of the 27 TRQs have country-specific in-quota volume allocations. U.S. imports of dairy products subject to these TRQs are primarily cheese, butter (including AMF), and other dairy products, such as ice cream and yogurt.[44] In some cases where U.S. imports of dairy products face TRQs, particularly for butter and related butter products in 2014 and 2015, over-quota imports are common because the over-quota ad valorem equivalent is not prohibitively

[42] TRQs are defined in footnote 5 in chapter 1. In addition, some food preparations and chocolate products that are covered in chapters 18, 19, and 21 of the Harmonized Tariff System of the United States (HTS) and that contain dairy products also face import restraints. Import restraints operate in conjunction with a complex system of federal, state, and local laws intended to help market dairy products and support the domestic dairy industry. Among these are two federal programs authorized under the Agricultural Act of 2014 (2014 Farm Bill): the Margin Protection Program and the Dairy Product Donation Program. USDA, ERS, "Agricultural Act of 2014" (accessed April 13, 2017).
[43] National Milk Producers Federation, written submission to the USITC, February 4, 2011, 5.
[44] For more information on the TRQ groups of dairy products, see the U.S. Department of Agriculture's (USDA) Dairy Monthly Imports at http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1892.

high and because seasonal U.S. prices spike far higher than global prices for the same products.[45]

The restrictiveness of a restraint is indicated by the TRQ fill rate, defined as the ratio between actual imports under the quota and the allotted quota level. To the extent that annual TRQs for U.S. dairy effectively "fill" (defined as reaching an over 90 percent fill rate), they may impede imports into the U.S. market, if the over-quota tariffs are high enough to make imports noncompetitive. In 2015, fill rates for butter (including AMF) exceeded 97 percent, including allocations for large global producers such as New Zealand and the EU (table 2.6).[46]

In the cheese categories, the 2015 TRQs were effectively filled for blue mold cheese, edam and gouda, and the so-called "other cheese" product group, which includes many specialty cheeses with country-specific quotas. Quotas for other cheeses, including American-type, gruyere-processed, and Swiss and emmenthaler cheeses, filled far less than their total allowed volumes. But even in cases where broad quota categories remain unfilled, TRQs can restrain imports if country-specific quantitative limits are filled and import volumes shift to other suppliers. Examples include EU quotas for cheddar, edam and gouda, and Italian-style cheeses (e.g., mozzarella) (table 2.6).[47]

Although 2015 is the base year used in the USAGE model for this update, U.S. dairy import data for full year 2016 are now available. In general, fill rates for U.S. dairy TRQs were at the same level or higher in 2016 compared to 2015: global dairy exporters such as New Zealand, Australia, and the EU exported substantial amounts of product to the United States because consumer demand for butter, related butter products, and certain cheeses resulted in higher prices for those products in the United States than in Oceania and Europe (table 2.6).[48]

[45] 2015 HTS.
[46] USDA, FAS, Dairy Monthly Imports: Licensed Cheese Imports, January–December 2014 and 2015, January 2016.
[47] Dairy shipments to the United States by U.S. free trade agreement (FTA) partners are typically not subject to import duties. An example is U.S. imports of AMF from Mexico. See 2015 HTS.
[48] Cessna, "Situation and Outlook for the U.S. Dairy Industry," February 24, 2017, 4.

Table 2.6: Certain butter and cheese imports subject to TRQs, from selected sources, 2015

Item, with sources	In-quota AVE tariff	Over-quota AVE tariff[b]	In-quota imports	Over-quota imports[b]	TRQ fill rate[c]	TRQ allocation
	%	%	%	mt	%	mt
Butter and related butter products						
Butter (note 6)[a]	2.6	27.7	6,856	11,994	98.3	6,977
Related butter products (note 14)	5.9	3.6	5,918	8,401	97.3	6,081
Subtotal	4.7	18.8	12,773	20,395	97.8	13,058
Cheese						
Other cheese (note 16)[a]	10	9.4	43,860	11,601	90.2	48,627
Blue mold cheese (note 17)[a]	15.9	22.9	2,838	824	97.5	2,911
Cheddar (note 18)[a]	9.1	13.8	10,361	4,248	83.4	12,423
EU			1,296	3,216	98.7	1,313
American-type inc. colby (note 19)[a]	10.0	83.4	1,683	120	47.8	3,523
Edam and gouda (note 20)[a]	14.9	8.0	6,580	1,524	96.5	6,816
EU			6,382	194	99.9	6,389
Italian-type (note 21)[a]	13.9	20.4	8,983	9,546	66.6	13,481
Argentina			2,530	0	39.6	6,383
EU			5,389	9,093	99.7	5,407
Gruyere-processed (note 22)[a]	7.3	22.4	3,066	40	39.0	7,855
Other cheese—low fat (note 23)[a]	10.0	15.6	19	94	0.3	5,475
Swiss and emmenthaler (note 25)[a]	6.4	17.6	24,561	94	71.2	34,475
Norway			5,596	0	81.3	6,883
Switzerland			3,584	29	98.7	3,630
EU			14,555	28	63.6	22,900
Subtotal			101,951		75.2	135,586

Sources: USDA, FAS, Dairy Monthly Imports, January 2016; 2015 HTS; USITC DataWeb/USDOC (accessed July 18, 2017).

[a] TRQ notes (e.g., note 16) correspond to "Additional U.S. Notes" found at the beginning of HTS chapter 4.

[b] Over-quota imports may enter under separate tariff lines. This category includes all imports, including those from U.S. FTA partners, which may enter free of duty. Many of the over-quota tariffs are "specific" tariffs—i.e., expressed in U.S. dollars per kilogram (kg); unlike average unit values, they will change as prices of the underlying products change.

[c] Fill rates in the table represent the sum of all country-specific TRQs within the product group, as well as any unallocated quota volumes (i.e., "all other country" quotas and "any country" quotas). In a given year, several country-specific TRQs for a product group may fill, resulting in over-quota duties being paid. But the fill rate for the sum of all TRQs in a category (e.g., note 16) still might not total 100 percent or more.

Projected Industry Trends

The Commission projects that the annual value of U.S. butter shipments (including butteroil/AMF) will increase 11.5 percent during 2015–20. This increase tracks rising prices for butter and estimated U.S. population growth over the period, but it also reflects a documented increase in per capita demand for butter since 2005.[49] Employment in the sector is projected to increase 3.9 percent. This is lower than the increase in shipments because of a gradual industry trend toward fewer workers per metric ton (mt) of U.S. production. U.S. butter exports are estimated to rise by 5 percent over the period, albeit from a very small base. Such exports are normally limited because U.S. consumption of butter typically exceeds domestic supply only

[49] Bentley and Ash, "Butter and Margarine Availability over the Last Century," July 5, 2016.

during certain months of the year.[50] The Commission estimates that over the next five years, growing U.S. demand will largely be met through a significant increase in butter imports—45.3 percent between 2015 and 2020—including out-of-quota imports. Over the past three years, despite high tariffs, importing butter at over-quota rates was profitable when U.S. prices spiked in late summer and early fall.[51]

U.S. cheese shipments are projected to increase 13.3 percent during 2015–20, reflecting the industry's growing exports to free trade agreement (FTA) trading partners such as Mexico, South Korea, Australia, Chile, Colombia, and countries belonging to the Dominican Republic-Central America-United States FTA (CAFTA-DR).[52] U.S. employment in the cheese sector is expected to increase 6.2 percent during 2015–20. The Commission estimates that U.S. imports of cheese will decline 4 percent as U.S. cheesemakers increase production of high-quality, price-competitive specialty cheeses (e.g., feta-style and Italian-style varieties) demanded by U.S. consumers.

Effects of Liberalization Relative to Projected Trends

Liberalization was modeled by eliminating all tariffs and TRQs. The Commission estimates that if all tariffs and TRQs on butter and related butter products were removed, U.S. shipments would increase 10.7 percent during 2015–20, a decline of almost 1 percentage point from the estimated increase if current import restraints remain in effect (table 2.5). Growth in U.S. employment in the butter sector during 2015–20 would diminish slightly, from 3.9 percent to 3.2 percent. As noted, imports of butter and related butter products often spike to take advantage of temporarily high U.S. butter prices in the late summer to mid-autumn months.[53] Imports would increase substantially, but from a low base.[54] Exports would also likely increase slightly if prices in foreign markets are higher than in the United States. Relative to the baseline projections, liberalizing import restraints for butter would increase average annual economic welfare by $27.7 million (table 2.1).

[50] During summer, when national milk production temporarily declines in the heat, cream that is used for butter in other seasons is instead diverted to producing ice cream. In addition, commercial bakeries producing goods for the Christmas season sometimes outstrip the domestic supply of butter in the late summer to mid-autumn months (late August–early November).
[51] USITC DataWeb/USDOC (accessed June 29, 2017).
[52] USITC estimate based on prior-year data from USITC DataWeb/USDOC (accessed July 18, 2017).
[53] Mulvany, "Butter Surges to 16-Year High," July 24, 2014.
[54] Removing significant butter import restraints would also reduce summer price spikes, which is a significant source of U.S. industry profitability.

The Commission estimates that if all import restraints on cheese were removed, U.S. cheese shipments would increase 12.8 percent during 2015–20, or 0.4 percent less than the increase that would occur if current import restraints remain in effect (table 2.5). Similarly, U.S. cheese sector employment would grow during 2015–20 by 0.4 percent less than it would in the baseline projection. Imports would increase 16.5 percent relative to the baseline, and exports would likely increase slightly if prices in foreign markets are higher than in the United States. Relative to the baseline projections, liberalizing import restraints for cheese would increase economic welfare by $32.7 million (table 2.1).

Sugar

The United States ranks as the world's sixth-largest sugar producer. U.S. sugar production averaged 7.8 million metric tons raw value (MTRV) annually during marketing year (MY) 2012 through MY 2015, representing 4.5 percent of the global total.[55] The United States is one of only two countries (the other being China) that rank in the top 10 for production of both beet and cane sugar; the United States ranks third and eighth, respectively.[56] U.S. cane sugar production, at 3.4 million MTRV, represents 2.4 percent of the global total, whereas U.S. beet sugar production, at 4.5 million MTRV, represents 12.3 percent of the global total.[57]

[55] The U.S. sugar marketing year (MY) begins on October 1 of the previous year and runs through September 30 of the current year, corresponding to the U.S. federal fiscal year. WTO sugar TRQs are administered on a fiscal-year basis, so most U.S. sugar data are reported on a fiscal year basis by original sources, primarily the USDA. The data in summary table 2.7, however, are reported on a calendar-year basis to be consistent with the data in other tables in chapter 2. MY data are specifically identified in the text; otherwise, data are for a calendar year. Data are mostly reported on a raw value equivalent. Raw value equals refined value times 1.07, except in the case of sugar from Mexico, where raw value equals actual weight times 1.06. USDA, ERS, "Documentation," *Sugar and Sweeteners Yearbook Tables* (accessed March 15, 2017); USDA, FAS, PSD Online (accessed March 15, 2017).
[56] USDA, FAS, PSD Online (accessed March 15, 2017).
[57] Combined, the 28 countries of the EU rank first in beet sugar production. Individually, the top three beet sugar producers are Russia, France, and the United States. EC, ARD, Markets and Prices, Statistics on Agricultural Markets, Sugar (accessed March 23, 2017); USDA, FAS, PSD Online (accessed March 15, 2017).

U.S. sugar production varies seasonally as well as with growing, processing, and market conditions.[58] Total U.S. sugar production increased by 5.8 percent between MY 2012 and MY 2013, and then decreased by 5.8 percent between MY 2013 and MY 2014.[59] The U.S. Sugar Alliance attributed this decrease to low domestic prices associated with a surge in imports from Mexico.[60] Between MY 2014 and MY 2015, total U.S. sugar production partially rebounded, growing by 2.3 percent.[61]

Both U.S. beet and cane sugar production are highly vertically integrated (see box 2.1 for discussion on market divergence by sugar source).[62] Sugar beets are processed directly into sugar at facilities owned by growers' cooperatives. Sugar cane is first milled into raw sugar and then refined. Milling and refining capacity is owned by various combinations of independent growers and millers, cooperatives, and private companies. Beet sugar production is concentrated in the upper Midwest, Plains, and Pacific Northwest states. Raw cane sugar production is found in Florida, Louisiana, and Texas.[63] Raw sugar is stable and transportable, so refineries are not necessarily located near sugar mills; thus, cane sugar refining is not as concentrated as beet refining.[64] The majority of sugar for human consumption—63.9 percent in 2015—is supplied to industrial users (including bakery, cereal, confectionery, and beverage uses), and the remainder is for direct consumption (including through restaurants, institutions, and retail stores).[65]

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[58] USDA, FAS, PSD Online (accessed March 15, 2017).
[59] Ibid.
[60] From MY 2009 through MY 2012, sugar imports from Mexico averaged 1.130 million MTRV. During MY 2013 and MY 2014, sugar imports from Mexico averaged 1.930 million MTRV, an increase of 71 percent. In response, the U.S. sugar industry initiated antidumping and countervailing duty investigations (see box 2.2) which are outside the scope of this report. ASA, written testimony to the USITC, January 30, 2017, 9 and 51.
[61] USDA, FAS, PSD Online (accessed March 15, 2017).
[62] The sugar content of sugar cane and sugar beets begins to deteriorate from the time the cane or beets are harvested until they are processed. Thus, sugar beet processing plants and sugarcane mills are typically located near the cane and beet fields. This perishability also contributes to the economic incentives for vertical integration. ASGA, "What Is a Sugarbeet?" (accessed May 30, 2017); UNICA, "Virtual Tour of a Sugarcane Mill" (accessed May 30, 2017).
[63] ASGA, *Where We Are: The U.S. Sugar Industry* (accessed March 17, 2017). Through 2012, the NAICS classified sugar cane milling and cane sugar refining as separate industries under codes 311311 and 311312, respectively. Since 2012, NAICS has combined sugar cane milling and cane sugar refining under a single industry code, 311314, for cane sugar manufacturing. The U.S. Department of Labor's Bureau of Labor Statistics (BLS) and the U.S. Census both report employment data at the aggregate level for cane sugar manufacturing (311314). However, the U.S. Census *Annual Survey of Manufactures* (ASM) reports product shipments at the disaggregated level. USDOL, BLS, "Quarterly Census of Employment and Wages" (accessed May 30, 2017).
[64] Cane sugar refineries are located in California, Florida, Louisiana, Georgia, Maryland, and New York. ASGA, *Where We Are*: *The U.S. Sugar Industry* (accessed March 17, 2017).
[65] Consumption shares are based on U.S. human consumption, which was 9.9 million MTRV in 2015. USDA, ERS, *Sugar and Sweeteners Yearbook Tables* (accessed March 15, 2017), table 20a.

Box 2.1: Beet sugar and cane sugar market divergence

Incipient structural change could alter the relationship between the beet and cane sugar sectors. Historically, cane sugar and beet sugar markets have been highly integrated; however, there are indications that markets are diverging, as U.S. beet sugar prices have fallen below cane sugar prices.[a] Market divergence may be related to uncertainty about state and federal legislation on labeling foods containing ingredients from genetically engineered sources, along with food manufacturers' product differentiation and ingredient sourcing strategies to deal with this uncertainty.[b]

[a] The stocks-to-use ratio for beet sugar and cane sugar are currently diverging. The USDA) recently estimated that the stocks-to-use ratio for beet sugar would increase from 15.9 percent during MY 2015 to 36.5 percent in MY 2017. Meanwhile, the cane sugar stocks-to-use ratio would fall from 14.3 percent to less than 1 percent over the same period. USDA, ERS, *Sugar and Sweeteners Outlook*, February 15, 2017, and March 15, 2017.

[b] The chemical composition of sugar derived from sugar beets is virtually identical to sugar from sugarcane and contains no genetically engineered material. However, nearly all U.S.-grown sugar beets are genetically engineered to be resistant to glyphosate, a broad-spectrum herbicide (mostly marketed under Monsanto's trade name Roundup). By contrast, there are currently no genetically engineered sugarcane varieties approved for commercial use. Some large sugar users, e.g., Hershey, have reformulated products to use only sugar sourced from sugarcane.

Direct employment in the sugar industry averaged more than 29,000 full-time equivalent workers annually during 2012–15 (table 2.7). Although total employment decreased by 3.9 percent from 2012 to 2015, there was a slight rebound between 2014 and 2015 in each of the segments. Employment in beet sugar manufacturing changed the most between 2012 and 2015, with a large decrease between 2012 and 2013.

The United States is a net importer of sugar, mostly raw cane sugar. The total value of sugar imports decreased by $556 million (8.5 percent) between 2012 and 2015 (table 2.7). The value of refined and other sugar imports decreased by $394 million, accounting for 71 percent of the total decrease in the value of sugar imports, even though refined and other sugar represented only 42 percent of total import value during this period (table 2.7). About 11 percent of imports, on a quantity basis, were imported under various re-export programs from MY 2012 to MY 2015.[66]

[66] Generally speaking, the re-export program provides access, at world prices, to imported sugar that is used an input to produce products that are later re-exported. USDA administers three re-export programs for sugar: (1) the refined sugar re-export program, (2) the sugar-containing products re-export program, and (3) the sugar for the production of polyhydric alcohol program. See details at USDA, FAS, "Sugar Import Program" (accessed March 21, 2017). USDA, FAS, ESMIS, Sugar Monthly Import and Re-Export Data (accessed March 21, 2017).

Table 2.7: Sugar: summary data, 2012–15, baseline and liberalization simulation results

Indicator	2012	2013	2014	2015	Baseline change, 2015–20	Effect of liberalization
Employment	*Full-time equivalent workers*				*%*	*%*
Sugar crop farming						
Sugarcane farming [a]	4,692	4,468	4,515	4,525	4.4	-12.4
Sugar beet farming [b]	11,114	11,116	10,572	10,609	1.4	0.4
Sugar manufacturing [c]						
Beet sugar manufacturing	7,796	6,702	6,899	7,003	3.6	0.4
Cane sugar manufacturing [d]	6,489	6,616	6,439	6,779	4.6	-10.7
Total	30,091	28,902	28,425	28,916	3.2	-4.2
Shipments	*Million $*					
Sugar crop farming [e]						
Sugarcane	1,363	1,248	978	1,016	11.1	-10.2
Sugar beets	2,101	2,049	1,478	1,458	8.3	0.3
Sugar processing						
Beet sugar	([g])	4,496	3,716	3,510	10.8	0.4
Cane sugar	5,753	5,427	5,356	5,657	11.1	-7.7
Raw sugar	2,363	2,730	2,497	2,586	12.9	-10.9
Refined sugar	3,368	2,683	2,853	3,066	9.5	-5.0
Total	([g])	13,220	11,528	11,641	10.6	-4.5
Imports [f]						
Raw cane sugar	1,377	790	927	1,215	0.0	12.7
Refined and other sugar	1,011	912	773	617	0.0	49.4
Total	2,388	1,702	1,700	1,832	0.0	25.0
Exports [f]						
Raw cane sugar	3.9	3.5	2.6	2.7	0.0	-4.6
Refined and other sugar	190	188	171	129	0.0	12.9
Total	194	192	174	132	0.0	12.5

Sources: USDA, ERS, *Farm Income and Wealth Statistics* (accessed March 15, 2016); USDOL, BLS, "Quarterly Census of Employment and Wages" (accessed March 15, 2017); U.S. Census, "Annual Survey of Manufactures: Value of Products Shipments," 2014 and 2015 (accessed March 15, 2017 USDOC, U.S. Census, "Annual Survey of Manufactures: Value of Products Shipments," 2014 and 2015 (accessed March 15, 2017); USITC estimates.

Note: Model sectors are determined by U.S. input-output classifications and may differ from summary data.

[a] Peak quarterly employment reported during the calendar year.

[b] Data from BLS include only establishments where sugar beet farming is the predominant activity; thus BLS data underestimate total direct employment in sugar beet farming. Sugar beet farming employment was estimated using LMC International data from 2009/10 season and includes only time devoted directly to sugar beet production. LMC International, *The Economic Importance of the Sugar Industry*, August 2011.

[c] Peak quarterly employment reported during the calendar year.

[d] The BLS Quarterly Census of Employment and Wages does not report separate employment figures for sugar cane milling and cane sugar refining.

[e] Cash receipts in nominal dollars (the dollar value of a product at the time it was produced).

[f] Raw cane sugar includes trade classified under HTS 1701.13 and 1701.14; refined and other sugar includes trade classified under HTS 1701.12, 1701.91, and 1701.99. For the purposes of these subheadings, raw sugar means sugar whose content of

sucrose by weight, in the dry state, corresponds to a polarimeter reading of less than 99.5 degrees. USITC, HTS, chapter 17, subheading note 1.
[g] Not available.

The largest sources of imported raw cane sugar were Mexico (28 percent share of 2012–15 average value), Guatemala (10 percent), and Brazil (9 percent).[67] FTA partner countries supplied 76 percent of all raw cane sugar imported by the United States.[68] Mexico was also the largest supplier of refined and other sugar imports (74 percent on a value basis), and FTA partner countries supplied 84 percent of refined and other sugar imported by the United States.[69] Though most-favored-nation (MFN) in-quota duties are not zero, most sugar imports enter the United States duty-free under FTAs or other duty reduction programs.[70]

U.S. sugar exports are small relative to imports and are dominated by refined and other sugar. Refined and other sugar exports averaged $170 million annually during 2012–15 (about 8.9 percent of the value of sugar imports) and accounted for more than 97 percent the average annual value of all U.S. sugar exports during this period (table 2.7). In fact, the share of refined sugar in all sugar exports rose from about 69 percent in 2012 to more than 97 percent in 2015. The value of U.S. sugar exports overall, on the other hand, declined by 31.9 percent from 2012 to 2015.

[67] USITC DataWeb/USDOC (accessed March 22, 2017). Mexican sugar had unlimited access to the U.S. market due to the North American Free Trade Agreement (NAFTA) from 2008 until 2014, when the Mexican Suspension Agreements became effective. See box 2.2 for a description of the suspension agreements.
[68] USITC DataWeb/USDOC (accessed March 22, 2017).
[69] Ibid.
[70] An MFN tariff rate is the rate that countries commit to impose on imports from other members of the World Trade Organization. Within the United States this rate is usually called the "normal trade relations" (NTR) rate.

Nature of Trade Restraints

Restraints on U.S. sugar imports are a necessary component of the U.S. sugar program, the first iteration of which was established in the 1930s.[71] The primary objectives of the U.S. sugar program are (1) to provide a guaranteed floor for domestic sugar prices and (2) to do so at no budgetary cost to the federal government. The 2014 Farm Bill defines the current U.S. sugar program primarily through two provisions which create a price floor: nonrecourse loans and flexible marketing allotments (supply management).[72] The objectives of U.S. sugar policy would likely be unachievable without U.S. sugar import restraints because global market prices can be highly volatile.[73] U.S. sugar policies would be largely ineffective in achieving the goals of the sugar program without TRQs to control the quantity of U.S. sugar imports.[74]

Nonrecourse loans and marketing allotments work together to create a U.S. domestic price floor. The current national average loan rates are 18.75 cents per pound for raw cane sugar and 24.09 cents per pound for refined beet sugar, though the effective price floor is higher than the loan rate because processors must offset all costs associated with loan repayment.[75] The overall allotment quantity (OAQ), the quantity of sugar that domestic producers are allowed to supply for human consumption, must be at least 85 percent of the U.S. Department of Agriculture (USDA) forecast of total domestic sugar deliveries (demand) for human

[71] The Jones-Costigan Act of 1934 was the first U.S. legislation to institute quotas to allocate U.S. sugar demand among domestic and foreign suppliers. USITC, *Sugar*, March 2001, 21. Elements of the U.S. sugar program have evolved under successive Farm Bills; the primary basis for the current sugar program is found in the Agriculture and Food Act of 1981. USITC, *Sugar*, March 2001; CRS, *U.S. Sugar Program Fundamentals*, April 6, 2016, 1.

[72] Nonrecourse loans are a short-term, low-cost financing source used by cane sugar mills and beet sugar processors until sugar is sold. If market prices are below the effective loan rate (the published loan rate plus interest and carrying costs) when loans are due, processors may forfeit the sugar used as loan collateral to USDA. Sugar marketing allotments limit the amount of domestically produced sugar that processors may sell each year. The overall allotment quantity, or OAQ, is the total quantity of individual marketing allotments. The OAQ is intended to ensure that the total supply of domestically produced sugar plus the minimum required imports do not depress prices below loan forfeiture levels. CRS, *U.S. Sugar Program Fundamentals*, April 6, 2016, 1.

[73] Historically, many countries have regulated sugar markets and trade to maintain stable domestic prices for producers and consumers; thus, shocks in supply or demand that create internal surpluses or shortages have tended to be more prominent in global market prices than in domestic markets.

[74] To illustrate this point, the American Sugar Alliance contended that the surge in sugar imports from Mexico during MY 2013 undercut U.S. domestic prices, resulting in forfeiture of nonrecourse loans (see the next footnote) at the cost of $259 million to the federal government. ASA, written testimony to the USITC, January 30, 2017, 12. Analysis by the Congressional Research Service (CRS) also supports this conclusion, though it gives lower figures for the forfeiture: 381,875 tons of sugar valued at $172 million. CRS, *U.S. Sugar Program Fundamentals*, April 6, 2016, 7. More broadly, the ASA describes the global sugar market as highly distorted by domestic subsidies in sugar-producing countries; as a result, according to the ASA, world market prices are volatile and do not reflect sustainable returns. ASA, written testimony to the USITC, January 30, 2017, 29.

[75] Actual rates are adjusted to reflect regional differences. CRS, *U.S. Sugar Program Fundamentals,* April 6, 2016, 2.

consumption during the marketing year.[76] The OAQ is divided between refined beet sugar, at 54.35 percent, and raw cane sugar, at 45.65 percent, among other allotment conditions specified in legislation.[77] The effectiveness of these policies depends on the TRQs limiting U.S. sugar imports.[78]

Box 2.2: Mexican Sugar Suspension Agreements

In December 2014, the U.S. Department of Commerce (USDOC), the Government of Mexico, and Mexican sugar producers/exporters entered into agreements to suspend antidumping and countervailing duty (AD/CVD) investigations on sugar from Mexico. Amendments to these agreements were negotiated and approved in June 2017. The agreements place volume restrictions and set minimum reference prices (among other restrictions) on Mexican sugar exports to the United States. The initial request letter for this report indicated that the reports subject to this request should not include import restraints resulting from final AD/CVD investigations (see appendix A). Since 1992, the Commission has interpreted this language to exclude not only the restraining effects of AD/CVD orders but also the restraining effects of suspension agreements, which also result from final AD/CVD investigations. Therefore, this report does not address the removal of the restraining effects of these suspension agreements. For a detailed description of the AD/CVD investigations associated with these suspension agreements, see USITC, *Sugar from Mexico*, Publication Nos. 4467 (Preliminary, May 2014), 4523 (Review, April 2015), and 4577 (Final, October 2015).

World Trade Organization Tariff Rate Quotas

To manage the supply of imported sugar, the United States administers a system of TRQs for imports of raw cane sugar, certain other sugars, syrups, and molasses (generally and hereafter referred to as refined sugar), as well as certain sugar-containing products.[79] These TRQs are available to members of the World Trade Organization (WTO) in accordance with the Uruguay Round Agreement on Agriculture. In addition, the United States has established TRQs specific to selected countries under various FTAs.[80]

To fulfill its WTO commitment, the United States must provide minimum access of 1,139,000 MTRV for various forms of raw and refined sugar. The USDA sets the total access quantity for raw cane sugar and refined sugar at the beginning of the marketing year; these quantities may

[76] USDA's forecast of U.S. sugar supply and use, which are adjusted and approved by the World Agricultural Outlook Board, are available through USDA's monthly "World Agricultural Supply and Demand Estimates," https://www.usda.gov/oce/commodity/wasde/.
[77] CRS, *U.S. Sugar Program Fundamentals,* April 6, 2016, 2.
[78] Many countries regulate sugar markets and trade to maintain stable domestic prices for producers and/or consumers. Such policies can transfer price shocks from domestic markets to the global market, as well as insulate domestic markets from global price volatility. ASA, written testimony to the USITC, January 30, 2017, 42-45.
[79] The WTO TRQs for raw cane sugar, refined sugar, certain SCPs, and blended sugar syrups are provided for under additional U.S. notes 5, 7, 8, and 9 to chapter 17 of the HTS. TRQs under notes 7 and 9 are set to zero.
[80] Note that WTO sugar quotas are for fiscal/marketing year periods, while FTA quotas are for calendar year periods. Though substantively consistent with all other U.S. FTAs, the agreements with Colombia and Peru are titled trade promotion agreements rather than FTAs. This text refers to all of these agreements as FTAs.

be increased throughout the marketing year, subject to various constraints.[81] The Office of the U.S. Trade Representative (USTR) allocates the initial quantities to specific countries, typically in proportion to historic market shares. It also allocates any increases, and reallocates unused allotments at various times during the marketing year. Refined sugar, including specialty sugar, is generally allocated on a first-come, first-served basis.[82] Canada and Mexico, however, received country-specific allocations of refined sugar as defined by commitments under the Uruguay Round Agreement on Agriculture. Provisions in the North American Free Trade Agreement (NAFTA) excluded Mexico from participation in WTO TRQs, although Canada continues to be allotted refined sugar under WTO TRQs.

USDA announced the initial allocations for WTO sugar TRQs during MY 2015 in September 2014.[83] The aggregate allocation of raw cane sugar was set at 1,117,000 MTRV, representing 98 percent of the minimum WTO requirement (table 2.8). The initial allocation of 127,000 MTRV of refined sugar TRQs included the WTO minimum access requirements of 22,000 MTRV.[84] Eighty-four percent of the refined sugar TRQ was reserved for specialty sugar. While USDA did not increase the raw cane sugar quota during MY 2015, in June 2015 refined sugar access was increased by 20,000 MTRV, all reserved for specialty sugar. Thus a total of 106,656 MTRV of the refined sugar TRQ was reserved for specialty sugars.[85]

USTR allocated the initial raw cane sugar allotment of 1.1 million MTRV, based on historical shipments, in September 2014.[86] In consultations with quota holders, USTR determined that 157,937 MTRV of the original allocations would go unfilled and reallocated these quantities in June 2015.[87] As a result of the final allocations, the four largest supplying countries—Brazil, the Dominican Republic, Australia, and the Philippines—accounted for about 49 percent of the total allocations and nearly 52 percent of total imports under the raw cane sugar TRQ (table 2.8). Fill rates of the largest suppliers approached 100 percent, and the overall fill rate exceeded 94 percent.

[81] Provisions added to the 2008 Farm Bill and continued in the 2014 Farm Bill require USDA to set the initial raw cane sugar TRQ access at the minimum level necessary to comply with WTO requirements. Before April 1 of each year, the total raw cane sugar TRQ access may be raised only if there is a shortfall due to an emergency (weather or war). After April 1, the raw cane sugar TRQ access may be raised in accordance with sugar program objectives.
[82] Specialty sugars, which are designated by the USTR, include brown slab, organic, and vanilla sugars, as well as items like decorations and rock candy. 61 Fed. Reg. 26785 (May 29, 1996); 61 Fed. Reg. 42935 (August 19, 1996).
[83] 79 Fed. Reg. 52625 (September 4, 2014).
[84] Ibid.
[85] 80 Fed. Reg. 34129 (June 15, 2015).
[86] 79 Fed. Reg. 53505 (September 9, 2014).
[87] 80 Fed. Reg. 32430 (June 8, 2015).

Table 2.8: Sugar: tariff rate quota fill rates, 2012–15

Agreement, TRQ, and source	TRQ fill rates[a]				Imports	Allocation
	2012	2013	2014	2015	2015	2015
WTO		*%*			*MTRV*	
WTO raw cane sugar quota (note 5)	84	54	81	94	1,054,320	1,117,195
Australia	98	33	98	100	109,026	109,141
Brazil	100	94	100	100	189,775	190,669
Dominican Republic	99	51	54	100	184,662	185,335
Philippines	86	39	82	100	63,460	63,460
All others	71	51	81	89	507,397	568,590
WTO refined sugar quota (note 5)	94	100	100	97	142,282	147,000
Global	100	100	100	85	7,090	8,294
Canada	100	100	100	71	8,536	12,050
Specialty	94	100	100	97	122,312	126,656
Sugar-containing products (note 8)[b]	100	100	90	94	60,302	64,709
					mt	
Free trade agreements	96	84	99	86	164,610	190,350
CAFTA-DR	98	97	99	91	125,897	138,100
Colombia[d]	([c])	20	98	74	38,713	52,250

Source: IHS Markit, GTA database (accessed March 22, 2017); USDA, ERS, Sugar and Sweeteners Yearbook Tables (accessed March 22, 2017); USITC, HTS, chapter 17.

[a] Fill rates are based on final allocations.

[b] The majority of this quota is typically allocated to Canada; Canada's share was 59,250 MTRV in 2015.

[c] The Colombia FTA entered into force on May 15, 2012.

[d] During 2015, Chile, Morocco, Peru, and Panama did not meet the net exporter conditions, so their TRQ allocation for 2015 was set at zero.

Free Trade and Trade Promotion Agreements

Under NAFTA, sugar imports from Mexico became duty-free and quota-free beginning on January 1, 2008.[88] U.S. FTAs also provide duty-free/quota-free access to Bahrain, Israel, Jordan, South Korea, Oman, and Singapore.[89] The United States has agreed to additional TRQs, but not duty-free/quota-free access, with most FTA partners, including Chile, Morocco, Costa Rica, the

[88] As stated earlier, sugar imports from Mexico have been subject to suspension agreements negotiated as a direct result of antidumping and countervailing duty investigations during the period covered by this report. Thus, according to the original request for this investigation from the USTR (appendix A), the effects of these suspension agreements are not considered in this report.

[89] Imports from these FTA partners are typically subject to specific rules of origin, and these countries are typically net importers of sugar; sugar exports from these sources are minuscule. IHS Markit, GTA database (accessed March 22, 2017).

Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, Peru, Colombia, and Panama.[90]

The TRQs associated with these FTAs are generally subject to a net-exporter condition in addition to rules of origin; that is, the TRQ amount is set equal to the lesser of the scheduled quantity or the FTA partners' net export position from the most recently available data.[91] During 2015, Chile, Morocco, Peru, and Panama did not meet the net exporter conditions, so their TRQ allocation for 2015 was set at zero. The CAFTA-DR countries and Colombia received FTA TRQ allotments totaling 190,350 MTRV in 2015 and achieved a fill rate of 86.5 percent (table 2.8).

Projected Industry Trends

The baseline simulation projects that in the absence of liberalization, the value of U.S. sugar shipments would continue to increase, and little would change in U.S. sugar trade between 2015 and 2020. The value of sugar cane shipments would increase by 11.1 percent, while the value of sugar beet shipments would increase by 8.3 percent (table 2.7). The value of raw cane sugar shipments would increase by 12.9 percent; of refined cane sugar shipments, by 9.5 percent; and of beet sugar shipments, by 10.8 percent.[92] There would be very little change in sugar imports and exports, suggesting that increased domestic shipments would keep pace with changes in domestic consumption. Employment is projected to increase by about 3.2 percent across all sugar sectors because of higher shipments (table 2.7).

Effects of Liberalization Relative to Projected Trends

Liberalization was simulated by eliminating all TRQs and all related tariffs.[93] Removal of restrictions on imports of sugar would generally result in contraction in the domestic cane sugar sector, both in absolute terms and relative to the baseline. Meanwhile, the domestic beet sugar sector would grow at a faster rate relative to the baseline (table 2.7). Employment and the value of shipments in all facets of the cane sugar sector would be expected to decline, while employment and the value of shipments in the beet sugar sector would be expected to grow in

[90] Australia did not receive tariff reductions or additional market access for sugar and sugar-containing products subject to WTO TRQs via the United State-Australia FTA.
[91] The scheduled quantities are available in 79 Fed. Reg. 75854 (December 19, 2014).
[92] These rates are generally consistent in trend and magnitude with USDA's long-term projections. USDA, OCE, *USDA Agricultural Projections to 2026,* February 16, 2017.
[93] As indicated earlier, constraints on sugar from Mexico implemented in response to the suspension agreements were not removed by this simulation.

line with increased production. Gains in average annual welfare, at $342.7 million, would be the second highest among all the sectors identified (table 2.1).

In the event that sugar import restraints were removed, the value of shipments from cane sugar manufacturing would be expected to contract by 7.7 percent, with sugarcane milling contracting by 10.9 percent and raw sugar refining by 5.0 percent (table 2.7). Refined sugar contracts less because the sugar refining sectors would gain increased access to imported raw sugar feedstock. Raw cane sugar imports would increase by 12.7 percent. Responding to the decline in domestic prices relative to world prices, and to an increased ability of U.S. refiners to import raw cane sugar, producers would increase total sugar exports by 12.5 percent, albeit from a low base. Nonetheless, employment in the sugarcane farming and cane sugar manufacturing sectors would decrease by 12.4 and 10.7 percent respectively. In addition, imports of refined and other sugar would increase by almost 50 percent (table 2.7).

The value of both sugar beet shipments and refined beet sugar shipments would still be expected to increase in the event that sugar import restraints were removed. Similarly, employment in the sugar beet farming and beet sugar manufacturing sectors would increase. Growth rates in the sugar beet sector would be about the same as the growth rates projected without the removal of these import restraints. These results suggest that the beet sugar produced by United States under 2015 market conditions was competitive with imported sugar.[94]

Canned Tuna

The United States is the world's fourth-largest canned tuna producer,[95] with shipments valued at an estimated $773 million in 2015 (table 2.9). It is also the world's leading market for canned tuna, accounting for about 24 percent of global consumption.[96] The U.S. canned tuna industry, which includes production facilities in the continental United States and American Samoa, has become increasingly concentrated over time, such that the three major brands—Bumble Bee, StarKist, and Chicken of the Sea—account for between 75 and 85 percent of the U.S. market.[97]

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[94] Since the 2015 base year, conditions in global sugar markets have changed dramatically, and international sugar prices have dropped to well below U.S. loan rates. These results are dependent upon market conditions that existed during the base year, and a change from base year conditions could alter these results.

[95] Throughout this section, the term "canned tuna" refers to both canned and pouched tuna. In the HTS, both tuna in cans and tuna in pouches are referred to as "tuna in airtight containers," found under HTS subheading 1604.14. FAO, Fishery Commodities Global Production and Trade database (accessed May 12, 2017).

[96] The Pew Charitable Trusts website, "Global Tuna Fishing," http://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2012/06/21/global-tuna-fishing (accessed April 18, 2017).

[97] Makoto et al., *Recent Developments in the Tuna Industry*, 2010, 93, 98.

The U.S. canned tuna industry is at a competitive disadvantage because its wage rates for fish processing are significantly higher than those of foreign competitors, such as Thailand, Vietnam, and Ecuador. As a result, tuna companies' two remaining U.S. domestic mainland operations have become mechanized in order to improve efficiency and save on labor costs. These mechanized tuna canneries (a Chicken of the Sea facility in Georgia and a Bumble Bee facility in California) employ only a few hundred workers each. Operations in American Samoa, which are considered part of U.S. production, were originally established to take advantage of the combination of proximity to tuna fisheries, relatively low wages, and duty-free access to the U.S. market. Plants in American Samoa, however, are more affected by labor cost pressures because they are not mechanized like operations on the mainland. Employees in American Samoa are currently estimated to be less than 3,000.[98] In recent years, major tuna companies have eliminated or cut back operations in American Samoa, reportedly due to an increase in the minimum wage there.[99] In 2015, the U.S. Congress passed an additional minimum wage increase for American Samoa, which will reportedly make it more difficult for canneries there to compete with those in the rest of the world.[100]

Despite efforts to keep U.S. canneries cost competitive, U.S. production has fallen from about 200,000 mt in 2005 to about 180,000 mt in 2015 (although the 2015 level was slightly higher than in 2012).[101] The 2015 level of production reflects a U.S. industry that is about 40 percent smaller than it was in the 1990s, but has partially recovered from its low of 174,000 mt produced in 2013. (In 2012–13, the industry experienced very high prices for raw tuna used to make canned tuna; this situation made conditions difficult for all producers, including those in the United States.[102])

[98] Sagapolutele, "Tuna Cannery in American Samoa to Halt Production," October 14, 2016.
[99] Rushford, "Charlie the Tuna's Economic Woes," July 7, 2010.
[100] Wallbank, McMahon, and Duggan, "Chicken of the Sea Gets Samoans a Wage Hike," October 8, 2015.
[101] USDOC, *Fisheries of the United States 2006*, July 2007, 45; USDOC, *Fisheries of the United States 2015*, September 2016, 63.
[102] FAO, "Canned Tuna: July 2012," July 1, 2012. Recent court cases in which tuna company executives have pleaded guilty to price fixing suggest that the tuna companies may have also worked together to keep prices higher than they otherwise would have been during this period; Whoriskey, "Three Popular Tuna Brands Conspired," May 16, 2017.

Table 2.9: Canned tuna: Summary data 2012–15, baseline and liberalization simulation results

Indicator	2012	2013	2014	2015	Baseline change, 2015–20	Effect of liberalization
	Full-time equivalent workers				*%*	*%*
Employment	4,000	4,000	3,460	2,660	0.0	-2.5
	Million $					
Shipments	886	852	783	773	-10.0	-2.9
Imports	803	745	678	566	-10.0	8.5
Exports	13	13	11	21	-38.0	6.9

Sources: USDOC, *Fisheries of the United States 2015*, September 2016, 63; USITC DataWeb/USDOC (accessed November 16, 2016 and May 12, 2017); Sagapolutele, "Tuna Cannery in American Samoa to Halt Production," October 14, 2016; Georgia.org, "Chicken of the Sea to Open Canning Operation," May 4, 2009.

Notes: Employment and shipments estimates are for the United States, American Samoa, and Puerto Rico. Imports and exports are for the United States and Puerto Rico only (U.S. customs territory).

The United States is the world's largest canned tuna importer,[103] with imports of about $566 million in 2015. Imports are concentrated among a few major supplier countries. In 2015, Thailand accounted for 46 percent of U.S. canned tuna imports, while the top five suppliers (Thailand, Ecuador, Vietnam, the Philippines, and Indonesia) together accounted for 92 percent. In the past several years, tuna prices have come down from the highs they experienced in 2012 and 2013, but imports fell even in volume terms between 2012 and 2015, from around 161,000 mt to 143,000 mt. This is likely due to a combination of lower U.S. consumption as a result of the continuing decline in popularity of canned tuna among consumers,[104] a drawdown of canned tuna held in inventory,[105] and increased domestic production. Imports made up 44 percent of estimated U.S. consumption in 2015, down from 52 percent in 2011, and exports accounted for less than 2 percent of domestic production.

The canned tuna sector comprises two principal products: tuna packed in oil and tuna packed in water. Production costs for tuna in oil and tuna in water are nearly identical; canneries can switch production from one product to the other at little cost. For the same brand and size of can or pouch, the two products often have identical wholesale and retail prices. Tuna packed in water, however, is by far the more popular product, accounting for about 85 percent of U.S. production and about 97 percent of total U.S imports.

[103] The United States is the largest single-country importer of canned tuna. If the 28 countries of the EU are taken together, however, they are a larger import market. IHS Markit, GTA database (accessed May 31, 2013).
[104] Whoriskey, "Three Popular Tuna Brands Conspired," May 16, 2017.
[105] FAO, "Lower Imports from Traditional Markets," April 11, 2016.

Nature of Trade Restraints

Import restrictions on tuna packed in oil are much higher than on tuna in water because before the 1980s, tuna in oil was the more popular product form.[106] Imports of canned tuna packed in oil are subject to a high tariff of 35 percent, but are not subject to TRQs. U.S. imports of canned tuna packed in water are subject to a TRQ, but both the in-quota rate of 6 percent and the over-quota duty rate of 12.5 percent are below the 35 percent rate for tuna packed in oil.[107] The TRQ volume for any given calendar year is equal to 4.8 percent of apparent U.S. consumption (as reported annually by the U.S. Department of Commerce) of canned tuna during the immediately preceding year.[108] There is substantial demand for canned tuna in the United States, however, and the over-quota tariff is not prohibitive. As a result, in-quota imports account for a small share of the total; in 2015, they were less than 1 percent of the volume of total imports of canned tuna in water.

The TRQ is administered on a global first-come, first-served basis. Because the relatively low in-quota tariff rate is about half the over-quota rate, importers attempt to qualify for as large a share of the TRQ as possible by storing thousands of cases of canned tuna in customs-bonded warehouses in late December, waiting to withdraw those cases as soon as the calendar year begins. As a result, the TRQ fills very rapidly. However, according to industry sources, this system is costly for importers because it raises storage costs and leads to uncertainty over whether an individual importer's product will face the in- or over-quota rate.

Projected Industry Trends

The baseline simulation projects a modest decline in U.S. canned tuna production to 2020, with production slowing by 10 percent over the period. Imports are also expected to decline by about 10 percent over the period, reflecting a continuation of the long-term trend toward a smaller U.S. canned tuna market (table 2.9). No changes are expected in employment levels, since employment figures represent a small number of canning facilities that have already reduced their reliance on labor by automating processes where possible. Finally, U.S. exports are expected to decline by 38 percent, consistent with the overall reduction in U.S. producers'

[106] Campling, "Trade Politics and the Global Production of Canned Tuna," February 2016, 4.
[107] Quotas on canned tuna imports were first introduced in 1956 and are administered on a calendar year basis. This was in response to sharply increasing imports of canned tuna (nearly all from Japan) beginning in the early 1950s. For example, between 1951 and 1956, imports of canned tuna increased from 13 million pounds to 44 million pounds, or from 6 percent of domestic consumption to 16 percent. U.S. Tariff Commission, *Tuna Fish*, 1958; USITC, *Competitive Conditions in the U.S.* Tuna Industry, 1982.
[108] For example, for calendar year 2012, the TRQ for canned tuna was 17,270,370 kilograms. 77 Fed. Reg. 22797 (April 17, 2012).

output levels and the fact that the U.S. industry is domestically oriented, with export levels consistently below 3 percent of production.

Effects of Liberalization Relative to Projected Trends

Liberalization in canned tuna was modeled by eliminating the TRQs and all related ad valorem equivalents of the duties on canned tuna packed in water and in oil. In the 2020 projected baseline, the anticipated ad valorem equivalents are 22.0 percent for tuna packed in oil and 12.0 percent for tuna packed in water. Compared to the baseline simulation, removing trade restraints on canned tuna would slightly accelerate the decline in U.S. production, with shipments falling by an additional 2.9 percent. Elimination of the duties would cause imports to become more competitive in the U.S. market, and as a result, import levels would be 8.5 percent higher than under the baseline scenario (although they would still decline slightly overall). Because the domestic price would fall relative to the world price, U.S. producers would export a larger share of their shipment—a 6.9 percent increase in exports over the baseline. However, this would still represent a 31.2 percent decline in exports from 2015. Average annual welfare would be $33.7 million higher (table 2.1).

Beef

The cattle and calf sector is the single largest sector in U.S. agriculture, and the United States is the world's largest beef producer and fourth-largest exporter by volume.[109] U.S. beef production is primarily grain-finished, and divided between the cow-calf sector and the cattle feeding sector.[110] The states with the largest production in 2015, in both volume and value, were Texas, Nebraska, Kansas, and Oklahoma.[111]

The United States is also the world's largest beef importer and was a net importer of beef in both 2014 and 2015.[112] Imports are primarily lean grass-finished beef.[113] Australia, Canada, New Zealand, and Mexico were the largest sources of U.S. beef imports in 2015. Australia and

[109] USDA, ERS, Farm Income and Wealth Statistics database, February 7, 2017; USDA, FAS, *Livestock and Poultry: World Markets and Trade*, April 2016, 14–15.
[110] USITC, *Global Beef Trade*, 2008, 3-1 to 3-4.
[111] USDA, NASS, *Meat Animals Production, Disposition, and Income: 2015 Summary*, April 2016, 11.
[112] USDA, FAS, *Livestock and Poultry: World Markets and Trade,* April 2016, 14–15.
[113] USDA, ERS, "Cattle and Beef: Trade," https://www.ers.usda.gov/topics/animal-products/cattle-beef/trade/ (accessed March 24, 2017). Grain-fed beef typically contains more intramuscular fat (marbling) and is often preferred for whole-muscle cuts such as steaks.

New Zealand are typically the largest import sources of frozen boneless beef for processing, while Canada and Mexico supply more fresh/chilled beef.[114]

Between 2012 and 2014, the U.S. cattle herd shrank by 2.9 percent, and U.S. beef production declined 6.5 percent by volume. A drought in much of the U.S. southern Plains states that began in 2011 delayed the expansion phase of the most recent U.S. cattle cycle, and U.S. cattle numbers declined in every year between 2006 and 2014. The decline in U.S. beef production drove up prices for cattle and beef. The annual average wholesale price for choice beef rose 25.5 percent between 2012 and 2014, while the retail average unit value for all fresh beef (including ground beef and select grade) rose 19.3 percent, leading to a substantial increase in shipment value (table 2.10).[115] An increase in demand, in turn, led to higher prices for imports and increased imports from major import suppliers.[116]

Table 2.10: Processing beef: Summary data 2012–15, baseline and liberalization simulation results

Indicator	2012	2013	2014	2015	Baseline change, 2015–20	Effect of liberalization
			Full-time equivalent workers		*%*	*%*
Employment	18,327	17,805	23,413	24,743	12.1	-0.1
			Million $			
Shipments	9,706	9,837	14,418	14,926	18.8	-0.1
Imports	2,184	2,224	3,487	4,142	-20.0	1.2
Exports	3.1	3.7	3.2	9.7	-5.3	0.2

Sources: U.S. Census Bureau, *2015 Annual Survey of Manufactures* (December 16, 2016) and *2014 Annual Survey of Manufactures* (January 8, 2016); USITC DataWeb/USDOC (accessed January 10, 2017); USITC calculations.

At the same time that the U.S. cattle herd and beef production volumes were shrinking, production expanded in Oceania, the source of a large portion of U.S. beef imports. Beef production in Australia increased in 2014 and 2015 because of the effects of a drought in that country, which encouraged slaughter to the extent that Australia's cattle herd reached a 20-year low in 2016.[117] Many cattle producers in Oceania took advantage of the higher U.S. import demand and increased beef exports to the United States.

[114] USDA, FAS, "A Review of U.S. Tariff Quotas for Beef Imports," April 2016, 2.
[115] USDA, ERS, "Choice Beef Values and Spreads," August 16, 2016.
[116] The average unit value of U.S. imports of frozen boneless beef from Australia (the primary import source) increased 16 percent during 2012–14. Imports from Australia entered under HTS 0202.30. USITC DataWeb/USDOC (accessed December 19, 2016).
[117] USDA, FAS, *Australia: Livestock and Products Annual*, September 7, 2016, 2, 5.

Nature of Trade Restraints

U.S. imports of fresh/chilled and frozen beef from most countries other than Canada and Mexico are subject to a WTO TRQ with an over-quota rate of 26.4 percent.[118] In-quota imports are subject to duties of 4.4 cents per kilogram (kg) (about 1 percent ad valorem equivalent) for beef that is not processed, 4 percent for high-quality processed beef cuts, or 10 percent for processed beef cuts other than high quality.[119] The TRQ includes country-specific volumes. The country-specific quota volumes and 2012–15 fill rates are presented in table 2.11.

Table 2.11: Beef: Tariff-rate quota fill rates, 2012–15

	TRQ fill rates				Imports	Allocation
Source country	2012	2013	2014	2015	2015	2015
		%			*mt*	
Australia[a]	53	50	87	100	418,151	418,214
New Zealand	75	81	92	101	215,183	213,402
Argentina	0	0	0	0	0	20,000
Uruguay	94	111	128	193	38,611	20,000
Japan[b]	17	126	318	498	995	200
Other countries	72	64	91	72	46,871	64,805
Canada	([d])	([d])	([d])	([d])	210,726	No limit
Mexico	([d])	([d])	([d])	([d])	144,685	No limit
Chile[c]	([d])	([d])	([d])	([d])	602	No limit

Source: USITC DataWeb/USDOC.

[a] Australia's allocation includes additional volume under the U.S.-Australia FTA. In 2015, this was 40,000 mt. Australia has access to an additional volume of 4,000 mt (i.e., not included in this allocation) at a reduced rate of 21.0 percent.

[b] Japan has especially high fill rates because of the low import quota and because Japan exports primarily high-value Kobe beef, sales of which are less affected by the out-of-quota tariff.

[c] Chile has had unlimited access since 2007 through the U.S.-Chile FTA.

[d] Not applicable.

Note: This TRQ covers HTS 0201 and 0202.

[118] Australia also had access to an additional quota of 4,000 mt at a reduced rate of 21.0 percent. Some other countries have preferential access to the U.S. beef market through their respective FTAs. For example, the 2004 CAFTA-DR established TRQs for each of the partner countries; however, this preferential access is contingent on filling the WTO "other countries" quota, which has not been filled. Due to animal health status, many countries and regions are not eligible to ship fresh/chilled or frozen beef to the United States. Bahrain, Chile, Colombia, Morocco, Oman, Panama, and Singapore have preferential access to the U.S. beef market through their respective FTAs, but because of sanitary restrictions, only Chile is eligible to export beef to the United States. USDA, FAS, "A Review of U.S. Tariff Rate Quotas," April 2016.

[119] See USITC, HTS, additional U.S. note 1 for definitions of "processed" and "high-quality."

Australia and New Zealand are the two countries with the largest country-specific quota volumes. In most years, these quota volumes are not filled.[120] However, in 2014, fill rates for both countries were over 85 percent, and in 2015, both Australia and New Zealand filled their quota volumes. Further, imports from both countries declined substantially in the last quarter of the calendar year, indicating that the quota was restraining imports. Australia imposed export controls in the last quarter of the year, allocating export volume to the next year in order to prevent exceeding the quota.[121] Although New Zealand allocates 98 percent of the beef quota volume at the beginning of the year, U.S. beef imports from New Zealand in the fourth quarter were only about 12 percent of the annual total.[122]

More than half the beef consumed in the United States is in the form of ground beef.[123] Ground beef can be produced with various levels of fat composition, but most ground beef sold at retail is between 70 percent and 84 percent lean.[124] Ground beef is often produced from a mixture of lean processing beef, supplied by domestic cow beef and imports from Oceania, and trimmings from whole muscle cuts of beef, commonly 50 percent lean.[125] The U.S. TRQ on beef restricted 2015 imports of lean processing beef, which is primarily used to produce products such as ground beef.

Although the TRQ was effectively filled in 2015, import prices were affected more by changes in domestic and import supply than by the effects of the TRQ. Imported lean processing beef typically sells in the United States at a discount from domestic product.[126] The discount fluctuates seasonally: it is typically highest in the spring and summer and lowest in the winter. However, for much of 2015, the discount for imported product was greater than the comparable period in 2014, indicating that the TRQ had little impact on prices for most of the year.

The TRQ restricted imports of lean processing beef and boosted demand for domestic cow beef, leading to higher prices in this segment. The lower supply of lean processing beef also led

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[120] Uruguay often exceeds its beef quota volume of 20,000 mt, but imports from Uruguay are a very small share of U.S. beef imports and consumption. Japan also often exceeds its very small quota of 200 mt.
[121] ABC Rural, "Surging Demand for Australian Beef in the U.S.," September 3, 2015. Government of Australia, Department of Agriculture and Water Resources, "United States Beef Quotas" (accessed December 22, 2016).
[122] New Zealand Meat Board, "Guidance Note to US Beef and Veal Quota" (accessed December 27, 2016).
[123] North American Meat Institute, "The 2015 Meat and Poultry Facts," March 2016, 38.
[124] Speer, Brink, and McCully, "Changes in the Ground Beef Market," 2015, 5. In the accompanying analysis, ground beef is assumed to consist of 77 percent fat on average.
[125] "Cow beef" is produced domestically from cows and bulls (as distinguished from steers and heifers). Ground beef can also be produced from cuts with a higher fat content and a smaller volume of trimmings.
[126] National weekly weighted average prices for fresh 90 percent lean boneless processing beef compared to imported 90 percent lean cow processing beef on the East Coast, free on board (f.o.b.) basis, 0–15 days. USDA, *2014 Annual LPGMN Statistics Summary* and *2015 Annual LPGMN Statistics Summary* (accessed November 14, 2016).

to a decrease in demand for 50 percent trim and a decline in its price. More ground beef was produced from domestic steer and heifer beef. As beef from fed steers and heifers typically is less than 90 percent lean, less of the 50 percent trim is used to produce ground beef with the same fat content. The use of steer and heifer beef to produce ground beef also left less to be sold as whole muscle cuts. Thus, aside from the direct impact of higher prices for ground beef for foodservice firms, the restriction on imports of lean processing beef likely led to a small increase in the price of domestic whole muscle cuts of beef.

Projected Industry Trends

Beef exporters in Oceania are not likely to fill U.S. beef import quotas in the near future because of lower U.S. demand and reduced Oceanian (mainly Australian) supply. U.S. beef production reached a low in 2015, and in 2016 was 3.9 percent above that of 2014, lessening demand for imports.[127] This growth is expected to continue because the U.S. cattle herd has increased: it expanded 3.8 percent between January 2014 and January 2016. Moreover, USDA projects that the U.S. cattle herd (and the beef cow herd) will increase over the next five years, and that the volume of imports will remain below the level observed in 2015.[128]

In addition, beef production in Oceania has declined since 2015. Cattle numbers were sharply lower in Australia and somewhat lower in New Zealand in January 2016, so that the potential supply of beef for exports from those countries is lower for the near future.[129] Although exporters in Oceania are not likely to fill U.S. beef import quotas in 2016–20, it is possible that beef from other countries could be constrained by the TRQ.[130]

Effects of Liberalization Relative to Projected Trends

Model results indicate that the impact of import restrictions on U.S. beef imports is small. As the TRQ is not expected to be binding on imports from Australia and New Zealand over 2016–20, if beef tariffs and TRQs had been eliminated in 2015, U.S. processing beef shipments and employment would be an estimated 0.1 percent lower in 2020, U.S. processing beef imports 1.2

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[127] USDA, FAS, PSD online database (accessed July 28, 2016).
[128] USDA, OCE, *USDA Agricultural Projections to 2026*, February 2017, 97, table 36, "Beef Trade Long-term Projections."
[129] Australia's beef production in 2016 was 16.0 percent lower than in 2014. New Zealand beef production was 0.5 percent higher than in 2014, but 4.5 percent lower than in 2015. Australia's cattle herd contracted 5.5 percent and New Zealand's herd contracted 2.1 percent between January 2014 and January 2016. USDA, Production, Supply, and Distribution database (accessed July 28, 2016).
[130] The "other countries" quota is 64,805 mt. It applies to U.S. beef imports from all countries without a country-specific quota volume, including Ireland, Lithuania, the Netherlands, Brazil, Namibia, and France, all of which have received approval to export beef to the United States since 2015.

percent greater, and exports 0.2 percent higher than baseline projections (table 2.10). Average annual welfare would be $19.5 million higher (table 2.1).

The effect of import restraints in this sector varies considerably, depending on the situation of the industry both in the United States and in the countries from which it imports. For example, import restraints are not expected to significantly impact beef imports in 2020, but had a stronger effect in 2015. If the tariffs and TRQs had not been in place in 2015, imports would have been an estimated 3.5 percent higher, and U.S. shipments and employment 0.5 percent lower.[131] Import prices would have been an average 2.5 percent lower, as duty savings were split between exporters and importers, and overall U.S. prices for processed beef would have been less than one-tenth of 1 percent lower.[132]

The primary impact on consumers of the U.S. beef import quota in 2015 was to lower the supply and raise the price of ground beef. However, most imported lean processing beef is destined for the foodservice market, rather than retail grocery sales.[133] Prices for products such as hamburgers sold in quick-service restaurants are relatively insensitive to small temporary changes in the price of ingredients, so foodservice firms and their importers had higher costs and lower profits, but there was little to no impact on consumption.

Textiles and Apparel

The United States was the largest single-country importer of textiles and apparel during 2012–15, accounting for one-fifth of global imports by value. U.S. textile and apparel production has declined over the last few decades.[134] The trend continued during 2013–15, as domestic shipments dipped by 1.5 percent, driven in part by a 6.8 decrease in domestic shipments of apparel during this period (table 2.12). The U.S. market for textiles and apparel products is composed primarily of imports, although import levels vary by sector. U.S. imports of textiles and apparel grew by 11.4 percent during 2012–15, with imports of textile products registering the highest percentage increase (up 17.5 percent), followed by yarn, thread, and fabric (up 10.5 percent) and apparel (up 10.2 percent). Apparel articles are characterized by high import penetration levels in the U.S. market, generally above 91 percent, while the levels for textile

[131] U.S. exports of processing beef would have also been lower, by an estimated 1.5 percent. This is a small share of U.S. production.
[132] Calculations by USITC.
[133] Industry representative, interview by USITC staff, January 30, 2017.
[134] U.S. textile and apparel imports were previously subjected to quotas under the 1974 Multifibre Arrangement, which was replaced by the WTO Agreement on Textiles and Clothing (ATC) in 1995. The quotas imposed under the ATC were phased out after 10 years, and were eliminated completely on January 1, 2005. WTO, "Textiles: Back to the Mainstream" (accessed May 1, 2017).

mill products are around 48 percent.[135] U.S.-produced apparel is largely high-quality niche products that do not compete directly with the low-value imports that generally feed "fast fashion" trends.[136]

Table 2.12: Textiles and apparel: Summary data 2012–15, baseline and liberalization simulation results

Indicator	2012	2013	2014	2015	Baseline change, 2015–20	Effect of liberalization
Employment	*Full-time equivalent workers*				*%*	*%*
All textiles and apparel	380,400	375,600	371,800	368,200	-3.7	-3.8
Textile mills[a]	117,200	118,100	117,200	115,200	-5.7	-4.3
Textile products[b]	116,500	113,800	117,100	116,900	-5.9	-1.2
Apparel[c]	146,700	143,700	137,500	136,100	-1.2	-4.6
Shipments		*Million $*				
All textiles and apparel	([d])	66,751	67,488	65,733	1.4	-3.1
Yarn thread, and fabrics	30,216	31,539	31,714	31,355	1.3	-4.1
Textile products	22,100	22,889	24,308	22,889	2.0	-1.1
Apparel	([d])	12,323	11,466	11,489	0.5	-4.7
Imports						
All textiles and apparel	106,021	109,989	113,731	118,089	3.6	3.9
Yarn thread, and fabrics	7,606	7,850	8,246	8,404	3.7	2.1
Textile products	17,224	18,121	19,036	20,232	7.1	2.6
Apparel	81,191	84,018	86,449	89,453	3.0	4.2
Exports						
All textiles and apparel	14,752	15,052	15,419	13,731	2.8	-4.8
Yarn thread, and fabrics	8,583	8,822	9,150	8,153	4.3	-10.6
Textile products	2,865	2,952	3,000	2,672	-9.5	2.8
Apparel	3,304	3,278	3,269	2,906	10.0	5.0

Sources: Estimates for projected changes and effect of liberalization were compiled by USITC. Other information was gathered from USITC DataWeb/USDOC; USDOL, BLS, "Quarterly Census of Employment and Wages"; U.S. Census, *Annual Survey of Manufactures*; U.S. Census, M3 Survey (accessed May 3, 2017).

[a] Yarn, thread, and fabric are primarily produced by textile mills (NAICS code 313)

[b] Textile products include carpets, rugs, home linens, canvas products, rope, twine, tire cords, and other miscellaneous made-up textile articles (NAICS code 314).

[c] Apparel includes knit, knit-to-shape, and woven garments, and hosiery (NAICS code 315).

[d] Not available.

In contrast to the labor-intensive apparel industry, the capital-intensive U.S. textile products sector, consisting of yarns, threads, and fabrics, has grown 4 percent between 2012 and 2015 as a result of capacity increases and new investment in automation, particularly in yarn

[135] Carter, *Textile Mills in the US*, February 2016.

[136] Sharma, "Made in America versus Fast Fashion," November 25, 2016.

spinning and weaving mills.[137] According to the U.S. Census' Annual Capital Expenditures Survey, total capital expenditures for textile mills and textile mill products rose 42 percent during 2011–15 (from $1.2 billion in 2012 to $1.7 billion in 2015) and contributed to increased productivity.[138] In contrast, capital expenditures for apparel articles remained relatively flat during this period.[139] In particular, the nonwoven fabric segment has contributed to the positive growth of the textile mills sector due to its capital-intensive nature, and the fact that many low-cost producers have not invested in machinery to produce nonwoven fabrics (see box 2.3 for discussion of U.S. technical fabric production).[140] However, U.S. production of woven and knit fabrics that are mostly used in apparel articles continues to decline, as manufacturers source these fabrics from Asian suppliers.[141]

Despite the growth in shipments, both employment and exports declined during 2012–15. The increased transition to automation in the textile industry led to a 3.2 percent contraction in U.S. employment. Overall, the value of U.S. exports of textiles and apparel fell by 6.9 percent during 2012–15. Specifically, U.S. exports of apparel dropped by 12.0 percent during 2012–15, while U.S. exports of textile products dropped by 6.7 percent as foreign suppliers increased global exports of these products.

[137] Carter, *Textile Mills in the US*, February 2016; CRS, *U.S. Textile Manufacturing and the Proposed Trans-Pacific Partnership Agreement*, September 1, 2016; Textile World, "2016 State of the U.S. Textile Industry," May 23, 2016; Buklovoska, "Reshoring U.S. Textiles and Clothing Manufacturing," July 20, 2015.
[138] USDOL, BLS, "Current Employment Statistics" (accessed February 2017, to April 2017); USITC, *Trans-Pacific Partnership Agreement*, May 19, 2016.
[139] U.S. Census, Annual Capital Expenditures Survey, 2013–17.
[140] Carter, *Textile Mills in the US*, February 2016.
[141] Ibid.

Box 2.3: Rise in U.S. technical fabric production

The U.S. textile mill producers are increasingly focused on the production of technical fabrics[a] (also known as "performance textiles") and smart fabrics[b] used in the automotive, construction, healthcare, sportswear, and agriculture industries, as well as in protective applications.[c] According to the U.S. Department of Commerce, the value of U.S. technical fabric production is expected to increase by 4 percent annually on average during 2015–17 due to strong global demand.[d] The technical and smart fabric sectors are less price sensitive than imports of lower-cost commodity fabrics because technical and smart fabrics are produced through advanced manufacturing processes, after significant research and development, and therefore are not materially affected by the removal of import restraints.[e] Further, one of the largest consumers of U.S.-produced technical textiles is the U.S. military, which by law must purchase its textiles from U.S. producers.[f]

[a] Technical textiles are primarily used for their technical performance and functional properties in order to improve the performance of a product. They contain specialized materials such as nonwoven, antiballistic, or flame-resistant fabrics. USDOC, ITA, "2016 Top Markets Report: Technical Textiles," May 2016; Panteva, *Textile Mills in the U.S.*, 2012, 8.

[b] Smart fabrics are textiles that are "non-traditional, have interactive functionalities, and offer new or non-commodity applications." Examples include textiles with heat-sensing properties that alert the wearer to a potential fire threat, or fabrics that can transfer electronic or other signals to the wearer. Ramkumar, "Bold Predictions," August 2016, 68; Horrocks and Anand, *Handbook of Technical Textiles: Technical Textile Applications*, 266.

[c] USDOC, ITA, "2016 Top Markets Report: Technical Textiles," May 2016; *Specialty Fabrics Review*, "State of the 2016 Industry, Part 2," March 2016, 48.

[d] USDOC, ITA, "2016 Top Markets Report: Technical Textiles," May 2016.

[e] Carter, *Textile Mills in the US*, 2016; USDOC, ITA, "2016 Top Markets Report: Technical Textiles," May 2016.

[f] These purchases are made through U.S government defense contracts under the Berry Amendment. Such purchases are not affected by the removal of import restraints because the U.S. military is statutorily required to purchase U.S.-produced textiles and apparel. Industry experts estimated that these purchases would be about $1.5 billion in 2016: this was a decline from 2014–15 levels because of the withdrawal of U.S. troops in war zones. Warner, "2016 State of the U.S. Technical Textiles Industry," April 4, 2016; NCTO, "U.S. Military Relies on American Textiles" (access date July 20, 2017); *Specialty Fabrics Review*, "State of the 2016 Industry, Part 2," March 2016, 47.

The global textile and apparel manufacturing industry is mainly concentrated in Asia, where the costs of labor and raw materials are generally low.[142] China, the leading supplier of U.S. imports of textiles and apparel, accounted for 39.1 percent of U.S. imports during 2012–15. Wages in China have increased in recent years, eroding its competitiveness in the textile and apparel industry.[143] Other important Asian suppliers are Vietnam (7.7 percent of total U.S. textile and apparel imports), India (6.0 percent), and Bangladesh (4.3 percent), all of which benefit from having lower wages than China.[144] Also significant as sources of U.S. imports are NAFTA and CAFTA-DR[145] member countries, which enjoy duty-free treatment. These collectively supplied about 6 percent of total U.S. textile and apparel imports during 2012–15.

[142] Textile Outlook International, "Trends in US Textile and Clothing Imports," June 2016, 150; USDA, ERS, "U.S. Textile and Apparel Industries and Rural America," February 16, 2017.

[143] WTO, "Apparel Manufacturing has Potential," April 28, 2016.

[144] USITC DataWeb/USDOC (accessed June 20 and July 26, 2017); USITC, "Textiles and Apparel," (accessed July 20, 2017); and USITC, "Textiles and Apparel," (accessed July 20, 2017).

[145] The CAFTA-DR Agreement comprises Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, and the United States.

Nature of Trade Restraints

Though there are no quantitative restrictions on U.S. textile and apparel imports, the trade-weighted average U.S. tariff on these goods remained relatively high at 9.2 percent ad valorem in 2015. Generally, the ad valorem tariff rate increases with each stage of manufacturing, resulting in lower tariffs for U.S. imports of yarn, thread, and fabric, and higher tariffs for finished apparel articles. The trade-weighted average tariff on U.S. imports of yarn, thread, and fabric was 4.8 percent ad valorem in 2015, while textile products and apparel articles had much higher average tariffs of 6.4 percent and 12.7 percent ad valorem, respectively. The United States has several compound tariff rates on apparel articles, whereby imports are subject to a fixed cost per kg plus an ad valorem duty rate. For example, men's wool trousers classified under HTS 6103.41.10 are dutiable at 61.1 cents per kg plus an additional 15.8 percent ad valorem.

FTAs, Preference Programs, and Rules of Origin

U.S. imports of textiles and apparel may be eligible for duty-free treatment under various FTAs and preference programs.[146] To qualify for duty-free treatment under the various ROOs of these agreements and programs, goods usually must be formed from inputs (yarns and fabrics) made in the United States or regionally. One exception to this rule that has often been written into FTAs is called a tariff preference level, which grants duty-free treatment for limited quantities of yarns, fabrics, apparel and made-up textile goods that are used as inputs into finished textile products and apparel articles.[147]

U.S. textile and apparel imports under FTAs or preference programs totaled $17.5 billion in 2015 (14 percent of total U.S. imports in this sector). Three-fourths of these imports entered the United States duty-free under CAFTA-DR and NAFTA.[148]

[146] U.S. textile and apparel imports may benefit from numerous FTAs, including NAFTA, CAFTA-DR, the U.S.-Morocco FTA, the U.S.-Bahrain FTA, the U.S.-Chile FTA, and the U.S.-Colombia FTA, among others. These imports may also benefit from trade preference programs, including AGOA, the Haiti HOPE Act, and the Caribbean Basin Trade Partnership Act (CBTPA).

[147] Under a TPL, these inputs do not meet the rules of origin criteria under the FTA, which state that inputs must originate in one or more of the FTA partners. However, the inputs are subject to significant processing in one or more FTA partners and produced into finished textile products or apparel articles, and would benefit from preferential duty treatment under a FTA. USDOC, OTEXA, "Free Trade Agreements: Summary of the North American Free Trade Agreement."

[148] USDOC, OTEXA, "U.S. Imports by Free Trade Agreements," (accessed May 2, 2017).

Projected Industry Trends

The baseline simulation projects a nominal 1.4 percent increase in U.S. domestic shipments of textile and apparel during 2015–20 (table 2.12). Specifically, U.S. domestic shipments of textile products are expected to increase 2 percent, while shipments of yarn, thread, and fabric are expected to increase 1.3 percent during this period. U.S. domestic shipments of apparel articles are expected to increase nominally by one-half of 1 percent during 2015–20. Meanwhile, U.S. textile and apparel imports are expected to increase 3.6 percent. U.S. imports of textile products are expected to increase more rapidly, rising by 7.1 percent as a result of growing capabilities in foreign countries to produce textile products.[149] Further, the appreciation of the U.S. dollar relative to the cost of domestic production is also expected to fuel increased imports of textile products to the United States.[150]

Significant investment in automation in the U.S. textile and apparel industry, particularly in yarn, thread, and fabric production, has depressed U.S. employment despite increases in domestic shipments.[151] In coming years, increased capital investment in automation[152] should contribute to a further expected decline of 3.7 percent, on average, in employment in the textile and apparel industry during 2015–20. The most significant decline is projected in the textile products (5.9 percent) and textile mills sectors (5.7 percent). At the same time, U.S. textile and apparel exports are expected to increase 2.8 percent, with U.S. apparel exports increasing by 10 percent as a result of growing demand for higher-quality, specialized, or "Made in the USA" apparel.[153]

Effects of Liberalization Relative to Projected Trends

Liberalization involves removing all duties on textile and apparel goods, which implies that foreign producers no longer need to meet FTA ROO requirements to gain access to the U.S. market. The Commission estimates that if these significant U.S. import restraints were removed, U.S. shipments of textile and apparel would decrease 1.7 percent, a 3.1 percent decline from the expected increase if current import restraints remain in effect (table 2.12). Relative to the baseline, employment is estimated to decrease 3.8 percent if import restraints are removed. Liberalizing tariffs removes the incentives for foreign producers to purchase U.S.

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[149] Carter, *Textile Mills in the US*, February 2016.
[150] Ibid.
[151] "Mercer, "Textile Industry Comes Back to Life," February 5, 2014; Carter, *Textile Mills in the US*, February 2016.
[152] Carter, *Textile Mills in the US*, February 2016; CRS, *U.S. Textile Manufacturing and the Proposed Trans-Pacific Partnership*, September 1, 2016.
[153] Haider, *Apparel Knitting Mills in the USA*, December 2015.

inputs to meet ROO requirements, which would reduce demand for U.S. exports of yarn, thread, and fabric that are used as inputs to produce finished goods that are ultimately exported back to the United States; therefore, it is estimated U.S. exports of these products would decline 10.6 percent and would contribute to an overall decline in U.S. exports of apparel and textile products of 4.8 percent relative to the baseline, even though exports of textile products and apparel would increase.

At the same time, liberalization lowers import prices, and consumers, including producers who use imports as inputs, are able to purchase more; it is thus estimated that imports would increase by 3.9 percent relative to the baseline. Overall, removing import restraints in the textile and apparel sectors are estimated to increase U.S. welfare by $2.4 billion on average during 2015–20, by far the largest welfare change of the sectors identified (table 2.1).

Leather and Allied Products Manufacturing

Domestic production accounts for only a small share of the U.S. market for leather and allied products (henceforth referred to as "leather goods and footwear")[154] and is primarily geared toward high-end fashion and niche markets, such as protective footwear and footwear for the military.[155] Most U.S. leather goods and footwear companies focus on high-value activities, including design, branding, marketing, and distribution.[156] Total domestic output for the sector rebounded briefly following the U.S. economic recession of 2007 to 2009 and rose to almost $5.8 billion in 2013 (table 2.13). However, shipments fell to $5.5 billion in 2014 and to $4.7 billion in 2015, which may indicate that the industry has resumed a general decline.[157] Total sector employment fell by 2.1 percent during 2012–15, from 29,437 workers to 28,822 workers.[158]

[154] The leather and allied product manufacturing sector consists of firms that transform hides into leather by tanning or curing (NAICS 3161—leather and hide tanning and finishing), and establishments that manufacture a variety of products made from leather for final consumption. The latter are divided into two core groups: (1) other leather and allied products (NAICS 3169—luggage and women's handbags and accessories such as billfolds) and (2) footwear (NAICS 3162—dress shoes, sneakers, slippers, boots, galoshes, sandals, athletic, and work footwear, and footwear parts). This section focuses on finished leather goods and footwear unless otherwise noted.
[155] USITC, hearing transcript, February 9, 2017, 16 (testimony of Thomas Crockett, Footwear Distributors and Retailers of America).
[156] U.S. footwear industry representatives state that most of the value of footwear generated by U.S. footwear companies is still created in the United States. USITC, hearing transcript, February 9, 2017, 16 (testimony of Thomas Crockett, Footwear Distributors and Retailers of America).
[157] IBISWorld, *Shoe and Footwear Manufacturing in the US*, July 2016, 7.
[158] USDOL, BLS, "Quarterly Census of Employment and Wages" (accessed April 17, 2017).

Table 2.13: Leather and footwear: Summary data 2012–15, baseline and liberalization simulation results

Indicator	2012	2013	2014	2015	Baseline change 2015–20	Effect of liberalization
			Full-time equivalent workers		*%*	*%*
Employment	29,437	29,482	28,777	28,822	-2.8	1.8
			Million $			
Shipments	5,676	5,758	5,525	4,668	-5.0	1.8
Imports	36,183	37,514	39,271	41,130	-5.0	3.4
Exports	2,802	3,198	3,317	2,981	-2.0	6.3

Sources: USITC DataWeb/USDOC (accessed April and May 2017); U.S. Census, *Annual Survey of Manufactures 2012–15,* "Value of Product Shipments" (accessed April 3, 2017); USDOL, BLS, "Quarterly Census of Employment and Wages" (accessed March 20 and April 24–25, 2017).

The U.S. industries producing leather goods and footwear have experienced significant import penetration and competition, despite average tariff rates that are much higher than those on most consumer goods, with tariffs on leather goods and footwear averaging 10.1 percent (table 1.1) but with effective duty rates as high as nearly 70 percent (see box 2.4 for further discussion).[159] Because production of finished leather goods and footwear is labor intensive, many firms moved manufacturing overseas decades ago to reduce costs.[160] Imports now satisfy more than 95 percent of domestic consumption for these goods.[161]

[159] A number of footwear subheadings have compound duty rates of 37.5 percent plus an additional $0.90 per pair, which results in an effective duty rate of nearly 70 percent. U.S. industry representative, email message to USITC staff, July 26, 2017.

[160] Footwear production is especially labor intensive—"still requiring more than 120 touches to make a basic pair of leather shoes and over 200 touches for upscale dress shoes." Footwear Distributors and Retailers of America, post-hearing submission to the USITC, February 19, 2017, 2.

[161] IBISWorld, *Leather Good and Luggage Manufacturing in the US*, August 2016, 10. Imports of footwear account for 99 percent of domestic consumption. Footwear Distributors and Retailers of America, post-hearing submission to the USITC, February 16, 2017.

Box 2.4: Industry Perspectives on Trade Restraints

The historically high average tariff on footwear[a] contrasts with the average tariff rate of just 1.7 percent on most consumer goods.[b] Moreover, although footwear imports account for only 1 percent of the total value of U.S. imports, they generate close to 9 percent of total U.S. tariff revenue.[c] Tariffs on footwear can reach as high as 37.5 percent, 48 percent, and 67.5 percent, depending on the type of footwear involved. Most of the high tariff rates (37.5 percent and 48 percent) are imposed on waterproof work footwear, as well as on certain low-end footwear. Certain U.S. industry representatives contend that these tariffs limit the ability of U.S. footwear companies to compete globally, because they divert funds that could otherwise be allocated to investments in innovative design and processes to stay competitive.[d]

Some footwear industry representatives also note that compliance with the existing HTS footwear classifications, which they say are "complex and outdated," imposes a burden and additional costs on footwear firms.[e] They allege that the lack of clarity from U.S. Customs and the complex structure and language of HTS chapter 64 (covering footwear) add costs to firms because of the hours spent, and the large customs compliance staff and legal staff needed, to ensure proper classification.[f] They argue that the complex classification system also consumes resources that could otherwise be used for job creation and innovation and encourage "designing shoes based on qualifying for lower duty rates, rather than solely on the needs and desires of consumers."[g]

[a] The high tariff rates on footwear date back to the 1930s and have been kept in place to protect the few remaining U.S. footwear producers.
[b] Based on total U.S. imports for consumption for footwear and consumer goods, 2015; USITC DataWeb/USDOC (accessed June 29, 2017).
[c] Based on U.S. imports of footwear for consumption, 2015; USITC DataWeb/USDOC (accessed June 29, 2017).
[d] USITC, hearing transcript, February 9, 2017, 21 (testimony of Thomas Crockett, Footwear Distributors and Retailers of America).
[e] Ibid.
[f] U.S. industry representative, email message to USITC staff, June 29, 2017.
[g] USITC, hearing transcript, February 9, 2017, 20–21 (testimony of Thomas Crockett, Footwear Distributors and Retailers of America).

The United States is the world's largest importer of other leather goods and footwear, accounting for about 20 percent and 23 percent, respectively, of global imports of leather goods and footwear, by value, in 2015.[162] During 2012–15, U.S. imports of leather goods and footwear rose by 13.7 percent to $12.2 billion and by 15.1 percent to $26.8 billion, respectively.[163] Both industries source the vast majority of imports from leading global suppliers: China,[164] Vietnam, and Italy. Many U.S. footwear firms have shifted some of their production from China to Vietnam, where competitive labor costs have enabled that country to emerge as the second-largest supplier of leather goods and footwear to the United States and the global market. U.S. exports of sector goods rose 6.4 percent during 2012–15 to just under $3.0 billion.[165] Mexico, Canada, and China are the leading export markets for the United States.

Nature of Trade Restraints

Leather goods and footwear have some of the highest tariffs on consumer goods in the United States.[166] Over 90 percent of imports of these goods are dutiable.[167] In 2015, the trade-weighted average ad valorem tariff was 11.6 percent on leather goods and 10.8 percent on footwear.

Projected Industry Trends

Industry sources project that the leather goods and footwear industries will continue to contract. However, this contraction will take place at a slower rate through 2021,[168] in part because most of the movement of manufacturing operations to foreign countries with lower labor costs has already occurred.[169] In addition, industry sources report that some domestic

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[162] IHS Markit, GTA database (accessed April 17, 2017). In 2015, the U.S consumer bought an average of 7.7 pairs of shoes. USITC, hearing transcript, February 9, 2017, 16 (testimony of Thomas Crockett, Footwear Distributors and Retailers of America).

[163] In 2015, the United States imported 2.5 billion pairs of shoes. USITC DataWeb/USDOC (accessed May 1, 2017); USITC, hearing transcript, February 9, 2017, 15 (testimony of Thomas Crockett, Footwear Distributors and Retailers of America); IHS Markit, GTA database (accessed April 17, 2017).

[164] Although China remains by far the largest supplier of leather goods and footwear to the United States, growth in U.S. imports from China has slowed during the past few years because of rising labor, material, and freight costs; labor shortages; employee turnover; and the appreciation of the Chinese yuan against the U.S. dollar. Footwearbiz.com, "Shoe Factory Closes in Putian," January 28, 2016; Footwearbiz.com, "China's Share of U.S. Footwear Market," February 11, 2016; Footwear Distributors and Retailers of America, post-hearing submission to the USITC, February 16, 2017, 5.

[165] Just under half of these exports are leather hides and skins. USITC DataWeb/USDOC (accessed April 10, 2017).

[166] Footwear Distributors and Retailers of America, "Tariff Reduction Initiatives" (accessed January 30, 2017).

[167] A small number of imports enter the U.S. market free of duty from Mexico under NAFTA and from Central America (primarily the Dominican Republic) under CAFTA-DR.

[168] IBISWorld, *Leather Goods and Luggage Manufacturing in the US*, August 2016, 5; IBISWorld, *Shoe and Footwear Manufacturing in the US*, July 2016, 5.

[169] IBISWorld, *Leather Goods and Luggage Manufacturing in the US*, August 2016, 5.

firms are now considering bringing back production to the United States (referred to as "reshoring") because of China's rising production costs.[170] Some firms have initiated plans to produce in the United States to facilitate and accelerate delivery for high-demand niche products with rapidly changing consumer trends.[171] Several companies—Under Armour, Adidas, and Reebok—have set up small-scale manufacturing operations in the United States to implement innovations in manufacturing automation and shoe design.[172]

The baseline simulation projects a 5.0 percent decline in U.S. shipments of leather goods and footwear between 2015 and 2020, reflecting the general decline in the sector producing these goods (table 2.13). Domestic employment in the sector is projected to fall by 2.8 percent during the period. U.S. exports of sector goods are projected to fall by 2.0 percent, and U.S. imports are projected to fall by 5.0 percent.

Effects of Liberalization Relative to Projected Trends

Removing import restraints in the leather goods and footwear sectors would increase U.S. average annual welfare by $320.2 million during 2015–20. This would be the third-largest welfare gain among the sectors studied, according to the model results provided in table 2.1. The Commission estimates that if all tariffs on leather goods and footwear were removed, U.S. shipments would increase 1.8 percent during 2015–20. Given the relatively high tariffs imposed on leather goods and especially footwear, the removal of all tariffs is projected to boost imports by 3.4 percent compared to the baseline projection (table 2.13). Other effects of liberalization include a 6.3 percent increase in exports relative to the baseline and a decline of 1.0 percent in employment during 2015–20, which is almost 2 percent less than the decline in the baseline simulation.

Other Goods Sectors with Significant Import Restraints

The remaining significant import restraints that the Commission identified are tariff restraints faced by a wide variety of products in 11 sectors. The tariff rates for these products range from 4.6 percent (pesticides and other agricultural chemicals) to 7.5 percent (costume jewelry and novelties) (table 1.1). In 2015, the combined employment across these sectors was almost

[170] IBISWorld, *Leather Goods and Luggage Manufacturing in the US*, August 2016, 5; Pethokoukis, "How the Story of the Decline," May 26, 2016.
[171] Miel, "Adidas, Reebok Both Bringing Shoe Production," October 26, 2016.
[172] McGregor, "Under Armour's Next Lighthouse Location," October 11, 2016; Miel, "Adidas, Reebok Both Bringing Shoe Production," October 26, 2016.

85,000 full-time equivalents, and shipments amounted to $67.6 billion (table 2.14). Ball and roller bearings (26 percent of employment) and pressed and blown glass and glassware (16 percent) had the largest employment. Cigarettes accounted for nearly half of shipments, followed by pesticides and other agricultural chemicals. The sectors with the largest imports were pressed and blown glass and glassware; and ball and roller bearings (each with 16 percent of imports). Exports of these products were a combined $8.2 billion in 2015, led by pesticides and other agricultural chemicals (29 percent), ball and roller bearings (26 percent), and pressed and blown glass and glassware (18 percent).

Table 2.14: Sectors with significant tariffs: Summary data, baseline and liberalization simulation results

Indicator	Summary data, 2015	Baseline change, 2015–20	Effect of liberalization
Employment	*Full-time equivalent workers*	*%*	*%*
China, fine earthenware, other pottery	3,527	-20.0	-3.6
Ceramic wall and floor tiles	4,916	-3.0	-2.5
Pressed and blown glass and glassware	13,798	11.6	-1.3
Ball and roller bearings	22,299	4.2	-1.6
Residential electric lighting fixtures	6,742	0.7	-0.4
Costume jewelry and novelties	4,000	-7.4	-1.1
Pens and mechanical pencils	2,117	6.3	-1.5
Cigarettes	10,593	-4.0	-0.1
Synthetic organic dyes and pigments	2,076	-25.0	-0.1
Cellulosic organic fibers	3,713	0.0	-0.5
Pesticides and other ag. chemicals	10,877	10.0	0.1
Total	84,658	2.0	-1.1
Shipments	*Million $*		
China, fine earthenware, other pottery	5400	-3.0	-4.0
Ceramic wall and floor tiles	1,2600	6.7	-2.8
Pressed and blown glass and glassware	3,4920	16.3	-1.5
Ball and roller bearings	8,3600	3.3	-1.5
Residential electric lighting fixtures	1,4980	4.8	-1.0
Costume jewelry and novelties	2230	2.3	-1.2
Pens and mechanical pencils	5349	9.0	-1.7
Cigarettes	33,1150	-3.0	-0.1
Synthetic organic dyes and pigments	1,9160	-20.0	-0.2
Cellulosic organic fibers	2,3890	5.0	-0.5
Pesticides and other ag. chemicals	14,2609	20.0	0.1
Total	67,589	3.9	-0.5
Imports			
China, fine earthenware, other pottery	2,943.0	22.7	2.2

Indicator	Summary data, 2015	Baseline change, 2015–20	Effect of liberalization
Ceramic wall and floor tiles	2,007.0	10.8	3.2
Pressed and blown glass and glassware	3,304.0	27.2	4.5
Ball and roller bearings	3,186.7	2.0	8.8
Residential electric lighting fixtures	3,071.0	61.0	1.3
Costume jewelry and novelties	1,794.0	12.9	4.6
Pens and mechanical pencils	958.6	22.5	4.1
Cigarettes	195.0	14.9	9.7
Synthetic organic dyes and pigments	577.0	5.0	4.3
Cellulosic organic fibers	704.0	25.0	4.9
Pesticides and other ag. chemicals	1,347.5	50.0	3.4
Total	20,088	25.3	4.8
Exports			
China, fine earthenware, other pottery	50.0	-9.0	3.4
Ceramic wall and floor tiles	48.0	-15.1	3.3
Pressed and blown glass and glassware	1,503.0	1.4	3.6
Ball and roller bearings	2,112.0	-6.1	6.2
Residential electric lighting fixtures	188.0	0.0	1.6
Costume jewelry and novelties	100.0	-11.5	3.4
Pens and mechanical pencils	132.1	32.4	3.4
Cigarettes	258.9	-15.2	5.9
Synthetic organic dyes and pigments	748.0	-25.0	2.8
Cellulosic organic fibers	692.0	-15.0	3.3
Pesticides and other ag. chemicals	2,396.1	20.0	2.0
Total	8,228	0.7	3.7

Sources: USITC DataWeb/USDOC (accessed November 8, 2016, to April 14, 2017); U.S. Census, *Annual Survey of Manufactures 2015* (accessed November 8, 2016 to April 14, 2017); U.S. Census, County Business Patterns 2015 (accessed November 8, 2016, to April 14, 2017); USITC estimates for projected changes and liberalization effects.
Notes: Projected changes are based on quantity trends. See appendix D for details and sector definitions.

Projected Industry Trends

Over the next five years, employment across these 11 sectors is expected to grow by 2 percent overall, although employment in 5 sectors should decline (table 2.14). Shipments are expected to rise by 4 percent overall, but 3 sectors will likely contract. Imports are expected to expand by one-fourth across all sectors, in most cases increasing by double digits. Exports are projected to grow by less than 1 percent, with most of the growth due to the large expected increase in exports of pesticides and other agricultural chemicals; more than half of the sectors—7 in total—are expected to see exports fall. Some of these industries are considered more mature

sectors, with slower growth compared to the U.S. economy as a whole. Six of the sectors are expected to see growth in both shipments and employment between 2015 and 2020:

- **Ball and roller bearings**. Employment levels, domestic shipments, and imports are projected to increase 4 percent, 3 percent, and 2 percent, respectively. This is consistent with moderate growth in demand for bearings from the automotive, defense, aerospace, and heavy industrial equipment sectors.[173]
- **Residential electric light fixtures**. The market is likely to continue expanding during 2015–20, spurred by growth in new home construction and demand for new lighting products, such as those incorporating LED lamps.[174] This is likely to lead to increases in shipments, employment, imports, and exports, while prices are likely to fall significantly as LED technology matures.[175]
- **Pressed and blown glass and glassware**. Employment levels, domestic shipments, and imports are projected to increase 12 percent, 16 percent, and 27 percent, respectively, due to a continuing recovery in construction activity and consumer spending.[176] The trends reflect expanding U.S. production of glass products and increasing imports of lower-value goods from China and Mexico due to their lower labor and regulatory costs, as well as an appreciation of the U.S. dollar.[177]
- **Pesticides and other agricultural chemicals**. Baseline projections reflect anticipated growth in the U.S. market[178] combined with recent lagging employment growth, resulting in projected increases in employment, shipments, imports, and exports.
- **Pens and mechanical pencils**. The U.S. market is likely to continue to grow, albeit slowly. Demand for pens and pencils has been weakening as more and more tasks are taken over by full-sized computers and tablets.
- **Cellulosic organic fiber.** Baseline projections for the industry reflect recent and projected slow growth. No change in employment is expected, but increases in production and imports are projected, as well as a decline in exports.

Two sectors are expected to have falling employment but rising shipments:

- **Ceramic floor and wall tile**. Employment levels are expected to decline 3 percent while domestic shipments increase 7 percent. Rising domestic shipments and imports reflect growing demand from the residential and nonresidential construction sectors, while

[173] Kalyani, *Ball Bearing Manufacturing in the US*, May 2016.
[174] Transparency Market Research, "Lighting Products Market," March 3, 2017; CSIL Milano, "The Lighting Fixtures Market in the United States," June 2016.
[175] Vijay, "LED Luminaire Growth Looms," February 23, 2015; Wright, "Popping the Charts," April 28, 2016.
[176] Morea, *Glass Product Manufacturing in the US*, July 2016.
[177] Ibid.
[178] *Farm Journal*'s AgPro, "Study Shows Global Pesticide Market," August 18, 2015.

domestic producer investments in process equipment have reduced the demand for labor.[179]

- **Costume jewelry**. Employment levels in the industry are anticipated to decline by 7 percent, but domestic shipments are expected to rise by 2 percent. Increasing domestic shipments reflect the benefit of continued consumer spending on fashion jewelry as a less costly alternative to precious jewelry. Conversely, employment declines are projected from less efficient producers exiting the industry, as profit margins are squeezed between high wage costs and increasing import and price competition in a highly labor-intensive industry.[180]

Declines in both employment and shipments are expected in the remaining three sectors:

- **Cigarettes**. The U.S. industry is likely to continue to decline during 2015–20, as a result of steadily declining cigarette consumption, increased government regulation and taxation of the industry, and the public's increased understanding of the health risks of smoking.
- **China, fine earthenware, and other pottery**. Employment levels and domestic shipments are expected to decline 20 percent and 3 percent,[181] respectively, despite a recovery in the housing market and projected increases in disposable income. At the same time, imports are expected to increase 23 percent, reflecting a trend of higher volume of low-cost imports from China and Mexico due to lower labor and regulatory costs, as well as an appreciation of the U.S. dollar.[182]
- **Synthetic organic dye and pigment**. The U.S. industry is expected to continue a longer-term, 25-year decline in U.S. dye production.[183] Declines in employment (-25 percent), production (-20 percent), and exports (-25 percent) are projected, along with a 5 percent increase in imports between 2015 and 2020.

Effects of Liberalization Relative to Projected Trends

The liberalization of import restraints is modeled by removing tariffs one sector at a time. The simulation results found that eliminating tariffs in these sectors would result in lower import prices and expanded imports, as well as lower domestic employment and reduced shipments for all sectors except pesticides, compared to the baseline projections (table 2.14). The combined average annual welfare effect of removing tariffs from all 11 of these sectors is expected to be positive; however, at the sector level, there are projected to be negative

[179] Yucel, *Clay Brick and Product Manufacturing in the US*, October 2016.
[180] Modgan, *Jewelry Manufacturing in the US*, February 2017, 14–15.
[181] U.S. Census, *Annual Survey of Manufactures*, January 19, 2017.
[182] LeClair, *Ceramics Manufacturing in the US*, May 2016.
[183] IHS Markit, "Chemicals Economics Handbook: Dyes," December 2014.

welfare effects from removing tariffs on 2 of these product types, while for 9, positive welfare effects are projected (table 2.1).

U.S. welfare would increase the most from the removal of import restraints on other pressed and blown glass and glassware, which would increase welfare an average of $100.8 million per year from 2015 to 2020. However, employment and domestic shipments would contract, and import quantities would increase as the prices of imports fell, reducing prices for both domestic and foreign product in the U.S. market. The U.S. industry would become more price-competitive with the lower domestic prices, and exports would also grow. There is a similar pattern for other products in this section, except for pesticides and other agricultural chemicals, which would see positive welfare changes, but virtually no change to domestic employment and shipments.

Removing import restraints on ball and roller bearings would cause the largest negative welfare change, with an average welfare decrease of $29.1 million per year from 2015 to 2020. Similar to the products with welfare gains, there would also be a contraction in employment and shipments in the ball and roller bearing sector, along with higher imports and lower prices of both domestic and foreign products in the U.S. market. The sector would also become more competitive and see some export growth.

Services Import Restraints

This section presents a summary of key barriers to services trade in the United States for a range of services sectors. The model results presented in the first section of this chapter estimating the economic impact of U.S. import restraints do not include services, because services barriers largely take the form of nontariff measures that are difficult to quantify. However, in view of the growing importance of U.S. services trade, this section includes a brief description of U.S. trade restrictions affecting key services industries.

The United States continues to be the world's largest importer of services, as well as the world's largest exporter of services. The United States imported $467 billion of services in 2015, or 10 percent of the global total of $4.6 trillion, while U.S. exports of services totaled $730 billion in the same year, or 15 percent of total global exports (see box 2.4 for details on different modes of services trade).[184] At the same time, data summarizing the important trade restrictions in each services sector in each country are now available from the Organisation for

[184] WTO, Statistics database, Time Series on International Trade, Trade in Commercial services, 2005–onwards (BPM6) (accessed July 17, 2017).These data refer to cross-border trade in services, and include what is known as mode 1, 2, and 4 trade.

Economic Co-operation and Development (OECD) and the World Bank, enabling cross-country comparison of trade restraints in services.

Box 2.5: Services Trade "Modes of Supply" under the WTO's General Agreement on Trade in Services

The WTO's General Agreement Trade in Services (GATS) defines four modes of services delivery. In general, cross-border trade in services occurs via modes 1, 2, and 4, whereas affiliate transactions occur via mode 3.

- Mode 1 is cross-border trade, which occurs when an individual or firm in one country provides a service to a consumer in another country, often through electronic delivery.
- Mode 2 is consumption abroad, or when an individual from one country travels to another country to consume a service (e.g., a student from China studying at a U.S. university).
- Mode 3 pertains to commercial presence, or when a company headquartered in one country opens a branch, office, or subsidiary in another country in order to provide services to residents of that country.
- Mode 4 pertains to the movement of natural persons, or when an individual from one country travels to another country to supply services on a short-term basis (e.g., a U.S. engineer traveling to Germany to provide services for a construction project located in that country).

Source: WTO, "Chapter 1: Basic Purpose and Concepts," https://www.wto.org/english/tratop_e/serv_e/cbt_course_e/c1s3p1_e.htm (accessed July 26, 2017).

The analysis below focuses on the following nine services industry sectors, discussed in seven groups: architecture and engineering services; legal services; telecommunications; commercial banking; insurance; retail distribution; and air and maritime transport. These nine services sectors were chosen based on (1) their significance in overall trade; (2) the degree to which they experience significant trade barriers, including those pertaining to U.S. import restraints; and (3) their importance to the U.S. and global economy. Each section is composed of a brief overview of the nature and composition of international trade in the sector and an analysis of relevant trade restraints. It should be noted that the majority of services trade occurs through foreign direct investment (i.e., affiliate transactions) rather than cross-border imports and exports. Notable exceptions, however, are air and maritime transport services, which are principally traded across borders.[185]

The description of nontariff measures draws from the OECD Services Trade Restrictiveness Index (STRI), which quantifies information on laws and regulations affecting international trade in services in all OECD members, including the United States, and in select non-OECD countries

[185] Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Transport and Courier Services*, 2014.

as of 2016.[186] The STRI scores summarize a country's restrictions across multiple modes of trade, including both sector-specific and economy-wide (horizontal) measures.[187] Although the STRI does not focus solely on U.S. import restraints, it provides a useful tool for comparing U.S. services restrictions with those in other countries. These restrictions differ from the import restrictions on cross-border trade considered in the rest of the report and are addressed here because they are part of the OECD's STRI.

The OECD STRI groups trade restrictions into five categories:

- Restrictions on foreign entry
- Restrictions to movement of people
- Barriers to competition
- Other discriminatory measures
- Regulatory transparency[188]

Each of the following "trade restraints" sections discusses these restrictions in more detail, focusing first on restrictions prevalent across all countries in the OECD database, including the United States, and then more specifically on the nature of U.S. restrictions on the foreign provision of services for select industries The discussion focuses mainly on sector-specific measures, unless horizontal measures (such as economy-wide limitations on movement of people) also feature prominently.

Table 2.15 shows the STRI score for the United States in each of the sectors in this section, ordered from most restrictive to least restrictive. (The STRI scores range from zero, when markets are open to foreign service providers, to one, when markets are completely closed to foreign service providers.) As a comparison, the table also shows the average STRI score in each sector for all countries in the OECD's database, as well as the range of scores present in the database for each sector. In most sectors, the STRI score for the United States is lower (indicating more openness) than the average for all countries in the OECD's database, including both OECD countries and select non-OECD members labeled "all-country" in figures that appear later in this section. This suggests that the United States maintains fewer or less intense

[186] OECD, "Services Trade Restrictiveness Index Simulator," n.d. (accessed November 28, 2016).
[187] For more specific information, see sector papers referenced in each section. In many sectors that are regulated at the state in addition to the federal level, the OECD uses New York law as a representative state. Where applicable, the sector write-ups note the New York law basis.
[188] "Other discriminatory measures" is a category of impediments reported for each services sector. Generally in the context of services restrictions, a regulation is considered discriminatory if it specifically "discriminates" against foreign service providers. The OECD STRIs include both discriminatory and nondiscriminatory measures. As an example of a nondiscriminatory measure, countries may restrict advertising of certain services by both foreign and domestic providers; while such a measure applies to both kinds of providers, it may be more onerous for foreign providers.

restrictions on trade in these services than other countries in the database. However, U.S. scores for air transport, maritime transport, and insurance services are higher than the all-country average scores for these sectors, suggesting that the United States maintains additional or more intense restrictions on trade in these services.

Table 2.15: OECD STRI scores for select services industries, 2016

	United States	All-country average	All-country score range
Air transport	0.54	0.42	0.19–0.58
Maritime transport	0.37	0.26	0.12–0.57
Insurance	0.29	0.22	0.10–0.54
Commercial banking	0.21	0.24	0.12–0.49
Engineering	0.21	0.22	0.11–0.48
Legal	0.19	0.37	0.07–1.00
Architecture	0.18	0.25	0.10–0.62
Distribution	0.16	0.19	0.08–0.63
Telecommunications	0.12	0.24	0.12–0.53

Source: OECD, Services Trade Restrictiveness Index, "Compare Your Country," n.d. (accessed February 15, 2017).
Note: This table lists the U.S. and simple average all-country scores provided by the OECD, which reflect policies in place as of 2016.

Architectural and Engineering Services

Architects and engineers provide services related to the construction and design of buildings and other infrastructure, as well as the design of industrial production processes and equipment. In foreign markets, these services are supplied through multiple modes of delivery.[189] Due to technological advances, cross-border supply (mode 1—see box 2.4 for details on the different modes of services trade), and specifically the digital delivery of services (for example, supplying architectural designs or engineering plans abroad via e-mail), is a growing area of trade. U.S. cross-border exports and imports of architectural and engineering services experienced 6.9 and 10.2 percent average yearly growth from 2006–15, respectively.[190] Cross-border supply is often complemented by trade in the form of "movement of persons" (mode 4)—that is, when architects and engineers travel to provide services in foreign markets. For example, architectural designs provided through cross-border delivery might also warrant the architect visiting the project site to implement and manage the project. Finally, supplying architectural and engineering services through the establishment of a

[189] This paragraph is based on Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Construction, Architecture and Engineering Services,* November 2014, 10–12.
[190] USDOC, BEA, Interactive Data Table 2.1, October 24, 2016. In some services sectors, all available years of data are used in order to present longer time trends. Bureau of Economic Analysis (BEA) data on cross-border trade roughly corresponds to modes 1, 2, and 4 (cross-border supply, consumption abroad, and the presence of natural persons), while BEA data on foreign affiliate transactions roughly corresponds to mode 3 (commercial presence) in the GATS modes of supply framework for services trade (box 2.4). See Koncz et al., "U.S. International Services," 2006, 39–40.

commercial presence (e.g., a foreign affiliate) is an alternative and possibly complementary mode of supply (mode 3), allowing companies to easily provide services throughout various phases of the installation of projects in host countries.

Architectural and engineering services supplied by U.S.-owned foreign affiliates (foreign affiliate sales) grew by an average annual rate of 12.3 percent between 2006 and 2014, while purchases from U.S.-located affiliates of foreign firms (U.S. affiliate purchases) grew at an average annual rate of 5.5 percent over the same time period.[191] In 2014, the latest year of comparable data, U.S. affiliate purchases ($13.5 billion) far exceeded cross-border imports ($5.4 billion).[192]

Nature of Trade Restraints

Although most countries' policies related to the provision of architectural and engineering services by foreign or foreign-owned providers tend to be less restrictive than in other areas of professional services, many countries maintain regulations affecting the entry or operation of foreign services providers that likely impede trade.[193] In architectural and engineering services, the most prevalent restrictions across countries in the OECD database pertain to the movement of people (this category affects either all modes of trade or specifically mode 4 trade) and restrictions on foreign entry (mode 3). In the former category, quotas and labor market tests are prevalent and restrict or limit foreign architects and engineers' travel to host countries to provide their services.[194] Also in this category, restrictions on recognition of foreign qualifications (for example, local practice or examination requirements) and licensing (residency and in a few cases, nationality requirements) are prevalent and affect all modes of trade.[195]

One important restriction affecting the entry of foreign firms is the imposition of specific requirements (such as residency) on the composition of boards of directors or the management of engineering and architecture firms. Other significant restraints include restrictions on acquiring land (which affects construction services directly and the architectural and engineering services indirectly) and, in some cases, foreign equity restrictions for non-locally

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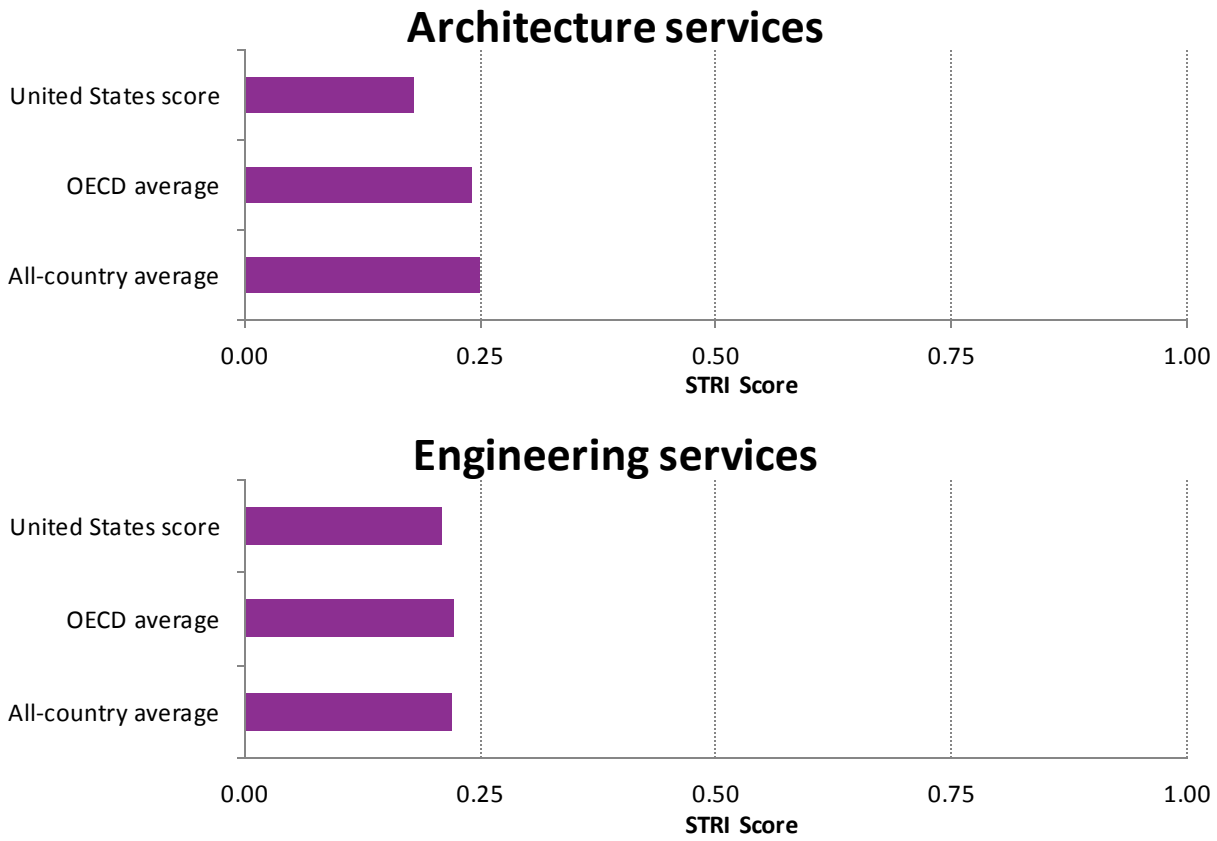
[191] BEA Interactive Data Tables 4.1 and 5.1, December 19, 2016. According to BEA, "In 2014, there was a sizable increase in the number of reporting enterprises. This increase led to a significant increase in aggregate services supplied and may account for a significant portion of the increases for certain industries and countries."
[192] USDOC, BEA, Interactive Data Table 2.1, October 24, 2016; BEA Interactive Data Tables 4.1 and 5.1, December 19, 2016.
[193] The following paragraph is based on Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Construction, Architecture and Engineering Services*, 2014, 24–25; OECD, "Sector Brief: Engineering Services," January 2017; OECD, "Sector Brief: Architecture Services," January 2017.
[194] These appear to be economy-wide (horizontal) restrictions.
[195] Temporary licensing systems are often available, and some countries recognize foreign degrees with some additional local criteria.

licensed architects or engineers. The remaining restrictions affect the use of professional titles (e.g., titles of "architect" or "engineer"), prices, and advertising architectural services.

The STRI scores for architectural and engineering services in the United States are lower than their counterparts in the other countries rated. As noted, this suggests the United States imposes fewer or less intense restrictions on trade in these services than many other countries (figure 2.2).[196] Table 2.16 summarizes select measures that apply to the United States. Measures specific to these services include requirements that professionals pass local examinations and meet certain practice requirements.[197] Moreover, engineering service providers must either be U.S. citizens or have established permanent residency. Additional restrictions which are not specific to architecture and engineering services, but which affect trade in the sector, include screening of foreign investments and the potential applicability of quotas or labor market tests under certain visa categories.

[196] For architectural, engineering, and legal services, the OECD STRI scores for the United States are partially based on policies in effect in the state of New York and may not reflect policies of other states.
[197] These refer to New York Education Law requirements, specific to architecture and engineering services.

Figure 2.2: Architectural and engineering services: U.S. STRI scores compared to all-country and OECD averages



Source: OECD, Services Trade Restrictiveness Index, "Compare Your Country," n.d. (accessed March 1, 2017); OECD, Service Trade Restrictiveness Index, OECD.Stat, n.d. (accessed February 15, 2017); USITC calculations.
Note: These table list the U.S. and all-country average scores provided by the OECD, as well as the OECD country averages calculated by USITC, which reflect policies in place as of 2016.

Table 2.16: Select architectural and engineering restrictions in the United States

Sector and STRI score	Restrictions on foreign entry	Restrictions on movement of people
United States architecture: 0.18, engineering: 0.21	Foreign investment screening	Quotas and labor market test (contractual/independent service suppliers); local exam and practice requirements; permanent residency/domicile required for practice (engineering)

Source: OECD, Services Trade Restrictiveness Index Simulator (accessed March 1, 2017).

Legal Services

International trade in legal services typically involves foreign lawyers providing legal services in relation to their country of origin (home-country law), international law, or third-country law. A fourth category, host-country law (also referred to as domestic law), is normally subject to local

requalification or restricted from trade.[198] However, with the growing significance of foreign affiliates of law firms established abroad and supplying multi-jurisdictional advice to their local clients' international business dealings, the provision of legal advice related to host-country law is an increasingly important area of international trade.[199] It is reported that supplying services via the establishment of a commercial presence (mode 3) and via the movement of people (mode 4) are the preferred modes of delivery in foreign markets.[200] In 2014, the latest year of comparable data, U.S. cross-border imports ($2.1 billion)—which include trade via modes 1, 2, and 4—exceeded U.S. affiliate purchases ($0.11 billion) of legal services, which includes mode 3 trade.[201]

Nature of Trade Restraints

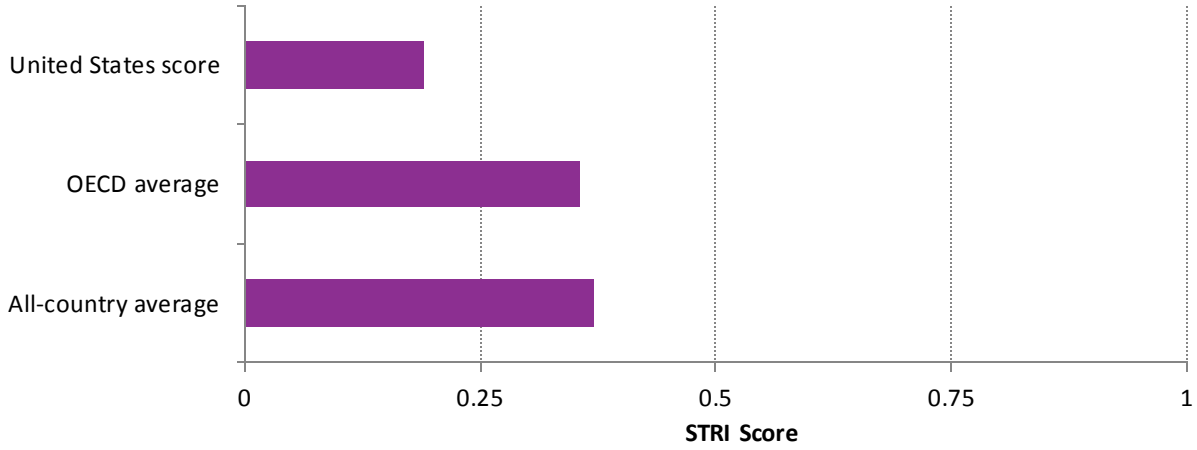
Overall, policies related to the foreign provision of legal services tend to be the most restrictive among professional services.[202] The most prevalent restrictions for legal services across countries in the OECD database involve the categories "movement of people" and "foreign entry of firms." Notably, in the former category, nationality and/or residency requirements to practice law, along with lack of recognition of foreign qualifications, are significant impediments and affect all modes of trade.[203] In this same category, horizontally applied quotas and labor market tests are also prevalent and restrict or limit foreign attorneys from traveling to host countries to provide their services. When applicable, the category of restrictions affecting foreign entry differentiates between firms practicing international versus domestic law. For example, countries commonly restrict ownership of law firms to locally qualified lawyers only in domestic law practice. Other prevalent restrictions in this category include local qualifications for a majority of the board of directors/equity partners/managers of a law firm and limits on

[198] Third-country law refers to laws of countries other than those of the foreign attorney's home country or the country where the service is being exported, while host-country law refers to laws of countries receiving the export.
[199] Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Legal and Accounting Services*, November 2014, 7–8.
[200] As indicated above, part of mode 4 is captured in the data on cross-border trade.
[201] USDOC, BEA, Interactive Data Table 2.1, October 24, 2016; BEA Interactive Data Tables 5.1, December 19, 2016. See the text of earlier footnote for an explanation of the increase in the number of reporting affiliates in the foreign affiliate data for 2014.
[202] The following paragraph is based on Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Legal and Accounting Services*, November 2014, 9–10, and OECD, "STRI Sector Brief: Legal Services," 2017.
[203] Some countries have implemented limited-licensing schemes, which circumvent the need to be licensed in the host country and allow foreign attorneys to practice in their qualified areas of law (in this case, they are typically known as foreign legal consultants). Temporary practice rules adopted by some jurisdictions are considered another way for foreign attorneys to be able to practice law.

commercial association between locally and non-locally licensed attorneys.[204] Restrictions in other categories relate to fee-setting and advertising.

The legal services STRI score for the United States is much lower than for other countries, and this suggests fewer or less intense restrictions on trade in these services (figure 2.3). Table 2.17 summarizes the most restrictive measures that apply to the United States. Horizontal restrictions that affect legal services trade include screening of foreign investments and quotas on contractual and independent services suppliers. Restrictions specific to legal services provision include requirements that shareholders, boards of directors, and managers must be licensed to practice under local laws (for domestic law practice) and that nonresident attorneys must maintain a physical law office.[205] Additionally, although foreign attorneys may practice on a limited basis as foreign legal consultants without taking the bar exam, the exam is required to practice domestic law, and practicing on a temporary basis is not allowed.[206]

Figure 2.3: Legal services: U.S. STRI scores compared to all-country and OECD averages



Source: OECD, Services Trade Restrictiveness Index, "Compare Your Country," n.d. (accessed March 1, 2017); OECD, Service Trade Restrictiveness Index, OECD.Stat, n.d. (accessed February 15, 2017); USITC calculations.
Note: This table lists the U.S. and all-country average scores provided by the OECD, as well as the OECD country averages calculated by USITC, which reflect policies in place as of 2016.

[204] Restrictions on commercial association can impede the ability of foreign firms to partner with or employ local lawyers as an avenue to provide host-country law to their clients, without the need to requalify in local markets.
[205] These requirements refer to New York state laws.
[206] Again, these measures are based on regulations in the state of New York. See also Terry, "Jurisdictions with Rules Regarding Foreign Lawyer Practice," October 14, 2016. As in architectural and engineering services, there are additional horizontal restrictions scored by the OECD.

Table 2.17: Select legal services restrictions in the United States

Sector and STRI score	Restrictions on foreign entry	Restrictions on movement of people
Legal: 0.192	Licensing requirements for board of directors, managers, and shareholders (domestic law); foreign investment screening; requirements for local office for nonresident attorneys.	Quotas and labor market tests (contractual/independent service suppliers); local exam requirements (domestic law); lack of temporary licensing.

Source: OECD, Services Trade Restrictiveness Index Simulator, n.d. (accessed March 1, 2017).

Telecommunications Services

Telecommunications services encompass both basic and value-added services. Basic services involve end-to-end transmission of voice or data information from senders to receivers. The most widely used basic services are landline and mobile telephone calls and packet-switched data transmission services (Internet services and corporate data services); other basic services include facsimile (fax), paging, and teleconferencing services.[207] By contrast, value-added services typically complement or supplement basic services, with examples including voice mail, email, online data processing, and online data storage and retrieval.[208]

International trade in telecommunications services occurs primarily through the subsidiaries of large, multinational telecom companies offering services in foreign countries (mode 3). During 2007–14, sales by the U.S.-based subsidiaries of foreign telecom services companies grew at an average annual rate of 19.1 percent to $67.2 billion.[209] However, data on such transactions are frequently not reported by the Bureau of Economic Analysis (BEA) to avoid disclosing the confidential information of individual companies. During this same period, and for the same reason, BEA suppressed data on sales by the subsidiaries of U.S.-based telecom services companies in foreign countries in all years except 2009–11.[210]

Cross-border trade in telecom services (mode 1) covers receipts (exports) and payments (imports) primarily derived from telephone calls, telex, telegraph, and other jointly provided basic services; private lease circuit services; value-added services; support services; and reciprocal exchanges.[211] During 2007–15, U.S. cross-border imports of telecom services declined by an average annual rate of 1.7 percent to $6.2 billion, likely due not only to competition-induced per-minute price declines for international voice telephone calls, but also

[207] WTO, "Coverage of Basic Telecommunications and Value-added Services," n.d. (accessed December 14, 2015).
[208] Ibid.
[209] USDOC, BEA, U.S. International Services Tables, table 5.1, January 24, 2016.
[210] USDOC, BEA, table 4.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliates," December 19, 2016.
[211] USDOC, BEA, "Form BE-125: Quarterly Survey of Transactions in Selected Services and Intellectual Property with Foreign Persons," n.d. (accessed May 12, 2017).

to the growing adoption of free (or very inexpensive) voice and messaging applications like Skype, WhatsApp, and Facetime for international communications.[212]

Nature of Trade Restraints

Many countries maintain policies and regulations that restrict trade in telecom services. Most restrictions across countries in the OECD database are barriers to competition, with the most common barriers involving restrictions that impede access to network infrastructure, and government ownership positions in domestic carriers.[213] Mode 3 restrictions on foreign market entry—often foreign equity caps—also feature prominently in many countries' telecom STRI scores.[214]

The United States' telecom STRI score (0.124) is among the lowest in the index (figure 2.4); only one country (Denmark) has a lower score (0.122). The main factor driving up the United States' telecom STRI is its restrictions on foreign entry (38 percent of the total score), including screening requirements and restrictions on cross-border mergers and acquisitions (M&A) (table 2.18). The screening restrictions noted in the OECD database stem from the mandate of the Committee on Foreign Investment in the United States to screen foreign investment for threats to national security. Regarding M&A restrictions, U.S. legislation caps foreign investors to a direct ownership position of 20 percent in telecom carriers, and indirect ownership is limited to 25 percent.[215] The impact of such regulation is mitigated, in practice, as petitions to exceed U.S. foreign ownership caps are typically approved by the U.S. Federal Communications Commission (FCC) on a streamlined basis for investors from WTO countries. In addition to the FCC, however, petitions to exceed U.S. foreign equity restrictions must also be approved by the so-called "Team Telecom," composed of representatives from the U.S. Department of Justice, the U.S. Department of Defense, the U.S. Department of Homeland Security, and several other U.S. government agencies. Obtaining approval by the Telecom Team is said to be more difficult, with issues reportedly ranging from lengthy review periods to nontransparent rules to high legal costs.[216]

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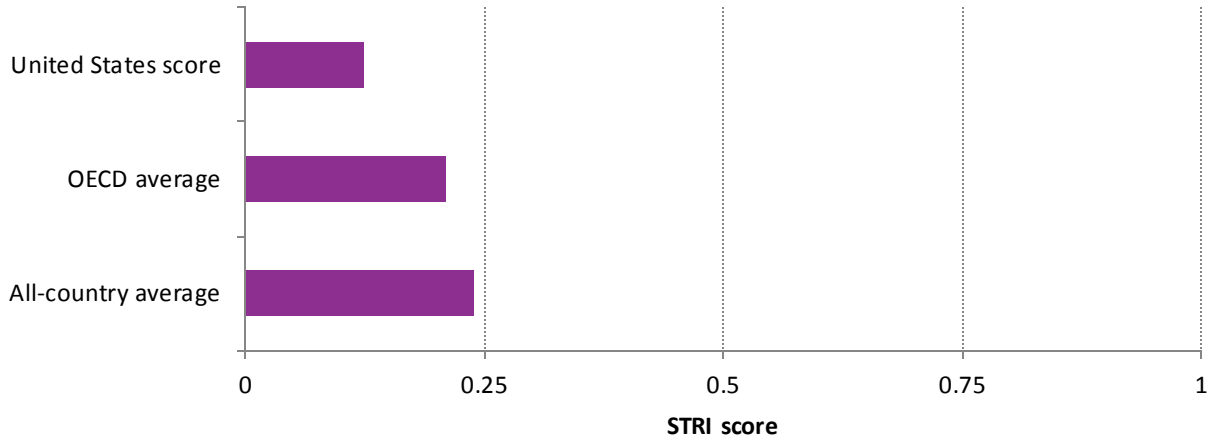
[212] USDOC, BEA, table 2.1, "U.S. Trade in Services by Type of Service." December 19, 2016; Christian, "Market Sees First Decline in International Voice Carrier Traffic," January 26, 2017.
[213] Government ownership positions in telecommunications operators are typically viewed as a trade barrier due to the potential for favoritism and/or anticompetitive behavior.
[214] Nordås et al., *Services Trade Restrictiveness Index (STRI): Telecommunication Services*, 2014, 20–21.
[215] 47 U.S.S. §310(b)(3); 47 U.S.C. §310(b)(4).
[216] Industry representative, email message to USITC staff, August 3, 2011. The U.S. Federal Communications Commission, in conjunction with interested parties, has begun the process of reviewing and streamlining the process used by Team Telecom to review foreign investment in the U.S. telecommunications industry. Stanley, "FCC Pauses Effort to Streamline Team Telecom Reviews," November 30, 2017.

The OECD also indicates that the United States maintains restrictions in the "barriers to competition" category (regulation of roaming rates) as well as horizontal measures which affect the industry. These measures encompass public procurement measures; quotas and labor market tests for contractual and independent services suppliers; and measures pertaining to business visas and company registration procedures.

Figure 2.4: Telecommunications services: U.S. STRI scores compared to all-country and OECD averages



Source: OECD, Services Trade Restrictiveness Index, "Compare Your Country," n.d. (accessed February 15, 2017), OECD, Service Trade Restrictiveness Index, OECD.Stat, n.d. (accessed February 15, 2017), and USITC staff calculations.

Note: This table lists the U.S. and all-country average scores provided by the OECD, as well as the OECD country averages calculated by USITC staff, which reflect policies in place as of 2016.

Table 2.18: Select telecommunications services restrictions in the United States

Sector and STRI score	Restrictions on foreign entry	Barriers to competition
Telecommunications: 0.124	Screening exists without explicit exclusion of economic interests (fixed, mobile, and Internet). Restrictions on cross-border M&A.	Wholesale roaming rates regulated. Retail roaming rates regulated.

Source: OECD, Services Trade Restrictiveness Index Simulator, n.d. (accessed January 26, 2017).

Commercial Banking

Commercial banking is a set of services that intermediate between savers and borrowers.[217] These services include accepting deposits, lending (e.g., consumer and mortgage credit), transmitting payments, and making financial guarantees. Banks typically earn most of their revenues from the difference between interest received on loans and interest paid to depositors, though they also charge fees for transactions.

Banking services are traded internationally, both cross-border (corresponding to mode 1 delivery, e.g., when a person in one country purchases a banking service from a bank located in

[217] The broader category of banking services comprises both commercial banking and investment banking.

another country) and through the establishment of bank affiliates in foreign markets (mode 3). The increasing use of digital payments is facilitating more cross-border trade, but commercial entry is still the primary mode of banking services trade for most countries.[218]

The United States runs a trade surplus in banking services. In 2015, U.S. cross-border imports of banking services were $17.9 billion.[219] In 2014, sales by foreign affiliates of U.S. banking companies were $47.5 billion, while purchases from U.S. affiliates of foreign banking companies were $43.9 billion.[220] Both cross-border and affiliate trade in banking services have grown steadily in recent years, but the latest available data show slowing growth in cross-border imports and declines in cross-border exports and affiliate trade, possibly because of low interest rates and new regulations.

Nature of Trade Restraints

Banking is a heavily regulated sector, as governments seek to set prudential rules to maintain the stability of the financial system and prevent or limit financial crises. These regulations cover the juridical form of banks, transfers of financial information, access to payment and clearing systems, and other issues. In many countries banking is regulated at both the national and subnational levels, and international regulatory harmonization is discussed in venues like the Group of Twenty international forum, the Basel committee on Banking Supervision, and the Transatlantic Financial Market Regulatory Dialogue. The regulatory landscape is likely to change rapidly in the near future; for example, the EU is reconsidering its regulatory equivalence rules in light of Brexit,[221] while in the United States, some of the regulations established by Dodd-Frank may soon be undone.[222] FTAs that cover banking services typically give countries broad latitude to regulate their financial sectors for prudential reasons, though often they emphasize that such regulations must not discriminate between foreign and domestic firms.

The main barriers to trade in banking services, prevalent across countries in the OECD database, are restrictions on foreign entry (mode 3), as commercial presence is the primary (though not the only) means by which banks provide services in foreign markets. These barriers can be measures limiting market access and national treatment, or domestic regulations which favor

[218] USITC, *Recent Trends in U.S. Services Trade*, 2016, 68.
[219] These numbers are the totals for the BEA categories of "financial management, financial advisory, and custody services" plus "credit card and other credit-related services." USDOC, BEA, table 2.2, "U.S. Trade in Services, by Type of Service and by Country or Affiliation," n.d. (accessed February 22, 2017).
[220] USDOC, BEA, table 4.1, "Services Supplied to Foreign Persons by U.S. MNEs through Their MOFAs, by Industry of Affiliate and by Country of Affiliate," n.d.; table 5.1, "Services Supplied to U.S. Persons by Foreign MNEs through Their MOUSA, by Industry of Affiliate and by Country of UBO," n.d. (both accessed February 22, 2017).
[221] Barker and Brunsden, "EU Reconsiders Financial Market Access Rules," November 6, 2016.
[222] Rappeport, "Bill to Erase Some Dodd-Frank Banking Rules Passes in House," June 8, 2017.

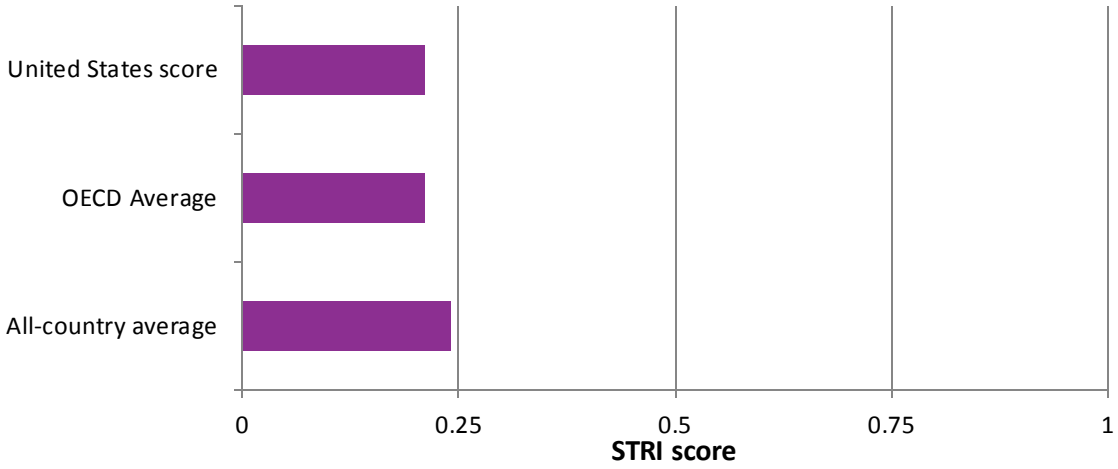
domestic banks. For example, many countries place limits on foreign direct equity stakes or require foreign firms to enter through joint ventures. Economic needs tests, restrictions on branch expansion, discriminatory access to payment clearing systems, prohibitions on some types of financial activities, and nationality or residency requirements for board members are also common.[223] These regulations may sometimes have the effect of favoring incumbents even when they do not discriminate explicitly between foreign and domestic banks.

Barriers to competition are another category of restrictions impeding trade in banking services; these include the presence of state-owned commercial banks that receive preferential treatment, as well as approval requirements for certain financial products. Banking trade is also affected by restrictions on the movement of people, such as senior managers and intracorporate transferees.

The U.S. STRI score for commercial banking (0.21) is equal to the average for OECD countries, but below the average for all countries (figure 2.5).[224] Most U.S. restrictions concern the entry of foreign banks, including nationality and residency requirements for directors and restrictions on access to federal deposit insurance (table 2.19). Some foreign banks have objected to recent Federal Reserve rules, stated to serve as a safeguard against future financial crises, that require foreign lenders with large U.S. operations to ring-fence their capital (i.e., the rules force U.S. subsidiaries to meet the same capital and liquidity standards as U.S. banks, without relying on parent company assets).[225] Broad restrictions maintained by the United States that affect banking services as well as other industries include a quota on the entry of services suppliers.

[223] Rouzet et al., *Services Trade Restrictiveness Index (STRI): Financial Services,* 2014, 17.
[224] This score is based on state laws in New York, which is used by the OECD as a representative state due to its economic importance.
[225] *Economist*, "Inglorious Isolation," February 22, 2014.

Figure 2.5: Commercial banking: U.S. STRI scores compared to all-country and OECD averages



Source: OECD, Services Trade Restrictiveness Index, "Compare Your Country," n.d. (accessed November 21, 2016), OECD, Service Trade Restrictiveness Index, OECD.Stat, n.d. (accessed February 15, 2017), and USITC staff calculations.

Note: This table lists the U.S. and all-country average scores provided by the OECD, as well as the OECD country averages calculated by USITC staff, which reflect policies in place as of 2016.

Table 2.19: Select commercial banking restrictions in the United States

Sector and STRI score	Restrictions on foreign entry
Commercial banking: 0.21	Branches of foreign banks cannot apply for federal deposit insurance.
	Directors must be U.S. citizens and a majority of directors must have resided in the state of location for at least one year.
	When licensing foreign banks, the Comptroller takes into account the effects on competition and the needs of the community.
	Foreign banks must have a minimum amount of capital located in the state where the branch is to be opened—either what would be required of a domestic bank or 5 percent of the branch's total liabilities.
	Non-U.S. banks are not allowed to solicit deposit-taking or payment business without a commercial presence.

Source: OECD, Services Trade Restrictiveness Index Simulator, n.d. (accessed February 22, 2017).

Insurance Services

Three broad segments of insurance services are traded internationally: life insurance, which is optional and designed to increase financial security of consumers; non-life insurance, which includes insurance segments like automobile and property insurance and is frequently compulsory for consumers and businesses; and reinsurance, which is used by insurance firms to distribute risk across the sector.[226] Trade in insurance services also includes insurance-related services, including services provided by insurance brokers and agents. Insurance is primarily distributed through two modes of delivery: cross-border supply (mode 1) and establishment of

[226] U.S. life insurance generally also includes health insurance, which is publicly provided in much of the rest of the world. Insurance Information Institute, *The Insurance Fact Book 2016*, 2016, 1–3.

a commercial presence (mode 3).[227] Generally speaking, since it is difficult to verify the financial stability of insurance companies outside of a domestic regulatory framework—or enforce the payment of claims made to them—people tend to buy insurance from foreign affiliates rather than buy it across the border, i.e., directly from a foreign insurance firm. Large international corporations and insurance firms are better equipped to take on the risk associated with cross-border trade in insurance. However, while large insurance firms are generally allowed to purchase reinsurance through cross-border channels, multinational companies are generally prohibited from buying other insurance cross-border.[228]

In 2014, the last year with comparable data, U.S. insurance imports through affiliate sales were around $20 billion larger than cross-border imports (import values were $73 billion and $52 billion respectively).[229] The majority of cross-border trade in insurance is in the reinsurance sector, which accounted for about 85 percent of U.S. imports of insurance services in 2015.[230] These data highlight the overall trends in restrictions in trade in insurance services. With the exception of reinsurance services, policies related to the cross-border provision of insurance services tend to be more restrictive than measures governing provision via foreign affiliates.

Nature of Trade Restraints

The OECD STRI for insurance services compiles restrictiveness scores for four categories of insurance services: (1) life insurance; (2) property and casualty insurance; (3) reinsurance; and (4) services auxiliary to insurance, including broking and agency services.[231] These category scores are aggregated and averaged to produce an overall score for the insurance industry.

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[227] Rouzet et al., *Services Trade Restrictiveness Index (STRI): Financial Services,* 2014, 10.

[228] Individuals are also prohibited from purchasing cross-border insurance, but also tend not to need to be insured in multiple jurisdictions. USITC, *Property and Casualty Insurance Services*, 2009, 3-1.

[229] For 2014, the BEA conducted its benchmark survey for affiliate transaction data, which increased the number of firms responding to the survey. BEA, Interactive Data Tables 4.1, n.d. (accessed January 3, 2017).

[230] USDOC, BEA, table 2.1, "U.S. Trade in Services by Type of Service," December 19, 2016; USDOC, BEA, table 5.3 "Services Supplied to U.S. Persons by Foreign MNEs through Their MOUSAs, by Industry of Affiliate," December 19, 2016. Cross-border trade roughly corresponds to modes 1, 2 and 4 of service trade, while foreign affiliate transitions correspond to mode 3 trade.

[231] The OECD categories include "property and casualty insurance" rather than "non-life insurance" because the OECD STRI for insurance services does not currently include health insurance and pension services. These types of insurance are excluded because in many countries they are publicly provided rather than sold by private insurers. Additionally, in the 2016 release of the STRI, insurance categories were rearranged. Before 2016, the five categories in the insurance sector were life and accident insurance; non-life insurance; reinsurance; marine, aviation, and transit insurance; and services auxiliary to insurance. Rouzet et al., *Services Trade Restrictiveness Index (STRI): Financial Services,* 2014, 7; OECD, "STRI Sector Brief: Insurance," 2017, 1.

Typically, higher STRI scores across countries in the OECD database reflect restrictions on foreign entry and barriers to competition.[232]

In the category of foreign entry restrictions, many economies ban cross-border trade in insurance services for all products except reinsurance, which is completely open in 29 of the 44 countries in the STRI for insurance services. In contrast, cross-border trade in non-life insurance is completely closed in 40 of the 44 countries.[233] There are also limits on the establishment of foreign affiliates. Note that countries that limit foreign equity share in local insurance companies, restrict establishment of branches of foreign insurers, and impose different licensing requirements for domestic and foreign firms tend to have higher (more restrictive) STRI scores. In the category of barriers to competition, approval requirements for new products, price restrictions, and state-owned insurers tend to drive higher scores.[234]

The U.S. STRI score for insurance services tends to be higher than other OECD countries, as well as in the overall country average (figure 2.6).[235] Cross-border trade in insurance is banned for both life and non-life insurance, for example, though it is permitted for reinsurers. The most restrictive measures in the STRI for the United States are restrictions to foreign entry, including limits on M&A of insurance companies (which are prohibited for non-U.S. firms) and licensing requirements for foreign firms (which require 150 percent of the capital needed for a domestic firm to apply for the same license). Another notable U.S. restriction is that before both life and non-life insurance providers begin offering new types of insurance products or services, they must have the approval of a regulatory authority (table 2.20).[236]

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[232] One challenge of measuring trade restrictions in the insurance sector is the presence of prudential regulations, which are necessary to protect consumers but may have the side effect of restricting foreign entry into the insurance market. In the GATS, as well as in most trade agreements, countries are explicitly granted the right to introduce prudential regulation, with the limitation that this regulation cannot be used to disguise trade barriers. Rouzet et al., *Services Trade Restrictiveness Index (STRI): Financial Services,* 2014, 16.

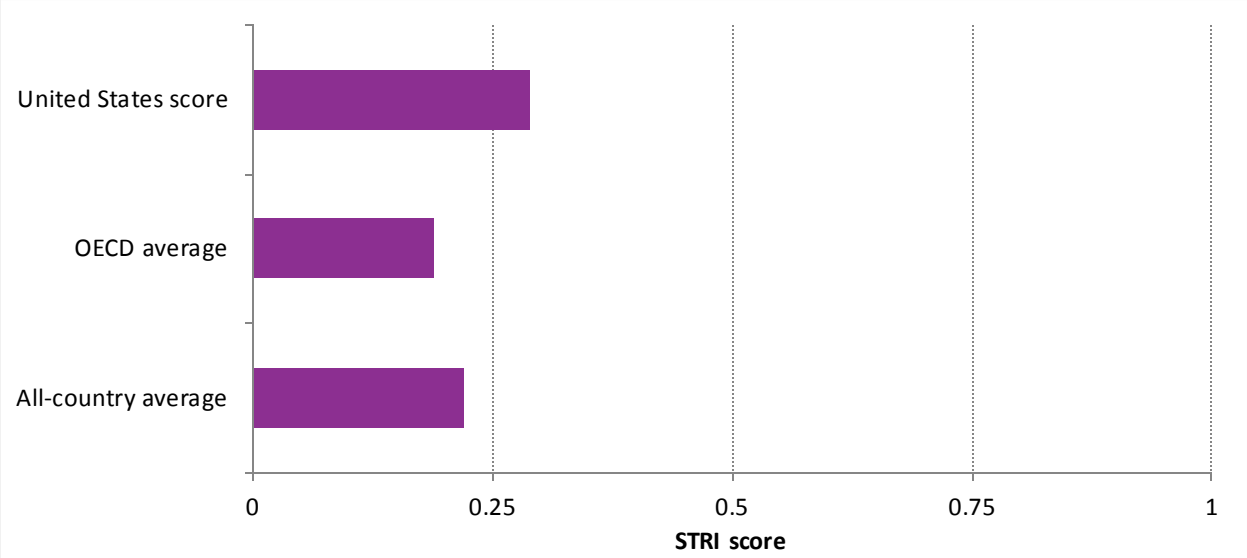
[233] OECD, Services Trade Restrictiveness Index Simulator (accessed February 15, 2016).

[234] OECD, "STRI Sector Brief: Insurance," 2017, 2.

[235] For the United States, OECD STRI scores on insurance-specific measures are based on regulations in New York State. Since insurance is regulated at the state level, there are variations in openness in this sector by state. For example, the World Bank STRI notes that 13 U.S. states prohibit foreign companies from establishing branches unless already licensed in another state. World Bank, "Services Trade Restrictions Index," n.d. (accessed November 14, 2016).

[236] These policy measures may also be considered necessary prudential measures in the United States, and therefore acceptable under WTO rules; however, the OECD explicitly states that a judgement on whether these types of measures are prudential are "beyond the scope of the STRI." Rouzet et al., *Services Trade Restrictiveness Index (STRI): Financial Services,* 2014, 16.

Figure 2.6: Insurance services: U.S. STRI scores compared to all-country and OECD averages



Source: OECD, Services Trade Restrictiveness Index, "Compare Your Country," n.d. (accessed February 15, 2017); OECD, Service Trade Restrictiveness Index, OECD.Stat, n.d. (accessed February 15, 2017); USITC calculations.
Note: This table lists the U.S. and all-country average scores provided by the OECD, as well as the OECD country averages calculated by USITC, which reflect policies in place as of 2016.

Table 2.20: Select insurance restrictions in the United States

Sector and STRI score	Restrictions on foreign entry	Barriers to competition	Other restrictions
Insurance (0.29)	Commercial presence required to provide cross-border insurance services (life, non-life)	Approval by the regulatory authority required for new insurance products or services (life, non-life).	Foreign reinsurers must post $20 million collateral in a New York bank unless there is a specific agreement with the reinsurers' home country in place. If there is an agreement, the collateral level can be reduced based on ratings and a $250 million surplus.
	Cross-border mergers and acquisitions prohibited, licensing criteria more stringent for foreign companies (higher capital requirement), and license must be renewed yearly (versus an indefinite term for domestic insurers).		

Source: OECD, Services Trade Restrictiveness Index Simulator, n.d. (accessed March 2, 2017).

Retail Services

Retail services are a subsector of distribution services. Along with wholesale services, they represent a major share of most countries' GDP. Retail services provide a vital link between consumers and producers and represent the final stage in the merchandise distribution process.[237] Retailers operate via physical stores or through multiple other channels, including, increasingly, the Internet (e-commerce).[238] Two significant trends are rapidly transforming U.S. and global retailing: (1) increasing concentration, with large retailers capturing increasing market share; and (2) substantial growth in online shopping. Most U.S. retail services are provided to foreign consumers through foreign affiliates of U.S. retail firms (mode 3).[239] Retail services can also be supplied through cross-border channels using e-commerce, as when a foreign consumer purchases goods and services via the Internet from a U.S.-based retailer.[240]

Data on affiliate transactions for retail services trade cover the distributive services supplied by retailers' foreign affiliates.[241] In 2014, sales by foreign affiliates of U.S. firms were $113.8 billion, up from $53.4 billion in 2006, for an increase of 113 percent. Purchases by U.S. consumers from U.S. affiliates of foreign firms were $48.8 billion in 2014, up from $42.9 billion in 2006, an increase of 13.7 percent during 2006–13.[242]

Nature of Trade Restraints

Barriers to trade in retail services are generally low relative to other services sectors. Since trade in retail services is primarily conducted through commercial presence (mode 3), policies that impede trade across countries in the OECD database are mainly focused on foreign ownership, such as screening of investments, limitations on board members and managers,

[237] Distribution services account for between 8 and 19 percent of GDP in most countries. OECD, "STRI Sector Brief: Distribution Services," May 2014. Retailers generally sell goods and services to consumers or households. Wholesalers are middlemen who take title to products and resell the products to retailers. U.S. Census, "2007 NAICS Definition: Retail," 2007.

[238] Cross-border e-commerce refers to trade in goods and services that are conducted electronically, principally facilitated by the Internet. Many U.S. retailers are multichannel suppliers that sell and distribute goods from their brick-and-mortar stores and through online channels, or a combination of both.

[239] These sales occur when a foreign consumer purchases goods from a store in their home country through a foreign affiliate of a U.S. retailer.

[240] These transactions, although expanding significantly, are estimated to represent a small share of retail services. These transactions are recorded in official U.S. statistics as merchandise trade in goods; the online cross-border transaction is not currently captured in official U.S. statistics.

[241] Koncz and Flatness, "U.S. International Services," October 2008.

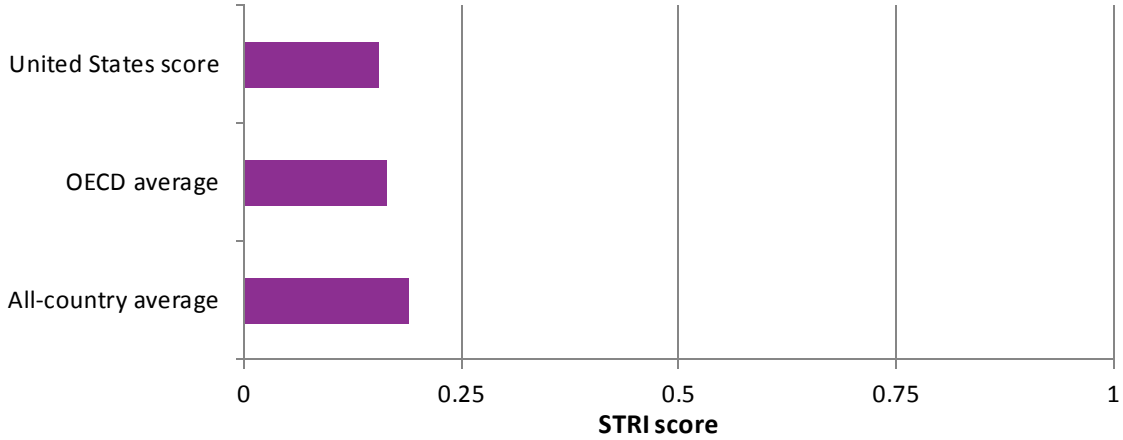
[242] For 2014, the BEA conducted its benchmark survey for affiliate transaction data, which increased the number of firms responding to the survey. BEA, Interactive tables 4.1 (sales) and 5.1 (purchases), n.d. (accessed April 24, 2017).

economic needs tests for licensing, and restrictions on the acquisition of land.[243] Restrictions on cross-border e-commerce include requirements to establish a commercial presence in order to engage in cross-border sales; restrictions on the type of goods that may be sold; and prohibitions on business-to-consumer e-commerce.[244]

The U.S. restrictiveness index for distribution services is just below the OECD country average in the database (figure 2.7), implying that the U.S. market for distribution services tends to be less restricted. While restrictions on market entry and other discriminatory measures contribute most to the U.S. index, there are several restrictions (both horizontal and specific to retail services) that are maintained across the five categories of restrictions in OECD's STRI.[245] Selected measures that specifically apply to U.S. retail services are shown in table 2.21. Restrictions that involve obstacles to market entry and to competition include limits on the type and number of certain types of retailers; regulatory transparency measures; and U.S. citizenship or permanent residency requirements to obtain retail licenses.[246] Other measures include requirements that food labels contain certain nutrition information.[247]

[243] Among all services included in the OECD index, distribution services have the lowest average restrictiveness score (0.185). OECD, "STRI Sector Brief: Distribution Services," January 2017. For additional discussion of barriers that impede international trade in retail services, see Kalirajan, "Restrictions on Trade in Distribution Services," August 2000, and Reisman and Vu, "Nontariff Measures in the Global Retailing Industry," May 2012.
[244] OECD, "STRI Sector Brief: Distribution Services," January 2017. Other restrictions on cross-border e-commerce include data localization restrictions (requirements that servers and data be stored within national borders) and restrictions on cross-border data and information flows. For additional information on barriers to e-commerce, see USITC, *Trans-Pacific Partnership Agreement: Likely Impact*, May 19, 2016, 347–51.
[245] For distribution services, the OECD STRI scores for the United States are partially based on policies in effect in the state of New York and may not reflect policies of other states.
[246] Certain barriers apply to retail and wholesale licenses for the sale of alcoholic beverages in the state of New York.
[247] For a full description of barriers, see OECD STRI Policy Simulator, n.d. (accessed February 21, 2016).

Figure 2.7: Distribution services: U.S. STRI scores compared to all-country and OECD averages



Source: OECD, Services Trade Restrictiveness Index, "Compare Your Country," n.d. (accessed February 21, 2017); OECD, Service Trade Restrictiveness Index, OECD.Stat, n.d. (accessed February 15, 2017); USITC calculations.
Note: This table lists the U.S. and all-country average scores provided by the OECD, as well as the OECD country averages calculated by USITC, which reflect policies in place as of 2016.

Table 2.21: Select retail services restrictions in the United States

Sector and STRI score	Barriers to entry and competition	Other discriminatory measures
Distribution: 0.156	Retail food stores can obtain a license to sell beer and wine, but not liquor. Liquor stores cannot sell other products. Number of sales outlets is limited.	Labeling provisions.

Source: OECD, Services Trade Restrictiveness Index Simulator, n.d. (accessed February 21, 2016).
Note: Most of the policy measures in the U.S. distribution services STRI apply to both retail and wholesale services. There are few policy measures that apply exclusively to wholesale services.

Air and Maritime Transport Services

Air and maritime transportation services are often, but not exclusively, provided across borders (mode 1) and are complemented by road, rail, and auxiliary transport services.[248] Trade in air passenger services is largely stimulated by international tourism, while trade in air freight and maritime services stems from merchandise trade.[249] Air freight and maritime services are also intermediate inputs in global value chains, facilitating the movement of goods through increasingly large and complex production networks.[250] Therefore, competitive restrictions in air and maritime transport services may have a discernible effect on the industries that they

[248] Services auxiliary to maritime transport include cargo-handling services and storage and warehousing services. UN, "Provisional Central Product Classification, Series M No. 7," 1991, 213–20.
[249] This section does not cover maritime passenger transport services, such as those provided by cruise ships and ferries.
[250] Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Transport and Courier Services*, 2014, box 2, "Air Services Agreements and Relationships Covered in the STRI."

supply by increasing the costs, decreasing the quality, and limiting the availability of such services.[251]

Overall, air transport accounts for 2 percent of the volume and about 30 percent of the value of global merchandise trade, for which it plays a significant role in delivering time-sensitive and perishable goods. By contrast, maritime transport accounts for 80 percent of the volume and about 70 percent of the value of merchandise trade. This reflects the wide range of primary, intermediate, and finished goods carried by ships—from iron ore to steel to automobiles.[252]

The air and maritime transport services industries supply a broad range of activities. For air transport, these include the transport of passengers and freight (also known as combination services) on scheduled commercial or charter airlines[253] or the carriage of freight on dedicated-cargo and express delivery carriers.[254] For maritime transport, primary services include water transportation services; supporting services for water transport, such as port and waterway operation services; and cargo handling, storage, and warehousing services. Water transportation services pertain to the transport of freight on maritime vessels that travel between coastal or deep-sea ports, between these ports and the U.S. and Canadian Great Lakes, and within inland lakes and waterways. Port and waterway operation services pertain to the operation of marine and passenger terminal facilities, and the servicing of locks and canals.[255]

As noted, air and maritime transport services are primarily traded across borders (mode 1), with less trade occurring via affiliate transactions (mode 3). However, mode 3 activities, along with activities in mode 4 (the movement of people), support cross-border trade in air transport services —for example, through the establishment of offices abroad for the sale and marketing of these services.[256] In 2015, U.S. imports of air transport services were $55.8 billion, higher

[251] Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Transport and Courier Services*, 2014, box 2, "Air Services Agreements and Relationships Covered in the STRI."
[252] OECD, "STRI Sector Brief: Air Transport Services," January 2017; OECD, "STRI Sector Brief: Maritime Freight Transport Services," January 2017; ArcelorMittal, "From Ore to Steel," n.d. (accessed November, 8, 2016).
[253] Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Transport and Courier Services*, 2014, 9.The STRI covers only scheduled air transport services, such as those provided by major commercial airlines. Charter services refer to the rental of aircraft (and crew) on a contract basis.
[254] BEA data on U.S. air transport services include three subcategories: air passenger transport services, air freight transport services, and port services. In general, U.S. exports of port services pertain to the value of U.S. goods and services (excluding fuel) purchased by foreign airlines in U.S. ports, whereas U.S. imports refer to the value of goods and services purchased by U.S. airlines in foreign ports. USDOC, BEA, "U.S. International Transaction Accounts: Concepts and Estimation Methods; Other Transportation," n.d. (accessed November 14, 2016); BEA representative, email message to USITC staff, November 24, 2014.
[255] UN, "Provisional Central Product Classification, Series M No. 7," 1991, 213–20.
[256] Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Transport and Courier Services*, 2014, 15.

than the $37.3 billion in U.S. maritime services imports.[257] Between 2006 and 2015, U.S. imports of air transport services increased by nearly 50 percent, compared to less than 4 percent for U.S. maritime services imports. The expansion of e-commerce and the continued rise of just-in-time manufacturing may partially explain the steep increase in U.S. air transport services trade.[258]

Nature of Trade Restraints

Air transport

For air transport services, the STRI scores primarily reflect commercial presence (mode 3) measures, but also include horizontal measures, such as those pertaining to mode 4, that apply to all services.[259] The OECD has developed a preliminary index for scoring air transport restrictions in cross-border trade (mode 1) by evaluating measures in bilateral air services agreements (see box 2.5 for more information). The most prevalent mode 3 restrictions in air transport across countries in the OECD database concern foreign entry and barriers to competition.[260] In general, restrictions on foreign entry largely comprise limits on foreign equity in domestic airlines, affecting the ability of a foreign entity to provide domestic air transport service (cabotage).[261] Foreign equity limits in the air transport sector are often accompanied by restrictions on the nationality of the board of directors and managerial staff.[262] Barriers to competition in the air transport industry primarily limit the allocation of takeoff and landing slots at domestic airports to airlines that provide domestic transport service.[263]

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[257] USDOC, BEA Interactive Data, "Table 2.1. U.S. Trade in Services, by Type of Service;" and "Table 5.1. Services Supplied to U.S. Persons by Foreign MNEs through Their MOUSAs, by Industry of Affiliate and by Country of UBO" (accessed November 14, 2016). Sales by U.S.-based foreign affiliates in air transport services were $1.8 billion in 2013, and for maritime services, $6.4 billion.

[258] Two-thirds of U.S. exports of air transport services were accounted for by air passenger transport ($41.7 billion), with $12.9 billion and $10.0 billion attributed to air freight transport and port services, respectively. U.S. exports of air freight transport services increased by 28 percent during the period 2006–15. BEA data on air freight services include courier services. USDOC, BEA, Interactive Data, "Table 2.1. U.S. Trade in Services, by Type of Service" (accessed November 14, 2016).

[259] OECD representative, email message to USITC staff, December 7, 2016, and January 25, 2017.

[260] OECD, "Services Trade Restrictiveness Index Simulator," n.d. (accessed November 8, 2016).

[261] Cabotage pertains to domestic point-to-point transport services. Foreign entry, including cabotage, is also addressed under bilateral air services agreements.

[262] Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Transport and Courier Services*, 2014, 37.

[263] A take-off or landing slot refers to the time of day at which a plane can depart from or arrive at a particular airport.

Box 2.6: OECD Estimates of Barriers to Air Transport[a]

Competition in the air transport sector is largely governed by a network of bilateral air services agreements which facilitate cross-border trade in the sector. These agreements grant traffic rights to airlines of signatory countries, allowing them to fly between designated points within each other's markets, as well as beyond these points to third-country destinations.[b] Although the most liberal type of air services agreement, known as an "open skies" agreement, provides nearly unrestricted access to a country's air transport market by removing controls on routes, capacity, and fares, these agreements still limit cabotage to domestic airlines.[c] More restrictive air services agreements (Bermuda I and II) place certain limitations on routes that signatory airlines can serve and include fare and capacity restrictions that curtail market entry and competition.[d] As of October 2016, the United States had signed 120 open skies agreements with other countries.[e]

The OECD STRI includes preliminary estimates for cross-border trade (mode 1) restrictions in air transport services by scoring measures in the bilateral air services agreements[f] of each of the 40 countries[g] in its database. The OECD's approach considers (1) whether or not such agreements permit countries to transport passengers and cargo between each other's markets (equivalent to mode 1 supply); and (2) how liberal or restrictive the agreements' provisions are in such areas as capacity; ownership and control; pricing; ground handling; and cooperative arrangements between airlines (such as code-sharing alliances). Restrictions in any of the latter areas may serve as barriers to competition: for example, code-sharing arrangements, which permit two or more airlines to coordinate flight schedules and fares, potentially limit competition by nonparticipating airlines. Other provisions may affect market entry, including limitations on capacity (i.e., the number of routes an airline is permitted to fly in a signatory's market and the frequency with which these routes can be served).

Overall, the United States, with its many open skies agreements, scores relatively low in restrictions on cross-border trade (0.2 on a scale of 0 to 1, with 1 being the most restrictive). By contrast, countries with the most mode 1 restrictions, as indicated by provisions in bilateral air services agreements, include Brazil, China, Japan, South Korea, Russia, and Turkey, with scores ranging from about 0.45 to 0.6.[h]

[a] For more information on the treatment of bilateral air services agreements in the STRI, see Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Transport and Courier Services*, annex D, "Scoring Methodology for Air Transport Services," 2014, 92–97.

[b] According to the OECD, there are 3,500 bilateral air services agreements in place. Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Transport and Courier Services*, 2014, 15. The ability of airlines of bilateral aviation partners to fly to third-county markets corresponds to the fifth and sixth "freedoms of the air." These rights are granted under the approval of a third-country market with which the airlines' country of registration does not have a bilateral air services agreement. For more information on the freedoms of the air, see Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Transport and Courier Services*, 2014, 26, box 1, "Freedoms of the Air."

[c] Cabotage refers to domestic point-to-point transport service within a country's borders. In bilateral aviation agreements, cabotage is equivalent to the eighth and ninth freedoms of the air. Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Transport and Courier Services*, 2014, 26, box 1, "Freedoms of the Air."

[d] Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Transport and Courier Services*, 2014, 15. For more information on air services agreements, see USITC, "Air Transport Services: International Regulation and Future Prospects," December 1999. The Bermuda I and II agreements were originally negotiated between the United States and the UK and were used as a template for subsequent bilateral air services agreements with other countries. They were named after the British territory of Bermuda, where U.S.-UK aviation negotiations took place.

[e] USDOS, "Open Skies Partners," November 14, 2016.

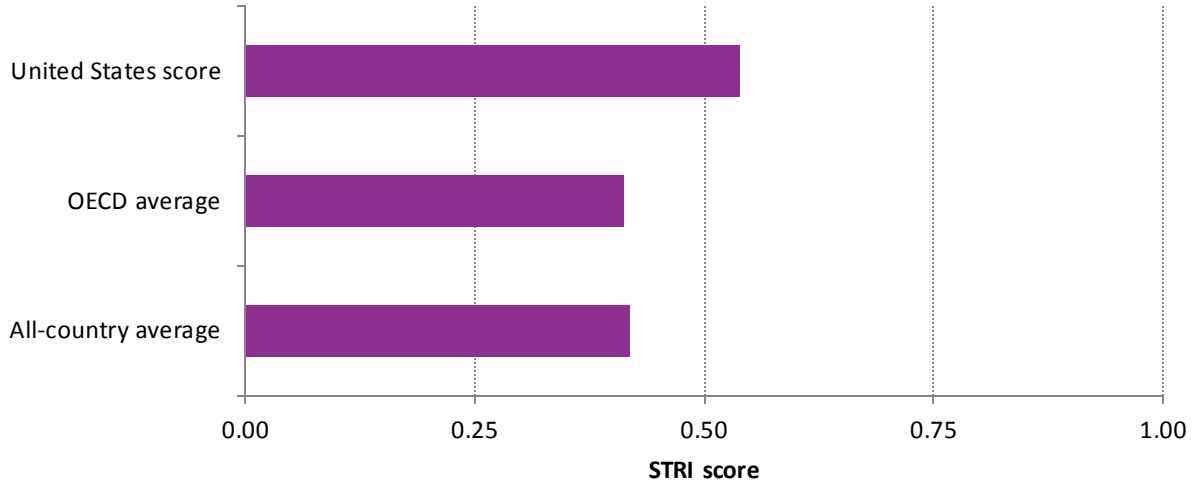
[f] The STRI covers 537 bilateral and seven plurilateral air services agreements. Six of the seven plurilateral agreements include the EU as a signatory. Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Transport and Courier Services*, 2014, box 2, "Air Services Agreements and Relationships Covered in the STRI."

[g] These include 34 OECD countries, as well as Brazil, China, India, Indonesia, Russia, and South Africa.

[h] Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Transport and Courier Services*, 2014, box 2, "Air Services Agreements and Relationships Covered in the STRI."

The United States limits foreign equity in U.S. airlines to 25 percent voting stock and 49 percent nonvoting stock (table 2.22).[264] In addition, at least two-thirds of the boards of directors and managers of U.S. airlines must be U.S. citizens.[265] Separately, U.S. incumbent airlines (i.e., those with grandfather rights) are given priority in the allocation of takeoff and landing slots at U.S. airports. Moreover, U.S. regulations prohibit U.S. domestic carriers from selling slots to non-incumbent airlines, further limiting entry into the U.S. domestic air transport market.[266] Overall, the STRI indicates that mode 3 restrictions in the air transport sector are high, with an average score of 0.42 for the 44 countries in the database (figure 2.8).[267] The United States scored above this average, as did 18 other countries, including Brazil, China, India, and Russia.[268]

Figure 2.8: Air transport services: U.S. STRI scores compared to all-country and OECD averages



Source: OECD, Services Trade Restrictiveness Index, "Compare Your Country," n.d. (accessed November 28, 2016); OECD, Service Trade Restrictiveness Index, OECD.Stat, n.d. (accessed February 15, 2017); USITC calculations.

Note: This table lists the U.S. and all-country average scores provided by the OECD, as well as the OECD country averages calculated by USITC, which reflect policies in place as of 2016.

[264] This restriction is specified under the Federal Aviation Act of 1958 (Public Law 85-726, 72 stat. 731).
[265] FAA, "Limited Liability Company Registration Information Sheet," n.d. (accessed November 17, 2016). This restriction is specified under 49 U.S. Code § 40102(a)(15)(C).
[266] OECD, "Services Trade Restrictiveness Index Simulator," n.d. (accessed November 28, 2016). The STRI database reports, "In high density traffic, [U.S. domestic] airports the system treats international and domestic aviation slots separately. Domestic slots are allocated on the basis of grandfather rights (in the other airports they are allocated on first-come-first-served basis), while for international operations any carrier shall be provided slots."
[267] OECD, "STRI Sector Brief: Air Transport Services," January 2017. These countries include 35 OECD countries, as well as Brazil, China, Colombia, Costa Rica, India, Indonesia, Lithuania, and Russia.
[268] OECD, "STRI Sector Brief: Air Transport Services," January 2017; OECD, "Services Trade Restrictiveness Index Simulator," n.d. (accessed February 17, 2017).

Table 2.22: Select air transport services restrictions in the United States

Sector and STRI score	Restrictions on foreign entry	Barriers to competition
Total: 0.54	The United States requires that 75% of the voting interest in a U.S. airline be owned or controlled by US citizens. Limitations on the establishment of subsidiaries and branches. Nationality and residency requirements for managers and boards of directors.	The allocation of take-off and landing slots for domestic traffic at U.S. high-density airports favors incumbent airlines.

Source: OECD, "Services Trade Restrictiveness Index Simulator," n.d. (accessed February 17, 2017).

Maritime transport

In the maritime transport industry, the most prevalent trade restrictions across countries in the OECD database consist of mode 3 limitations on foreign entry and barriers to competition. Foreign-entry restrictions include foreign equity limitations; residency and nationality requirements with respect to managers and boards of directors; restrictions on the provision of cabotage and port services; requirements to register vessels under the national flag; and cargo reservation schemes.[269] In addition, barriers to competition comprise antitrust exemptions for maritime carriers that participate in cooperative arrangements, such as conferences.[270]

In the United States, section 27 of the Merchant Marine Act of 1920, also known as the Jones Act, requires that the transport of cargo between U.S. ports be provided on vessels that are built and registered in the United States[271] and that are owned and crewed by U.S. citizens (table 2.23).[272] The United States also maintains cargo preference laws reserving the transport of at least 50 percent of U.S. government-owned cargo and military cargo to vessels that are

[269] OECD, "STRI Sector Brief: Maritime Freight Transport Services," January 2017. For more information on nontariff barriers in maritime services, see USITC, *Recent Trends in U.S. Services Trade: 2015 Annual Report*, 2015, chapter 5, "Maritime Transport Services," 87, box 4.2, "Types of Barriers to Trade in Maritime Transport Services."

[270] FMC, *54th Annual Report: Fiscal Year 2015*, March 31, 2016, 9–11. In general, there are three types of carrier agreements: conference agreements, which allow members to collectively establish freight rates and practices; rate discussion agreements, which permit nonbinding rate determinations among members; and operational agreements, which allow members to share services, but do not permit them to jointly establish freight rates. In addition, marine terminal operator agreements permit cooperative arrangements among either private or public port operators.

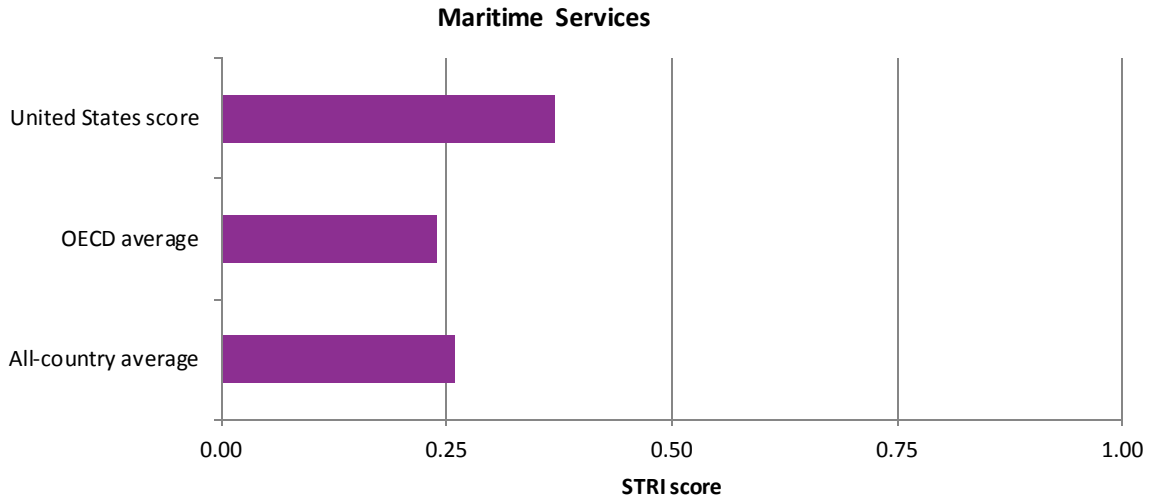
[271] The United States maintains a closed shipping registry in which U.S.-registered vessels (i.e., those that are able to fly under the U.S. flag) must be U.S.-built, U.S.-owned, and employ U.S. citizens as crewmembers. By contrast, some countries have open shipping registries that permit foreign-owned vessels to fly under those countries' flags. In 2013, 35 countries accounted for three-quarters of maritime vessel tonnage, indicating the widespread use of open registries. Panama, Liberia, and the Marshall Islands have the largest shipping registries, and are also known as "flags of convenience." Geloso Grosso et al., *Services Trade Restrictiveness Index (STRI): Transport and Courier Services*, 2014, 16.

[272] Section 27 of the Merchant Marine Act of 1920 is under 46 U.S.C. 883, 19 CFR 4.80, and 4.80 (b). U.S. Department of Transportation, Maritime Administration, "By the Capes: A Primer on U.S. Coastwise Laws," n.d. (accessed November 22, 2016). For more information on U.S. domestic shipping laws, see USITC, *The Economic Effects of Significant U.S. Import Restraints: Fourth Update 2004*, June 2004, 91–93.

registered in the United States and fly the U.S. flag.[273] In addition, the Shipping Act of 1984 gives the Federal Maritime Commission (FMC) the authority to grant antitrust immunity for certain cooperative arrangements among maritime carriers, subject to FMC review.[274]

The average STRI for maritime transport services is 0.26, with all countries in the database scoring between 0.13 and 0.58 (figure 2.9).[275] The STRI score for the United States is a relatively restrictive 0.37, partly reflecting cabotage restrictions and cargo preference laws in the U.S. domestic maritime industry. Other countries with higher-than-average STRI scores for maritime transport services include Indonesia, Russia, and South Africa.[276]

Figure 2.9: Maritime services: U.S. STRI scores compared to all-country and OECD averages



Source: OECD, Services Trade Restrictiveness Index, "Compare Your Country," n.d. (accessed November 28, 2016); OECD, Service Trade Restrictiveness Index, OECD.Stat, n.d. (accessed February 15, 2017); USITC calculations.

Note: This table lists the U.S. and all-country average scores provided by the OECD, as well as the OECD country averages calculated by USITC, which reflect policies in place as of 2016.

[273] This requirement is specified under the U.S. Cargo Preference Act of 1954 (Public Law 83-664). Separately, the Food Security Act of 1985 (Public Law 99-198) had required that U.S.-flag vessels transport a minimum of 75 percent of all international food aid provided by the U.S. Department of Agriculture and the U.S. Agency for International Development. However, in 2012, the U.S. government reduced this share to 50 percent. GAO, *International Food Assistance: Cargo Preference*, August 2015, 1.

[274] OECD, "Working Party No. 2 on Competition and Regulation: Competition Issues," June 19, 2015, 2. The Shipping Act of 1984 (46 U.S.C. App. §§ 1701-1719) was amended to become the Ocean Shipping Reform Act of 1998 (Pub. L. 105-258, 112 Stat. 1902).

[275] OECD, "STRI Sector Brief: Maritime Freight Transport Services," January 2017. The STRI covers maritime freight transport for 44 countries, including 35 OECD countries as well as Brazil, China, Colombia, Costa Rica, India, Indonesia, Lithuania, and Russia. The STRI does not include scores for internal waterways transport or for auxiliary services such as piloting, towing, tugging, maritime-related documentation, and cargo handling.

[276] OECD, "Services Trade Restrictiveness Index Simulator," n.d. (accessed November 23, 2016).

Table 2.23: Select maritime services restrictions in the United States

Sector and STRI Score	Restrictions on foreign entry	Barriers to competition
Total: 0.37	The United States reserves the transport of military and federally generated cargo to U.S.-flag vessels (a restriction known as cargo reservation). The U.S. maintains nationality requirements on managers and boards of directors. The Jones Act requires that U.S. domestic maritime transport services (cabotage) be provided on vessels that are U.S-owned and -registered, and that employ U.S. citizens as crew members.	The United States maintains certain antitrust exemptions on the participation of U.S. vessels in liner conferences.

Source: OECD, "Services Trade Restrictiveness Index Simulator," n.d. (accessed February 17, 2017).
Note: The STRI score for Jones Act restrictions is 0.017. A liner conference refers to an international group of ocean carriers that agree to establish shipping rates and service schedules together on the trade routes that they serve.

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Chapter 3
Effects of Tariffs and of Customs and Border Procedures on Global Supply Chains

Introduction

The effects of tariffs and of customs and border procedures on global supply chains (GSCs) are addressed in three sections in this chapter. The first section reviews the current literature on tariffs and on customs and border procedures, and examines the implications of these border costs within GSCs. The second section provides a quantitative assessment of the effects of tariffs on GSCs.[277] The third section presents three case studies that give examples of the types of inefficiencies in customs and border procedures that firms often encounter when they operate through GSCs. Two of the case studies focus on the automotive and semiconductor industries in South America and Southeast Asia, respectively. The third case study concerns logistics services in sub-Saharan Africa (SSA), an activity that is both an input to and a facilitator of GSC activity. Such services are especially critical to the transport of intermediate goods in GSCs.[278] Together these case studies illustrate the range of customs and border procedures that affect goods and services throughout the supply chain.

Overall, the chapter identifies two important effects that firms face when operating through GSCs. First, although tariffs on imported goods have largely decreased over time for a range of countries and products, goods that are produced in GSCs continue to face both direct and indirect tariffs that accumulate along the supply chain. Second, because they make multiple border crossings, goods produced in GSCs are subject far more often than other goods to customs and border procedures such as document preparation, goods inspection, the payment of customs duties and fees, and standards certification. When administered in an inefficient,

[277] Because data on customs and border procedures are not available on a level comparable to tariff data, this report does not include the effects of these procedures in its quantitative analysis.
[278] Government of Sweden, Kommerskollegium National Board of Trade, "Global Value Chains and Services," January 2013, 10.

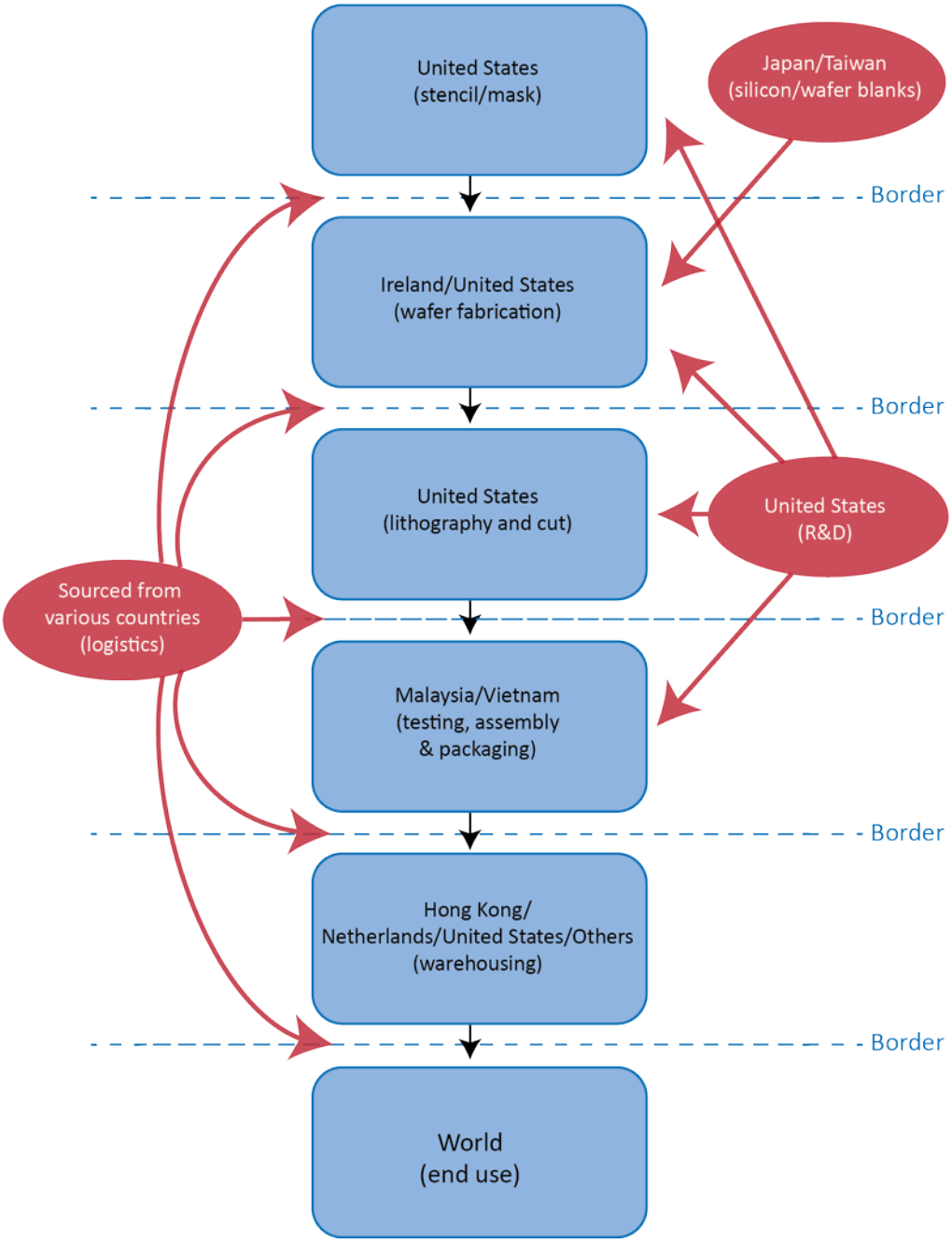
discriminatory, or burdensome way, these procedures serve as nontariff measures (NTMs) that drive up the costs and time of producing goods in a GSC.[279] Together, these two effects suggest that the trade costs associated with goods made in GSCs may be much higher than for their non-GSC counterparts.

The Rise of Global Supply Chains

A GSC is a process in which multiple firms or establishments undertake various stages of production in multiple countries. Figure 3.1 depicts a basic example of a GSC for a microprocessor as it is designed, produced, and assembled into a working chip. The initial design and fabrication occurs in the United States and Ireland; the chip is assembled, tested, and packaged in Malaysia or Vietnam; and it is eventually warehoused at routing points all around the world, including Hong Kong and Amsterdam. The microprocessors' production incorporates materials from countries such as Japan and Taiwan, as well as various services inputs ranging from research and development (R&D) services supplied in the United States to logistics and warehousing services supplied in Germany and the Netherlands. The finished product—a microprocessor—is itself often used as an intermediate input for other electronic goods within their respective GSCs.[280] Similar studies that focus on the supply chains of individual products have become quite common, including work that has examined the production of Barbie dolls,[281] T-shirts,[282] and computer hard drives.[283]

[279] In some cases, NTMs are intended to protect social interests, such as those concerning food safety and energy efficiency. In other cases, they exist principally to protect the domestic industry from foreign competition and, as such, are often referred to as nontariff barriers (NTBs) to trade. The WTO has established guidelines to identify NTMs that are designed to promote social interests rather than to inhibit trade; these guidelines state that the former should be transparent, nondiscriminatory, and scientifically based, and that better alternatives should be lacking. See, for example, Carrère and De Melo, "Non-Tariff Measures: What Do We Know?" December 2009, 21; Fontagné, von Kirchbach, and Mimouni, "An Assessment of Environmentally-Related Non-Tariff Measures," October 2005.
[280] Industry representative, interview by USITC staff, Washington, DC, March 10, 2017.
[281] Feenstra, "Integration of Trade and Disintegration of Production," 1998, 35.
[282] Planet Money, "Planet Money's T-shirt Project," 2013.
[283] Dedrick and Kraemer, "Who Captures Value from Science Based Innovation?" 2015.

Figure 3.1: A sample supply chain for a microprocessor



Source: Compiled by USITC.

The emergence of GSCs as a standard method of production is due to a variety of factors. On the demand side, there has been growth in consumer markets abroad. On the supply side, factors include (1) the lowering of average tariffs through trade liberalization; (2) advances in technology, such as those related to telecommunications, digital information, and transportation; (3) the harmonization of standards, such as sanitary, phytosanitary, and other

technical requirements; (4) the increasing availability of high-skilled, low-wage workers in developing countries; and (5) reductions in many other forms of NTMs.[284] In each case, improvements to production efficiency have increased the length and fragmentation of supply chains and have lowered the barriers faced within them.

While product-level studies of GSCs are informative, the level of detail required to conduct such a study is a major limitation. As an alternative, much research has turned instead to less granular studies of GSCs that focus on the extent to which countries combine foreign inputs with domestic value around the world (box 3.1). This type of aggregate analysis is typically done at an industry or sector level and therefore lacks many of the details present in a product-level study. Nonetheless, it can still provide valuable insight into the nature of GSCs and the barriers they face.[285] Such research has found, for example, that production in GSCs has grown considerably over the last half century.[286] In particular, since the 1970s, the use of foreign inputs in production has increased from about 15 percent of gross export value to between 25 and 30 percent.[287] In recent years, more than half of global manufacturing imports, and 70 percent of services imports, are used as intermediate inputs in the production of other goods.[288] Given this increased use of GSCs, the inefficiencies experienced between each stage of the supply chain have become increasingly important.

[284] Organisation for Economic Co-operation and Development (OECD), *Interconnected Economies*, 2013, 9–10; Timmer et al., "Slicing Up Global Value Chains," 2004; USITC, hearing transcript, February 9, 2017, 24–28 (testimony of Ed Brzytha, Information Technology Industry Council). Some of the same factors that have enabled the expansion of GSCs have also hindered their growth. For example, while advancements in information technology make it easier for companies to establish supply chain activity in foreign markets, server localization requirements and other restrictions on cross-border data flows may hamper such expansion.

[285] For a fuller discussion of this methodology, see Koopman et al., "Give Credit Where Credit Is Due," 2010; Powers, "The Value of Value Added," 2012.

[286] Yi, "Can Vertical Specialization Explain the Growth of World Trade?" 2003, 55.

[287] Johnson, "Five Facts about Value-Added Exports," Spring 2014, 123.

[288] OECD, *Interconnected Economies*, 2013, 8. Similarly, Johnson and Noguera find that foreign-sourced inputs account for as much as two-thirds of trade. Johnson and Noguera, "Accounting for Intermediates," March 2012, 1.

Box 3.1: Industry-level Findings about Global Supply Chains

Industry-level analysis of global supply chains (GSCs) has become popular in economic research and has led to a better understanding of GSCs and their role in international trade. This research has found that, as noted elsewhere in this report, 25 to 30 percent of the value of exported goods reflects foreign inputs that are used in their production. This share differs substantially across industries. Manufacturing, for example, exhibits a much higher ratio of foreign inputs than do services or agriculture. Similarly, these ratios differ across countries as well. Foreign content may range from 49 percent in exports from Taiwan to only 8 percent in exports from Russia.[a]

Analyses of foreign inputs and the various sources of these inputs are also useful in characterizing the position of a country in supply chains and the extent to which the country participates. Upstream countries tend to exhibit relatively low foreign content in their exports, while downstream countries exhibit much more.[b] Similarly, relatively large ratios of foreign inputs within a sector or a country are indicative of its extensive participation in GSCs.[c]

[a] Johnson, "Five Facts about Value-Added Exports," Spring 2014, 123–27.
[b] Upstream countries are those that provide primary inputs early in the production process, while downstream countries combine inputs at the end of the supply chain.
[c] Koopman et al., "Give Credit Where Credit Is Due," 2010, 20–21.

Tariffs and Customs and Border Procedures

As the manufacture of goods increasingly moves towards GSCs, the costs and inefficiencies associated with trade become more important. Each time a good crosses a border, it is subject to an array of barriers consisting of tariffs and nontariff customs and border procedures. Passing each of these barriers represents a cost, both monetary and nonmonetary, that some party must bear during the production or sale of the good. These procedures have become especially significant in recent years, because while tariffs have generally fallen over time, the number and relative effects of NTMs have largely increased.[289]

Tariffs, which typically consist of either ad valorem or unit-based charges on the importation of a good, are an explicit cost of a good crossing a border. Despite considerable trade liberalization, as well as global reductions in tariff rates, free-trade zones, and duty-drawback programs which eliminate some of these charges, tariffs continue to represent a significant friction to trade. As the following section will show in more detail, tariffs on GSC goods accumulate and compound at each stage of production, magnifying their costs relative to non-GSC goods. Given, however, that the nature of tariffs is generally well understood, the remainder of this section will focus primarily on the less transparent NTMs faced by goods at the border.

[289] Ferrantino, "Using Supply Chain Analysis to Examine the Costs," February 2012, 2–3; Beghin, Maertens, and Swinnen, "Non-Tariff Measures and Standards," 2015, 2–4.

Customs and Border Procedures

Customs and border procedures, which encompass the administrative requirements that firms must fulfill in order for their goods to clear customs, represent a less explicit but equally important cost of trade. The number of hurdles a shipment faces when entering or exiting a country is substantial, and to clear them often requires activities that include:[290]

- Preparing and submitting documents;
- Customs and pre-shipment inspections;
- Transit clearance, transportation delays, and congestion at the border;
- Payment of fees, such as duties and other taxes;
- Certification, which verifies the trader has fulfilled requirements such as technical, sanitary, and phytosanitary standards or import and export licenses;[291]
- Customs classification procedures;
- Customs valuation procedures, which occur when administering countries use nonstandard methods of assessing the value of the shipment; and
- Theft, bribes, and other forms of corruption.

The time and costs associated with customs and border procedures may, in some cases, be considerable. A 2014 study by the WTO found that border procedures remain cumbersome worldwide. According to this study, globally, each customs transaction requires on average 40 separate documents; calls for the submission (and often multiple resubmissions) of 200 data elements; and involves 20 to 30 different parties.[292] Other recent research, however, has found that just 2 to 5 documents are required to export on average, suggesting that the true extent of customs inefficiencies is still not well understood.[293] An older survey conducted by the World Bank in 2005 that focuses on exports provides some of the most detailed information available on border crossing requirements. The survey asked exporters in 146 countries to document all the procedures required to transport export goods from a factory to a ship, including the time, documents, and signatures required for each activity. Respondents indicated that that while in some countries these activities entailed relatively modest delays of only a few days, in many others these activities resulted in substantially longer delays, often in excess of 60 days.[294]

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[290] For further discussion of at-the-border procedures, see Arvis et al., "Connecting to Compete: Trade Logistics," 2016, 18–23; Deardorff and Stern, *Measurement of Nontariff Barriers*, 1998, 4, 57; Djankov, Freund, and Pham, "Trading on Time," 2010, 168.
[291] Examples of these types of requirements are safety standards, environmental protections, food and drug testing requirements, invasive species precautions, and quality standards, among others.
[292] WTO, "Briefing Note: Trade Facilitation," 2014.
[293] Arvis et al., "Connecting to Compete: Trade Logistics," 2016, 21.
[294] Djankov, Freund, and Pham, "Trading on Time," 2010, 167–68.

However, many countries have improved their procedures. For example, according to the aforementioned 2005 World Bank survey, to export a shipment from Burundi at that time required an average of 67 days, 29 signatures, and 17 visits to various offices to fulfill all customs-related requirements and move products from the factory to a ship.[295] More recent World Bank data concerning Burundi indicate that by 2014 export shipments took 32 days and import shipments took 43 days. These data indicate that the associated border procedures have been reduced and made more efficient, though delays still exist.[296]

When surveyed about barriers faced by exporters from the European Union (EU), firms reported that at-the-border NTMs were the most common hurdle they faced in their operations. Almost 32 percent of the issues faced by exporters related to conformity assessments at the border. In many cases, the difficulty of obtaining the proper certification for various standards represented a greater hurdle than satisfying the standard itself.[297] Recent World Bank data from 2016 confirm that these inefficiencies are still prevalent worldwide, with delays for the importation of goods for all countries averaging about 79 days. For some countries, they run as high as 588 days.[298] Similarly, documentary compliance costs were found to be $180 on average, and as high as $1,025 in some countries. It is clear that complying with customs-related requirements imposes significant costs on firms engaged in international trade.[299]

Delays in border clearance may also add costs to importers and exporters. For example, delays in the clearance of goods may require importers to pay for extra storage and security. Furthermore, the goods themselves may lose value through depreciation, technological obsolescence, quality degradation, or decay.[300] Moreover, efficient inventory management becomes difficult when shipment times are long and uncertain. The cost of time delays can be so significant that they have extensive impacts on trade behavior. Some research has found that reducing the shipment time of a good from 58 to 27 days could result in an increase in trade of 31 percent between the two parties.[301]

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[295] Ibid., 2010, 168.
[296] World Bank, World Development Indicators database (accessed August 18, 2017).
[297] International Trade Center and EC, "Navigating Non-Tariff Measures," 2016, 6–9.
[298] World Bank, "Doing Business DataBank," 2017.
[299] Several trade restrictiveness indexes, such as the World Bank's Logistics Performance Index (LPI) and the World Economic Forum's Trade Facilitation Index (TFI), include the customs and border procedures described here among the measures they track. See Arvis et al., "Connecting to Compete," 2016, and Geiger et al., *The Global Enabling Trade Report 2016*, 2016.
[300] For example, some parts for cell phones and other electronic parts have short life spans.
[301] Djankov, Freund, and Pham, "Trading on Time," 2010, 167. For similar results, see also Moïsé and Sorescu, *Contribution of Trade Facilitation Measures*, May 29, 2015.

The effect of reducing shipping times is larger for some industries than others. Automotive parts and other intermediate inputs, for example, are more sensitive to time delays than consumer or capital goods. This is likely due to the reliance on carefully managed inventories and just-in-time manufacturing in handling these goods. In such cases, producers keep limited inventories of inputs on hand at any given point and instead rely on their regular and timely delivery. Thus, the prevention of delays is especially important in the case of intermediate inputs, which are used to complete one production phase and move the good toward the next. Food is another type of good that is often highly time sensitive, given that delays in shipment can often cause serious quality degradation.[302]

The Effects of Trade Costs on Supply Chains

The presence of tariffs and customs and border procedures takes on increasing importance when goods are produced within GSCs. This is because a good that incorporates foreign inputs and services may cross many borders during its manufacture. As a result, both the relative and absolute costs associated with trade are generally higher for GSC goods than for goods produced within a single country. This cost magnification largely occurs as a result of three effects: (1) high costs relative to domestic content, (2) high costs due to accumulation, and (3) high costs due to shipment delays.

First, when goods face tariffs and other costs at the border, these costs are typically levied according to the total value of the exported good rather than the relative share of the value that was added domestically. When a good has been produced in a GSC, this total value consists of both domestic value and foreign value. In general, however, the costs charged at the border do not differentiate between the domestic value and the foreign value embodied in a good. As a result, the magnitude of the border costs can be significant relative to the value added by domestic producers, particularly when domestic value represents a small share of the total value of the good.[303] Economic research has been unable to establish whether this magnification of tariff rates relative to value added influences the behavior of traders or the production of goods in GSCs.

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[302] Hummels and Schaur, "Time As a Trade Barrier," January 2012, 30–32. In recent years, the WTO has made the reduction of unnecessarily burdensome NTMs a high priority among its member countries. In addition to commitments made by signatories to the WTO's Trade Facilitation Agreement, which entered into force on February 22, 2017, countries have pursued unilateral efforts to reduce customs and border NTMs by including trade facilitation principles in their bilateral and multilateral trade agreements. In fact, these agreements increasingly seek to address NTMs rather than traditional tariff barriers, which have fallen over time. Neufeld, "The Long and Winding Road," April 2014; WTO, "Trade Facilitation" (accessed May 19, 2017); Neufeld, "Trade Facilitation in Regional Trade Agreements," January 2014; Peterson, "An Overview of Customs Reforms to Facilitate Trade," August 2017.

[303] Koopman et al., "Give Credit Where Credit is Due," September 2010, 24–28; Rouzet and Miroudot, "The Cumulative Impact of Trade Barriers," 2013, 2–3.

Second, the absolute cost of trading a GSC-produced good increases because trade costs, including tariffs and other border costs, are paid each time intermediate inputs cross a border. Tariffs are applied on the total value of a good when it enters the customs territory of another country, not just on the value that was added at the most recent stage of production. Downstream tariffs are levied on goods that already embody upstream trade costs, resulting in the further compounding of costs upon costs—a phenomenon known as the magnification effect.[304] Higher tariffs or a longer GSC with more border crossings typically increases the magnification effect. In these instances, the cumulative tariff could be significant despite low individual tariffs.[305]

Attempts to quantify the absolute increase have largely found that the accumulation and compounding of costs significantly raises trade costs in GSCs. These studies have found that in the United States, about 87 percent of the tariffs paid on imports from China represent direct tariffs on Chinese value added, while 13 percent represent indirect tariffs paid on upstream inputs and their border costs. At the same time, 47 percent of tariffs paid on U.S. imports from South Korea have been found to represent direct tariffs, while 53 percent represent indirect tariffs.[306]

Third, delays in the transportation of goods often result in increased costs. However, these costs are generally much higher for products supplied through GSCs. Because the production process within GSCs is highly fragmented, each stage of the chain relies heavily on the timely arrival of upstream inputs. Delays at any border make manufacturing slow, unpredictable, and expensive. This risk has become increasingly significant given the widespread emergence of just-in-time manufacturing processes. Long or unpredictable delays for a single input can result in costly disruptions that also affect downstream manufacturers, raising costs and increasing the likelihood of delays at each step along the chain. Estimates suggest that the costs of adding an extra day to import inputs used within a supply chain are as much as 60 percent higher than for the costs of adding an extra day to import final goods.[307]

The Consequence of Higher Trade Costs in GSCs

As just noted, a good produced in a GSC will incur significantly higher costs from tariffs and from customs and border procedures than one produced without imported inputs. This fact implies that a reduction in trade costs would both lower the cost of foreign inputs and

[304] Yi, "Can Vertical Specialization Explain the Growth of World Trade?" 2003, 55–56.
[305] Koopman et al., "Give Credit Where Credit is Due," September 2010, 24–28; Rouzet and Miroudot, "The Cumulative Impact of Trade Barriers," 2013, 2–3.
[306] Rouzet and Miroudot, "The Cumulative Impact of Trade Barriers," 2013, 2–3.
[307] Hummels and Schaur, "Time as a Trade Barrier," January 2012, 1–2; Moïsé and Sorescu, "Contribution of Trade Facilitation Measures," May 29, 2015.

stimulate the exportation of goods to downstream parties or consumers. Policy makers appear to have recognized this implication, as many countries tend to set tariff rates and other economic policies with GSCs in mind.[308] For example, many nations have introduced special economic zones offering firms advantages beneficial to manufacturing in GSCs, such as duty-free importing of production inputs or logistical benefits. As of 2015, there were 186 free trade zones in the United States that exist to promote U.S. production and value added over foreign alternatives.[309] In China, similar free trade zones appear to have been successful in improving economic factors such as foreign direct investment, technological progress, and wages.[310] Alternatively, many policy makers have also enacted duty-drawback programs in which exporters are allowed to redeem the value of duties paid on imported inputs, thereby lessening the cumulative tariff for those exports.[311]

Firms are also well aware of and actively seek to mitigate the costs associated with multiple border crossings and cumulative tariffs. During the Commission's public hearing for this report, several industry participants including representatives from the Intel Corporation, the Footwear Distributors and Retailers of America, and the Information Technology Industry Council expressed concerns related to these costs and noted the efforts they put forth to reduce them.[312] In fact, improving supply chain efficiency and reducing costs has become a large standalone industry, as evidenced by the numerous third-party logistics firms that provide GSC expertise to firms and the many universities offering degrees in supply chain management.[313]

[308] Blanchard, Bown, and Johnson, "Global Supply Chains and Policy," January 2016, 4.
[309] U.S. Foreign-Trade Zones Board, *77th Annual Report of the Foreign-Trade Zones Board*, September 2016, inside front cover (U.S. Foreign-Trade Zones"), 1.
[310] Wang, "The Economic Impact of Special Economic Zones," March 2013, 135–36.
[311] International Bank for Reconstruction and Development and The World Bank, "Measuring and Analyzing the Impact of GVCs on Economic Development," 2017, 102.
[312] USITC, hearing transcript, February 9, 2017, 36–42 (testimony of Mario R. Palacios, Intel Corporation); USITC, hearing transcript, February 9, 2017, 15–21, 56–60 (testimony of Thomas Crocket, Footwear Distributers and Retailers of America); and USITC, hearing transcript, February 9, 2017, 22–28, 61–64 (testimony of Ed Brzytwa, Information Technology Industry Council).
[313] For example, companies such as UPS (https://www.ups-scs.com/logistics/), FedEx (http://supplychain.fedex.com/), and DHL (http://www.dhl.com/en/logistics.html) offer extensive global logistics services. Related programs are also offered by many schools, including MIT (http://scm.mit.edu/), Michigan State University (https://www.michiganstateuniversityonline.com/programs/certificate/supply-chain-management/), and Indiana University (https://kelley.iu.edu/programs/undergrad/academics/curriculum/supply-chain-management-curriculum.cshtml) (accessed August 21, 2017).

Quantitative Assessment of Tariffs on GSCs

Introduction

Within GSCs, intermediate components as well as final products cross national borders. This section presents estimates of the tariffs that accumulate from each border crossing. In contrast to the industry-specific information presented in the case studies, this section takes a broader view and uses multicountry data on production relationships and trade statistics for approximately 35 aggregated sectors and 60 countries (including a region that represents "the rest of the world") to estimate the total or cumulative effects of tariffs imposed throughout the entire supply chain. The estimates reflect actual paths taken by components and finished goods as they cross multiple borders, and so incorporate the extensive efforts made by firms to minimize tariff and border costs. Calculations show that the textiles and apparel sector has the highest cumulative tariffs.

Cumulative Tariffs

Concept of a Cumulative Tariff

As discussed earlier, the cumulative tariff applied on a good is the sum of the **direct tariff**—the final tariff applied on a good as it crosses the last border in its production chain before it is consumed—and **indirect tariffs**. Indirect tariffs are tariffs applied on a good as it passes through each stage or tier of the supply chain and is transformed from raw materials into a finished product. Indirect tariffs include tariffs paid on intermediate inputs that are used in the production process. As discussed later, although services are not subject to direct tariffs, services firms that use imported intermediate inputs pay indirect tariffs, as well.

As a hypothetical example of the accumulation of tariffs, consider a T-shirt that is produced in stages in multiple countries.[314] Here, we assume that cotton is grown in India and exported to China, where it is ginned and spun into yarn, knitted into fabric, and then cut and sewn into a T-shirt. The T-shirt is exported to the United States, where a logo is screened onto it. The T-shirt with a logo is then exported to Germany and eventually sold to an end user. In this simple example, assume that the Indian cotton costs $4 to produce and transport to China, where a 25-percent tariff raises the cost to the Chinese importer to $5. Assume that, in China, the importer adds $3 of value in manufacturing the T-shirt and then exports it at a cost of $8 to the United States, where a 12.5-percent tariff raises the cost of the T-shirt to the U.S. importer to $9. Assume further that U.S. companies add $1 in value for the logo and export the $10 T-shirt

[314] Although this example is a consumer good, similar principles apply to industrial goods, as discussed in the case studies. See appendix G for a technical explanation of these calculations.

to Germany. There, a 10-percent tariff raises the cost of the finished T-shirt to the German importer to $11. In this case, the German importer pays a direct tariff of $1, but the cumulative tariff is $3, of which $1 was paid at the Chinese border and $1 was paid at the U.S. border. Hence, in this hypothetical example, the indirect tariff of $2 exceeds the direct tariff paid by the final importer.

Table 3.1 presents another version of the same example. In this report, cumulative tariffs are divided into tiers. Direct tariffs are ordinary tariffs applied on goods as they cross a border. From the perspective of a retailer in Germany, the direct tariff is the tariff on the finished T-shirt from the United States. First-tier tariffs are tariffs applied to intermediate inputs used to produce final goods. In the example, the first-tier tariff is applied to the blank T-shirt imported into the United States from China. Second-tier tariffs are tariffs that are applied to intermediate inputs used to make intermediate inputs, and so on. In this case, the second-tier tariff is applied to the cotton imported into China from India. In general, cumulative tariffs are composed of indirect tariffs (the first- through last-tier tariffs) and direct tariffs.

Table 3.1: Direct, indirect, and cumulative tariffs in hypothetical example

Product	Border	Value at border, $	Tariff rate, %	Direct tariff, $	Indirect tariff, $	Cumulative tariff, $
Cotton	India to China	4	25.0	1	0	1
Plain T-shirt	China to USA	8	12.5	1	1	2
T-shirt with logo	USA to Germany	10	10.0	1	2	3

Source: USITC calculations.

Note: Indirect tariffs are the sum of the direct tariffs in previous stages of production, as shown in the lines above any particular indirect tariff.

In most cases, the data show that the direct tariff on goods exceeds the indirect tariff because the direct tariff is applied to the full value of a higher-priced good at a later stage of production, and indirect tariffs are always applied to the inputs of upstream products. Tariff escalation, in which import duties are higher on processed goods and final products than on intermediate goods and inputs, can also contribute to the low indirect tariffs. Nevertheless, it is possible for indirect tariffs to add a significant cost to the final good, especially in long GSCs.

Services are included in the calculations of cumulative tariffs, even though direct tariffs are not imposed on them. While many services are not traded or are traded duty free, tariffs affect services because they use traded intermediate inputs that have tariffs applied to them. For example, U.S. transportation services, such as trucking, may use trucks built in Japan, or U.S. medical services may use magnetic resonance imaging (MRI) machines constructed with parts built overseas.

To estimate the cumulative tariffs for GSCs, two types of information are needed.[315] First, information is needed that shows how all industries in each country are linked to each other. For example, for each dollar of U.S. agricultural output, how many cents of German chemicals, Japanese tractors, and U.S. transportation services are used? This information represents the input cost shares of producing each good. Second, information is needed on the effective tariffs that each country applies to each good imported from each of its bilateral trading partners. Broadly speaking, the estimation technique involves multiplying the input shares for each sector by the tariffs applied to the traded inputs.

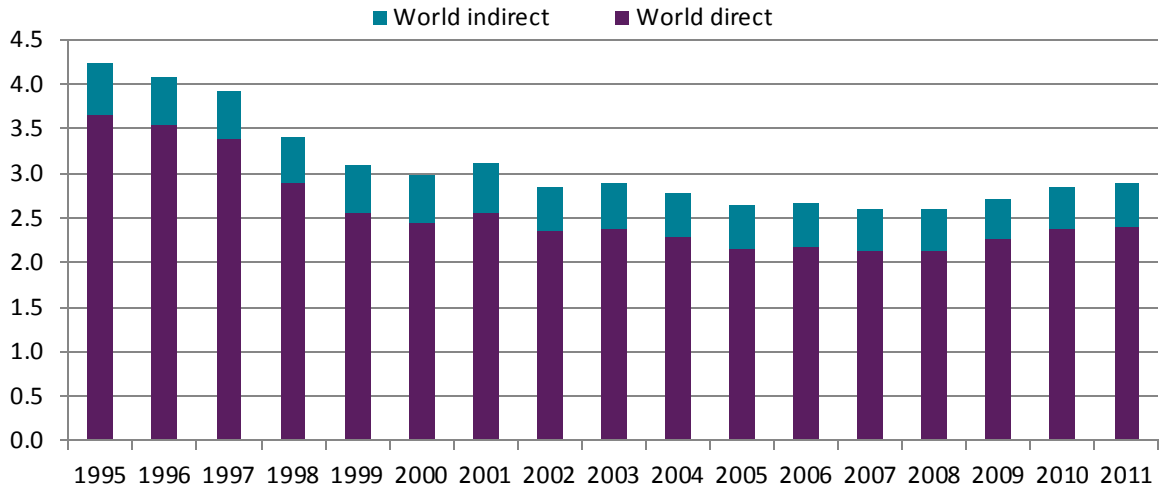
Estimation Results

Average direct import tariffs have decreased to the point where they are fairly low globally, especially for developed countries. Average indirect tariffs are low as well. Both tariffs contribute to low average cumulative tariffs. Average direct U.S. tariffs on all imports are lower than the average direct world tariffs, as the U.S. economy is among the world's most open (figures 3.2 and 3.3).[316] On the other hand, U.S. indirect tariffs are slightly higher than the world average, in part reflecting the fact that U.S. GSCs are longer than the global average. Since U.S. direct tariffs are lower than the world average, U.S. indirect tariffs constitute a more significant share of U.S. cumulative tariffs (about a third on average) than they do for the world (about a sixth on average).

[315] The approach used here is based on research by the OECD. See Rouzet and Miroudot, "The Cumulative Impact of Trade Barriers," 2013.

[316] Tariff data and information on industry interactions are needed to make these calculations. Tariffs are from the United Nations Conference on Trade and Development (UNCTAD) Trade Analysis Information System (TRAINS) database; information on industry interactions is based on intercountry input-output tables, available annually from the OECD for the years 1995–2011.

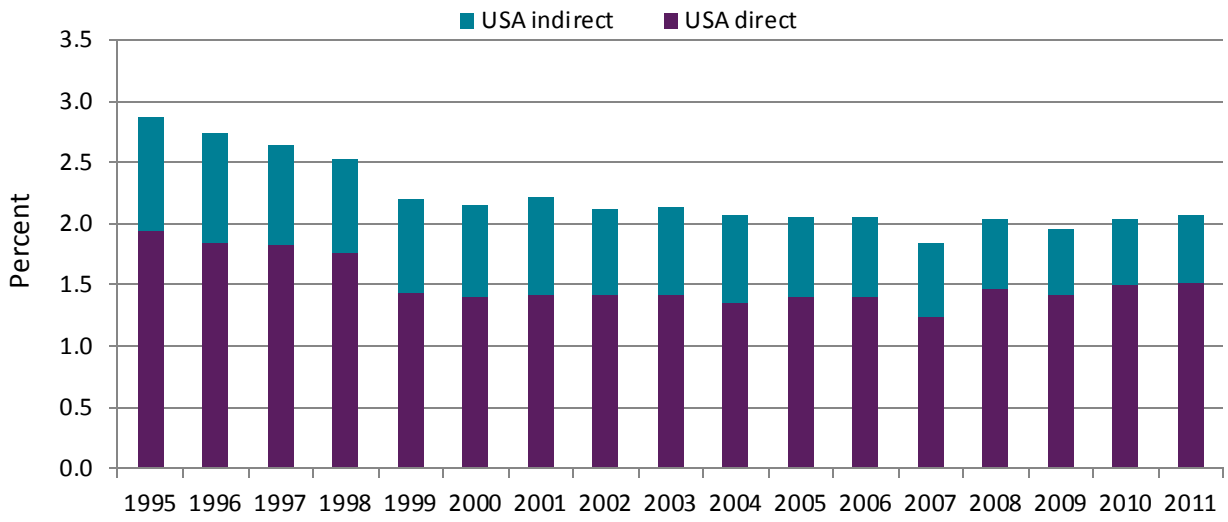
Figure 3.2: Direct and indirect tariffs on world imports, 1995–2011



Source: USITC estimates.

Globally, direct tariffs fell 34 percent over 1995–2011, while global indirect tariffs fell only 17 percent. Analysis indicates that, globally, supply chains have become more complex or longer, leading to a greater magnification effect. Indirect tariffs are affected by two contrary forces: (1) a general decline in direct tariff rates, and (2) an increase in length or complexity of the GSC. Consequently, indirect tariffs fall less than direct tariffs for the world. In contrast, when U.S. tariffs are examined, a different pattern emerges; direct tariffs fall by 22 percent but indirect tariffs fall by 41 percent, almost twice as much. Given the trend towards increased use of GSCs, there are two possible explanations for the precipitous decline in U.S. indirect tariffs: the United States may have shifted its GSCs to countries with which it has FTAs, or countries in the U.S. GSCs may have reduced their tariffs with each other.

Figure 3.3: Direct and indirect tariffs on U.S. imports, 1995–2011

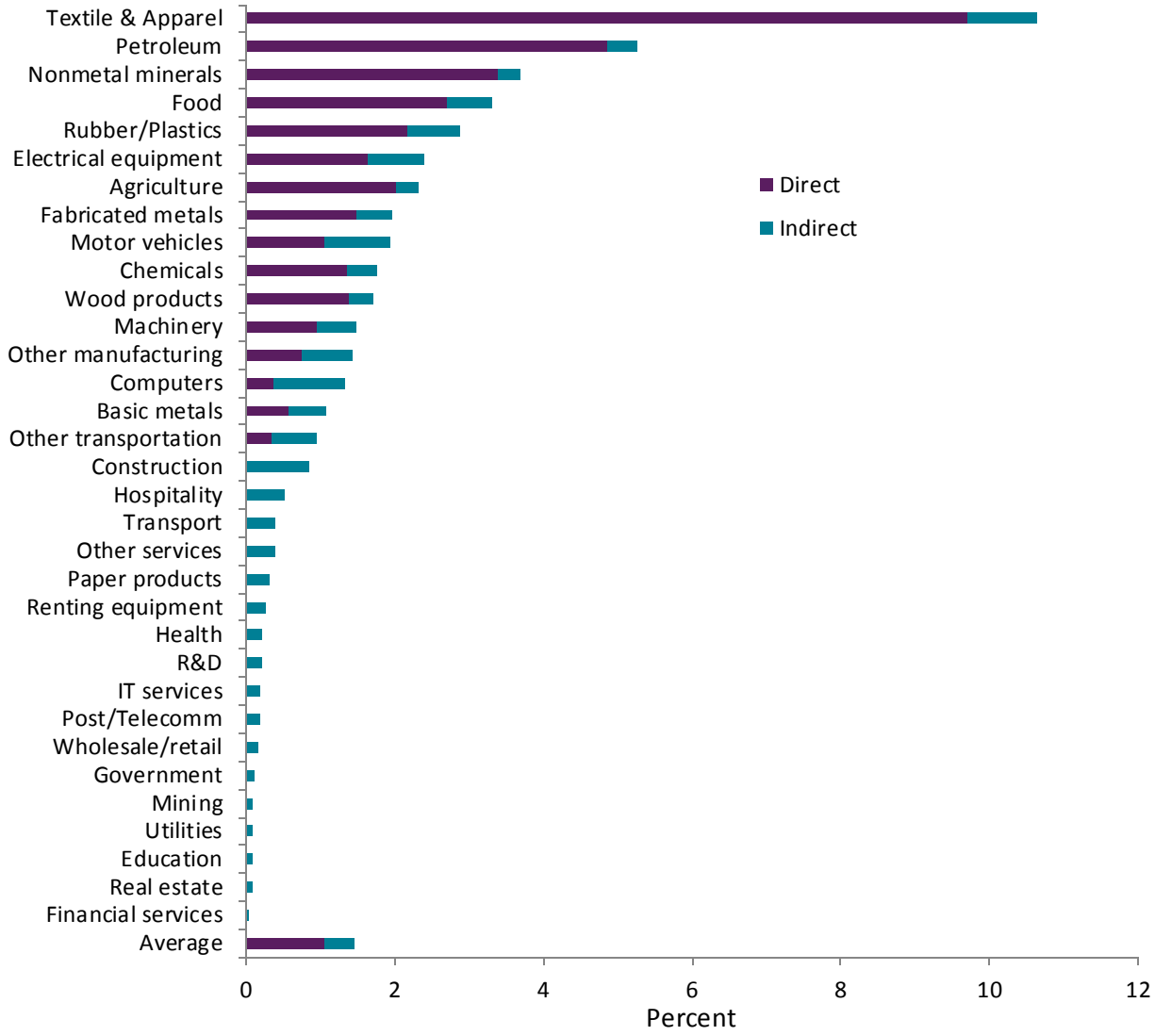


Source: USITC estimates.
Note: Import tariffs are weighted averages paid by the world and by the United States on imports from all countries and all sectors. The weights are based on total import expenditures by the world and the United States, respectively, from each exporting country and industry. For more details see Drenski, Hallren, and Powers, "A Guide to Calculating Cumulative Tariffs of Global Value Chains," forthcoming.

Although average cumulative tariffs on total U.S. imports are low, some sectors have large cumulative tariffs. The textile and apparel sector has the highest cumulative tariff (10.6 percent) due to its large direct tariff (9.7 percent) (figure 3.4). As a share of output value, the top imported intermediate inputs for U.S. textiles are textile inputs from China and wholesale services from China.[317] These represent about 5 percent of the value of output, so the relatively high cumulative tariff on textiles reflects the high rates applied to textile imports into the United States. The petroleum sector has the next-highest cumulative tariff followed by nonmetal minerals, owing to fairly large direct tariffs on both. As a share of output value, the top imported intermediate inputs for U.S. petroleum are inputs from the mining and quarrying industries in the "rest of the world" region, Canada, Saudi Arabia, Mexico, and Colombia. Together these constitute 20.5 percent of the value of petroleum output.

[317] Wholesale services involve purchasing and storing large quantities of goods and selling them in batches to resellers, such as retailers and professional groups.

Figure 3.4: Direct and indirect tariffs on U.S. imports by sector, 2011 percent



Source: USITC estimates.

Note: "Average" is the unweighted arithmetic mean of the industry cumulative tariffs.

The motor vehicle sector has a moderate cumulative tariff, with approximately equal direct and indirect tariffs. The services sectors have no direct tariffs but indirectly pay tariffs on imported intermediate goods. These indirect tariffs occur when service providers use equipment and capital that is imported from abroad or is made from imported components that are tariffed when they arrive in the U.S. Most U.S. services sectors primarily use value added and domestic intermediate inputs, so the portion of value that is dutiable is small. Among services, construction services and hospitality services have the largest indirect tariffs (0.9 percent and 0.5 percent, respectively). Of the services sector, construction uses the largest proportion of foreign intermediate inputs (8.9 percent). Of these, the top two are electrical equipment and

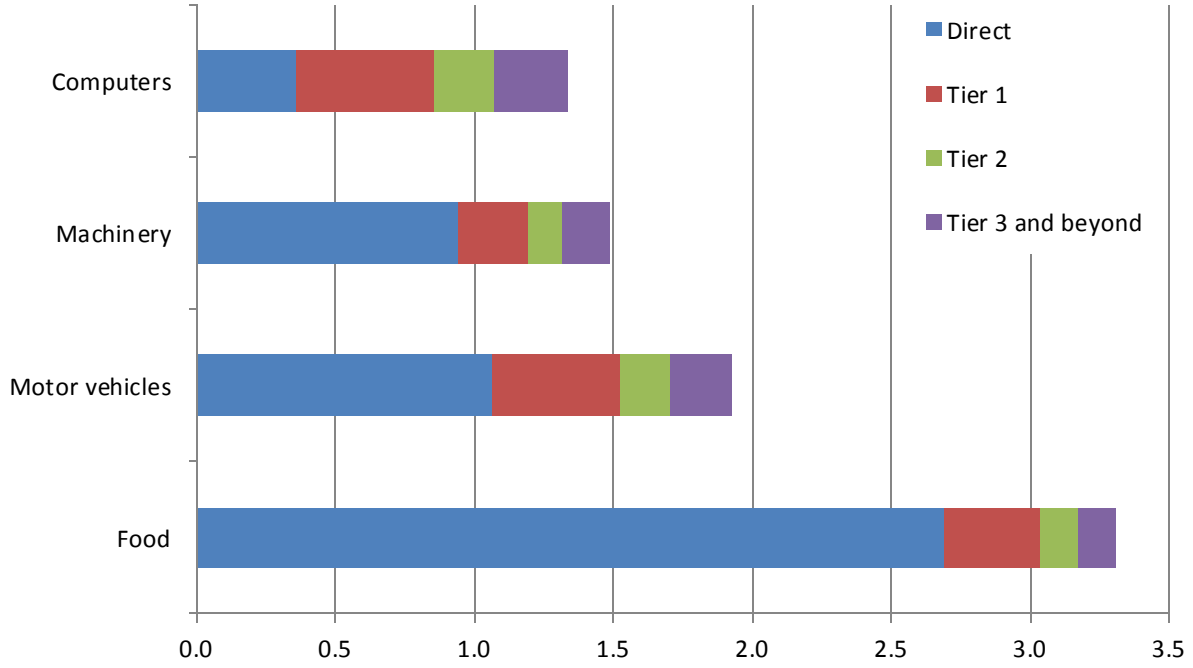
manufacturing equipment from China. The indirect tariffs reflect the duties applied to these products imported from China.

The cumulative tariff is low for computer and related products, consisting mainly of indirect tariffs. As discussed in the case study on semiconductors, signatories to the WTO Information Technology Agreement (ITA) pay no tariffs on their imports of semiconductors and various other electronic goods, which implies that direct tariffs are zero on many of these products. The low cumulative tariffs on these products likely contribute to this industry's broad use of GSCs. Other researchers using a related approach report that the length of the GSCs for computers and related industries increased more than those for other manufactured products between 1995 and 2009.[318] They also point out that developing countries that joined the ITA have higher average-participation rates in GSCs than members of the Organisation for Economic Co-operation and Development (OECD), and that these developing countries import inputs about as often as they export similar products to other countries.

Figure 3.5 breaks out U.S. cumulative tariffs into direct, first-, second-, and third-tier and beyond tariffs for selected industries in 2011. In three of the four cases, the direct tariffs constitute the largest share of the cumulative tariff. Moreover, the figure suggests that typically, the direct tariff accounts for more of the cumulative tariff than the tier-one tariff, while the tier-one tariff accounts for a greater proportion than the tier-two tariff and so on. However, this relationship does not always hold, as in the case of computers and related products, where the tier-one tariff (0.9 percent) is larger than the direct tariff (0.4 percent). This case arises in industries when final assembly is primarily done in the United States but relies on a large number of intermediate goods. It may also arise when the final good is imported at a low tariff rate, but the intermediate goods used in final assembly have higher tariffs levied on them.

[318] De Backer, Koen, and Miroudot, "Mapping Global Value Chains," December 19, 2013.

Figure 3.5: Upstream U.S. cumulative tariffs by direct suppliers and tier 1–3 suppliers and by tier 1–3 suppliers for selected sectors, 2011 (percent)



Source: USITC calculations.

The analysis also maps the tariffs paid by importing countries based on the source (exporting) country. Table 3.2 shows bilateral cumulative tariffs and the indirect share of cumulative tariffs from the source country (row) to the destination country (column); zeros (on the diagonal) occur because countries do not charge tariffs on themselves. For example, China's importers of goods from Korea pay an average cumulative tariff of 6.2 percent, and 24 percent of that is an indirect tariff. In general, it is expected that for products traded in regional trade blocs, the indirect tariff will be a high share of cumulative tariffs. The results presented in table 3.8 follow the expected pattern. For example, low cumulative tariffs and high indirect shares of the cumulative tariffs among Canada, Mexico, and the United States reflect the deep integration of these NAFTA countries in automotive supply chains and in other sectors.

Table 3.2: Bilateral cumulative tariffs and indirect tariffs share on imported goods in selected economies, 2011 (percent)

	Australia	Canada	China	Japan	S. Korea	Mexico	USA	EU	ROW
Panel A. Cumulative tariffs									
Australia	0	1.0	5.0	9.0	12.8	1.5	0.7	2.1	3.0
Canada	1.1	0	4.3	2.0	5.2	0.9	0.5	1.8	3.8
China	3.3	5.0	0	3.4	6.0	3.9	3.4	3.9	8.6
Japan	2.2	2.1	5.0	0	4.2	2.4	1.3	3.5	13.1
South Korea	4.1	4.8	6.2	4.1	0	8.2	3.1	5.1	9.1
Mexico	2.6	0.9	6.6	2.3	8.7	0	0.7	1.0	4.3
United States	0.2	1.1	4.7	1.4	16.6	0.5	0	1.6	4.1
EU	2.4	2.6	5.5	2.1	6.6	5.2	1.4	0	3.7
ROW	2.1	4.3	4.2	2.4	4.3	3.7	5.0	4.1	0
Panel B. Indirect share of cumulative tariff									
Australia	0	23	4	2	1	16	31	14	8
Canada	26	0	8	18	6	53	96	16	7
China	24	15	0	23	11	23	24	17	9
Japan	6	7	3	0	4	6	11	5	1
South Korea	43	39	24	56	0	18	50	31	16
Mexico	23	85	8	22	6	0	97	53	9
United States	92	24	5	12	1	57	0	12	5
EU	12	9	5	13	4	5	15	0	6
ROW	38	23	21	41	28	25	18	31	0

Source: USITC calculations.

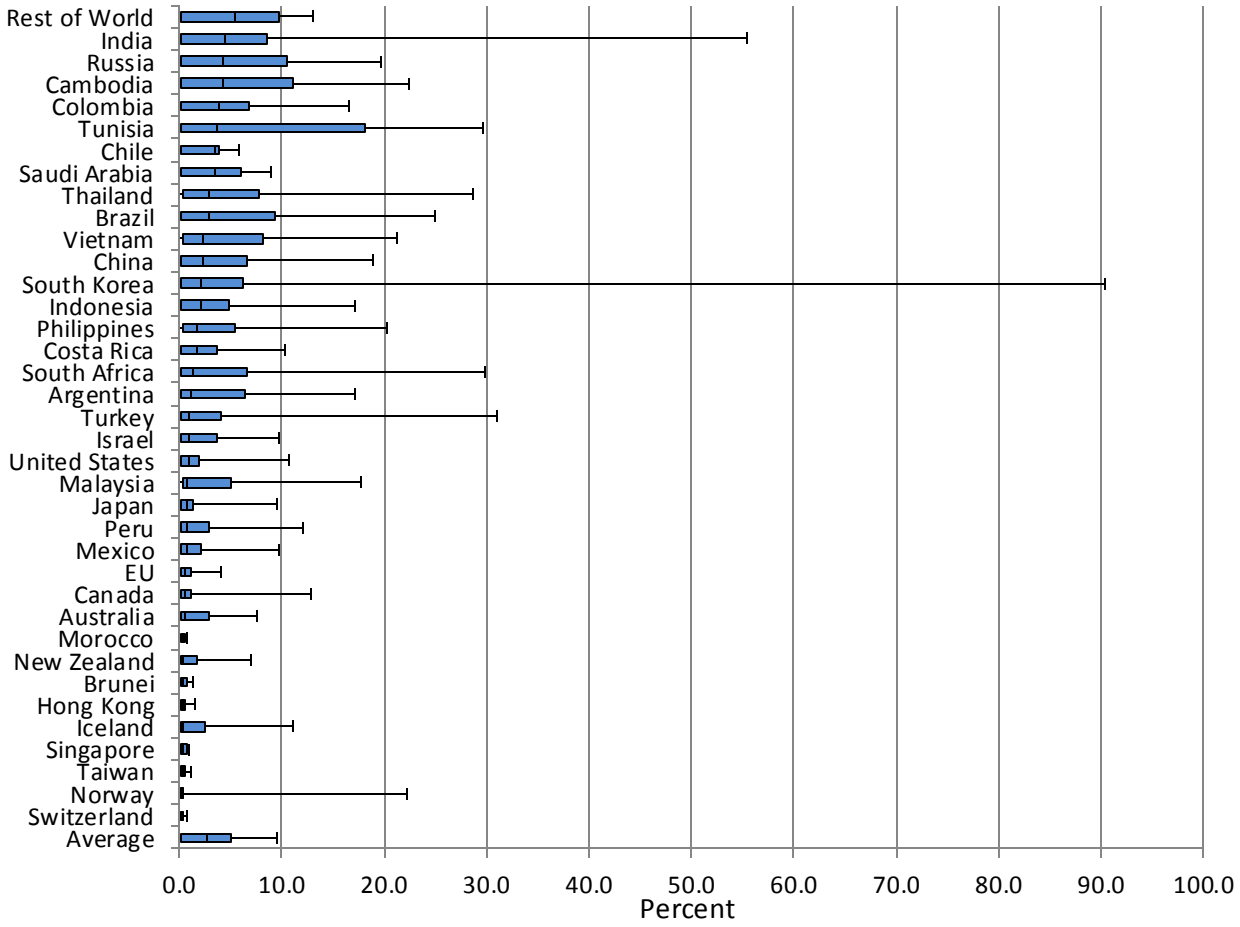
Note: Columns are destination countries or regions, and rows are source countries or regions. EU = the 28 EU economies; ROW = rest of the world.

Figure 3.6 summarizes the sectoral distribution of cumulative tariffs for selected countries for 2011; regions or countries are presented in descending order of the median cumulative tariff.[319] In this figure, the interquartile ranges—the distance between the 75th percentile and the 25th percentile appear as shaded boxes. The interquartile ranges indicate how a country's cumulative tariffs are dispersed by industry. For example, Tunisia has a large interquartile range, of between 0.2 percent and 18.1 percent, indicating that that its cumulative tariffs vary considerably by industry. By contrast, Canada has little variation by industry in its cumulative tariffs, as indicated by its small interquartile range, which lies between 0.1 percent and 1.1 percent. The five countries or regions with the highest median cumulative tariffs are the rest of

[319] The shaded boxes in figure 3.9 contain the middle half of the data, which is the interquartile range between the 75th percentile and the 25th percentile. The vertical line in the shaded box is the median. Maximum values are indicated by the "whisker," or extended line to the right.

the world, India, Russia, Cambodia, and Colombia. The medians fall within a fairly narrow range between 0.2 percent and 5.5 percent.

Figure 3.6: Sectoral distribution of cumulative tariff rates by country (2011), percent



Source: USITC calculations.

Note: "Average" is the unweighted arithmetic mean of the country cumulative tariffs; ROW = rest of the world.

Nevertheless, there is considerable variation in cumulative tariffs across industries within each country. This variation likely reflects differing degrees of international vertical specialization across industries. In addition, while most cumulative tariffs are relatively modest at the median, in some cases they can accumulate and magnify to more than three times the direct applied rate. For example, South Korea has a high cumulative tariff of 90.5 percent on agricultural imports.[320] By contrast, the cumulative tariffs on services and paper products are all less than 1 percent.

[320] The cumulative tariff rates for South Korea could be lower in later data from the period after the U.S.-Korea Free Trade Agreement went into effect in March 2012, although South Korea continues to have high direct tariffs on agricultural products with other countries as well.

Conclusion

Average cumulative tariffs are fairly low. The world average, weighted by expenditures on imports, is about 2.9 percent, with an average direct tariff of 2.4 percent and an average indirect tariff of 0.5 percent. The indirect tariff reflects the accumulated tariffs on upstream inputs resulting from multiple border crossings. Despite the low overall averages, there is considerable variability by sector. For example, the cumulative tariff faced by U.S. importers of textiles and apparel is almost 10 percent, and the cumulative tariff on agricultural imports into South Korea is over 90 percent. Although services are not subject to direct import tariffs, they are an important link in GSCs and are affected by indirect tariffs. For example, the indirect tariff for imports of construction services into the United States is nearly 1 percent, the largest of any U.S. services sector. Of the goods sectors, computers and related products have fairly high indirect tariffs reflecting lengthy GSCs.

Case Studies

Introduction

The following section presents three case studies illustrating how customs and border procedures affect goods that are produced through GSCs. The first case study examines the passenger vehicle supply chain in Argentina and Brazil, while the second looks at the manufacture of semiconductors in the Philippines and Vietnam. The third case study examines logistics services in sub-Saharan Africa (SSA). Since logistics services often facilitate GSC activity, customs and border procedures encountered by logistics firms may affect both the upstream production and the downstream distribution of GSC goods.

Each case study identifies specific customs and border procedures that serve as NTMs affecting supply chain activity because they increase the monetary costs and add to the time associated with moving goods through GSCs. Broadly, these NTMs fall into three categories: border procedures, document procedures, and measures concerning domestic transport and cross-border data flows (table 3.3). Border and document procedures generally affect the speed with which goods are cleared at customs checkpoints. Moreover, inadequate or poorly regulated information, technology, and communications and transport infrastructure may hamper the efficient flow of goods "behind the border" (i.e., after the goods have cleared customs), thus adding costs to firms' supply chain operations.[321] These "behind-the-border" measures may

[321] Sadikov, "Border and Behind-the-Border Trade Costs," December 2007, 4; USITC, hearing transcript in connection with *The Economic Effects of Significant U.S. Import Restraints: Ninth Update*, February 9, 2017, 24, 28.

also undermine the efficiency with which financial, logistics, and other services are supplied in GSCs.[322]

Table 3.3: Customs- and border-related nontariff measures (NTMs) identified in the literature and illustrated in case studies

NTM category	NTM	Passenger vehicles in Argentina and Brazil	Semiconductors in the Philippines and Vietnam	Logistics in SSA
Border procedures	Burdensome inspections		●	●
	Lack of transparency		●	●[a]
Document procedures	Preparing and submitting customs documents	●	●	●
	Payment of fees, duties, and taxes	●	●	●
	Customs classification			
	Customs valuation			
	Certification requirements, including export and/or import license	●	●	
Measures affecting domestic transport and cross-border data flows	Inadequate port, road, and/or rail infrastructure			●
	Inadequate information, communications, and technology infrastructure			●
	Regulations that limit or restrict the cross-border transmission of data, including server localization requirements			

Source: Adapted from the World Bank, "Doing Business: Trading Across Borders Methodology," 2016.
Note: All listed NTMs were identified in the literature.
[a] Includes inefficient or costly operations due to trucking cartels in sub-Saharan Africa (SSA).

Although the focus of this chapter is on customs and border procedures, the case studies illustrate how such measures are often linked to broader trade restrictions that have an adverse impact on firms' supply chain operations. For example, in Vietnam semiconductor production is hampered by inconsistent and burdensome licensing requirements for the importation of used equipment. In addition, some firms operating in Vietnam are prohibited from importing such equipment altogether, even if they have applied for an import license.

[322] In this case, services are viewed as what the Kommerskollegium (Swedish National Board of Trade) labels as "enablers" of GSC activity, facilitating the flow of goods from origin to end consumer. Such services include, for example, insurance, finance, telecommunications, transport, and logistics services. Government of Sweden, Kommerskollegium National Board of Trade, "Global Value Chains and Services," January 2013, 6. For further discussion of services' input into manufacturing and their role in GSCs, see also USITC, *The Economic Effects of U.S. Import Restraints: Eighth Update*, "The Role of Services in Manufacturing," December 2013.

Thus, semiconductor firms operating in Vietnam may encounter a related set of customs and trade barriers (i.e., nontransparent import licensing procedures for used equipment and a ban on such imports). Both types of measures increase the costs of semiconductor firms operating in that country.

Passenger Vehicle Supply Chain Case Study: Argentina and Brazil

Introduction

The first case study examines the effects of import licenses on the automotive supply chain in Argentina and Brazil. These two countries are the largest producers of passenger vehicles and auto parts in South America. They are both significant suppliers of passenger vehicles and, to a lesser extent, of parts to each other. However, relatively high trade costs, including those due to import licenses, appear to have hindered deeper integration of these countries' vehicle supply chains.[323] In particular, according to industry representatives, the approval process for Argentina's import licensing system historically has been nontransparent and inconsistent.[324] Thus, it was often difficult for Argentine auto manufacturers to learn why the issuance of an import license for a particular good was delayed, as well as if and when they could expect the arrival of the imported parts they need.[325] Recently, however, the new Argentine government has reformed the country's import licensing program, reducing the time and expense associated with importing parts used in vehicle manufacture.[326] These reforms may ultimately lower the costs of producing vehicles in Argentina and result in more trade in intermediate parts between Argentina and Brazil.

In addition to customs and border procedures, local content rules and trade-balancing requirements related to the Mercosur customs union may have hampered the integration of Argentina's and Brazil's automotive supply chains.[327] Both countries' tax incentives are aimed at

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[323] Industry representatives, interview by USITC staff, Buenos Aires, October 31 and November 1, 2016.
[324] Disciplines under the WTO indicate that a country's import licensing procedures should be "simple, transparent, and predictable." Where information about licensing procedures is not readily available to traders, or where the licensing process itself is unpredictable, import licensing may be considered as an NTM affecting trade. WTO, "Understanding the WTO: The Agreements: Import Licensing" (accessed April 4, 2017).
[325] Industry representatives, interview by USITC staff, Buenos Aires, October 31 and November 1, 2016.
[326] Mauricio Macri was elected president of Argentina in November 2015, and economic reform was a major part of his election platform.
[327] Argentina and Brazil are members of Mercosur (or Mercosul in Portuguese), a customs union which has helped facilitate the establishment of a regional automotive supply chain in South America. Argentina, Brazil, Paraguay, and Uruguay are full members of Mercosur. Bolivia is currently in the process of becoming a full member, and Chile, Colombia, Ecuador, Guyana, Peru, and Suriname are all associate members. Venezuela's membership was suspended on December 1, 2016.

increasing the local content of vehicles sold in the domestic market. Moreover, sales of both Brazilian-produced vehicles in Argentina and Argentine-produced vehicles in Brazil are required to be no more than half of total vehicle sales in either country due to the trade-balancing requirements. Together, these restrictions may limit trade, and hence supply chain activity, between the two countries.

Overview of the Passenger Vehicle Industry

Industry Description

Most passenger vehicle manufacturers produce a range of products, including passenger cars, sport-utility vehicles, minivans, work vans, and light trucks.[328] The passenger vehicle supply chain tends to be regional, with the majority of vehicles and parts sourced from nearby countries.[329] The regional nature of the automotive supply chain is partly motivated by the fact that vehicles are heavy, and thus expensive to transport, but it may also be influenced by government incentives for vehicles to be produced locally. In addition, many passenger vehicle manufacturers are attempting to use a larger share of common parts for their vehicles to achieve greater economies of scale. This focus has often led manufacturers to push their top suppliers to co-locate plants that produce parts close to each passenger vehicle assembly plant around the world.[330] By keeping their suppliers close to their production plants, automotive manufacturers minimize the need to maintain a large inventory of parts. At the same time, however, as more top suppliers locate facilities near assembly plants, less work goes to smaller local suppliers that could only supply assembly plants in a single market.[331]

[328] The passenger vehicle industry encompasses products under the following six-digit product classification codes within the global Harmonized System (HS) for classifying traded goods: 870321, 870322, 870323, 870324, 870331, 870332, 870333, 870390, 870421, and 870431.
[329] Klier and Rubenstein, *Who Really Made Your Car?* 2008, 3; Sturgeon and Van Biesebroeck, "Global Value Chains in the Automotive Industry," 2011.
[330] Klier and Rubenstein, *Who Really Made Your Car?* 2008, 133.
[331] Klier and Rubenstein, *Who Really Made Your Car?* 2008, 3; Sturgeon and Van Biesebroeck, "Global Value Chains in the Automotive Industry," 2011.

Primary U.S. and Global Participants in Argentina and Brazil

The top five global vehicle manufacturers are Volkswagen, General Motors, Toyota, Hyundai, and Ford. Each firm has a significant presence in Argentina and Brazil, as indicated by the number of assembly plants they have in those countries as well as their market share (table 3.4). Fiat Chrysler Automotive, another global automobile manufacturer, also has significant vehicle sales in Brazil.

Table 3.4: Top global vehicle manufacturers in Argentina and Brazil

Group	Headquarters	2016 global sales (millions of units)	Assembly plants in Argentina and Brazil	2015 market share by volume of sales in Argentina and Brazil, %
Volkswagen	Germany	10.4	4	15.4
General Motors	United States	10.0	4	14.8
Toyota[a]	Japan	8.9	3	7.5
Hyundai[b]	South Korea	7.7	1	7.0
Ford	United States	6.7	3	11.2
Fiat Chrysler	Italy	4.4	2	17.3
Subtotal		48.1	17	73.4
Other		44.8	15	26.6
Total		92.9	32	100.0

Source: Fiat Chrysler, *Fiat Chrysler Automobiles Annual Report 2016*, February 9, 2017, 14; Ford, *Ford Motor Company 2016 Annual Report*, 2; General Motors, *General Motors Company Annual Report 2016,* April 2017, 2; Hyundai, *Hyundai Motor Company Annual Report 2015*, January 26, 2016, 16; Kia, *Kia Motors Corporation Annual Report 2015*, 2016, 8; Toyota, *Toyota Motor Corporation Form 20-F: Annual Report*, June 24, 2016, 2; Volkswagen, *Volkswagen Annual Report 2016*, 2017, 2; Binder, *Ward's Automotive Yearbook 2016*, 2016, 75–76; ANFAVEA, *Brazilian Automotive Industry Yearbook 2017*, 2017, 30.

[a] All Toyota data are from the fiscal year ending on March 31, 2017.

[b] Global sales represent a combination of Hyundai and Kia sales in 2015.

Overall, automotive supply chains have changed in recent years as top global manufacturers have upgraded vehicles to increase their fuel efficiency, their use of common parts, and their use of technology for safety and entertainment. Firms such as Fiat Chrysler, for example, have made significant investments in powertrain technology, as well as in new engine technologies (e.g., hybrid, electric, and hydrogen) aimed at increasing fuel efficiency.[332] These trends have helped nontraditional automotive suppliers gain entry into the supply chain, strengthened large multinational vehicle suppliers, and increased competitive pressures on smaller national suppliers.

[332] In 2015, Fiat Chrysler invested $53 million in a R&D center in northeastern Brazil for the production of powertrain technology, or engine and transmission-controlling software. Mari, "Fiat Chrysler Invests $53M in Brazil R&D Center," December 7, 2015.

The Passenger Vehicle Supply Chain in Argentina and Brazil

Overview

Argentina and Brazil are the top two suppliers of passenger vehicles for the South American market. In 2015, these two countries accounted for 98 percent (2.95 million) of vehicles produced in South America (3.02 million).[333] In addition, Argentina and Brazil accounted for 95 percent of the region's passenger vehicle exports in 2015.[334] In the same year, vehicle sales for all countries in South America totaled 3.9 million units, with Argentina and Brazil supplying 3.2 million of those sales.[335]

Passenger vehicles produced in Argentina have approximately 30 percent Argentine content, but some vehicles have as much as 40 percent.[336] Brazil produces more vehicles than Argentina, and passenger vehicles produced in Brazil tend to have higher levels of Brazilian content, as there is more R&D and parts production in Brazil than in Argentina. Also, Brazil's domestic content program has been in place for a longer time.[337] Brazil was South America's largest importer of vehicles and parts in 2015, as well as the region's largest exporter of parts (it was second in passenger vehicle exports to Argentina).[338]

Vehicle Trade between Argentina and Brazil

Argentina and Brazil trade significantly more finished vehicles than vehicle parts.[339] In 2016, Argentina accounted for two-thirds of Brazil's passenger vehicle imports ($2.8 billion) and Brazil was Argentina's top market for vehicle exports (figure 3.7).[340] On an average annual basis, 55.5 percent (or $5.1 billion) of Brazil's passenger vehicle imports were from Argentina during the period 2012–16.[341] Many of these imports likely represented intracompany shipments by

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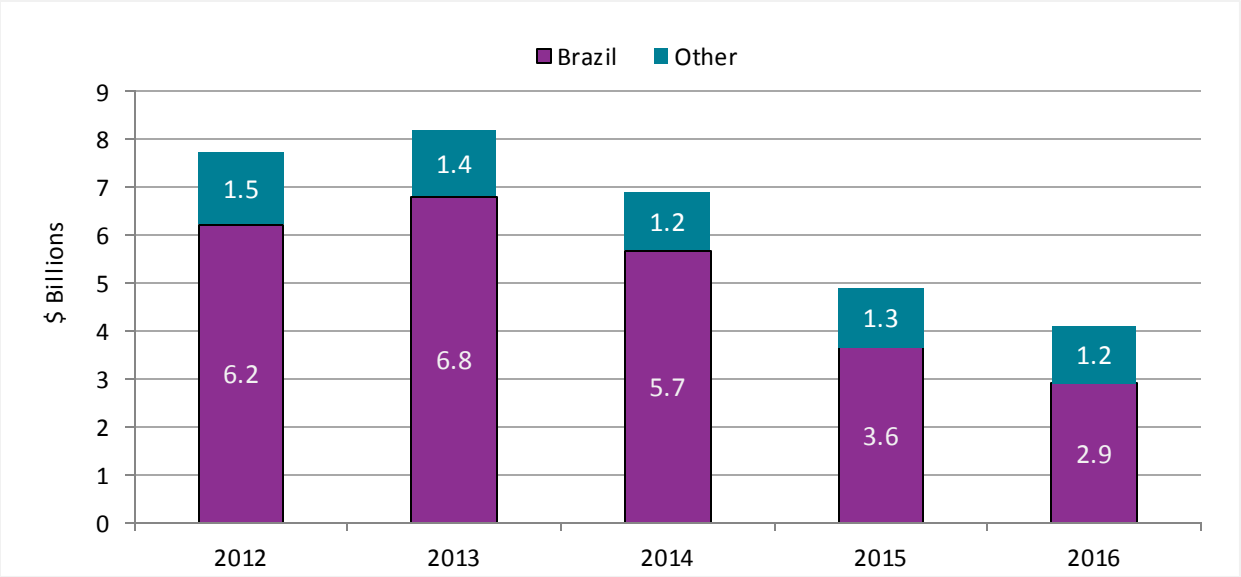
[333] OICA, "2015 Production Statistics," March 2, 2016.
[334] IHS Markit, GTA Database (accessed September 12, 2016).
[335] Binder, *Ward's Automotive Yearbook 2016*, 2016.
[336] Industry representative, interview by USITC staff, Buenos Aires, October 31, 2016.
[337] Domestic parts account for as much as 80 percent of parts in some vehicles produced in Brazil. Michaud, "Driving Up the Local Content of Brazilian Cars," September 2015, 4.
[338] IHS Markit, GTA Database (accessed February 3, 2017).
[339] In other regional markets (e.g., North America or Europe), parts trade can be significantly higher than it is in South America.
[340] IHS Markit, GTA database (accessed June 28, 2017).
[341] Declining exports to Brazil was the primary factor accounting for a 40 percent drop in Argentina's passenger vehicle exports during 2011–15. This decline was due to a recession and decreasing demand for vehicles in Brazil. No other country accounted for more than 5 percent of Argentina's passenger vehicle exports in 2015, with Australia accounting for 4.7 percent ($230 million) in that year. IHS Markit, GTA database (accessed June 28, 2017).

foreign vehicle manufacturers in Brazil. Domestically produced vehicles made up 82 percent of Brazil's new-vehicle registrations from 2012 to 2016.[342]

Figure 3.7: Argentina's passenger vehicle exports, 2012–16

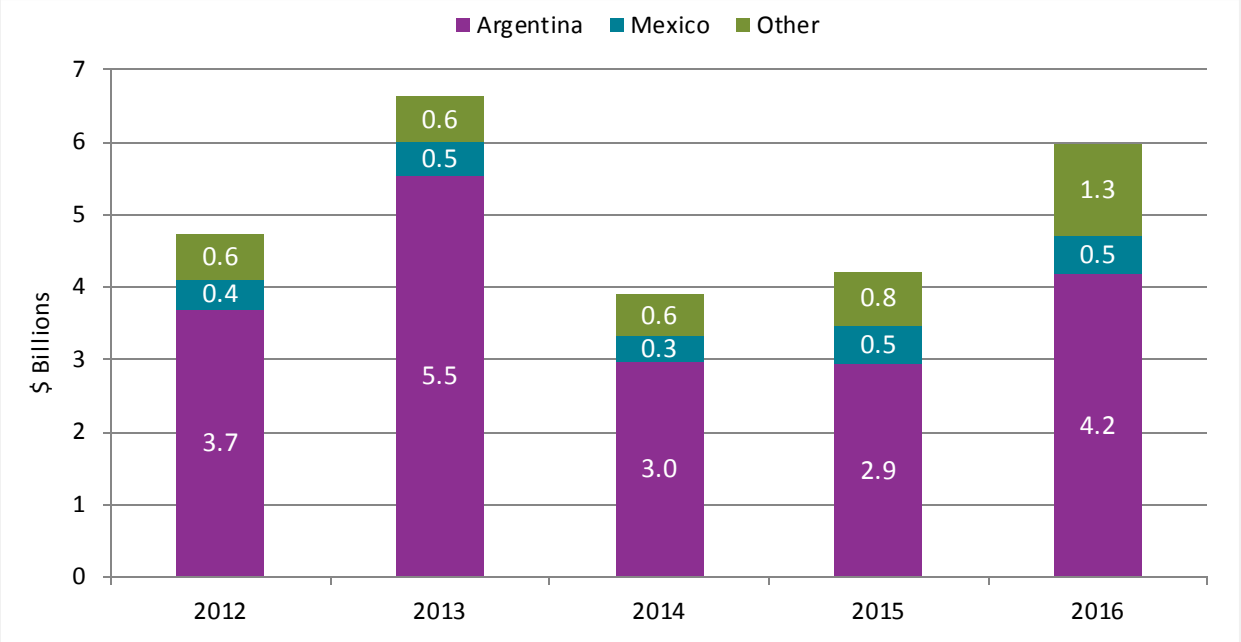


Source: IHS Markit, GTA Database (accessed June 28, 2017).

At the same time, between 2012 and 2016, Brazil was Argentina's top passenger vehicle supplier, as well as the top destination for Brazilian passenger vehicle exports (figure 3.8). Total Argentine passenger vehicle imports ranged from a high of $7.9 billion in 2013 to a low of $3.8 billion in 2015. However, during 2016, Brazil was the source of 78 percent of Argentina's passenger vehicle imports.[343] Domestically produced vehicles made up 45 percent of Argentina's vehicle sales from 2011 to 2015.[344]

[342] ANFAVEA, "Series Historicas [Historical series]," 2016 (accessed June 29, 2017).
[343] IHS Markit, GTA Database (accessed June 28, 2017).
[344] Asociación de Fábricas de Automotores (ADEFA) [Association of Automobile Manufacturers], *Basic Automotive Statistics 2013*, 14, 20; ADEFA, *Basic Automotive Statistics 2015*, 69, 72.

Figure 3.8: Brazil's passenger vehicle exports during 2012–16



Source: IHS Markit, GTA Database (accessed June 28, 2017).

Parts Trade between Argentina and Brazil

As noted, Argentina and Brazil also supply each other with vehicle parts. However, while a large share of vehicle parts exports from Brazil are destined for Argentina, Brazil imports a much smaller share of its vehicle parts from Argentina. In 2016, Brazil was Argentina's top foreign supplier of automotive parts. During 2012–16, Brazil averaged $5.0 billion in parts exports, with over 39 percent ($2.0 billion) sent to Argentina. Such exports included a variety of different vehicle components.[345]

Customs Barriers and Efforts at Reform

Argentina and Brazil have made recent efforts to liberalize their trade regimes. Specifically, Argentina's implementation of a new import licensing program in 2015 is a positive step towards addressing a lack of transparency in the previous import licensing program that sometimes delayed the import of intermediate goods. This new import license program was partly in response to a WTO dispute between the United States and Argentina in which the United States claimed that some measures in Argentina's previous import licensing program were inconsistent with various WTO agreements.[346] The new program could be a significant step leading to enhanced integration of the Argentina-Brazil vehicle supply chain. In addition,

[345] IHS Markit, GTA Database (accessed August 19, 2016).
[346] WTO, "DS444: Argentina," January 26, 2015.

both countries recently have taken other bilateral trade liberalization measures. For example, they have worked to increase the flexibility of Mercosur's export-balancing requirements and have demonstrated greater openness to automotive trade.

Import License Barriers in Argentina

Argentina still imposes some restrictions on vehicles and parts and uses import licenses to enforce these measures. Argentina requires import licenses for the import of vehicles and some parts, and also has import quotas for vehicles that do not have a domestic equivalent.[347] While nearly 87 percent of goods are governed by automatic import licenses, which are granted upon completion of the import license application, passenger vehicles and many vehicle parts can only be imported under non-automatic licenses, which are reviewed by Argentina's Federal Administration of Public Revenues (AFIP).[348] Nonautomatic licenses are only valid for 90 days, and approval time for these licenses can vary significantly.[349] According to U.S. industry representatives in Argentina, non-automatic licenses for parts used in vehicle assembly are approved rapidly (often in less than 48 hours).[350] Rapid approval of import licenses increases certainty for manufacturers, and reduces the time it takes to import inputs, which may make it more competitive to produce vehicles using inputs from GSCs in Argentina. By contrast, licenses for the import of parts that will be sold in the aftermarket tend to take longer, though usually no more than 60 days. Industry sources indicate that the longer approval times for aftermarket parts may potentially be used to increase the costs and time it takes for importers to receive such parts relative to domestic producers. However, industry representatives also acknowledge that the reasons for approval delays are often unclear.[351]

Efforts to Improve Argentina's Import Licensing Regime

In December 2015, Argentina's AFIP established a single window for the management of import licenses, both automatic and non-automatic. This new import licensing system is an attempt to increase clarity and reduce the extent to which Argentina's import license system acts as a barrier to trade. Industry representatives report that this new system represents a significant improvement over the old one, and that even when problems arise, it is much easier to

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[347] USDOC, ITA, Office of Transportation and Machinery, *Compilation of Foreign Motor Vehicle Import Requirements*, December 2015, 16–17. The quotas are designed to limit the share of vehicles imported into Argentina to a fraction of domestically produced vehicles.

[348] Administración Federal de Ingresos Públicos (AFIP) is Argentina's tax-collecting body under its Ministry of Treasury and Public Finances. Government of Argentina, Ministry of Justice and Human Rights, "Transaction of Automatic and Non-Automatic Import Licenses," Ministry of Production, Resolution 5, 2015, Annexes XVI and XVII, December 22, 2015.

[349] U.S. Embassy in Argentina, "Trade Barriers," August 2016, 28–29.

[350] Industry representative, interview by USITC staff, Buenos Aires, October 31, 2016 and November 1, 2016.

[351] Ibid., November 1, 2016.

communicate with Argentine customs officials to resolve issues.[352] However, customs officials in Argentina are still sensitive to imports of parts and components that compete directly with domestically produced parts and components. Those parts and components typically receive import licenses, but they may take the full 60 days to gain approval.[353]

Local Content Rules and Export-Balancing Requirements

As mentioned, the local content rules and Mercosur-related trade-balancing requirements may limit the integration of Argentina and Brazil's automotive supply chains through two specific measures. First, Brazil's "Inovar Auto" program, established in 2012, is a system of tax incentives aimed at motivating the assembly of vehicles in Brazil and encouraging firms to engage in other high-value-added activities in Brazil. Argentina has drafted a similar law.[354] These laws each encourage the use of domestic (Argentine or Brazilian) content, but not content sourced from either trade partner. Thus, they reduce the incentive to strengthen the supply chain between Argentina and Brazil. Second, according to the current automotive agreement between Argentina and Brazil under Mercosur, Brazilian auto manufacturers may export only 50 percent more vehicles (by value) to Argentina than they import from Argentina. In total, Brazilian-produced vehicle sales in Argentina cannot account for more than 44 percent of total vehicle sales. However, Argentine-produced vehicle sales in Brazil cannot account for more than 11 percent of total vehicle sales.[355] The goal of the Mercosur-related requirements is to encourage development of vehicle manufacturing industries in both Argentina and Brazil. The automotive agreement was extended in June 2015 and June 2016.[356] The June 2016 extension will last until 2020, with the possibility of expanding the ratio to 70 percent for Mercosur countries if certain conditions are met.[357]

Conclusion and Outlook

According to industry sources, changes to Argentina's import licensing program may reflect a desire to work more closely with global trade partners, as the new program appears to meet

[352] Industry representative, interview by USITC staff, Buenos Aires, October 31, 2016.
[353] Ibid., November 1, 2016.
[354] Government of Argentina, *Boletín Oficial de la República Argentina* [Official Journal of the Republic of Argentina], Régimen de Desarrollo y Fortalecimiento del Autopartismo Argentino [Plan for Developing and Strengthening the Argentine Auto Parts Industry], August 1, 2016; Façanha, "Brazil's Inovar Auto-Incentive Program," February 2013, 1–3; industry representatives, interviews by USITC staff, Buenos Aires, October 31 and November 1, 2016. The EU has filed a complaint regarding the Inovar Auto program with the dispute settlement body of the WTO, "Brazil—Certain Measures Concerning Taxation and Charges," March 26, 2015.
[355] Marsh, "Argentina, Brazil Sign New Car Trade Pact," June 11, 2014; Invest In Brazil, "Brazil and Argentina Renew Automotive Agreement by 2020" (accessed August 31, 2016).
[356] Invest In Brazil, "Brazil and Argentina Renew Automotive Agreement by 2020" (accessed August 31, 2016).
[357] Industry representative, interview by USITC staff, Buenos Aires, October 31, 2016.

the standards of the WTO's Trade Facilitation Agreement.[358] While industry representatives indicate that import licenses, local content rules, and export-balancing requirements still have an impact on the automotive supply chain between Argentina and Brazil, they maintain that the negative effect of such policies is much less than it was in previous years, and it may decline further in light of the economic reforms promised by President's Macri's administration. This, in turn, may increase the efficiency with which vehicles and vehicle parts are traded between the two countries. Despite progress in addressing these issues, the auto supply chains in Argentina and Brazil remain much less integrated than the North American auto supply chain.

Semiconductor Supply Chain Case Study: The Philippines and Vietnam

Introduction

The second case study examines the semiconductor supply chain in the Philippines and Vietnam. In general, semiconductor supply chains have undergone a significant transformation since their development in the 1960s, primarily as a result of the elimination of tariffs and lower border costs.[359] In particular, the WTO Information Technology Agreement (ITA) eliminated tariffs on semiconductors and various electronics goods among all signatories, which in turn facilitated the development of GSCs for these products.[360] Semiconductor firms are careful to select countries with low tariffs and without other trade barriers affecting their supply chains.[361] Modern semiconductor supply chains take advantage of increased specialization in various locations with large increases of intermediate-goods trade among ITA participants. In 2016, the semiconductor industry estimated that a typical semiconductor product travels through a supply chain across at least four national borders and 25,000 miles before being inserted into a final good.[362]

Southeast Asian countries, including the Philippines and Vietnam, are among the top importers and exporters of semiconductor products. Intermediate and final semiconductor products are imported and exported during the "assembly, test, and packaging" portion of the supply

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[358] Ibid, October 31 and November 1, 2016.
[359] USITC, hearing transcript, February 9, 2017, 30–32 (testimony of Devi Keller, Semiconductor Industry Association).
[360] WTO, "15 Years of the Information Technology Agreement," May 2012, 43. As of May 2017, there were 82 participants in the ITA. These countries account for approximately 97 percent of international trade in information technology products. WTO, "Information Technology Agreement" (accessed May 19, 2017).
[361] Multinational semiconductor firms also choose Southeast Asian countries like the Philippines and Vietnam for their production activities due to relatively low-wage labor, high productivity yield, and proximity to final semiconductor purchasers.
[362] SIA and Nathan Associates, *Beyond Borders: The Global Semiconductor Value Chain*, May 2016, 10.

chain.[363] These countries also import finished semiconductors as intermediate parts for electronics goods (such as mobile phones and computers). In recent years, both the Philippines and Vietnam have made improvements to their respective customs agencies and introduced government certification programs to speed customs processes for approved firms. These improvements have reduced clearance times for imports. However, some customs barriers remain, as explored in this case study. Foremost among these are inconsistent import licensing enforcement on used equipment, import and export licensing procedures on cryptographic goods, and inadequate infrastructure that hinders the efficient border clearance of intermediate and finished semiconductors.

Overview of the Semiconductor Industry

Industry Description

Pioneered by U.S. engineers in the late 1940s and 1950s, semiconductors are small electronic goods, based primarily on silicon materials that enable all modern electronics. The computing and data processing facilitated by semiconductors has played a crucial role in the development of information and communications technology and related industries since the 1960s.[364] Semiconductor products include integrated circuits, memories, microprocessors, and analog devices. The semiconductor industry is a supplier to almost all manufacturing industries that use electronic components, including, for example, computers, mobile phones, industrial machinery, and transportation equipment. Semiconductor research and design, as well as front-end manufacturing, take place in both developed and developing economies, while back-end manufacturing usually takes place in developing countries to leverage low labor costs and proximity to end-markets.[365]

In 2016, global semiconductor sales reached $357 billion.[366] Firms headquartered in the United States accounted for 50 percent of global sales, followed by South Korea (17 percent), Japan (11 percent), and Taiwan (6 percent).[367] The 5 five global semiconductor firms accounted for 41 percent of the market share, while the top 10 firms' market share was 56 percent (table 3.5).[368] In 2016, 4 firms from the United States were among the top 10 global suppliers of semiconductors and accounted for 27 percent of global semiconductor sales. China is the

[363] Intermediate semiconductors include cut and uncut wafers. Final, or finished, semiconductors include microprocessors that have undergone the "assembly, testing, and packaging" stage of production.
[364] CRS, *U.S. Semiconductor Manufacturing*, 2016, 1–2.
[365] Front-end manufacturing primarily consists of wafer production that is highly technical and machinery intensive, requiring accuracy at nanometer levels. Back-end manufacturing adds relatively low value and includes assembly, testing, and packaging that is both machine- and labor-intensive.
[366] IC Insights, "Five Suppliers Hold 41% of Global Semiconductor Market," December 6, 2016.
[367] SIA, *Semiconductor Industry Association 2016 Factbook*, 2016, 3.
[368] IC Insights, "Five Suppliers Hold 41% of Global Semiconductor Market," December 6, 2016.

leading producer of electronic and industrial goods requiring semiconductor components and consumes as much as 59 percent of global semiconductors.[369]

Table 3.5: Top 10 global semiconductor firms by sales revenue, 2016

	Company	Location of headquarters	2016 revenue (billion $)
1	Intel	United States	56.3
2	Samsung	South Korea	43.5
3	TSMC (foundry)	Taiwan	29.3
4	Qualcomm (fabless)	United States	15.4
5	Broadcom (fabless)	Singapore	15.3
6	SK Hynix	South Korea	14.2
7	Micron	United States	12.8
8	Texas Instruments	United States	12.3
9	Toshiba	Japan	10.9
10	NXP	Netherlands	9.5

Source: IC Insights, "Five Top-20 Semiconductor Suppliers," November 15, 2016.
Note: Fabless firms provide only semiconductor design, with no manufacturing capacity.

The costs of producing cutting-edge semiconductor devices have increased dramatically in recent years, even as prices of semiconductors have fallen, leading to a period of accelerated industry consolidation.[370] In addition, these costs, along with the increasing complexity of semiconductor manufacturing, have led to the fragmentation of tasks and the proliferation of GSCs to leverage efficiencies.[371] As a result, most semiconductor firms with manufacturing capabilities operate production facilities in multiple countries. Intel, for example, runs design facilities in California and Oregon; front-end manufacturing facilities (i.e., for the manufacture of semiconductor wafers) in Arizona, New Mexico, and Oregon, as well as in China and Israel; and back-end manufacturing facilities (i.e., for assembly, testing, and packaging) in China, Malaysia, and Vietnam.[372] At the same time, Texas Instruments maintains facilities in Arizona, California, and Texas, in addition to overseas locations in Germany, Japan, Malaysia, Mexico, the Philippines, Scotland, and Taiwan.[373]

Semiconductor Manufacturing and Trade

Because semiconductors are produced in several steps that cross multiple borders before they become finished products, the value of total global imports of semiconductors is more than double the value of global semiconductor sales. In 2015, global imports of semiconductors

[369] PwC, *China's Impact on the Semiconductor Industry*, January 2017, 4.
[370] The pace of industry innovation so far accords with Moore's law, a prediction by Gordon Moore, a co-founder of Intel, that the industry would be able to double the number of transistors within the same amount of space every 18 months. While that pace of innovation continues, the costs are reportedly becoming prohibitive. SIA and Nathan Associates, *Beyond Borders: The Global Semiconductor Value Chain*, 2016, 5.
[371] SIA and Nathan Associates, Beyond Borders: *The Global Semiconductor Value Chain*, May 2016, 15.
[372] Intel, *Intel 2016 Annual 10K Report*, 2017, 9.
[373] Texas Instruments, *Texas Instruments 2016 Annual 10K Report*, February 2017, 14.

totaled $728 billion, compared to global semiconductor sales of $335 billion.[374] While U.S.-based firms account for a majority of global semiconductor sales, the United States ranks as only the fourth-largest importer and sixth-largest exporter of semiconductors (table 3.6).

Table 3.6: Top 11 global importers and exporters of semiconductors in 2015

	Importer	2015 import value, billion $	Exporter	2015 export value, billion $
1	China	262.0	China	105.4
2	Hong Kong	115.4	Hong Kong	97.6
3	Singapore	59.2	Singapore	85.1
4	United States	42.1	Taiwan	72.6
5	South Korea	37.4	South Korea	58.0
6	Taiwan	37.4	United States	42.1
7	Malaysia	29.2	Malaysia	35.7
8	Japan	25.6	Japan	34.7
9	Germany	19.7	Germany	19.4
10	Mexico	18.3	Philippines	17.3
11	Vietnam	14.3	France	8.8

Source: IHS Markit, GTA database, 2016 (accessed January 24, 2017). Products are classified in HS 8541, 8542, 381800, 852352 (corresponds to NAICS 334413).
Note: Vietnam is the 13th-largest exporter, accounting for $4.7 billion in global semiconductor exports.

Even as firms based in the United States have maintained leadership in global semiconductor sales, a significant portion of front-end manufacturing capacity has shifted to Asia. In 2016, Taiwan accounted for 21 percent of semiconductor wafer manufacturing capacity, followed by South Korea (20.9 percent), Japan (17.1 percent), North America (13.4 percent), China (10.8 percent), and Europe (6.4 percent).[375] The Philippines and Vietnam do not currently have any front-end manufacturing capabilities. However, as participants in back-end manufacturing activities, such as assembly, testing, and packaging, the Philippines was the 10th-largest global exporter of semiconductors by value in 2015, and Vietnam was the 11th-largest global importer of semiconductors by value during that year.

Major Customs Barriers Encountered by the Semiconductor Industry in Vietnam and the Philippines

Semiconductors cross multiple borders; in many cases, a good may cross the same border multiple times before being sold. Hence, semiconductor firms choose markets where border

[374] IHS Markit, GTA Database, 2016 (accessed January 24, 2017); SIA, *Semiconductor Industry Association SIA 2016 Factbook*, 2016, 2.
[375] IC Insights, "Taiwan Maintains Largest Share," February 23, 2017. According to SIA, the United States accounts for nearly all of North America's semiconductor production. Industry representative, email message to USITC staff, April 6, 2017.

costs are low.[376] For example, Brazil and India are notably absent from semiconductor production chains, primarily due to the high costs of getting goods into and out of those markets.[377] In addition, because tariffs are rarely imposed on semiconductor products within a supply chain, customs barriers are mainly due to burdensome regulations (including regulatory uncertainty) and inadequate infrastructure.[378] Localization requirements, including data localization laws, have been also noted by the industry as a significant supply chain barrier, as GSCs rely heavily on cross-border data flows.[379]

In the Philippines and Vietnam, certain regulations limit the capacity of semiconductor and electronics firms to produce goods in these countries and clear them at border checkpoints. First, in Vietnam, the new Law on Information Security (LONIS) may impose significant customs delays if semiconductor companies and importers are required to submit extensive certification processes for imports of goods that use civil cryptography.[380] Second, Vietnam's inconsistent import licensing procedures and its restrictions on used equipment that is older than 10 years have made it harder for semiconductor firms to bring in necessary equipment and consolidate operations from other countries through intra-firm trade.[381] Separately, in the Philippines, burdensome customs procedures for importing specialized goods, including certain chemicals used to manufacture semiconductors, add to border costs for semiconductor firms. Overall, regulations in both the Philippines and Vietnam have increased the costs, time, and risks associated with clearing semiconductor goods through customs checkpoints in those two countries.

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[376] SIA and Nathan Associates, *Beyond Borders: The Global Semiconductor Value Chain, 2016*, 15.

[377] Most semiconductor products receive duty-free treatment among signatories of the Information Technology Agreement (ITA), and the agreement covers most of the semiconductor market. Countries that are not signatories to the ITA, or have not implemented the agreement completely, are usually absent from the supply chain. WTO, "Information Technology Agreement at 15," 2013; USITC hearing transcript, February 9, 2016, 25–26, 30–32 (testimonies of Devi Keller, Semiconductor Industry Association, and Ed Brzytwa, Information Technology Industry Council).

[378] Some tariff issues still exist due to a few countries within the supply chain that have not yet joined the WTO ITA expansion agreement or are implementing it only slowly. The expansion agreement includes duty-free treatment of newer generations of semiconductor products.

[379] Localization requirements stipulate that firms must include content made locally for imported products. USITC hearing transcript, February 9, 2016, 28 (testimony of Ed Brzytwa, Information Technology Industry Council). Other industry sources state that three types of data that need constant flows are: (1) technical data required for highly precise manufacturing that needs real-time monitoring, (2) R&D data that need real-time monitoring and updates, and (3) logistics data that require a firm to track supply-chain functionality in real time.

[380] Civil cryptography refers to cryptography functions used in nonmilitary applications to ensure privacy and deter theft of information. While cryptography restrictions are usually related to cross-border data flows, this section addresses trade restrictions on cryptographic goods.

[381] Semiconductor manufacturing equipment can have a lifespan of more than 30 years.

Vietnam's Law on Network Information Security (LONIS)

The Vietnam began implementing LONIS in July 2016, after it passed the National Assembly in May 2015.[382] LONIS requires import and export permits and licensing for all goods identified as "civil cryptographic products."[383] The Vietnamese government's list of civil cryptographic products includes semiconductors, as well as many electronic goods that contain semiconductors as key components.[384]

The Semiconductor Industry Association (SIA) estimates that about 90 percent of semiconductor products enable or use cryptographic functions, and states that as a result, such border procedures add significantly to the costs of the industry's participation in the supply chain.[385] Several semiconductor firms operating in Vietnam have argued that if customs agencies fully implement the rules as currently legislated, significant border costs will be imposed for both the export and import of semiconductor products.[386] Export and import licensing fees, and the required time-consuming permitting process, would have an adverse impact on the operations of firms that rely on efficient border procedures.

Inconsistent Import Licensing Procedures on Used Equipment in Vietnam

Industry representatives indicate that the customs administration in Vietnam is inconsistent in its enforcement of import licensing requirements. In particular, the government of Vietnam has issued a decree that places restrictions on the importation of used equipment, including machinery used in the production of semiconductors and semiconductor components. This law applies to all firms, whether domestic or foreign owned. Industry representatives report that customs officials in Vietnam enforce the law in an unpredictable, opaque manner, potentially

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[382] According to its preamble, LONIS is aimed at making certain that organizations and individuals are responsible for ensuring network information security. Government of Vietnam, National Assembly, "Law on Network and Information Security (LONIS)," Law 86 2015, QH13 (2015) paragraph 1 (accessed May 22, 2017); Tilleke and Gibbins, "New Law on Cyber Security in Vietnam," June 2016 (accessed August 2, 2017).

[383] The provisions indicate a requirement for both permits and licenses. The difference between the two is not yet clear and is pending further clarification through decrees. Government of Vietnam, National Assembly, "Law on Network and Information Security (LONIS)," Law 86 2015, QH13 (2015) paragraph 1 (accessed May 22, 2017).

[384] Includes all items in HS 8541 (transistors and unmounted semiconductor wafers) and in HS 8542 (processors and memories). Government of Vietnam, National Assembly, "Law on Network and Information Security (LONIS)," Law 86 2015, QH13 (2015) annex 1 (accessed May 22, 2017).

[385] Sashida, "Why Do We Need Encryption Rules in the TPP?" September 2013, 9. LONIS allows firms to obtain permits to import and export civil cryptographic products if they acquire a business license to trade in such goods and are able to verify that such imports do not damage national defense or security. Applications are processed by a government agency in Vietnam. However, significant uncertainties regarding permitting procedures remain. SIA, "Comments on Draft Vietnam Encryption Regulations," July 10, 2013.

[386] Industry representatives, interviews with USITC staff, Ho Chi Minh City, December 1 and 2, 2016. As of June 2017, the implementation of this law is still undergoing consideration by the government of Vietnam.

increasing costs for semiconductor firms importing used equipment from their affiliates.[387] According to industry sources, some firms in Vietnam can import used equipment with relatively simple and informal licensing procedures, without such equipment undergoing further inspections by customs authorities. By contrast, other firms can import used equipment only after a completing a lengthy import-licensing procedure of at least two months, with the possibility of facing further customs inspections.[388] Still other firms are not able to import any used equipment at all despite applying for licenses, and it is unclear what criteria Vietnamese customs officials use to make this determination.[389]

Inefficient Customs Procedures for Specialized Goods in the Philippines

Industry representatives state that certain specialized inputs needed for semiconductor manufacturing, especially chemicals, are often subject to inefficient customs procedures in the Philippines.[390] Industry representatives in the Philippines report that while significant improvements have been made to facilitate the importation of chemicals, customs procedures still impose costs. The importation of chemicals once required 64 signatures by various officials before goods could be imported and transported.[391] That has since been reduced to 30 signatures, and then further reduced to 5 signatures. If any of the 5 signatories are not available, however, the importer must wait.[392] Unfortunately, the chemical permitting process is not included in the Philippines' efforts to create a national single customs window, which is aimed at increasing the efficiency of customs processing and decreasing the potential for corruption by customs officials.[393]

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[387] Industry representatives, interviews with USITC staff, Ho Chi Minh City, December 1, 2016.
[388] Industry representatives, interviews with USITC staff, Ho Chi Minh City, December 1 and 2, and Hanoi, December 8, 2016.
[389] Ibid.
[390] Industry representatives, interviews with USITC staff, Manila, December 5 and 6, 2016.
[391] Ibid., December 6, 2016.
[392] Ibid.
[393] Single windows are efforts by customs and other government agencies to simplify border procedures so that importers and exporters can complete all customs-related documentation, including that required by other government agencies, through a single electronic interface. In the Philippines, the "Philippines National Single Window" is still in the process of being completed. In general, it is reported that the increased use of electronic interfaces in the Philippines for customs processing has lessened opportunities for corruption by customs officials and has reduced clearance time for imports into the country. However, industry representatives observed that, due to customs revenue targets imposed by the Philippines government, difficulties exist in implementing electronic customs systems. As a result, opportunities remain for corruption at ports through direct exchanges with customs officials. Industry representatives, interviews with USITC staff, Manila, December 6, 2016; World Bank, *Doing Business 2017: Trading Across Borders; Technology Gains*, 2017, 84–85.

Infrastructure Constraints near Manila

Inadequate infrastructure constrains the importation of certain chemicals at ports in Manila. Chemicals often require refrigeration to maintain specific temperatures, and they have a limited shelf life.[394] However, bottlenecks in Manila ports can sometimes lead to refrigerated cars losing power if kept idle for an extended period of time, or refrigerator doors may be kept open too long while awaiting outgoing inspection.[395] While the breakdown of these chemicals does not always hinder semiconductor manufacture, the need for firms to maintain reserves of supplies and, potentially, to reorder goods may affect their profitability and redirect resources away from production.[396]

Other infrastructure inadequacies at and near the border are also a major concern for semiconductor firms operating in the Philippines. The widely recognized road congestion in the Manila metro area has caused significant delays for importing and exporting firms, even as customs procedures are generally becoming more efficient.[397] Costs at the border, including customs clearance, documentation, and brokerage costs, account for 20 to 30 percent of logistics costs for semiconductor firms operating in the Philippines.[398] The remaining 70 to 80 percent of logistics costs are the costs of physical transportation. One semiconductor firm estimates that a one-day delay in clearing goods at customs checkpoints could cost the firm up to an additional $250,000 in daily logistics expenses.[399] To avoid such delays, firms maintain about a three-week inventory, despite the associated cargo and warehousing costs.[400]

Attempts to Remediate Customs Barriers

Both the Vietnamese and Philippine governments have engaged in efforts to streamline their customs and border processes to encourage participation in the semiconductor supply chain, including the expansion of specialized trade zones.

Streamlining Customs Procedures

Vietnam has worked closely with electronics and semiconductor firms to design and implement an electronic customs system to clear goods within 30 seconds of entering the port.[401] While not all goods are eligible, semiconductors and electronics supply chains are direct beneficiaries

[394] Industry representatives, interviews with USITC staff, Manila, December 6, 2016.
[395] Ibid.
[396] Ibid.
[397] Government of the Philippines, Philippine Institute for Development Studies, "A System-Wide Study of the Logistics Industry," March 2015.
[398] Ibid.
[399] Ibid.
[400] Industry representatives, interviews with USITC staff, Manila,, December 6, 2016.
[401] Vietnam Plus, "Intel Celebrates 10th Anniversary in Vietnam," December 10, 2016.

of speedy customs clearances. The Ho Chi Minh City customs office reports that only 18 percent of port clearance time is accounted for by customs, with the remaining 82 percent due to other government agencies requiring import or export licensing.[402] Similarly, in the Philippines, the customs bureau has designed an electronic-to-mobile automated customs system. While it is a significant improvement from a paper-based system, the electronic system is reportedly not modern and requires frequent maintenance. In addition, firms cited weekly power and communications blackouts that last from several hours to as long as three days.[403]

In Southeast Asia, trade facilitation efforts through the Asia-Pacific Economic Cooperation (APEC) forum and the Association of Southeast Asian Nations (ASEAN), as well as multilateral initiatives under the WTO, have been important in lowering trade costs and simplifying customs procedures in member countries.[404] Further, for both the Philippines and Vietnam, the attempts to create single customs windows are still ongoing.[405] The WTO trade facilitation efforts, coupled with APEC and ASEAN programs, are expected to positively contribute to lowering the costs of trade in both countries.[406]

Specialized Import and Export Processing Zones

The Philippines and Vietnam have designated certain areas and specific firms as part of export processing zones, allowing some firms to import and export goods without tariffs or value-added taxes and to benefit from rapid border processing. In Vietnam, the first specialized zones were introduced over 20 years ago. Currently, four export processing zones (three in and around Ho Chi Minh City, and one in Tay Ninh province) accommodate firms in various supply chains, including most semiconductor manufacturers.[407]

In the Philippines, the Department of Trade and Industry's Philippine Economic Zone Authority (PEZA) has authorized the creation of over 230 information technology parks and centers and more than 70 manufacturing economic zones since 1995.[408] These zones (which could be as large as industrial parks and as small as single buildings) aim for regulatory consistency and

[402] Government representatives, interviews with USITC staff, Ho Chi Minh City, December 2, 2016.
[403] Industry representatives, interviews with USITC staff, Hanoi, December 6, 2016.
[404] USITC, hearing transcript, February 9, 2017, 24, 28 (testimony of Ed Brzytwa, Information Technology Industry Council). APEC established two Trade Facilitation Action Plans—TFAP I (2002–06) and TFAP II (2007–10)—to advance "free and open trade" among APEC's 21 member countries. Among other goals, these plans aim to simplify customs procedures among APEC members and to ensure the mutual recognition of these countries' authorized economic operator (AEO) programs. Both the Philippines and Vietnam, which have ratified the WTO Trade Facilitation Agreement, are committed to customs reforms outlined in the TFAP.
[405] World Bank, *Doing Business 2017: Trading Across Borders; Technology Gains, 2017*, 82; World Bank, *Doing Business 2017: Trading Across Borders*, 2016.
[406] Government representatives, interviews with USITC staff, Ho Chi Minh City, December 2, and Hanoi, December 9, 2016.
[407] Vietnam Business Forum, "Industrial, Export Processing and Economic Zones," June 16, 2015.
[408] Government of the Philippines, DTI-PEZA, "Operating Economic Zone Map," October 31, 2016.

predictability, as well as offer exemption from corporate income tax, duty-free status for the import of raw materials and capital equipment, and simplified import and export procedures.[409] The PEZA program has been used by the Philippine government to encourage specific industries to invest, especially in two priority areas: information technology parks and export manufacturing. As a result, the semiconductor industry in the Philippines relies on PEZA zones to avoid tariffs and costly customs procedures. Almost all major semiconductor firms in the Philippines operate in PEZA zones.[410]

Conclusion and Outlook

The GSC for semiconductors is highly sensitive to tariffs and border costs in places like the Philippines and Vietnam. Semiconductor firms' successful participation in supply chains requires an environment of low tariff barriers and predictable application and enforcement of regulations.[411] The WTO ITA has eliminated tariffs on most semiconductor products among its signatories, including the Philippines and Vietnam. Thus, firms are allowed to operate through GSCs without facing significant tariff barriers. Moreover, regional and multilateral trade facilitation efforts, such as those associated with APEC, ASEAN, and the WTO, have helped streamline customs procedures and reduce trade costs in countries like the Philippines and Vietnam, thereby enabling these countries to more fully participate in GSCs.[412] In addition, national, regional, and multilateral initiatives to address these barriers and to lower border costs are currently being implemented or are under consideration in both countries. At the same time, however, the existence of LONIS in Vietnam, as well as the unpredictable enforcement of regulations and other technical barriers to semiconductor trade in Vietnam and the Philippines, may continue to impose costs on such trade in the two countries.[413]

[409] Government of the Philippines, DTI-PEZA, "Activities Eligible for PEZA Registration and Incentives" (accessed May 19, 2017).
[410] Industry representatives, interviews with USITC staff, Manila, December 5 and 6, 2016.
[411] USITC, hearing transcript, February 9, 2017, 101–102 (testimonies of Devi Keller, Semiconductor Industry Association; and Mario R. Palacios, Intel Corporation).
[412] Ibid., 24, 28, 36, 39, 42, and 101–102 (testimonies of Ed Brzytwa, Information Technology Industry Council; Devi Keller, Semiconductor Industry Association; and Mario R. Palacios, Intel Corporation).
[413] Ibid., 28 (testimony of Ed Brzytwa, Information Technology Industry Council).

Logistics Services in Sub-Saharan Africa

Introduction

The third and final case study discusses customs and other border impediments to trade affecting third-party logistics (3PL) firms in sub-Saharan Africa (SSA).[414] In general, the logistics sector is a growing facilitator of global trade and supply chain activity, and global 3PL revenues rose by 5.9 percent annually between 2010 and 2015.[415] The largest global logistics firms have evolved from being primarily transportation services providers to managing their customers' supply chains.[416] This evolution reflects, in part, the geographic dispersion of production activities and the increasing tendency for manufacturing firms to outsource noncore functions to third-party firms, including logistics providers.

In SSA, the quality of the region's logistics infrastructure has often been poor, constraining trade within the region as well as between SSA and foreign countries. This handicap has limited the region's participation in GSCs.[417] Goods encounter repetitive and lengthy delays at the border, decreasing the efficiency and increasing the costs of trade for supply chains in the region. World Bank data show that SSA is the world's most expensive and time-consuming region in terms of meeting border compliance requirements (figure 3.9).[418] Customs barriers at SSA's ports of entry, coupled with the poor quality of the region's road infrastructure, result in even higher transport costs in SSA's landlocked countries, further impeding the region's supply chain performance. Illustratively, 94 percent of SSA's losses in agricultural goods are due to the poor condition of the region's logistics infrastructure.[419]

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[414] 3PL firms provide a range of services to their customers, including transportation, warehousing, freight forwarding, customs brokerage, and supply chain management services, among others. USITC, *Recent Trends in U.S. Services Trade*, May 2015, 54. For the purposes of this section, the terms "3PL" and "logistics" are used interchangeably.

[415] Capgemini, *2012 Third-Party Logistics Study*, 2012, 7; Armstrong & Associates, "Global 3PL Market Size Estimates," October 3, 2016.

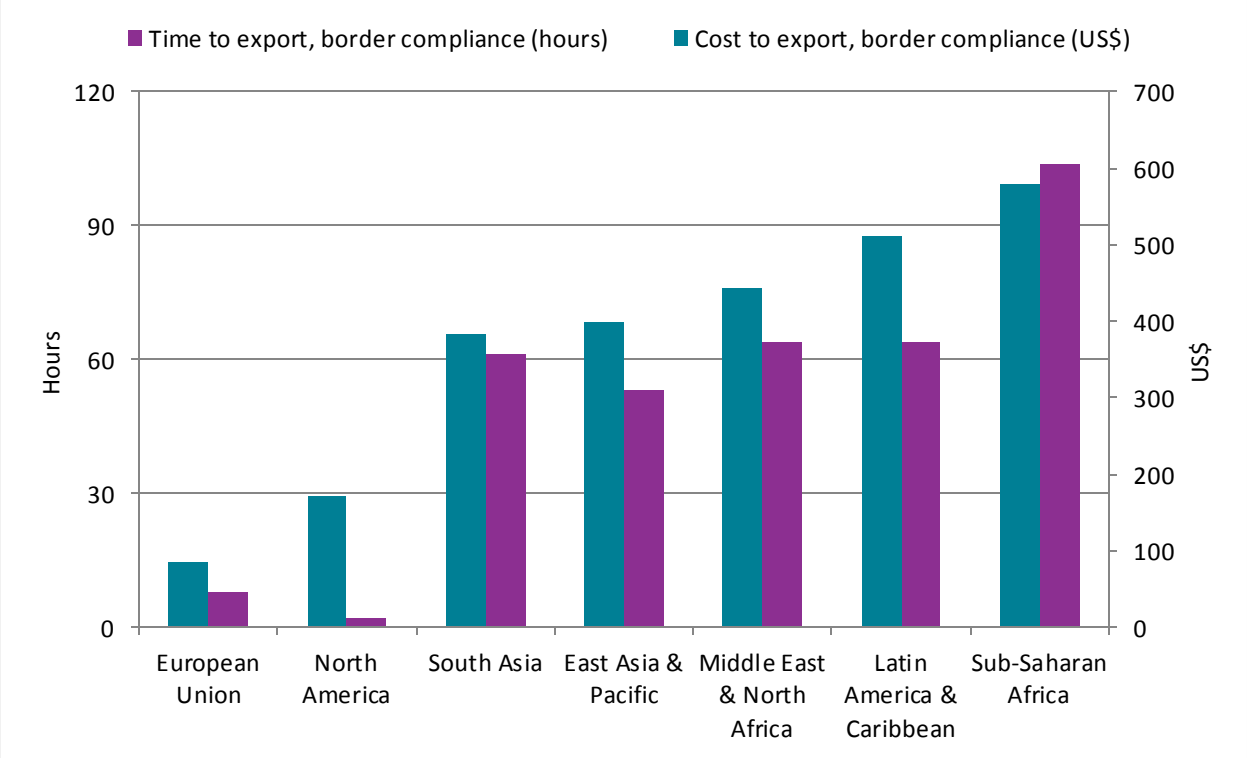
[416] World Economic Forum, *Outlook on the Logistics and Supply Chain Industry,* 2013, 6.

[417] Limão and Venables, "Infrastructure, Geographical Disadvantage, Transport Costs, and Trade," October 2001.

[418] The World Bank databank defines border compliance as "the time and cost associated with compliance with the economy's customs regulations and with regulations relating to other inspections that are mandatory in order for the shipment to cross the economy's border, as well as the time and cost for [cargo] handling that takes place at its port or border. The time and cost for this segment include time and cost for customs clearance and inspection procedures conducted by other government agencies."

[419] *Logistics Update Africa*, "Capitalizing on Perishables Trade," 2016.

Figure 3.9: Cost and time to export in sub-Saharan Africa compared to other regions based on border compliance procedures, 2016



Source: World Bank, "Databank: World Development Indicators," 2017 (accessed June 30, 2017).

However, although measurements of trade and logistics performance in SSA lag behind those of other developing regions, it is notable that many SSA countries are experiencing some of the fastest improvements in both areas, albeit from a low base.[420] Recognizing the benefits of increased international trade for their economies, a number of countries in SSA are taking measures to address the poor quality of their logistics services. They are primarily targeting the pervasive problem of customs delays, both at the border and along trade routes. For example, there has been a rise in the number of single customs windows dedicated to streamlining paperwork at the border in SSA countries.[421] Also, there have been initiatives to track and discourage customs officials from demanding bribes and imposing delays on trucks passing through customs checkpoints.[422] Finally, a number of large-scale port, road, and rail investments are being made. These are aimed at achieving low-cost delivery service to SSA's

[420] USITC calculations from World Bank, World Development Indicators, 2017. For further discussion of how logistics performance, among other factors, help influence the degree to which developing countries, such as those in SSA, better integrate into global value chains, see OECD, "The Participation of Developing Countries," April 2015.
[421] Tsen, "Ten Years of Single Window Implementation," 2011, 5. Single customs windows do not necessarily require Internet technology, although it has been part the aim of most single-window projects to establish a single paperless facility where traders can submit all relevant information, whether for export, import, or transit.
[422] Kingombe, *Hard and Soft Infrastructure Development in Africa*, July 1–3, 2014, 18.

landlocked countries, thereby potentially improving the efficiency of the region's supply chain operations.

This case study begins with an overview of the global logistics market, followed by a discussion of logistics services in SSA as they relate to the region's ability to integrate into GSCs. It then explores how inefficient and nontransparent customs and border procedures, as well as inadequate transport infrastructure, limit market access for logistics firms in SSA and increase the costs of moving goods throughout the region. The case study concludes with an overview of recent efforts to improve SSA's customs environment.

Overview of the Global Logistics Market

Industry Description

Logistics services include a range of activities that pertain to the transport of primary, intermediate, and final goods between suppliers, producers, and consumers. These activities often include freight forwarding; transport by air, ship, truck, or rail; warehousing and storage; tracking and tracing; and customs brokerage.[423] Producers seeking to export may outsource many of these services to 3PL providers in order to reduce their costs and allow them to better focus on their core competencies. In addition, 3PL firms provide services to help their customers manage all phases of their supply chains from planning, storing merchandise, and facilitating border crossing, to final delivery of products. Many logistics firms have operations dedicated to supply chains that make trade more efficient.[424] As 3PL firms are increasingly involved with each supplier in their customers' supply chain, they are important participants in global trade.

Primary Global Participants

Many of the largest 3PL firms began by providing physical distribution in the 1960s and 1970s, expanding to become larger logistics operations in the 1980s and 1990s and evolving into broader supply chain management service providers in the 2000s.[425] In 2015, global 3PL revenue reached $721 billion.[426] The Asia-Pacific region comprised the largest market, accounting for 38.4 percent of global revenue, followed by North America (26.4 percent),

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[423] USITC, *Logistic Services: An Overview of the Global Market*, May 2005, 2-1. These activities facilitate the physical distribution of goods from origin to end user.

[424] For instance, see DHL, "Supply Chain Solutions," http://www.dhl-usa.com/en/logistics/supply_chain_solutions.html; FedEx, "Making Integrated Logistics Management Your Competitive Advantage," http://supplychain.fedex.com/; UPS, "Welcome to UPS Supply Chain Solutions," https://www.ups-scs.com/ (all accessed May 3, 2017).

[425] Dittmann and Vitasek, "Selecting and Managing a Third Party Logistics Provider," 2016, 3.

[426] Armstrong & Associates, Inc., "Global 3PL Market Size Estimates," October 3, 2016.

Europe (21.4 percent), and South America (4.9 percent) (table 3.7). Together, these four regions account for 91.1 percent of the global 3PL market, with the remaining 8.9 percent encompassing the Middle East, North Africa, and SSA.[427]

Table 3.7: Global third-party logistics (3PL) revenues by region, 2006–15

Region	2015 global 3PL revenue (billion $)	Global market share (%)	Annual revenue growth, 2006–14 (%)
Asia-Pacific	276.9	38.4	10.2
North America	190.1	26.4	4.3
Europe	154.5	21.4	0.7
South America	35.3	4.9	8.1
Other	64.2	8.9	
Total	721.0		

Source: Capgemini, *2016 Third-Party Logistics Study*, 2016, 12; Armstrong & Associates, "Global 3PL Market Size Estimates 2015," October 3, 2016.

In 2015, Europe as a whole ranked third in terms of 3PL global market share: 5 of the top 10 individual 3PL providers in that year were European firms (table 3.8), possibly reflecting historical trade relationships.[428] Overall, 17 of the 50 largest 3PL firms are based in Europe, and those firms account for 56 percent of the total gross revenue among the top 50 ranked firms. In addition, 19 firms on the list were from the United States, 6 from Japan, and 1 from China.[429]

Table 3.8: Leading global 3PL firms, 2015

Rank	3PL firm	Country of headquarters	Gross revenue (million $)	Market share (%)
1	DHL Supply Chain & Global	Germany	29,562	4.1
2	Kuehne + Nagel	Switzerland	21,100	2.9
3	DB Schenker	Germany	17,160	2.4
4	Nippon Express	Japan	15,822	2.2
5	C.H. Robinson	United States	13,476	1.9
6	UPS Supply Chain Solutions	United States	8,215	1.1
7	DSV	Denmark	7,574	1.1
8	Sinotrans	China	7,314	1.0
9	CEVA Logistics	Netherlands	6,959	1.0
10	Expeditors	United States	6,617	0.9
25	Imperial Logistics	South Africa	3,596	0.5

Source: Armstrong & Associates, Inc., "A&A's Top 50 Global Third-Party Logistics Providers (3PLs) List," July 14, 2016, and USITC calculations.

Several of the largest 3PL firms have a significant international presence outside of their respective domestic markets, although some are domestically oriented. In 2015, Germany's

[427] Armstrong & Associates, Inc., "Global 3PL Market Size Estimates," October 3, 2016.
[428] Armstrong & Associates, Inc., "A&A's Top 50 Global Third-Party Logistics Providers (3PLs) List," July 14, 2016.
[429] Europe is the largest U.S. export and import market for air freight and airport services, used here as a proxy for logistics services, followed by the Asia-Pacific region and Latin America. SSA holds the smallest share of both U.S. exports and imports of logistics services, accounting for only 2 percent each. USDOC, BEA, *Survey of Current Business*, December 2016, 14–25, table 2.2.

Deutsche Post DHL Group (DHL) derived less than half of its revenue from the European market, compared to 37 percent from the Asia-Pacific region and 19 percent from the Americas.[430] Similarly, Kuehne + Nagel, a Switzerland-based firm, derived 64 percent of its revenue from Europe, the Middle East, and Africa in 2015.[431] Conversely, two of the largest U.S. 3PL firms—C.H. Robinson and UPS—earned the majority of their revenue in the domestic market. In 2015, C.H. Robinson garnered roughly 90 percent of its revenue in the United States,[432] while this share was 78 percent for UPS.[433]

GSCs and the Logistics Environment in SSA

Background on GSCs in the Region

While 3PL firms expand the range of services that they provide to their clients, GSCs in SSA have been less prominent than those in other parts of the globe. However, they are growing in significance. In the apparel sector, for example, GSC activities related to design, production, and retail are routinely carried out in SSA.[434] African designers of men's wear and women's wear, particularly in Nigeria, are achieving global acclaim, and cut-and-sew and other production operations related to GSCs are common in SSA. In a 2015 survey by the management consulting firm McKinsey, 13 percent of the responding procurement professionals from large apparel companies identified Ethiopia as one of their top three global locations for garment manufacturing.[435] Although many garments made in Africa are marketed abroad, online shopping sites, such as Jumia and Konga, facilitate efforts by African garment designers and manufacturers to complete the final retail link of the GSC within Africa. 3PL firms are expected to play an increasingly important role in facilitating this transformation.

Similarly, as governments across the continent invest in its agricultural sector and adopt more market-friendly policies, important supply chains in SSA will consist of agricultural products that are grown in SSA and marketed in Europe.[436] Examples include table grapes from South Africa,[437] fresh fruits from South Africa,[438] and cashews from West Africa.[439] Many of these products, the most perishable of which are transported in refrigerated containers, must clear

[430] DHL, *Deutsche Post DHL 2015 Annual Report*, March 9, 2016, 62.
[431] Kuehne + Nagel, *Kuehne + Nagel 2015 Annual Report*, March 2016, 20.
[432] C.H. Robinson, *C.H. Robinson 2015 Annual Report*, February 29, 2016, 40.
[433] UPS, *UPS 2015 Annual Report*, 2016, 2.
[434] Toesland, "Africa's Fashion Industry Comes of Age," October 12, 2016.
[435] Berg, Hedrich, and Russo, "East Africa: The Next Hub for Apparel Sourcing?" August 2015.
[436] Sanghvi, Simons, and Uchoa, "Four Lessons for Transforming African Agriculture," April 2011.
[437] Ras and Vermeulen, "Sustainable Production and the Performance," 2009, 1–17.
[438] Muller, Vermeulen, and Glasbergen, "Pushing or Sharing as Value-Driven Strategies," 2012, 127–40.
[439] See, for example, USAID, "Hub Looks to Build Links with Cashew Exporters," September 26, 2016. Nine countries in West Africa produce 35 to 40 percent of global cashews. Major supply chain steps include farming, trading, processing, roasting, and retailing.

customs promptly to maintain their integrity. As a result, the frequent delays associated with inspection at customs checkpoints are a serious problem.

The Role of 3PL Firms in SSA

International transport and logistics companies that have established operations in SSA now maintain a sizable footprint in the region. The companies provide 30 percent of SSA's logistics tonnage and of that amount, 15 to 20 percent is supplied by 3PL firms.[440] These firms have helped SSA to integrate into GSCs. For example, improved road and air cargo connections through Nairobi have helped to accelerate Kenya's position in the GSC for supplying horticultural products to Europe.[441] Kenya now accounts for a 38 percent share of the EU market for cut flowers: it has 10 air cargo freighters dedicated to that route, each equipped with the capability for cold-chain delivery.[442] However, although many foreign 3PL firms operate successfully in SSA, market barriers limit opportunities for local firms and may restrict smaller 3PLs from achieving economies of scale.

Regulatory Environment for SSA Logistics and Transport Firms

Limited growth in SSA's logistics sector is partly due to the region's regulatory environment for transportation services.[443] Logistics costs are consistently high within the region, but may vary by country. For example, while transport costs account for 30 to 50 percent of export value within SSA, in SSA's landlocked countries, transport costs account for as much as 75 percent of the value of export shipments.[444] Logistics costs are high both because of inadequate road, rail, and port infrastructure and also because of poor regulations and a poor regulatory environment. The regulatory environment includes the implementation of rules and informal practices, such as delays in approving licenses and bribery. Bribery occurs not just at the border, but at various points along trade routes and has been estimated to account for about 10

[440] *Logistics Update Africa*, "3PLs Have a New Focus," May–June 2015, 8–11. Although SSA's transition to a more integrated logistics environment is slow, many large firms in the region are increasingly using 3PL services, although some continue to handle logistics within the firm. Also, the majority of firms in SSA continue to use smaller logistics operators and single function trucking and shipping firms, often due to cost considerations. Industry representative, interview by USITC staff, Washington, DC, March 3, 2017.
[441] World Bank, *Air Freight: A Market Study*, 2009, 46–47.
[442] Kannoth, "From Farm to Vase," January–February 2016, 6–7.
[443] The regulatory environment refers to informal practices and the way regulations are made and carried out as discussed in Teravaninthorn and Raballand, "Transport Prices and Costs in Africa," 2009, 5. It may include freight-sharing schemes (where shippers must deal with a freight-assigning entity instead of directly with a trucking company), restrictions on the types of vehicles that can be used, and other practices.
[444] *Logistics Update Africa*, "Kenya: Country in Focus," May–June 2014.

percent of the direct logistics costs, with delays due to poor road conditions contributing much more than that (box 3.2).[445]

Box 3.2: Containers Transiting from Ghana to Burkina Faso Encounter Time Delays and High Costs

Supply chains that involve shipping into African ports and then overland to landlocked countries face especially high logistics costs in Africa.

A study of the trade route between Ghana and Burkina Faso published by the U.S. Agency for International Development (USAID) in 2010 details the delays and high costs that cargo can incur. The study found that, due to congestion at the port of Tema, containers could wait at sea for up to 41 hours before even reaching their berth.[a] Once offloaded from the ship, containers were held by the port for more than 14 days and could then take 56 hours to clear customs. The process of getting goods through the port took an average of 40 days from start to finish.[b]

The study also found that upon leaving the Tema port, transit cargo encountered more delays—and demands for bribes—as it continued north to Burkina Faso.[c] At checkpoints within Ghana, truck drivers paid between $0.03 and $0.17/km to officials from government agencies ranging from forestry and customs to the police—this varied by checkpoint and by time of year. Collectively, these payments accounted for between 2 and 10 percent of truck drivers' variable costs. At the Ghana-Burkina Faso border, further bribes and delays might be incurred while paperwork was being processed on both sides of the border before trucks could enter Burkina Faso. The USAID report found that, in total, it took an average of 599 hours (25 days) to transit 1,000 km from Ghana's port in Tema to Ouagadougou, Burkina Faso, for a travel speed of only 40 km (about 25 miles) a day.[d] The study also found that delays in some other routes from ports to landlocked countries in Africa and to other developing countries were comparable and suggested infrastructure improvements and better procedures to reduce costs and delays.

[a] USAID and Nathan Associates, Inc., *West Africa Logistics Analysis Using FastPath*, January 2010, x–xi.
[b] A firm survey conducted in 2011 found similar results. Raballand et al., *Why Does Cargo Spend Weeks in Sub-Saharan African Ports?* 2012, 4. This study found that after being unloaded from a vessel at Tema, transit containers remained at the port an average of 20 days before departing for their destination in Burkina Faso.
[c] USAID and Nathan Associates, Inc., *West Africa Logistics Analysis Using FastPath*, January 2010, x–xi.
[d] Ibid.

The indirect effects of SSA's regulatory environment also impose substantial costs on logistics services providers. For example, in West Africa, there is a quasi-duopoly by two terminal operators: Bolloré Logistics Limited (France) and APM Terminals (Netherlands). These operators manage almost 80 percent of the transport of containerized cargo in the region.[446] Although these two firms have introduced better technology and more modern infrastructure, their market power nonetheless limits competition.[447] In addition, the regulation of road freight

[445] *Economist*, "Trade: Obstacle Course," April 16, 2016.
[446] For example, in SSA, APM Terminals operates ports in Abidjan (Côte d'Ivoire), Tema (Ghana), Lagos-Apapa (Nigeria), and Badagry (Nigeria). Bolloré operates ports in Conakry (Guinea), Cotonou (Benin), Lomé (Togo), Freetown (Sierra Leone), and Dakar (Senegal).
[447] These firms are followed by DP World (Dubai) and Mediterranean Shipping Company (Switzerland). World Bank, "Making the Most of Ports in West Africa," 2015, 20.

through state-owned freight bureaus and shippers' councils—a process susceptible to corruption—encourages and supports small and inefficient trucking companies that do not typically invest in better technology or capital equipment.[448] As a consequence, one industry representative of a firm with operations throughout the continent noted that the firm only used a 3PL company in southern Africa, as high logistics costs prohibited the use of 3PL firms in East or West Africa.[449] Some logistics customers in Africa resort to using small trucking companies with just one or two trucks, despite these firms' relative inefficiency.[450]

Major Customs Barriers Faced by Logistics Firms in SSA

Many (though not all) SSA governments rely heavily on customs revenue. In 2015, 8 of the 20 countries most reliant on international trade taxes for government revenue were in SSA.[451] Lesotho led this global list, deriving 47 percent of its revenue from trade taxes, followed by Madagascar, at 42 percent; Côte d'Ivoire, at 40 percent; Namibia, at 35 percent; and Liberia, at 30 percent.[452] This fits with the empirical finding that less-developed countries rely more on trade-related revenue, whereas countries with higher levels of economic development and liberalized trade regimes rely on income and consumption taxes.[453]

While many SSA governments depend on customs revenue, the collection of such revenue is hampered by corruption,[454] inefficiencies in the customs clearance process, and inadequate road and rail infrastructure. In 2016, SSA surpassed South Asia as having the least efficient customs clearance process of any region, according to the World Bank's Logistics Performance Index (LPI).[455] For example, of the 13 countries where traders need 10 days or longer to clear goods through customs for export, 8 are in SSA.[456] In addition, goods transiting from one country to another within SSA may be required to travel in convoys escorted by customs vehicles. In the West African port of Lomé (Togo), these convoys depart from the port only

[448] Teravaninthorn and Raballand, *Transport Prices and Costs in Africa*, 2009, 33.
[449] Raballand et al., *Why Does Cargo Spend Weeks in Sub-Saharan African Ports?* 2012, 4.
[450] Industry representative, interview by USITC staff, Washington DC, March 3, 2017.
[451] Databank, World Development Indicators database (accessed June 30, 2017). According to the World Bank, taxes on international trade (as a percent of revenue) include "import duties, export duties, profits of export or import monopolies, exchange profits, and exchange taxes."
[452] World Bank, Databank, World Development Indicators database (accessed January 26, 2017).
[453] Seelkopf, Lierse, and Schmitt, "Trade Liberalization and the Global Expansion of Modern Taxes" January 2016; Brautigam, "Building Leviathan," May 2002, 10–20.
[454] Ghana Business News, "Ghana Loses $150m Monthly Due to Corruption at Tema Port," June 14, 2013.
[455] World Bank, Databank, World Development Indicators database (accessed January 26, 2017). In addition, customs transactions in SSA require 40 documents, 200 data entries (15 percent of which must be re-entered 30 times or more). Traders are not well informed about the required documentation, which further adds to delays. UNECA, "Trade Facilitation and Intra-African Trade," 2010, 3.
[456] These are Mauritania, Burundi, Tanzania, Malawi, Zambia, Djibouti, Kenya, and Uganda, as ranked from the longest delays to the shortest. World Bank, Databank, World Development Indicators database (accessed January 26, 2017).

three times per week, so that delays occur when trucks must await the departure of the next convoy.[457]

Moreover, border crossings in SSA could require authorization from numerous government entities, including the revenue authority, the standards bureau, and the police, as well as agencies pertaining to customs, immigration, agriculture, and health. Thus, bureaucratic approvals required at certain border posts result in goods waiting an average of 10.3 days to clear customs at the border in SSA, compared to a global average of 7.7 days.[458] An industry representative noted that these documentation and border delays posed the biggest challenge for moving goods throughout East or West Africa.[459]

SSA's landlocked countries also face higher logistics costs, as the region's road and rail network is not well connected to port infrastructure.[460] One report noted that high customs clearance costs in Niger, a landlocked country in West Africa, amounted to 20 percent of total logistics costs for truck operators in that country. The report goes on to say that delays from waiting at inland checkpoints, as well as from poor road and other infrastructure conditions, may impose further logistics costs on trucking firms.[461] By contrast, infrastructure improvements can increase customs revenue. For example, customs revenue collected at a border crossing between Sierra Leone and Guinea went up by 70 percent following the rehabilitation of the primary road that connects the border posts because of the growth in traffic volume.[462]

[457] USAID, West Africa Trade Hub, *Transport and Logistics Costs*, January 2012, 27. Overall, the cartelization of trucking services in many parts of SSA has resulted in the underutilization of trucking fleets—and the overloading of trucks that are placed into service. Overloading can cause premature damage to the fragile road network, so countries like Kenya, Tanzania, and Uganda have undertaken significant measures to restrict this practice through axle-weight restrictions, which limit the weight per axle of trucks. However, implementation of these rules has been limited, to some degree, by the insufficient training of personnel. Teravaninthorn and Raballand, *Transport Prices and Costs in Africa, 2009*, 55; Grodzicki, "Harmonization of Axle Load Control at EAC Level," 2013, 3.
[458] World Bank, Databank, World Development Indicators database (accessed June 30, 2017).
[459] Industry representative, interview by USITC staff, Washington, DC, March 3, 2017.
[460] Accenture, "African Ports: The Challenges and Opportunities 2015/16," August 28, 2015, 2.
[461] MCC, *MCC Niger Threshold Program Design Constraints*, January 2014, 12.
[462] MCC, *MCC Sierra Leone Threshold Program Design Constraints*, December 2013, 207.

Efforts to Improve Customs and Infrastructure Barriers in SSA

Among efforts to improve the customs environment in SSA are the introduction of single customs windows, the development of joint border posts, and improvement in the region's transport infrastructure. Most importantly, the use of single customs windows at SSA's border checkpoints has increased across the continent, although their deployment is partly hampered by inadequate information, technology, and communications infrastructure in the region.[463] These single windows are designed to simplify and harmonize trade documents, as well as to restructure the practices of customs-related government agencies. At least 12 countries across SSA are considering or have completed setting up single windows.[464]

For example, Rwanda's new single customs window has resulted in cost savings and improved government transparency in customs processing. In southern Africa, efforts to expedite the border crossing between Zambia and Zimbabwe—a major transit point for much of southern Africa, handling an average of 268 trucks daily—has created a single stop for transiting vehicles. Consequently, the time it takes for a truck to pass through the border post has been reduced from as long as two to three days to only two hours.[465] In West Africa, Senegal is also introducing a single customs window, and joint border posts are being built between the countries of Benin and both Niger and Nigeria, as well as between Ghana and Togo. These border posts are designed to assist with cross-border transactions and improve travel time and costs, and more projects are envisaged.[466]

Furthermore, there also have been reforms to facilitate trade at checkpoints within a country, especially along the main highway networks. For example, Tanzania has established "one-stop" inspection stations on the central corridor route that links the landlocked countries of Burundi, Rwanda, Uganda, and the Democratic Republic of the Congo.[467] These stations were established in order to coordinate and reduce the number of checks on transit vehicles by the country's revenue authority, police force, and national roads agency and have reduced total

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[463] African trade is still hampered by low levels of data sharing between customs administrations and exporters, importers, and shippers. One report suggests that improved single windows enabled with information, technology, and communications systems would improve customs-related data exchange, lessen the opportunity for data-entry errors, and lower transit times for cargo. World Bank, *ICTs for Regional Trade and Integrations in Africa*, 2012, 16–17.

[464] In SSA, the countries of Benin, Congo, Côte d'Ivoire, Ghana, Kenya, Madagascar, Mauritius, Mozambique, Rwanda, Senegal, Tanzania, and Togo have either solicited proposals for single windows or have already have established one. Tsen, "Ten Years of Single Window Implementation," 2011, 19, 22. For example, Rwanda introduced an electronic single window in January 2013 that reduced clearance times for goods from 34 hours in 2010 to 23 hours in 2014. OECD, "Rwanda Electronic Single Window," December 30, 2014, 1.

[465] Barka, Border Posts, *Checkpoints, and Intra-African Trade*," 2012, 4.

[466] Kingombe, "Hard and Soft Infrastructure Development in Africa," 2014, 21.

[467] Central Corridor Transit Transport Facilitation Agency, "Progress in Construction of Manyoni and Nyakanazi" (accessed June 30, 2017).

stops from 17 to 3.[468] These reforms, coupled with improvements at its largest port in Dar-es-Salaam, help explain why Tanzania went from being one of the worst-performing SSA countries in 1995 in terms of export participation in GSCs, to being the second best in 2011.[469]

Finally, SSA has dedicated resources to improving transportation infrastructure, although the pace of such reform is relatively slow. As an example, only 34 percent of rural SSA residents have access to roads that are open to vehicle traffic year-round, with some short-term exceptions. Despite new investment in roads, ports, and rail infrastructure, the region still has an $18.2 billion shortfall in transport spending, of which $9.4 billion is needed for the operation and maintenance of existing infrastructure.[470] A 2010 World Bank study estimated that a $50 billion infrastructure investment in SSA could increase annual GDP growth in the region by as much as 2.5 percent.[471]

Conclusion and Outlook

Cross-border trade in SSA has been aided by improvements in the region's transport infrastructure (including roads, airports, and shipping ports) and by customs reform. These improvements have also made it easier for 3PL firms to operate in the region and have encouraged SSA's participation in GSCs. However, there is still ample room to improve the overall customs environment in SSA and, by extension, the operating environment for 3PL firms. In Nigeria, for instance, high border costs still cause firms to divert trade to shipping ports in the nearby countries of Togo and Benin, or to stop trading through West African ports altogether.[472] While certain issues, such as corruption, may persist in the short to medium term, in the long term SSA's continued commitment to trade facilitation will likely improve the transparency and efficiency of customs and logistics services throughout the region.

[468] Kingombe, *Hard and Soft Infrastructure Development in Africa*, 2014, 18.
[469] UNECA, *Economic Report on Africa*, 2015, 110–11.
[470] World Bank, Databank, World Development Indicators database (accessed January 26, 2017).
[471] Foster and Briceno-Garmendia, *Africa's Infrastructure: A Time for Transformation*, World Bank, 2010, 25.
[472] Industry representative, interview by USITC staff, Washington, DC, February 28, 2017.

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Appendix A
Request Letter

THE UNITED STATES TRADE REPRESENTATIVE
Executive Office of the President
Washington, D.C. 20506

MAY 15 1992

The Honorable Donald E. Newquist
Chairman
U.S. International Trade Commission
500 E Street, S.W.
Washington, D.C. 20436

Dear Mr. Chairman,

The Commission's recent series of reports on the economic effects of significant U.S. import restraints (USITC publication 2222, dated October 1989; publication 2314, dated September 1990; and publication 2422, dated September 1991), prepared pursuant to a request from the Senate Committee on Finance dated September 12, 1988, has been an excellent source of objective, balanced information for the entire trade policy community. An understanding and appreciation of the economic implications of restraints imposed on trade are critical to any informed assessment of the trade policy options that confront the President and the Congress.

We would find it useful to have periodic updates of the types of assessments that the Commission has provided in its reports for the Finance Committee. Therefore, under authority delegated by the President and pursuant to section 332(g) of the Tariff Act of 1930, as amended, I request that the Commission periodically provide an updated assessment of the economic effects of significant U.S. import restraints. Each updating report should include quantitative assessments of the restraints' effects on U.S. consumers, on the activities of U.S. firms, on the income and employment of U.S. workers, and on the net economic welfare of the United States. The reports also should continue the broad analytical frameworks used in the original reports, namely partial equilibrium frameworks for the analysis of liberalization in individual sectors and a general equilibrium framework for assessment of the economy-wide effects of the simultaneous liberalization of all sectors covered.

With the exceptions noted below, the reports should consider the effects of all significant restraints on U.S. imports of goods and services whether they result from an act of Congress, an action taken under the fair trade laws of the United States (such as section 201 investigations), an international agreement, or voluntary export restraints by foreign nations. The reports should not include import restraints resulting from final

antidumping or countervailing duty investigations, section 337 or 406 investigations, or section 301 actions.

I would appreciate receiving the first updating report 18 months after receipt of this request. Subsequent reports should be provided thereafter at intervals of approximately two years until otherwise instructed.

In view of the outstanding instruction to the Commission on the security classification of reports prepared by the Commission at the request of the U.S. Trade Representative, I request that all reports on this investigation be made available to the public at the same time they are submitted to my office.

The Commission's assistance in this matter is greatly appreciated.

Sincerely,

Carla A. Hills

EXECUTIVE OFFICE OF THE PRESIDENT
THE UNITED STATES TRADE REPRESENTATIVE
WASHINGTON, D.C. 20508

The Honorable Irving Williamson
Chairman
United States International Trade Commission
500 E Street, S.W.
Washington, D.C. 20436

SEP 13 2016

Dear Chairman Williamson:

The U.S. International Trade Commission's (Commission) series of reports on the economic effects of significant U.S. import restraints, prepared as part of Investigation No. 332-325, has been an objective and balanced source of information for the President, the Congress, the trade policy community, and the public. As your reports have shown, the costs imposed on U.S. economic welfare by U.S. import restraints have declined markedly since 1992, even as the volume of U.S. imports has grown substantially. In this ninth update, I am requesting that the Commission include an assessment of how significant U.S. import restraints affect households with different incomes.

The United States now stands as one of the world's most open economies. As the Commission begins work on the ninth update of its report, and in light of the high degree of openness of U.S. markets to imports that has already been achieved, I am requesting that the Commission also include in its report information on another important development in U.S. trade.

The rising importance of global supply chains means that intermediate inputs are increasingly traded across borders. Tariffs and inefficient customs and border procedures can raise the price of these inputs in each country they enter along the supply chain, while their removal can substantially improve global welfare. An overview of the effects of these inefficiencies along the supply chain would be useful as a special topic in this report. I am therefore requesting that the Commission provide in this ninth update an overview of the effects of tariffs and customs and border procedures on global supply chains. The Report should, to the extent practicable, describe the cumulative effects of tariffs and customs and border procedures on goods traded through global supply chains. This should also include the effect on services to the extent that they depend on goods traded across borders. The Report should also provide an overview of the recent literature that discusses the effect of these costs along the supply chain. Finally, the Report should provide case studies examining supply chain inefficiencies stemming from customs and border procedures abroad in relevant industries.

Please provide the ninth update of this Report, with the additional section, 12 months after receipt of this request. As stated in the original 1992 request letter, subsequent updates of the report should be provided thereafter at intervals of approximately two years. USTR intends to make the Commission's report available to the general public in its entirety. Therefore, the report should not contain any confidential business or national security classified information.

EXECUTIVE OFFICE OF THE PRESIDENT
THE UNITED STATES TRADE REPRESENTATIVE
WASHINGTON, D.C. 20508

The Commission's assistance in this matter is greatly appreciated.

Sincerely,

Michael Froman

Ambassador Michael B. G. Froman

Appendix B
Federal Register Notice

SUPPLEMENTARY INFORMATION: The Commission instituted the original investigation on July 14, 2014 based on a complaint filed by Navico, Inc. of Tulsa, Oklahoma, and Navico Holding AS, of Egersund, Norway (collectively, ''Navico''). 79 FR 40778 (July 14, 2014). The complaint alleged violations of Section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. 1337, in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain marine sonar imaging devices, including downscan and sidescan devices, products containing the same, and components thereof by reason of infringement of certain claims of U.S. Patent Nos. 8,305,840 (''the '840 patent''), 8,300,499 (''the '499 patent''), and 8,605,550 (''the '550 patent''). *Id.* The notice of investigation named as respondents Garmin International, Inc. (''Garmin International''), Garmin USA, Inc. (''Garmin USA''), both of Olathe, Kansas; and Garmin (Asia) Corporation of New Taipei City, Taiwan (''Garmin Asia''). *Id.* The Office of Unfair Import Investigations (''OUII'') was also named as a party. *Id.*

On December 1, 2015, the Commission found a violation of Section 337 based on infringement of claims 1, 5, 7, 9, 11, 16–19, 23, 32, 39–41, 63, and 70–72 of the '840 patent and infringement of claims 32 and 44 of the '550 patent, but found no violation with respect to the '499 patent. 80 FR 76040–41 (Dec. 7, 2015). The Commission issued a limited exclusion order prohibiting Garmin International, Garmin USA, and Garmin Asia from importing certain marine sonar imaging devices, including downscan and sidescan devices, products containing the same, and components thereof that infringe certain claims of the '840 and '550 patent. *Id.* The Commission also issued cease and desist orders against Garmin International, Garmin USA, and Garmin Asia prohibiting the sale and distribution within the United States of articles that infringe certain claims of the '840 and '550 patents. *Id.* at 76041.

On August 30, 2016, Navico filed a complaint requesting that the Commission institute a formal enforcement proceeding under Commission Rule 210.75(b) to investigate violations of the December 1, 2015 cease and desist orders by Garmin International and Garmin USA (collectively, ''Garmin''). Having examined the complaint and the supporting documents, the Commission has determined to institute a formal enforcement proceeding to determine whether Garmin is in violation of the December 1, 2015 cease and desist orders issued in the original investigation and what, if any, enforcement measures are appropriate. The following entities are named as parties to the formal enforcement proceeding: (1) Complainant Navico; (2) respondents Garmin International and Garmin USA; and (3) OUII.

The authority for the Commission's determination is contained in Section 337 of the Tariff Act of 1930, as amended (19 U.S.C. 1337), and in section 210.75 of the Commission's Rules of Practice and Procedure (19 CFR 210.75).

By order of the Commission.

Issued: October 11, 2016.

Lisa R. Barton,

Secretary to the Commission.

[FR Doc. 2016–24987 Filed 10–14–16; 8:45 am]

BILLING CODE 7020–02–P

INTERNATIONAL TRADE COMMISSION

[Investigation No. 332–325]

The Economic Effects of Significant U.S. Import Restraints; Ninth Update; Special Topic: The Effects of Tariffs and of Customs and Border Procedures on Global Supply Chains

AGENCY: United States International Trade Commission.

ACTION: Notice of ninth update report, scheduling of public hearing, opportunity to file written submissions.

SUMMARY: Following receipt of a letter dated September 13, 2016 from the United States Trade Representative (USTR), the U.S. International Trade Commission (Commission) has announced its schedule for preparing the ninth update report in investigation No. 332–325, *The Economic Effects of Significant U.S. Import Restraints,* including the scheduling of a public hearing in connection with this update report for February 9, 2017. This year's report will include a chapter on the effects of tariffs and customs and border procedures on global supply chains.

DATES: January 26, 2017: Deadline for filing requests to appear at the public hearing.

January 30, 2017: Deadline for filing pre-hearing briefs and statements.

February 9, 2017: Public hearing.

February 16, 2017: Deadline for filing post-hearing briefs and statements.

March 1, 2017: Deadline for filing all other written submissions.

September 13, 2017: Transmittal of Commission report to USTR.

ADDRESSES: All Commission offices, including the Commission's hearing rooms, are located in the United States International Trade Commission Building, 500 E Street SW., Washington, DC. All written submissions should be addressed to the Secretary, United States International Trade Commission, 500 E Street SW., Washington, DC 20436. The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at *https://edis.usitc.gov/edis3-internal/app.*

FOR FURTHER INFORMATION CONTACT: Project Leader William Deese (*william.deese@usitc.gov.* or 202–205–2626) or Deputy Project Leader Lesley Ahmed (*lesley.ahmed@usitc.gov*) for information specific to this investigation (the eighth update). For information on the legal aspects of this investigation, contact William Gearhart of the Commission's Office of the General Counsel (202–205–3091 or *william.gearhart@usitc.gov*). The media should contact Margaret O'Laughlin, Office of External Relations (202–205–1819 or *margaret.olaughlin@usitc.gov*). Hearing-impaired individuals may obtain information on this matter by contacting the Commission's TDD terminal at 202–205–1810. General information concerning the Commission may also be obtained by accessing its Internet server *(https://www.usitc.gov).* Persons with mobility impairments who will need special assistance in gaining access to the Commission should contact the Office of the Secretary at 202–205–2000.

Background

The Commission instituted this investigation under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)) following receipt of an initial request from the USTR dated May 15, 1992. The request asked that the Commission assess the quantitative economic effects of significant U.S. import restraints on the U.S. economy and prepare periodic update reports after the initial report. The Commission published a notice of institution of the investigation in the **Federal Register** of June 17, 1992 (57 FR 27063). The first report was delivered to the USTR in November 1993, the first update in December 1995, and successive updates were delivered in 1999, 2002, 2004, 2007, 2009, 2011, and 2013.

In this ninth update, as requested by the USTR in a letter dated September 13, 2016, the Commission will provide, in addition to the quantitative effects analysis similar to that included in prior reports, an assessment of how significant U.S. import restraints affect households with different incomes and

a special chapter that presents an overview of the effects of tariffs and customs and border procedures on global supply chains.

The report will, to the extent practicable, describe the cumulative effects of tariffs and customs and border procedures on goods traded in global supply chains. It will include the effect on services to the extent that they depend on goods traded across borders. The report will also provide an overview of recent literature that discusses the effect of these costs along the supply chain. Finally, the report will include case studies in relevant industries that examine supply chain inefficiencies stemming from customs and border procedures abroad.

As in previous reports in this series, the ninth update will continue to assess the economic effects of significant import restraints on U.S. consumers and firms, the income and employment of U.S. workers, and the net economic welfare of the United States. This assessment will use the Commission's computable general equilibrium model of the U.S. economy. However, as per earlier instructions from the USTR, the Commission will not assess import restraints resulting from antidumping or countervailing duty investigations, section 337 and 406 investigations, or section 301 actions.

Public Hearing

A public hearing in connection with this investigation will be held at the United States International Trade Commission Building, 500 E Street SW., Washington, DC, beginning at 9:30 a.m. on February 9, 2017. Requests to appear at the hearing should be filed with the Secretary no later than 5:15 p.m., January 26, 2016, in accordance with the requirements in the ''Submissions'' section below. All pre-hearing briefs and statements should be filed not later than 5:15 p.m., January 30, 2017; and all post-hearing briefs and statements addressing matters raised at the hearing should be filed not later than 5:15 p.m., February 16, 2017. In the event that, as of the close of business on January 26, 2017, no witnesses are scheduled to appear at the hearing, the hearing will be canceled. Any person interested in attending the hearing as an observer or nonparticipant may call the Secretary to the Commission (202–205–2000) after January 26, 2017, for information concerning whether the hearing will be held.

Written Submissions: In lieu of or in addition to participating in the hearing, interested parties are invited to file written submissions concerning this investigation. All written submissions should be addressed to the Secretary, and should be received not later than 5:15 p.m., March 1, 2017. All written submissions must conform to the provisions of section 201.8 of the Commission's Rules of Practice and Procedure (19 CFR 201.8). Section 201.8 and the Commission's Handbook on Filing Procedures require that interested parties file documents electronically on or before the filing deadline and submit eight (8) true paper copies by 12:00 p.m. eastern time on the next business day. In the event that confidential treatment of a document is requested, interested parties must file, at the same time as the eight paper copies, at least four (4) additional true paper copies in which the confidential information must be deleted (see the following paragraphs for further information regarding confidential business information). Persons with questions regarding electronic filing should contact the Office of the Secretary, Docket Services Division (202–205–1802).

Confidential Business Information

Any submissions that contain confidential business information must also conform to the requirements of section 201.6 of the Commission's Rules of Practice and Procedure (19 CFR 201.6). Section 201.6 of the rules requires that the cover of the document and the individual pages be clearly marked as to whether they are the ''confidential'' or ''non-confidential'' version, and that the confidential business information is clearly identified by means of brackets. All written submissions, except for confidential business information, will be made available for inspection by interested parties.

The Commission will not include any confidential business information in the report that it sends to the USTR or makes available to the public. However, all information, including confidential business information, submitted in this investigation may be disclosed to and used: (i) By the Commission, its employees and Offices, and contract personnel (a) for developing or maintaining the records of this or a related proceeding, or (b) in internal investigations, audits, reviews, and evaluations relating to the programs, personnel, and operations of the Commission including under 5 U.S.C. Appendix 3; or (ii) by U.S. government employees and contract personnel for cybersecurity purposes. The Commission will not otherwise disclose any confidential business information in a manner that would reveal the operations of the firm supplying the information.

Summaries of Written Submissions

The Commission intends to publish summaries of the positions of interested persons. Persons wishing to have a summary of their position included in the report should include a summary with their written submission. The summary may not exceed 500 words, should be in MS Word format or a format that can be easily converted to MS Word, and should not include any confidential business information. The summary will be published as provided if it meets these requirements and is germane to the subject matter of the investigation. The Commission will identify the name of the organization furnishing the summary and will include a link to the Commission's Electronic Document Information System (EDIS) where the full written submission can be found.

By order of the Commission.

Issued: October 11, 2016.

Lisa Barton,

Secretary to the Commission.

[FR Doc. 2016–24984 Filed 10–14–16; 8:45 am]

BILLING CODE 7020–02–P

INTERNATIONAL TRADE COMMISSION

[Investigation Nos. 701–TA–382 and 731–TA–800, 801, and 803 (Third Review)]

Stainless Steel Sheet and Strip From Japan, Korea, and Taiwan; Notice of Commission Determination To Conduct Full Five-Year Reviews

AGENCY: United States International Trade Commission.

ACTION: Notice.

SUMMARY: The Commission hereby gives notice that it will proceed with full reviews pursuant to the Tariff Act of 1930 to determine whether revocation of the countervailing duty order on imports of stainless steel sheet and strip from Korea and the antidumping duty orders on imports of stainless steel sheet and strip from Japan, Korea, and Taiwan would be likely to lead to continuation or recurrence of material injury within a reasonably foreseeable time. A schedule for the reviews will be established and announced at a later date.

DATES: *Effective Date:* October 4, 2016.

FOR FURTHER INFORMATION CONTACT: Keysha Martinez (202–205–2136), Office of Investigations, U.S. International Trade Commission, 500 E Street SW., Washington, DC 20436. Hearing-impaired persons can obtain information on this matter by contacting

Appendix C
Calendar of Hearing Witnesses

CALENDAR OF PUBLIC HEARING

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

Subject: The Economic Effects of Significant U.S.Import Restraints: Ninth Update. Special Topic: The Effects of Tariffs and of Customs and Border. Procedures on Global Supply Chains

Inv. No.:332-325

Date and Time: February 9, 2017 - 9:30 a.m.

A session was held in connection with this investigation in the Main Hearing Room (room 101), 500 E Street, S.W., Washington, D.C.

ORGANIZATION AND WITNESS:

American Sugar Alliance ("ASA") Arlington, VA

Jack Roney, Director of Economics and Policy Analysis

Don Phillips, Trade Adviser

Footwear Distributors and Retaiiers of America

Washington, D.C.

Thomas Crockett, Director of Government and Regulatory Affairs

Information

Technolqgy Industry Council ("ITI")

Washington, D.C.

Ed Brzytwa, Director of Global Policy for Localization, Trade, and Multilateral Affairs

Semiconductor Industry Association ("SIA")
Washington, D.C.

Devi Keller, Director of Global Policy

Intel Corporation

Washington, D.C.

Mario R. Palacios, Global Director, Import and Export Policy

-END-

Appendix D
Summary of the Views of Interested Parties

Views of Interested Parties

Interested parties had the opportunity to file written submissions to the Commission in the course of this investigation and to provide summaries of the positions expressed in the submissions for inclusion in this report. This appendix contains these written summaries, provided that they meet certain requirements set out in the notice of investigation. The Commission has not edited these summaries. This appendix also contains the names of other interested parties who filed written submissions during investigation but did not provide written summaries. A copy of each written submission is available in the Commission's Electronic Docket Information System (EDIS).[473] The Commission also held a public hearing in connection with this investigation on February 9, 2017. The full text of the transcript of the Commission's hearing is also available on EDIS.

Written Submissions

American Apparel & Footwear Association

No written summary. Please see EDIS for full submission.

American Sugar Alliance (ASA)

Summary

In previous iterations of this investigation, the ITC has modeled a hypothetical situation: The effect on the U.S. economy of unilateral elimination of U.S. sugar-import restraints.

The ITC needs to model this scenario no longer. The U.S. eliminated sugar import restraints with Mexico, one of the world's largest sugar producers, on January 1, 2008. Duty-free, quota-free trade in sugar with Mexico continued for seven years, until December 2014.

The ITC need only look at the outcome of this experiment with free trade in sugar, and, in a separate investigation, it already has. In unanimous votes, the ITC found – preliminary in May 2014 and final in March 2015 – that Mexico had injured the U.S. sugar industry. The U.S. Department of Commerce in the fall of 2015 found that Mexico brought about that injury through massive subsidization (margins of 48-84%) and dumping (margins of 41-42%).

While Mexican producers prospered during the free-trade period, with domestic sugar prices often higher than the U.S., American producers suffered huge revenue losses. More American

[473] Available online at http://edis.usitc.gov.

sugar mills have closed and USDA incurred a cost to manage U.S. sugar policy for the first time in more than a decade.

Consumers, meanwhile, saw no benefit from the surge in imports and depressed producer prices for sugar. Retail refined sugar and sweetened-product prices did not fall, and, in fact, rose over the period of Mexican dumping and its aftermath. Passing none of its savings on cheaper sugar along to consumers, the sweetened-product-manufacturing sector maintained its status as one of the most profitable sectors of the U.S. economy and has continued to expand its operations in this country.

Key lessons from the U.S. sugar market's experience since 2008:

- "Free trade" is not free if trading countries are permitted to subsidize and dump. Mexican subsidies are not unique, but rather the norm among sugar-exporting countries. Opening the U.S. sugar market exposed it to Mexican unfair trading practices. Retaining U.S. sugar-import restraints would have sustained a critical buffer against foreign subsidies for efficient American sugar producers.
- When sweetened-product manufacturers pay less for sugar, consumers do not pay less for sweetened products. There is no evidence of manufacturers' pass-through of their savings along to consumers.
- With retail-product prices no lower, there is no reason to expect any price-related increase in demand for those products. Nor is there any reason to predict sales increases and job gains for the sweetened-product manufacturers stemming from lower sugar prices.
- Given the real-world experience of the past several years – with U.S. exposure to foreign sugar subsidization and dumping – the ITC should find a significant net benefit to the U.S. economy from sugar-import restraints.

Absent these restraints, American producers and taxpayers are harmed and consumers see no benefit. Economic gains accrue to subsidized foreign producers and, domestically, only to the sweetened-product sector which is already one of the most profitable and robust sectors of the U.S. economy.

Footwear Distributors of America

No written summary. Please see EDIS for full submission.

Intel Corporation

No written summary. Please see EDIS for full submission.

International Sugar Trade Coalition

No written summary. Please see EDIS for full submission.

Jewelers Vigilance Committee

No written summary. Please see EDIS for full submission.

Meat Import Council of America, Inc.

In summary, the TRQs on beef and veal have impacted beef imports to varying degrees during recent years, with some variations due to the use of historical data in setting quota levels which are no longer relevant to market conditions. The quotas had a notable recent impact in 2015 when both Australian and New Zealand imports were limited by volumes coming up on their respective entitlements while US supplies declined. The additional limitation on Uruguayan beef and veal imports has been a common occurrence in recent years.

It continues to be apparent that, consistent with Commission precedent and current industry practice, imported beef is more complementary to, than competitive with, domestic beef. The vast majority of imported beef is grass fed product destined for manufacturing use, unlike the grain-fed, table-ready product produced domestically. The fact that imported beef is frozen imparts processing characteristics for food manufacturers which are desirable in combination with U.S. fat trimmings from grain-fed cattle, and lean beef, principally from culled animals. The latter has historically been in short supply and even more so during recent years with the U.S. herd rebuilding.

National Milk Producers Federation

No written summary. Please see EDIS for full submission.

Semiconductor Industry Association

No written summary. Please see EDIS for full submission.

Sweetener Users Association (SUA)

SUA has frequently provided testimony and other evidentiary material to the Commission on the trade distorting nature of the U.S. sugar program and the adverse economic impacts it has on consumers and on food and beverage manufacturers. These negative impacts of the underlying policies persist and have now been exacerbated by the suspension agreements negotiated between the United States and Mexico in connection with the antidumping and

countervailing duty cases filed against Mexico by the domestic sugar industry. The key points that SUA recommends for consideration by the Commission are the following:

- The sugar program has been mostly impervious to trade liberalization efforts for decades. In contrast, barriers for sugar-containing products (SCPs) have been greatly reduced and net imports of sugar in SCPs are expected to reach one million tons this year, about 8 percent of U.S. sugar consumption. This has hurt U.S. manufacturers.
- U.S. refined sugar prices remain unnecessarily high, having been further boosted by the de facto increase in the U.S. market price support level under the suspension agreements. This has increased the harm to consumers and U.S. manufacturers.
- Employment in businesses manufacturing sugar-containing products continues to decline due to reduced competitiveness against other domestic food products, and increased net imports of sugar-containing products from other countries.
- Sugar users and cane sugar refiners remain unable to source adequate quantities of raw or refined sugar from the most efficient producers around the world.
- And more broadly, the sugar import restraints continue to have negative economic welfare effects on the U.S. economy.

At the Commission's hearing for this investigation on February 9, 2017, American Sugar Alliance (ASA) representatives tried to argue that one can no longer hypothesize unilateral elimination of U.S. sugar import restraints, citing the trade liberalization with Mexico that began in 2008. They ignored the inconvenient fact that as part of NAFTA, Mexico agreed to maintain the same level of protection against sugar imports as the United States. It was not an opening to the world sugar market.

Technology Industry Council

No written summary. Please see EDIS for full submission.

Appendix E
USAGE Model Appendix

Overview of the Modeling Framework

The analytical framework used to analyze the economic impact of significant U.S. import restraints in this ninth update is a new version of the U.S. Applied General Equilibrium (USAGE) framework that was used in previous updates. The USAGE model is a dynamic computable general equilibrium model that describes consumption, production, and trade in over 400 U.S. sectors.[474] The current USAGE model is calibrated to the 2007 benchmark input-output (I-O) table published by the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce.[475]

The USAGE model estimates the effects of removing (liberalizing) significant U.S. import restraints relative to a projection of the U.S. economy over the medium term. The model incorporates a baseline projection of the U.S. economy from 2015 to 2020, based on both historical and forecast economic data, including estimates of the size of the import restraints. The projection assumes that current U.S. import restraints remain in place.

Liberalizations reported in this update are alternative policy scenarios in which significant import restraints are completely eliminated, either individually or all at once. The economic impact of liberalization is assessed by comparing the baseline and the alternative policy outcomes.[476]

The USAGE model framework has three components: (1) I-O accounts for approximately 400 sectors and commodities, (2) behavioral parameters, and (3) a system of equations that constitute the model specification or theory. The I-O accounts specify the transactions among U.S. individuals, firms, and the U.S. government; they are derived from the annual I-O accounts for U.S. industries and types of final demand (e.g., imports; private and government consumption and investment expenditures; and inventory changes) published by the BEA.

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[474] For more detail on the USAGE framework, see USITC, *The Economic Effects of Significant U.S.Import Restraints: Sixth Update, 2009*, 2009, appendix E. For a complete specification of the USAGE model, see Dixon and Rimmer, "USAGE-ITC," June 2002.

[475] For more details about the calibration of the USAGE framework to the 2007 benchmark I-O account, see Dixon, Rimmer, and Waschik, "Updating USAGE," February 2017.

[476] The baseline and the policy projections are each subject to their own "closure," that is, their own choice of variables within the USAGE framework to treat as exogenous (determined outside the model) or endogenous (determined by model equations). For example, in the baseline projection, growth rates for the components of GDP and for sectoral employment, shipments, exports, and imports of the import restraints sectors are taken from external sources. These choices, in turn, determine the evolution of taste and technology parameters. In the policy scenario, these taste and technology parameters are taken as fixed, and the liberalization of import restraints determines changes in sectoral employment, shipments, exports, and imports, which are treated as endogenous. Certain macroeconomic relationships are assumed to hold in the policy scenario, too: overall labor force growth is assumed to follow that of the baseline.

For purposes of this study, some sectors with significant import restraints are identified at a level of aggregation much narrower than those of the core USAGE model. In order to analyze the effects of liberalizing these sectors, it is necessary to disaggregate or split each relevant aggregate sector into at least two sectors: one sector of interest and one "other" sector. The new commodity and industry groups identified through this process are shown in the first column of table E.1. The "other" sector is not shown and is composed of whatever is left of the original sector after the sector or sectors of interest are split out. The original aggregate sectors are in the second column. Sometimes the aggregate sector was split more than once. For example, sugar beet and sugar cane farming were split from other crop farming.

Table E.1: Sector disaggregation

Sectors disaggregated from the 2007 benchmark sector shown in the second column	Sectors in BEA's 2007 benchmark input-output (I-O) accounts
Sugarcane farming	Other crop farming
Sugar beet farming	Other crop farming
Beet sugar manufacturing	Sugar and confectionary manufacturing
Sugar cane mills	Sugar and confectionary manufacturing
Cane sugar refining	Sugar and confectionary manufacturing
Ceramic wall and floor tiles	Clay product and refractory manufacturing
China, fine earthenware and other pottery products	Clay product and refractory manufacturing
Other pressed and blown glass and glassware	Glass and glass product manufacturing
Pens and mechanical pencils	Office supplies (except paper) manufacturing
Residential electric lighting fixtures	Lighting fixture manufacturing
Costume jewelry and novelties	Jewelry and silverware manufacturing
Creamery butter	Fluid milk and butter manufacturing
Cigarettes	Tobacco product manufacturing
Canned tuna	Seafood product preparation and packaging
Beef for processing	Animal (except poultry) slaughtering, rendering, and processing
Synthetic organic dyes and pigments	Synthetic dye and pigment manufacturing
Cellulosic organic fibers	Synthetic rubber and artificial and synthetic fibers and filaments manufacturing

Sources: USITC estimates based on U.S. Census, North American Industry Classification System (NAICS) 2007 and 2012; USITC DataWeb/USDOC, Trade and tariff data for 2015 (accessed September 28, 2016); USDOC, BEA, 2007 Benchmark Input-Output (I-O) accounts, December 2013.
Note: This table does not include the sectors representing activities that remain after disaggregating the sectors of interest shown in the first column.

While the I-O accounts provide information on the initial equilibrium of the U.S. economy, a set of elasticities help the framework determine how the economy would respond to a policy change. Elasticities reflect the degree to which firms or consumers alter their behavior in response to certain economic developments, such as a drop in the price of imports. For example, an income elasticity of demand for a good is the percentage change in consumer demand for that good that occurs in response to a 1 percent change in household income. If demand for a given good is relatively inelastic, a household will purchase a fairly similar quantity even its income changes. In contrast, if demand for a good is relatively elastic,

household purchases of it will tend to rise when household income rises and to fall when household income falls.

The types of elasticities used by the USAGE model include elasticities of substitution between imported and domestic goods, price elasticities of import supply, price elasticities of export demand, elasticities of substitution between inputs in production, and income elasticities.

Where possible, the Commission has estimated some of these parameters using time series data that show how consumers and firms have responded to given changes in the past; otherwise, it has relied on published studies for estimates. With the exception of textiles and apparel, the elasticities of substitution between imported and domestic goods (known as Armington elasticities) are documented in the 2004 research note by Donnelly et al.[477] The Armington elasticities for the textile and apparel sectors are based on the 2003 working paper by Hertel et al.[478]

The final component of the USAGE framework is the system of equations that model the U.S. economy. These equations characterize three general conditions that together determine a general equilibrium solution. First, activities are characterized by constant returns, so firms must earn zero real economic profits at the margin, and all the production technologies and preferences are derived from theoretical formulations constrained by these zero-profit conditions. Second, the quantity supplied must equal the quantity demanded for each good and service in the economy. Third, all income must be accounted for either by spending on goods and services or by saving (spending can be on foreign or domestic goods and services, and savings can be on domestic or foreign saving instruments).

Model Projections

The USAGE baseline is a "business as usual" projection of the U.S. economy to 2020. Developing this baseline involves replacing key observable variables ("shocking") in the model with projections about how the economy will behave, which are derived from research conducted by Commission staff and other sources, mainly other federal government agencies. The detailed theoretical and empirical structure of the model then allocates these projected shocks across a wide range of variables at the sectoral level.

Key shocks include macroeconomic expenditure and income aggregates (consumption, investment, government spending, imports, and exports). This study sourced macroeconomic forecasts from other federal agencies. The USAGE baseline adjusts these projections by taking

[477] Donnelly et al., "Revised Armington Elasticities of Substitution," January 2004.
[478] Hertel et al., "How Confident Can We Be?" May 2003.

in additional information from the International Monetary Fund on the growth of world gross domestic product (GDP) and from the U.S. Department of Labor's Bureau of Labor Statistics on population, demographics, labor supply, and employment.

Projections for specific sectors are also informed by supplemental data from a wide range of sources. As discussed in chapter 1, the projections of sectors with significant restraints are refined using data on recent growth in employment, shipments, imports, and exports in these sectors, based on trade journals and industry research reports.

The baseline incorporates trade policy adjustments expected to be made by 2020, such as changes to tariff rates and to quantity allocations for tariff-rate quotas (TRQs) contained in the tariff staging schedules for U.S. free trade agreements and other trade agreements. These agreements provide the projected path of trade policy variables during the time horizon of the projection. For U.S. imports from countries that do not have such agreements with the United States, projected tariff rates and TRQs are set equal to their current values.

Some key model inputs, such as changes in consumer preferences, are not observable in projections. Values for these components of the USAGE baseline come from simulation analysis of expected changes during the baseline period. By shocking the baseline data with expected percentage changes for a wide range of macroeconomic aggregates, as well as production, price, and volume variables, the model is able to endogenously quantify model-consistent estimates of "unobservable" data. In addition to preferences, such variables include detailed technical change information, shifts in preferences between domestic and imported goods and services, and shifts in export demand and import supply functions.

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Appendix F
Household Effects Modeling

Data Description

This report uses the 2015 wave of the Consumer Expenditure Survey (CES) collected by the U.S. Census Bureau for the Bureau of Labor Statistics (BLS) to construct consumption baskets of households.[479] This survey collects sociodemographic, income, and expenditure information from nearly 130,000 consumer units in urban and rural areas of the United States.[480] The survey is a representative sample of the U.S. population.

The U.S. households are split into 10 deciles based on household income. Table F.1 shows income cutoffs and average expenditure for each decile. Note that households in the lowest deciles often spend more than they earn, because the income variable does not include in-kind and government transfers. These numbers are in line with the statistics reported by the BLS for the 2015 CES.[481]

Table F.1 Household income and expenditure, 2015, by decile

Decile	Lowest income	Highest income	Average income	Average expenditure
1		$12,100	$5,894	$18,633
2	$12,101	$19,746	$15,627	$19,254
3	$19,747	$28,400	$23,830	$25,586
4	$28,401	$38,300	$32,804	$29,939
5	$38,301	$50,000	$43,298	$33,156
6	$50,001	$64,500	$56,095	$38,676
7	$64,501	$82,000	$71,320	$45,811
8	$82,001	$106,000	$91,604	$55,137
9	$106,001	$151,570	$122,131	$69,912
10	$151,571	—	$231,885	$101,789

Source: USITC calculations using 2015 Consumer Expenditure Survey (CES) data.

CES data are used to create 10 different consumption baskets for the 10 income deciles. While the BLS obtains product prices from data, this assessment gets prices from the U.S. Applied General Equilibrium (USAGE) model (described in appendix E), which is used in this investigation to estimate prices and other economic variables in several scenarios. Each good in the consumption basket matches a product in the USAGE model, requiring aggregation of

[479] More details on the survey and collection methodology are available at the BLS website, https://www.bls.gov/CES/csxovr.htm.
[480] For more information about consumer units see the BLS website, https://www.bls.gov/cex/csxfaqs.htm#q3.
[481] BLS calculates aggregate expenditure share tables by deciles of income before taxes. USDOL, BLS, 2015 CES table, 2015. Income and expenditure calculations obtained from the CES data differ slightly from the BLS table due to "top-coding" of publicly available data. Top-coding is a method of disclosure limitation in which all cases in or above a certain percentage of the distribution are placed in a single category.

smaller consumption categories into several larger ones. Table F.2 presents a complete list of all goods and services included in the consumption basket.[482]

Table F.2: Goods and services included in the consumption basket

Accessories and parts	Gambling	Personal computers and peripheral equipment
Alcohol in purchased meals	Games, toys, and hobbies	Pets and related products
All non-health insurance	Garbage and trash collection	Pharmaceutical products
All other professional medical services	Gasoline and other motor fuel	Photo processing
Amusement parks, campgrounds, and related recreation services	Hairdressing salons and personal grooming establishments	Photo studios
Audio equipment	Higher education	Photographic equipment
Auto leasing	Home healthcare	Physician services
Bakery products	Hospitals	Pork
Beef and veal	Household cleaning products	Poultry
Beer	Household linens	Prerecorded and blank audio discs/tapes/digital files/downloads
Bicycles and accessories	Household paper products	Processed dairy products
Butter	Intercity buses	Processed fruits and vegetables
Cable and satellite television and radio services	Internet access	Railway transportation
Canned tuna	Intracity mass transit	Recreational books
Carpets and other floor coverings	Jewelry	Religious organizations' services to households
Cellular telephone services	Laundry and dry cleaning services	Repair and hire of footwear
Cereals	Legal services	Repair of audiovisual, photographic, and information processing equipment
Cheese	Lubricants and fluids	Repair of furniture, furnishings, and floor coverings
Child care	Luggage and similar personal items	Repair of household appliances
Children's and infants' clothing	Maintenance and repair of recreational vehicles and sports equipment	Shoes and other footwear
Cigarettes	Major household appliances	Small electric household appliances
Clocks, lamps, lighting fixtures, and household decorative items	Medical care and hospitalization	Social advocacy and civic and social organizations
Clothing materials	Medical laboratories	Social assistance
Clothing repair, rental, and alterations	Membership clubs and participant sports centers	Specialty outpatient care facilities and health and allied services
Coffee, tea, and other beverage materials	Men's and boys' clothing	Spectator sports
Commercial and vocational schools	Mineral waters, soft drinks, and vegetable juices	Spirits
Community food and housing/ emergency/other relief services	Miscellaneous household products	Sporting equipment, supplies, guns, and ammunition
Computer software and accessories	Motor vehicle maintenance and repair	Stationery and miscellaneous printed materials

[482] The second income decile has zero expenditure on nursing homes in the 2015 Consumer Expenditure Survey (CES).

Corrective eyeglasses and contact lenses	Motor vehicle rental	Sugar
Cosmetic/perfumes/bath/nail preparations and implements	Motorcycles	Sweets
Daycare and nursery schools	Moving, storage, and freight services	Tax preparation and other related services
Dental services	Musical instruments	Taxicabs
Dishes and flatware	Natural gas	Telecommunication services
Domestic services	New autos	Telephone and facsimile equipment
Educational books	New light trucks	Televisions
Eggs	Newspapers and periodicals	Therapeutic medical equipment
Electric appliances for personal care	Nonelectric cookware and tableware	Tires
Electricity	Nursing homes	Tobacco
Elementary and secondary schools	Other entertainment	Tools, hardware, and supplies
Fats and oils	Other delivery services (by non-U.S. postal facilities)	Travel and vacation services
Film and photographic supplies	Other fuels	Used autos
Financial services	Other household services	Used light trucks
First-class postal service (by U.S. postal facilities)	Other meats	Vegetables (fresh)
Fish and seafood	Other medical products	Veterinary and other services for pets
Flowers, seeds, and potted plants	Other personal business services	Videocassettes and discs, blank and prerecorded
Foundations and grantmaking and giving services to households	Other personal care goods and services	Video media rental
Fresh milk	Other purchased meals	Watches
Fruit (fresh)	Other recreational vehicles	Water supply and sewage maintenance
Fuel oil	Other video equipment	Window coverings
Funeral and burial services	Outdoor equipment and supplies	Wine
Furniture	Parking fees and tolls	Women's and girls' clothing

Source: USITC concordance of the CES 2015 and USAGE I-O sectors.

The consumption basket excludes savings and mortgage/rent expenses. Savings are excluded because the focus of this report is on the cost of living. (The Consumer Price Index constructed by BLS also excludes savings.) Mortgage and rental costs are excluded because they are not addressed consistently in the CES.[483]

Table F.3 illustrates different consumption patterns of households with different incomes. For each expenditure category in CES, a ratio of expenditure share of the richest (90th percentile) household group and poorest (10th percentile) household group is calculated. These ratios are then sorted in a descending order and show the top 5 and the bottom 5 of the 153 CES categories in the second column, "90/10 ratio," of table F.3. Numbers greater than 1 mean that

[483] For example, households that have paid off their mortgage do not have a mortgage expense. Unlike GDP calculations, CES does not include imputed rent for these households directly. The index constructed in this report is most similar to a special Consumer Price Index (CPI) calculated by the BLS, called CPI less shelter.

rich households spend a greater share of their budget on these items. Numbers less than 1 mean that poor households spend a greater share of their budget on these items. The third column in Table F.3, "50/10 ratio," shows a similar comparison of the median (50th percentile) household group and the poorest household group. The numbers tell us that wealthy and middle-class households spend a higher share of their total expenditure on watches, jewelry, footwear repair, new autos, and domestic services. The poorest households spend a higher share of their total expenditure on higher education, social assistance, and home healthcare. The difference between spending by the top and bottom deciles are seen in the 90/10 ratio. The top decile spends 11 times more, as a share, on photo studios than the bottom decile. The bottom decile spends 20 times more, as a share, on home healthcare than the top decile.

Table F.3: Expenditure patterns by household type, 2015

Rank	90/10 ratio	50/10 ratio
1	Photo studios (10.77)	Photo studios (6.80)
2	Watches (8.95)	Footwear repair (5.68)
3	Domestic services (7.97)	Jewelry (4.66)
4	Footwear repair (7.91)	Therapeutic medical equipment (4.02)
5	Commercial and vocational schools (7.64)	New autos (3.62)
147	Tobacco (0.23)	Nursing homes (0.21)
148	Cigarettes (0.18)	Funeral and burial services (0.18)
149	Social assistance (0.14)	Higher education (0.15)
150	Funeral and burial services (0.12)	Social assistance (0.13)
151	Home healthcare (0.05)	Home health care (0.01)

Source: USITC calculations.

Table F.4 shows the ratios of consumption shares of households with different incomes for the products that are subject to significant U.S. import restraints. As in table F.3, ratios that are greater than 1 indicate that the wealthier households spend a larger share of total expenditure on a particular good; ratios that are less than 1 indicate that the poorer households spend a larger share of total expenditure on that good. For example, wealthier households' expenditure share on costume jewelry exceeds poorer households' expenditure share by more than four times.

Table F.4: Expenditure patterns by household type, goods that are subject to significant import restraints only

Sector	90/10 ratio	50/10 ratio
Beef	0.52	0.77
Butter	0.59	0.73
Canned tuna	0.42	0.63
Ceramic wall and floor tiles	1.93	1.24
Cheese	0.64	0.78
China, fine earthenware, pottery	1.07	0.61
Cigarettes	0.18	0.73
Costume jewelry	4.38	4.66
Footwear and leather products	1.38	0.99
Pens and mechanical pencils	1.06	1.09
Pressed and blown glass and glassware	1.07	0.61
Residential lighting fixtures	2.46	2.08
Sugar	0.26	0.56
Textiles and apparel	1.11	0.79

Source: USITC calculations.
Note: this table lists only consumer end-use products.

Calculating the Cost of a Consumption Basket and CPI change

The cost of the consumption basket of household *j* in period 0 (year 2015) is $\sum_{i=1}^{N} p_{0i} q_{0i}^{j}$ where i is a good, p is its wage-adjusted (real) price, and q is its share in total expenditure in period 0. Share q is obtained from the data (CES), while prices p are obtained from the general equilibrium model. The cost of the same basket in period 1 (year 2020) is $\sum_{i=1}^{N} p_{1i} q_{0i}^{j}$. The change in the CPI for a household j between period 1 (year 2020) and period 0 (year 2015) is given by

$$\Delta CPI^{j} = \sum_{i=1}^{N} \frac{p_{1i}}{p_{0i}} q_{0i}^{j}$$

Consider two alternative scenarios in period 1: (1) the baseline scenario (denoted by superscript *b*) in which current trade policy remains in place, and (2) a hypothetical scenario (denoted by superscript *h*) in which trade policy changes. The objective is to compare the effects of the policy change with the baseline development of the economy. Therefore, the expression of interest is

$$\sum_{i=1}^{N} \frac{p_{1i}^{h}}{p_{0i}} q_{0i}^{j} - \sum_{i=1}^{N} \frac{p_{1i}^{b}}{p_{0i}} q_{0i}^{j} = \sum_{i=1}^{N} \frac{p_{1i}^{h} - p_{1i}^{b}}{p_{0i}} q_{0i}^{j}$$

Policy-specific Results

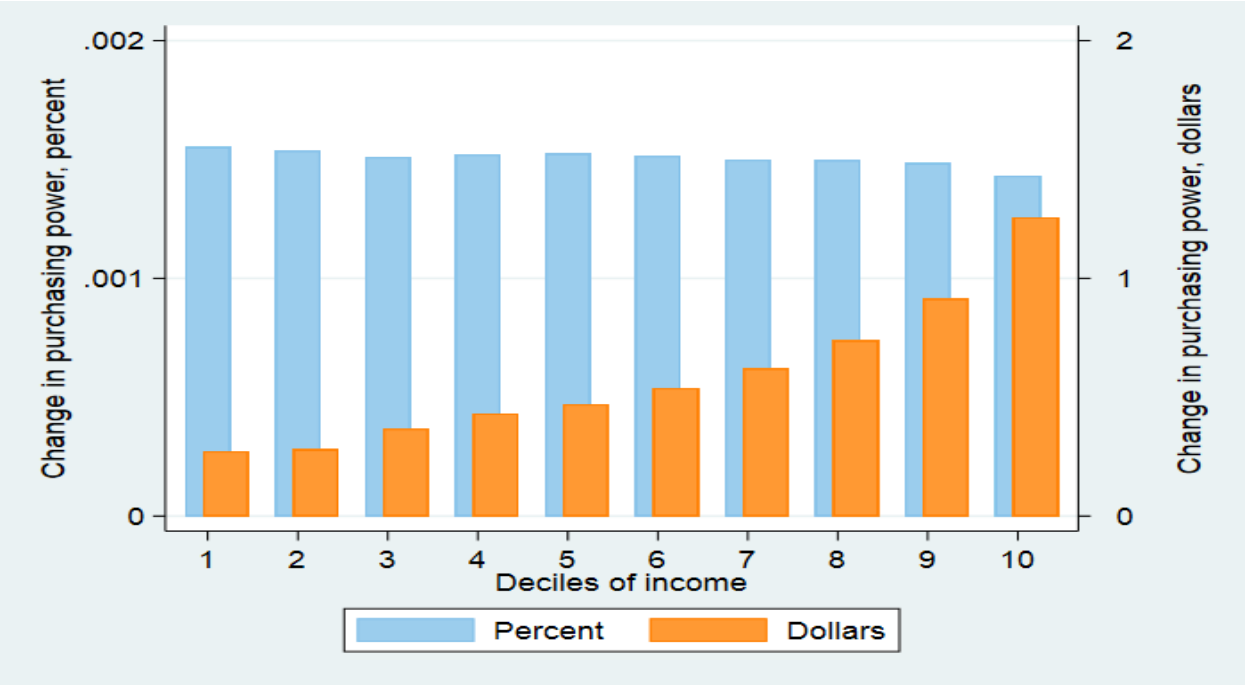
Figures F.1 through F.18 show the effects of the removal of significant U.S. import restraints on a single product category on households with different incomes. On the horizontal axis there are 10 groups of households, with the poorest households on the left. Orange bars show the decline in the cost of the household consumption basket in dollars from the removal of all significant U.S. import restraints. Light blue bars show these cost declines in percentage terms. All household groups benefit from the removal of significant U.S. import restraints. However, the benefits stemming from most experiments are relatively small for most sectors and are similar in percentage terms across all income deciles.

There are two notable sectors in terms of magnitude of the effects: experiments that produce relatively large effects on households are the leather goods experiment (figure F.11) and the textiles and apparel goods experiment (figure F.18). There are also several notable exceptions to the overall relatively flat distribution of the effects in percentage terms: trade restrictions on butter (figure F.3), canned tuna (figure F.4), cheese (figure F.7), cigarettes (figure F.9), and sugar (figure F.16) are all regressive (meaning that greater burden of trade restrictions falls on poorer households), although the magnitudes of these percentage differences are very small.

Ball and Roller Bearings

Figure F.1 shows the results of removal of import restraints on ball and roller bearings on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.27, while the cost of the consumption basket for the richest households is reduced by $1.26. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.0014 percent for the wealthiest households to 0.0016 percent for the poorest.

Figure F.1: Effects of removing ball and roller bearings import restraints on the cost of the consumption basket for consumers with different income levels

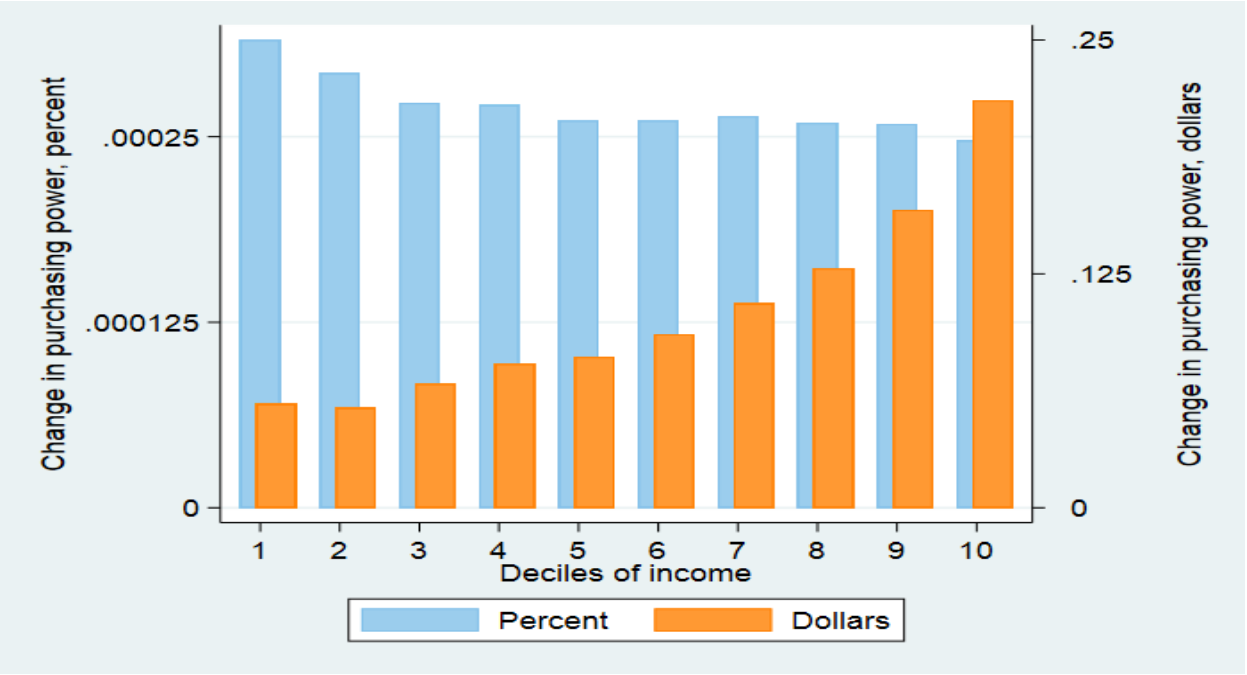


Source: USITC estimates.

Beef

Figure F.2 shows the results of removal of import restraints on beef on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.05, while the cost of the consumption basket for the richest households is reduced by $0.22. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.0002 percent for the wealthiest households to 0.0003 percent for the poorest. The small percentage changes reflect the small magnitudes of U.S. import restraints and the small share of expenditures on beef in total consumption expenditure.

Figure F.2: Effects of removing beef import restraints on the cost of the consumption basket for consumers with different income levels

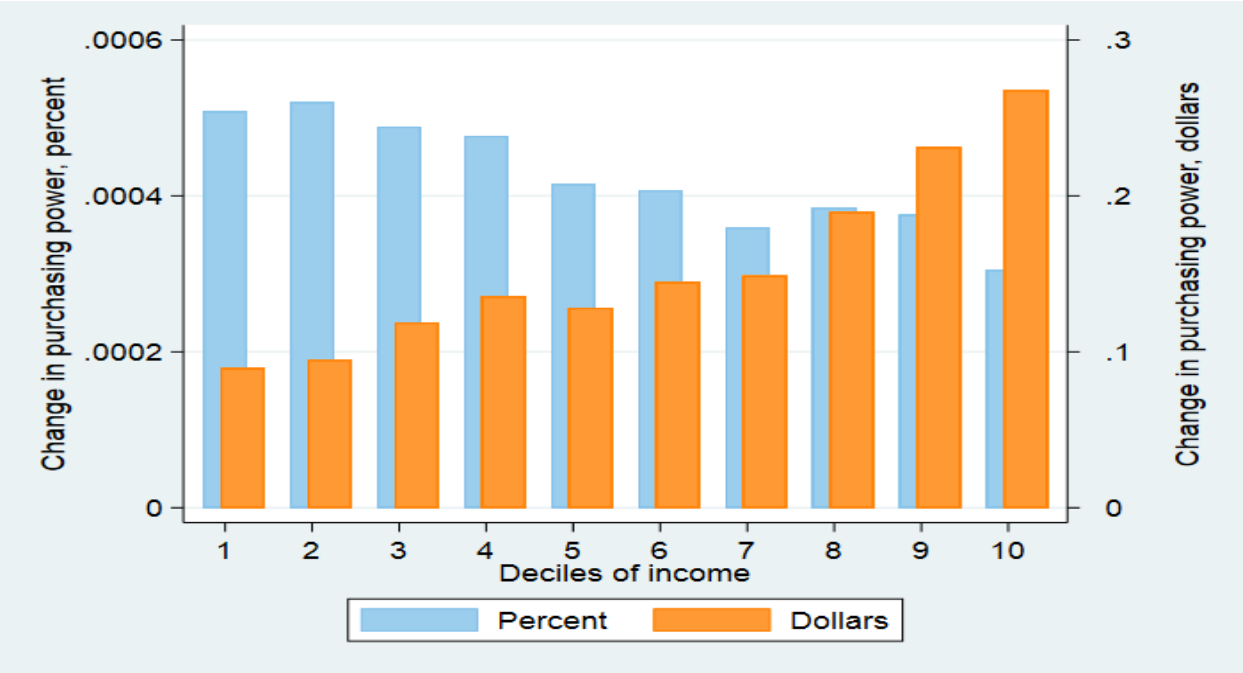


Source: USITC estimates.

Butter

Figure F.3 shows the results of the removal of import restraints on butter on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.09, while the cost of the consumption basket for the richest households is reduced by $0.27. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.0003 percent for the wealthiest households to 0.0005 percent for the poorest. The small percentage changes reflect the small magnitudes of U.S. import restraints and the small share of expenditures on butter in total consumption expenditure.

Figure F.3: Effects of removing butter import restraints on the cost of the consumption basket for consumers with different income levels

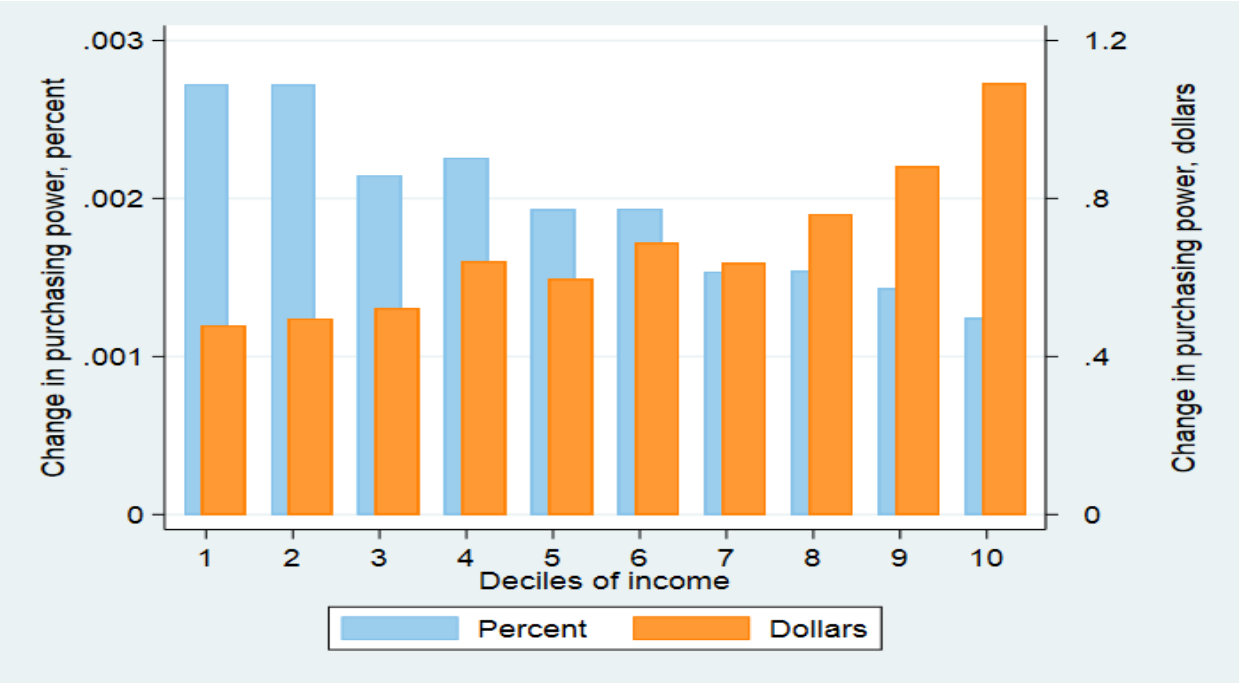


Source: USITC estimates.

Canned Tuna

Figure F.4 shows the results of the removal of import restraints on canned tuna on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.48, while the cost of the consumption basket for the richest households is reduced by $1.09. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.0012 percent for the wealthiest households to 0.0027 percent for the poorest. The small percentage changes reflect the small magnitudes of U.S. import restraints and the small share of expenditures on canned tuna in total consumption expenditure.

Figure F.4: Effects of removing tuna import restraints on the cost of the consumption basket for consumers with different income levels

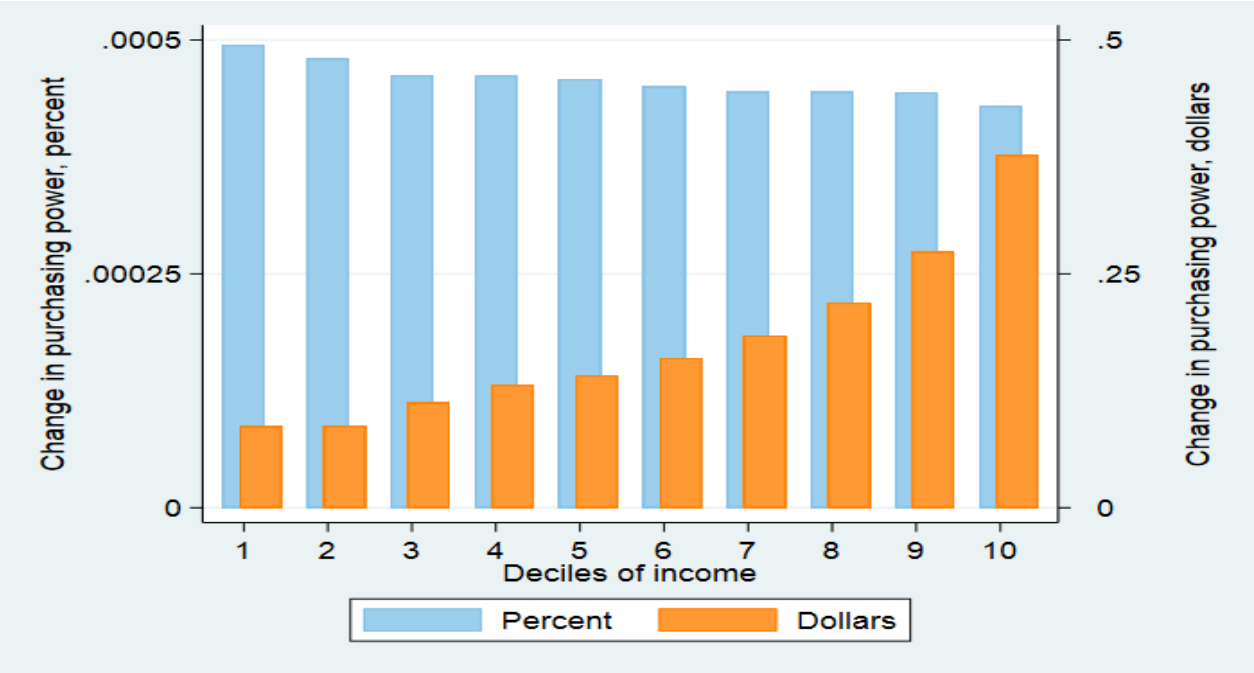


Source: USITC estimates.

Cellulosic Organic Fibers

Figure F.5 shows the results of the removal of import restraints on cellulosic organic fibers, such as rayon and acetate, on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.09, while the cost of the consumption basket for the richest households is reduced by $0.38. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.0004 percent for the wealthiest households to 0.0005 percent for the poorest.

Figure F.5: Effects of removing cellulosic organic fibers import restraints on the cost of the consumption basket for consumers with different income levels

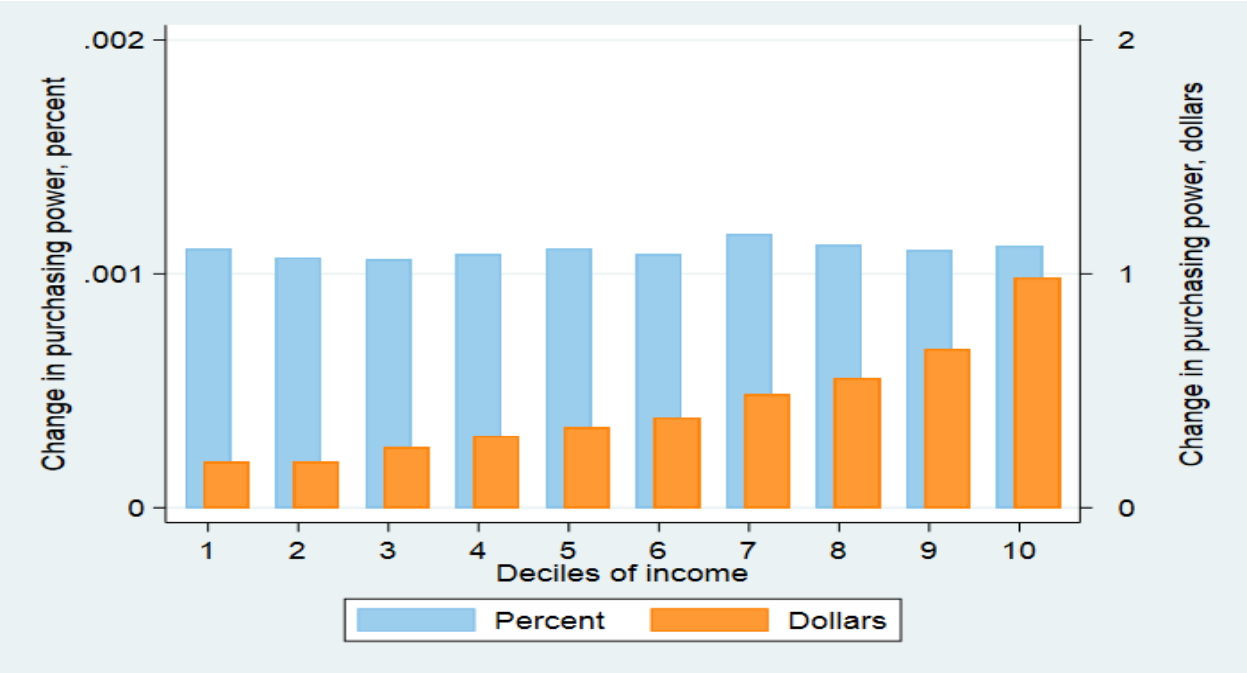


Source: USITC estimates.

Ceramic Wall and Floor Tiles

Figure F.6 shows the results of the removal of import restraints on ceramic wall and floor tiles on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.19, while the cost of the consumption basket for the richest households is reduced by $0.98. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.0011 percent for the poorest households to 0.0012 percent for the wealthiest. The small percentage changes reflect the small magnitudes of U.S. import restraints and the small share of expenditures on ceramic wall and floor tiles in total consumption expenditure.

Figure F.6: Effects of removing ceramic wall and floor tiles import restraints on the cost of the consumption basket for consumers with different income levels

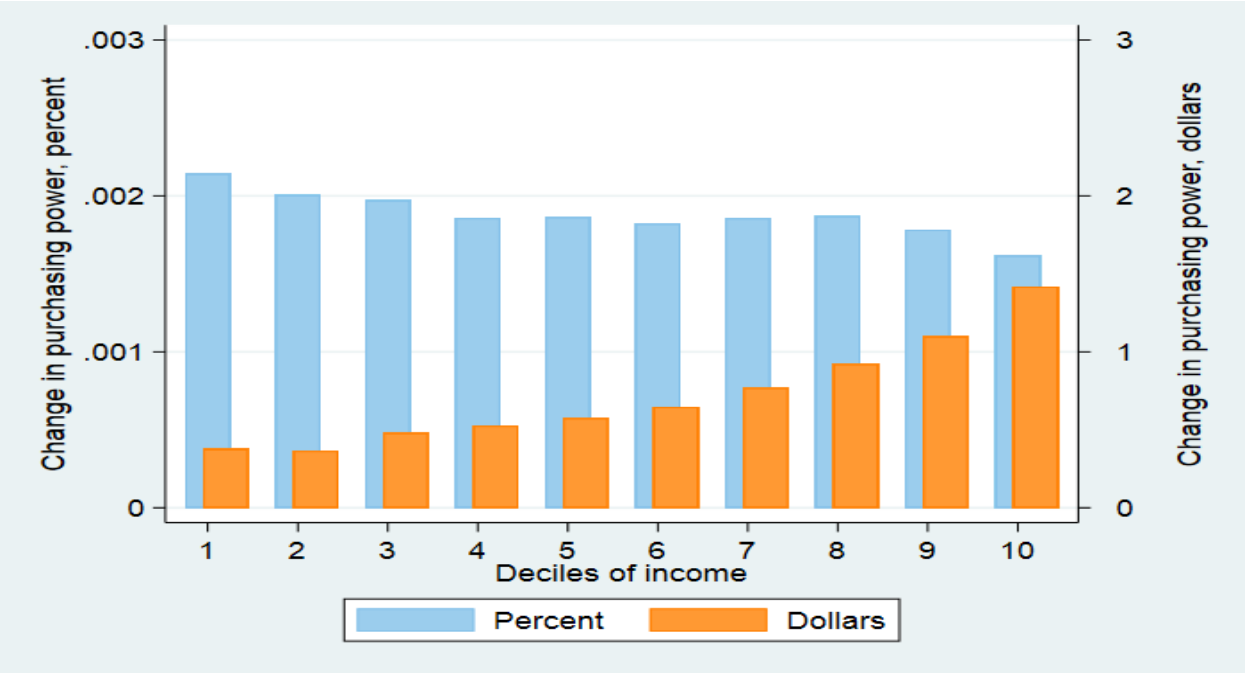


Source: USITC estimates.

Cheese

Figure F.7 shows the results of the removal of import restraints on cheese on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.37, while the cost of the consumption basket for the richest households is reduced by $1.42. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.0016 percent for the wealthiest households to 0.0021 percent for the poorest. The small percentage changes reflect the small magnitudes of U.S. import restraints and the small share of expenditures on cheese in total consumption expenditure.

Figure F.7: Effects of removing cheese import restraints on the cost of the consumption basket for consumers with different income levels

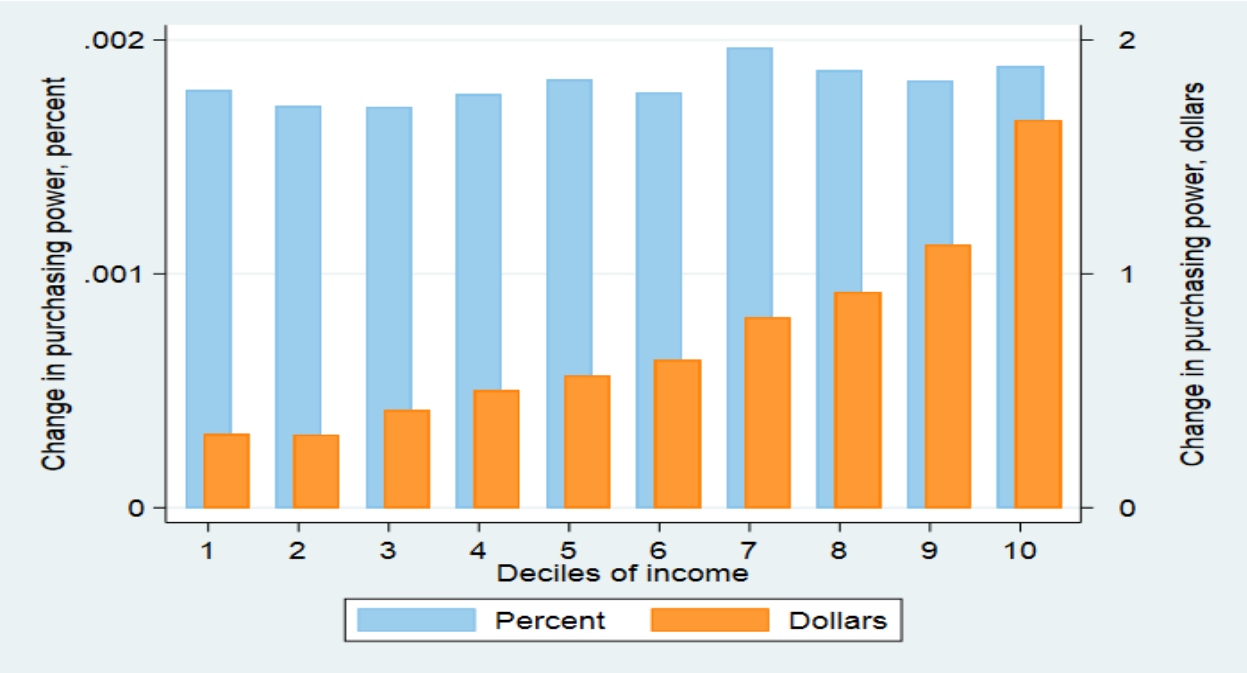


Source: USITC estimates.

China, Fine Earthenware, and Pottery

Figure F.8 shows the results of the removal of import restraints on china, fine earthenware, and pottery on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.31, while the cost of the consumption basket for the richest households is reduced by $1.66. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.0017 percent for the poorest households to 0.0020 percent for the wealthiest. The small percentage changes reflect the small magnitudes of U.S. import restraints and the small share of expenditures on china, fine earthenware, and pottery in total consumption expenditure.

Figure F.8: Effects of removing china, fine earthenware, and pottery import restraints on the cost of the consumption basket for consumers with different income levels

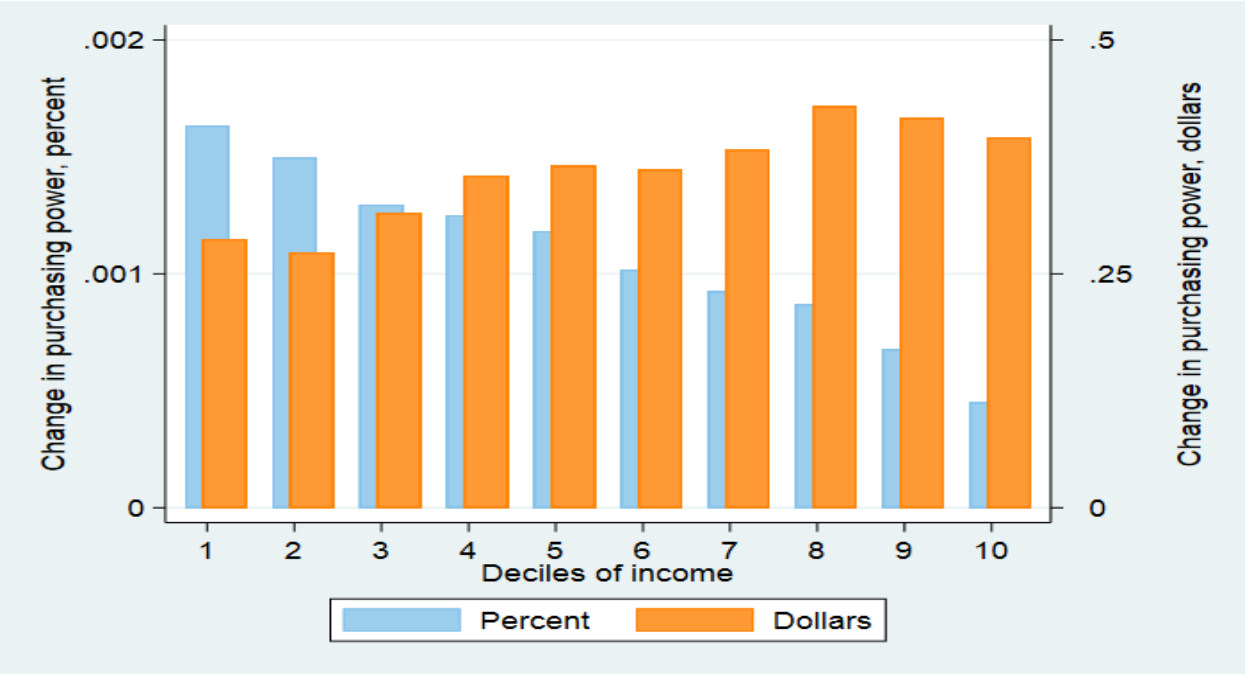


Source: USITC estimates.

Cigarettes

Figure F.9 shows the results of the removal of import restraints on cigarettes on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.27, same as the cost of the consumption basket for the wealthiest households. Households in the middle of the income distribution see a reduction in cost of the consumption basket by $0.43. In percentage terms, cost reductions range from 0.0005 percent for the wealthiest households to 0.0016 percent for the poorest. The small percentage changes reflect the small magnitudes of U.S. import restraints and the small share of expenditures on cigarettes in total consumption expenditure. Note that the import restraints on cigarettes are significantly regressive.

Figure F.9: Effects of removing cigarettes import restraints on the cost of the consumption basket for consumers with different income levels



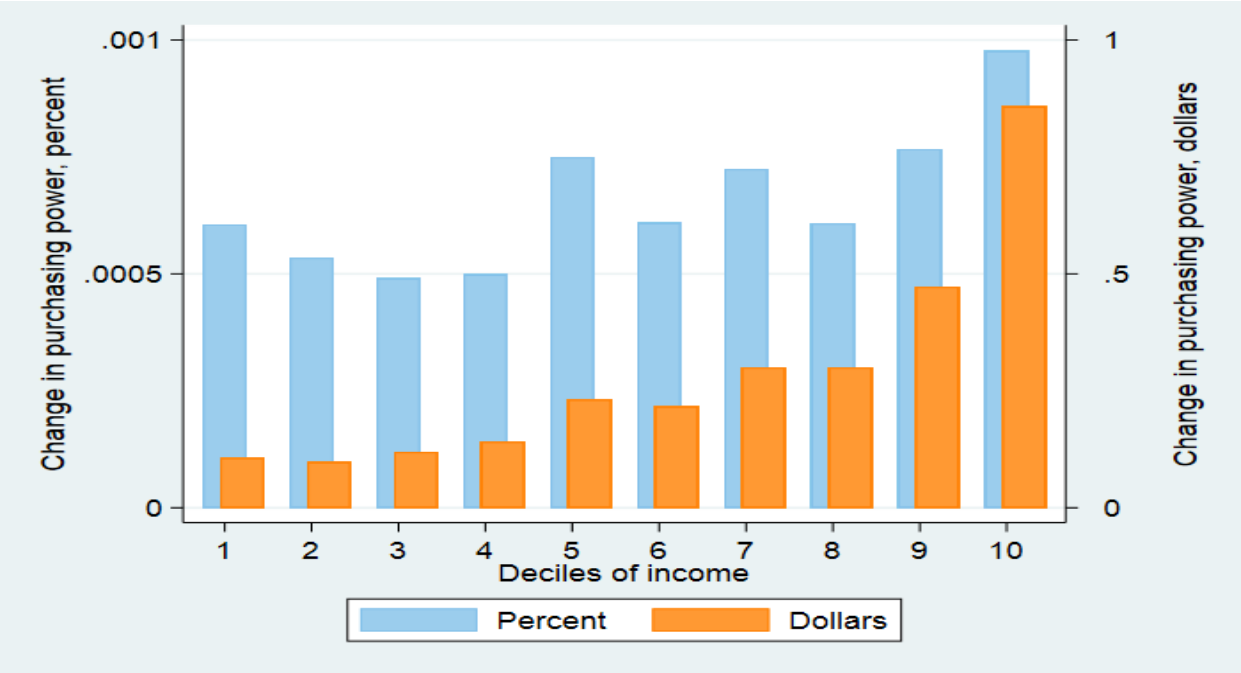
Source: USITC estimates.

Costume Jewelry

Figure F.10 shows the results of the removal of import restraints on costume jewelry on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.10, while the cost of the consumption basket for the richest households is reduced by $0.86. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.0005 percent for the poorer households to 0.0010 percent for the wealthiest.[484] The small percentage changes reflect the small magnitudes of U.S. import restraints and the small share of expenditures on costume jewelry in total consumption expenditure.

[484] Poorest households see a 0.0006% reduction in cost of the consumption basket. Households in the third income decile see the lowest percent reduction.

Figure F.10: Effects of removing costume jewelry import restraints on the cost of the consumption basket for consumers with different income levels

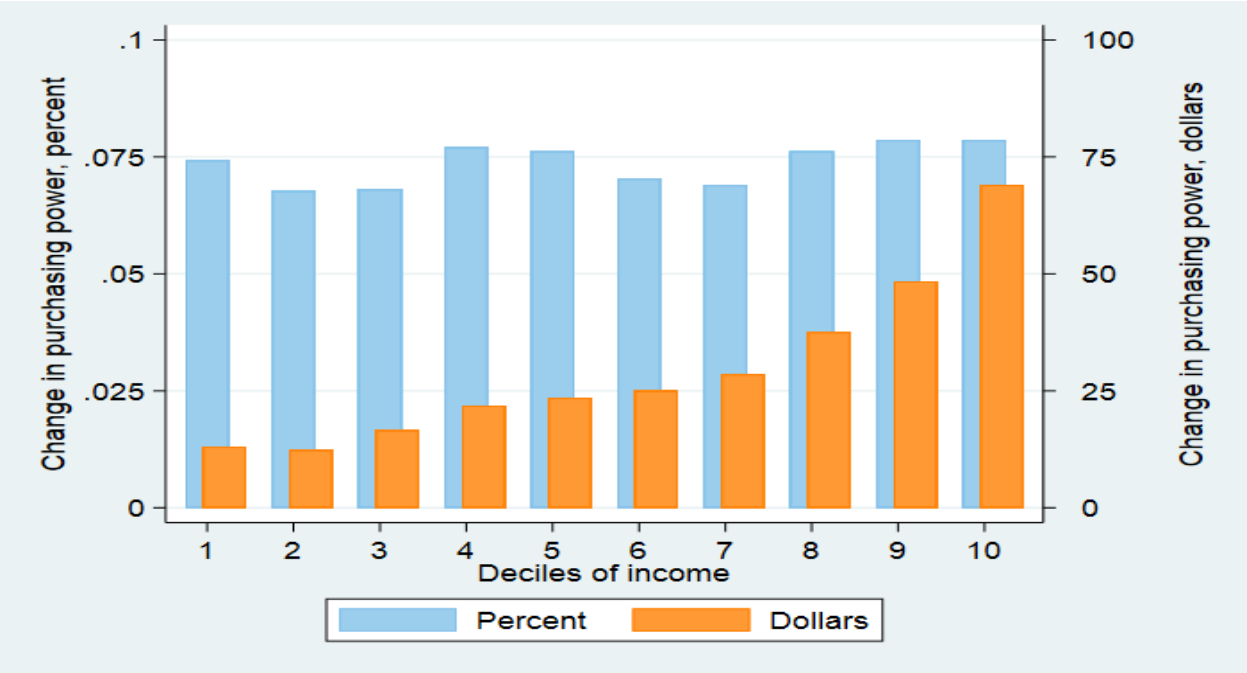


Source: USITC estimates.

Footwear and Leather Products

Figure F.11 shows the results of the removal of import restraints on footwear and leather products on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $12.33, while the cost of the consumption basket for the richest households is reduced by $69.00. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.07 percent for the poorest households to 0.08 percent for the wealthiest. The benefits from removing import restraints on footwear and leather products are significantly higher than those from removing import restraints in other sectors, with the exception of the textiles and apparel sector.

Figure F.11: Effects of removing footwear and leather products import restraints on the cost of the consumption basket for consumers with different income levels

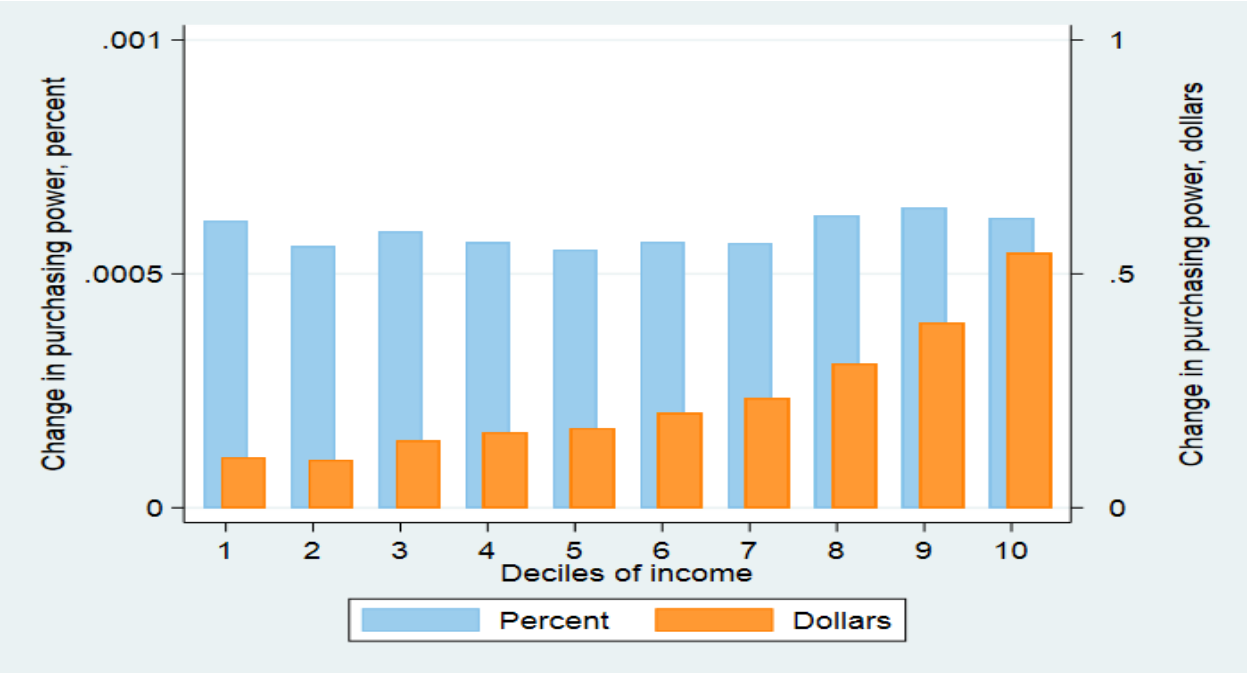


Source: USITC estimates.

Pens and Mechanical Pencils

Figure F.12 shows the results of the removal of import restraints on pens and mechanical pencils on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.10, while the cost of the consumption basket for the richest households is reduced by $0.54. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.0005 percent for the poorest households to 0.0006 percent for the wealthiest. The small percentage changes reflect the small magnitudes of U.S. import restraints and the small share of expenditures on pens and mechanical pencils in total consumption expenditure.

Figure F.12: Effects of removing pens and mechanical pencils import restraints on the cost of the consumption basket for consumers with different income levels

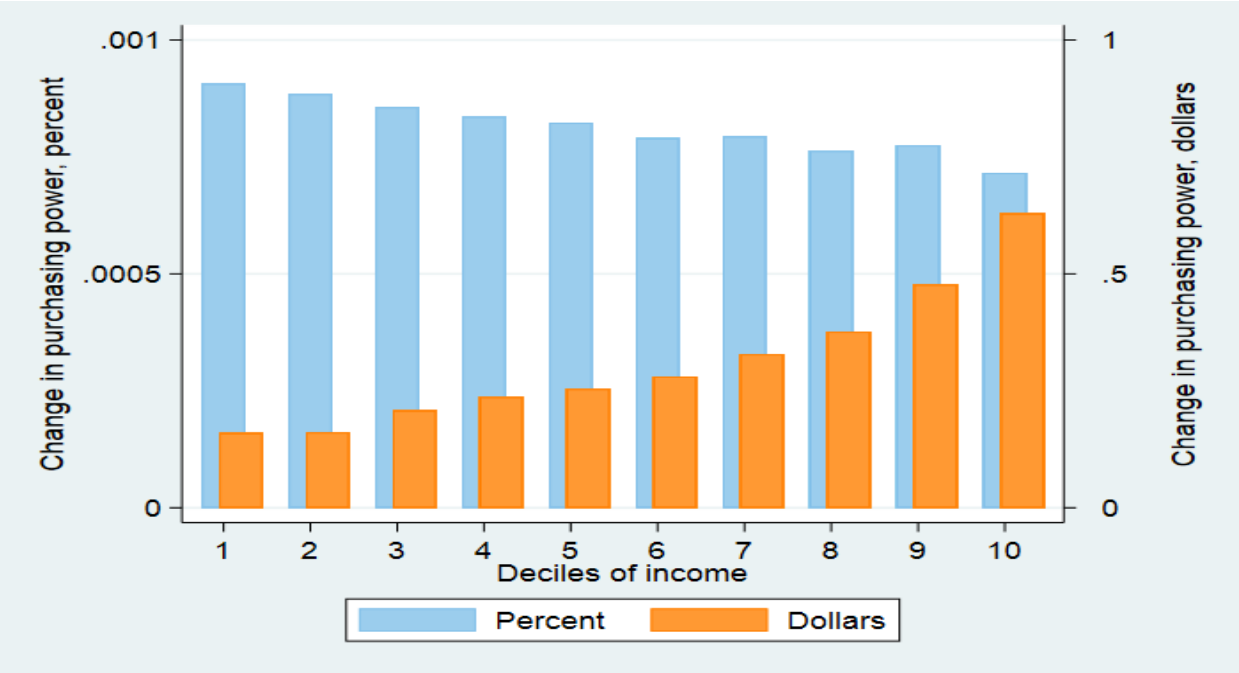


Source: USITC estimates.

Pesticides and Agricultural Chemicals

Figure F.13 shows the results of removing import restraints on pesticides and agricultural chemicals on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.16, while the cost of the consumption basket for the richest households is reduced by $0.63. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.0007 percent for the wealthiest households to 0.0010 percent for the poorest.

Figure F.13: Effects of removing pesticides and agricultural chemicals import restraints on the cost of the consumption basket for consumers with different income levels



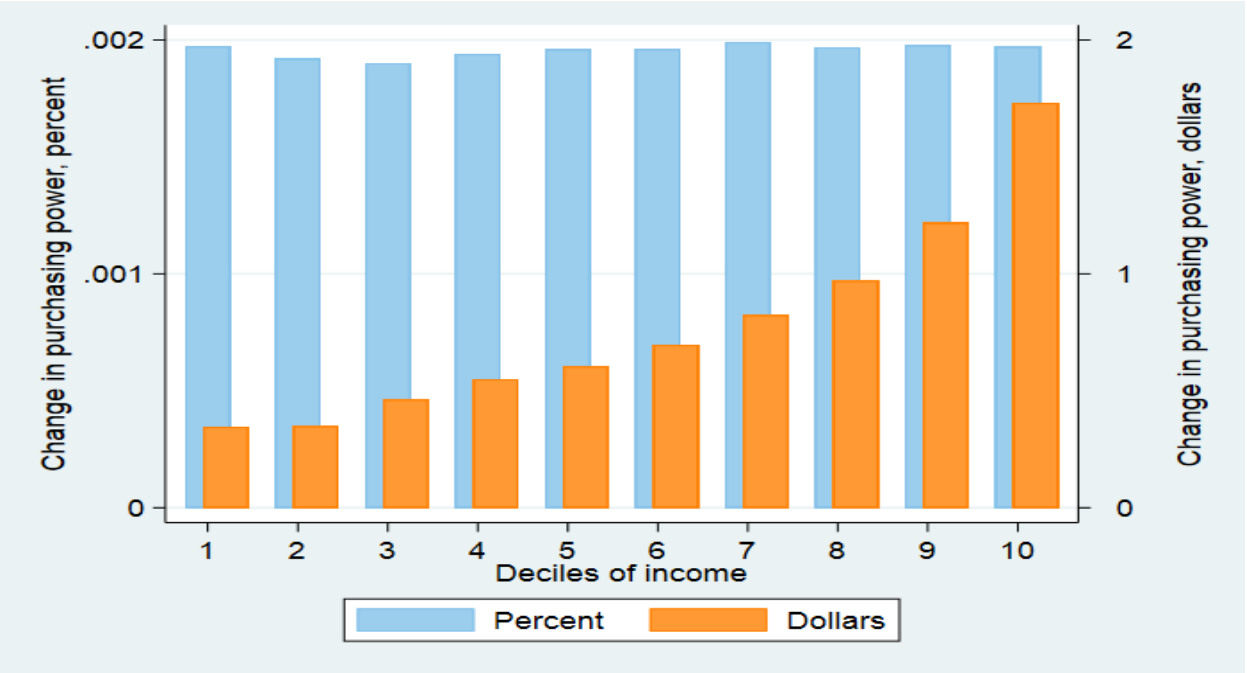
Source: USITC estimates.

Pressed and Blown Glass and Glassware

Figure F.14 shows the results of the removal of import restraints on pressed and blown glass and glassware on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.35, while the cost of the consumption basket for the richest households is reduced by $1.73. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.0019 percent for the poorer households to 0.0020 percent for the wealthiest. [485]

[485] Households in the third income decile see the lowest percent reduction.

Figure F.14: Effects of removing pressed and blown glass and glassware import restraints on the cost of the consumption basket for consumers with different income levels

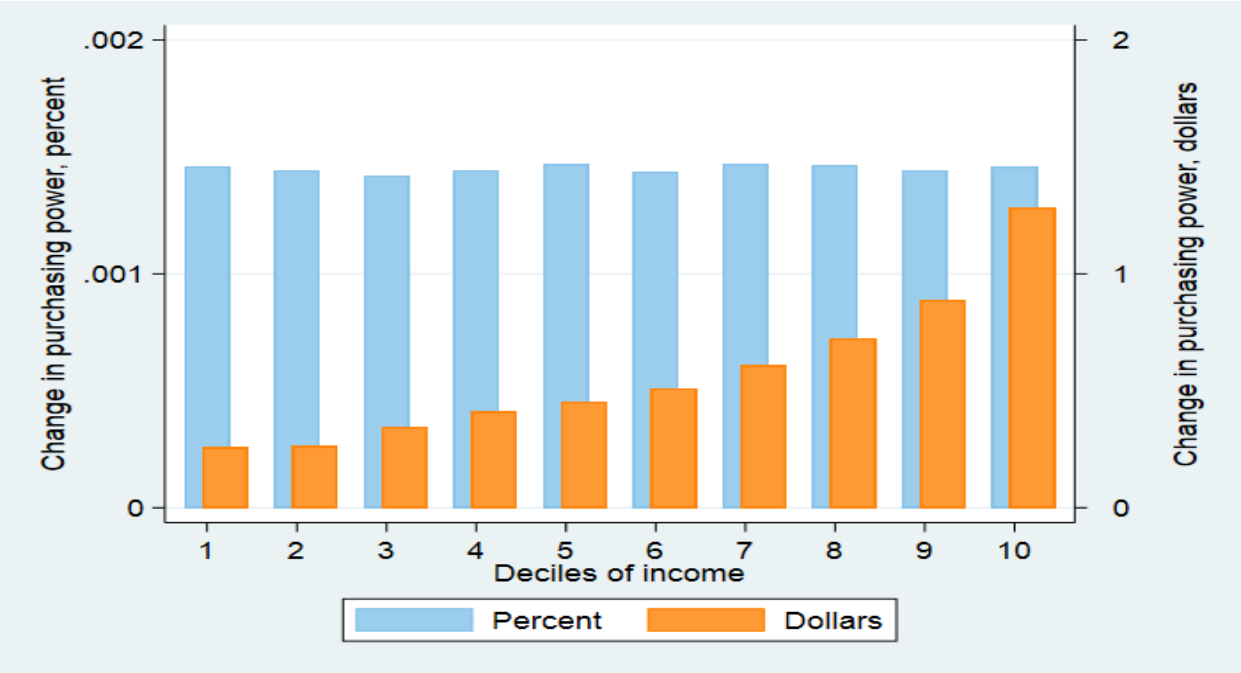


Source: USITC estimates.

Residential Lighting Fixtures

Figure F.15 shows the results of the removal of import restraints on residential lighting fixtures on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.26, while the cost of the consumption basket for the richest households is reduced by $1.28. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.0014 percent for the poorest households to 0.0015 percent for the wealthiest. The small percentage changes reflect the small magnitudes of U.S. import restraints and the small share of expenditures on residential lighting fixtures.

Figure F.15: Effects of removing residential lighting fixtures import restraints on the cost of the consumption basket for consumers with different income levels

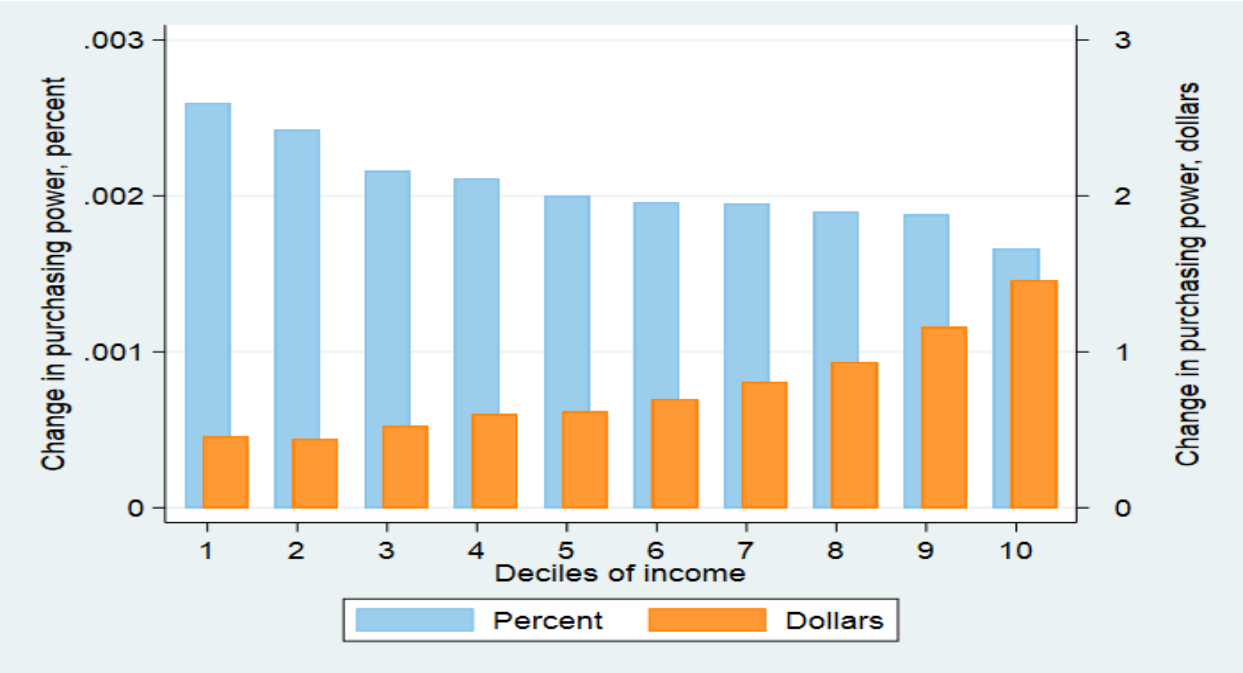


Source: USITC estimates.

Sugar

Figure F.16 shows the results of the removal of import restraints on sugar on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.44, while the cost of the consumption basket for the richest households is reduced by $1.46. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.0017 percent for the wealthiest households to 0.0026 percent for the poorest.

Figure F.16: Effects of removing sugar import restraints on the cost of the consumption basket for consumers with different income levels

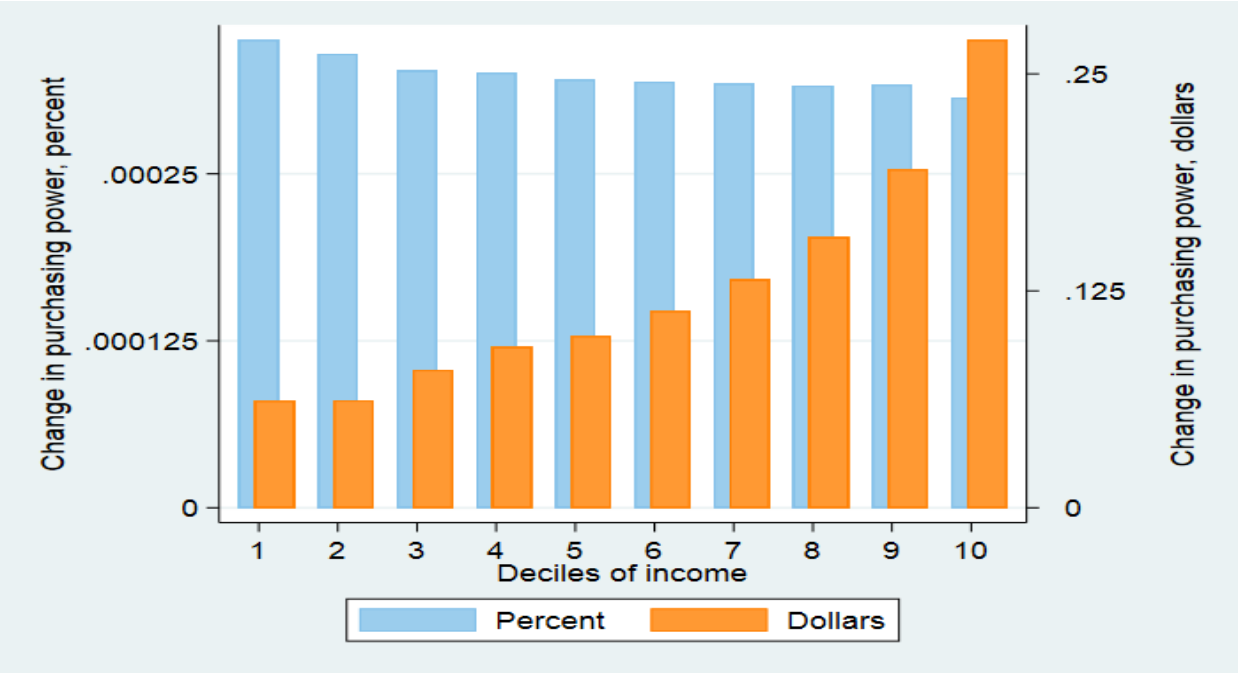


Source: USITC estimates.

Synthetic Organic Dyes and Pigments

Figure F.17 shows the results of the removal of import restraints on synthetic organic dyes and pigments on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $0.06, while the cost of the consumption basket for the richest households is reduced by $0.27. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reduction is about 0.0003 percent for all income groups.

Figure F.17: Effects of removing synthetic organic dyes and pigments import restraints on the cost of the consumption basket for consumers with different income levels



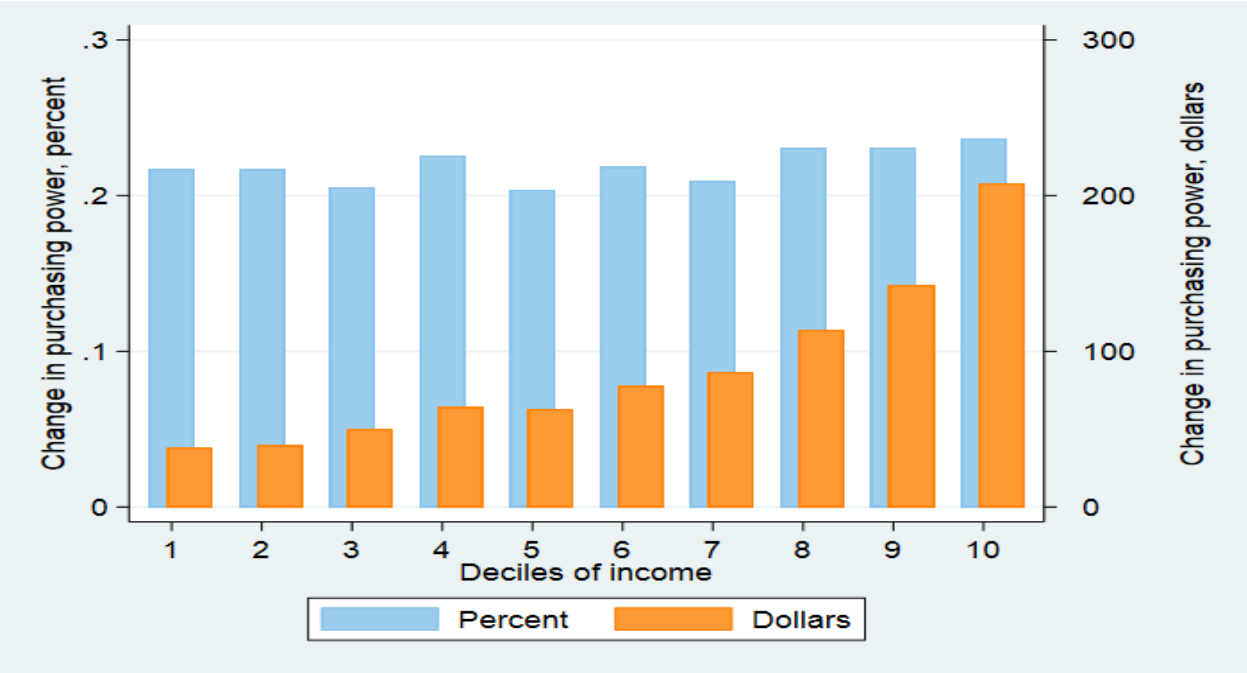
Source: USITC estimates.

Textiles and Apparel

Figure F.18 shows the results of the removal of import restraints on textiles and apparel on households with different incomes. The cost of the consumption basket for the poorest households is reduced by $38.16, while the cost of the consumption basket for the richest households is reduced by $207.79. The reduction is greater for richer households because their consumption baskets are more expensive. In percentage terms, cost reductions range from 0.20 percent for the poorest households to 0.24 percent for the wealthiest.[486] The benefits from removing import restraints in the textile and apparel sector are larger than the benefits from removing them in all other sectors.

[486] Households in the fifth income decile see the lowest percent reduction.

Figure F.18: Effects of removing textiles and apparel import restraints on the cost of the consumption basket for consumers with different income levels



Source: USITC estimates.

Review of Previous Literature

Relatively little existing literature has looked at the effects of trade restrictions, especially tariffs, on households with different income levels.[487] Furman, Russ, and Shambaugh (2017) uses the CES to estimate the tariff burden of U.S. households in different income deciles. Their main result is that the burden of U.S. tariffs relative to income is higher for poorer households than richer ones. The results of Furman Russ, and Shambaugh in "US Tariffs Are an Arbitrary and Regressive Tax" are carefully compared to the results of this report in the next section.

Moran 2014 calculates the average tariff faced by U.S. consumers for each of the 13 income brackets. In "Tariffs Hit Poor Americans Hardest," he finds that the average tariff rates faced by the poor consumers are higher than the average tariff rates faced by the rich consumers. Fajgelbaum and Khandelwal in "Measuring the Unequal Gains from Trade" use an econometric modeling approach to estimate the gains from trade across households with different income levels in a large number of countries. The authors compare current trade shares to a

[487] Three previous studies include those by Furman, Russ, and Shambaugh, , "US Tariffs Are an Arbitrary and Regressive Tax," (2017); Moran, "Tariffs Hit Poor Americans Hardest," (2014); and Fajgelbaum and Khandelwal, "Measuring the Unequal Gains from Trade," (2016).

hypothetical scenario where countries do not trade with each other at all (autarky).[488] They find that closing off trade has the highest negative welfare effects for the poor.

There are several important differences between the methodologies of this report and previous studies. First, this report uses a computable general equilibrium model to generate price changes due to changes in trade policy. By contrast, Furman, Russ, and Shambaugh and Moran assume that prices of imported goods change by the amount of tariff (a small-country assumption). The implications of this assumption are discussed in the next section. In addition, this report uses the CPI to measure the effects of policy changes on different households. Changes in the CPI measure the impact of policy changes on the cost of household consumption (purchasing power). Previous studies considered tariff burden relative to income, which includes consumption and savings.

Comparison of the Results to the Previous Literature

This section compares the results presented in this report to the recent study by Furman, Russ, and Shambaugh (2017). [489] Using the 2014 CES data, the authors match 381 consumption categories to their respective tariff rates from the Harmonized Tariff Schedule of the United States maintained by the USITC. The authors then split households into 10 income deciles and calculate the direct tariff burden for each of these deciles. Direct tariff burden is calculated by assuming that the imported final goods that are subject to tariff will see a price decline that is equivalent to the amount of the tariff.[490] The authors make two alternative assumptions about domestic prices of competing goods: under one assumption these prices do not change, while under the second assumption, domestically produced goods have a price reduction in the amount of 50 percent of the tariff rate reduction. The authors find that import restraints on nearly 400 consumption categories cost about 0.60 percent of the total household expenditure for the poorest households, but only about 0.45 percent of the total expenditure (including expenditure on savings) for the wealthiest households.

Compared to their methodology, this report uses a general equilibrium model to produce changes in goods prices. Therefore, prices of imported goods obtained in model simulations may decrease by less than the amount of the tariff. In addition, prices of goods not directly affected by tariffs can also change because of the general equilibrium effects.

This section will reconcile the results obtained in this report with the results of Furman, Russ, and Shambaugh. First, the methodology described in that 2017 study is applied to the set of

[488] This experiment can be thought of as imposing prohibitively large tariffs that cut off all trade flows.
[489] Furman, Russ, and Shambaugh, "US Tariffs Are an Arbitrary and Regressive Tax," January 12, 2017.
[490] This approach does not take into account any potential price changes in domestically produced goods that use imported inputs that could lead to reduction in prices as a result of reduction in tariffs on imported inputs.

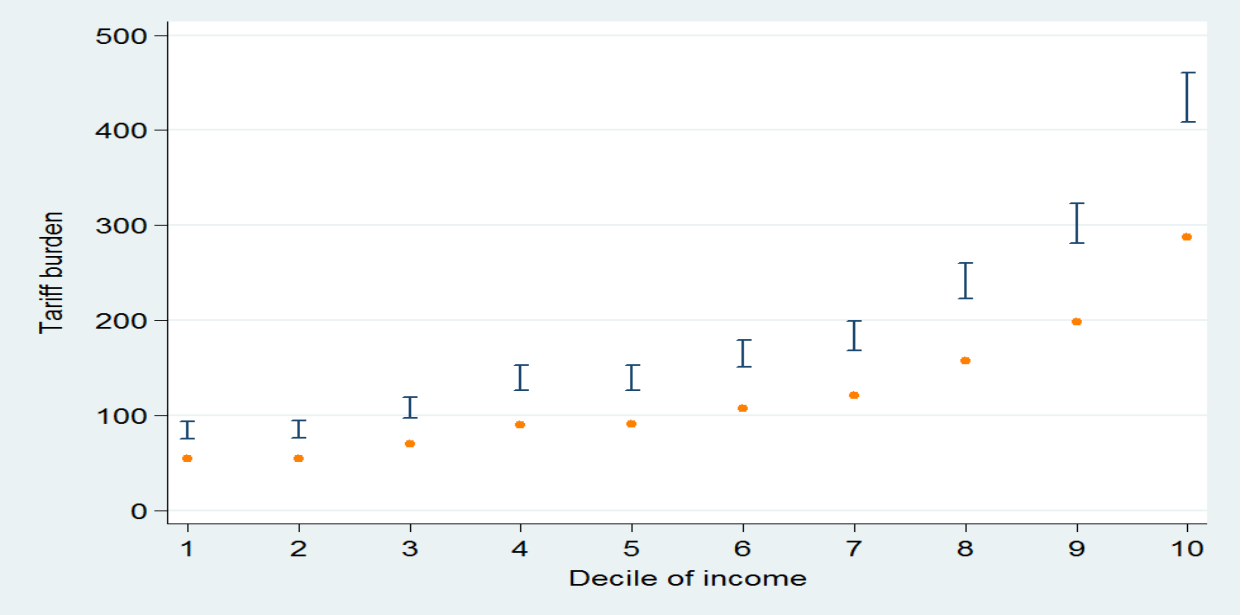
goods and services considered in this report (see table 1 for the full list). This report, as in Furman, Russ, and Shambaugh, considers two alternative assumptions regarding the changes in prices of domestic goods when U.S. import restraints are removed. Under the first assumption, there are no price changes in domestic goods that compete with the imported varieties affected by the tariff change. Under the second assumption, the reduction in the price of domestic goods is half of the reduction in tariff.

Figure F.19 shows the results and should be compared to figure 1 in Furman, Russ, and Shambaugh. Figure F.19 shows that households in the lowest income decile pay about $75–95 per year due to tariffs; households in the highest income decile pay about $410–460. These numbers are similar to those produced by Furman, Russ, and Shambaugh, but are about 15 percent smaller. The difference in magnitude is most likely due to the fact that this experiment reduces tariffs for a set of 20 goods with significant import restraints, compared to 381 goods in Furman, Russ, and Shambaugh. Thus, applying their methodology to the data used in this report produces similar results.

However, there are clear advantages to using a computable general equilibrium model to study the effects of removal of import restraints. The U.S. Applied General Equilibrium (USAGE) model used in this report produces price changes for imported and domestic goods. In general equilibrium analysis, prices of all goods change, even though some goods are not directly affected by import restraints.

The results of USAGE model simulations show that with the removal of import restraints, the economy grows and prices of many basic necessities, such as gasoline and electricity, rise. On the other hand, because prices of imported goods change as a result of the removal of import restraints, the prices of domestic substitutes change as well. On the net, removal of significant import restraints leads to a more modest gain in household purchasing power than predicted by Furman, Russ, and Shambaugh, as represented by orange dots on figure F.19.

Figure F.19: Tariff burden by decile of income



Source: USITC calculations using 2015 CES and significant import restraints described in section A.
Note: Bars show the lowest and highest tariff burden for each income decile. The lower and upper bounds result from assumptions of reduction in prices of domestic goods of 50% and 0% of tariff rate respectively. Dots show the tariff burden for each income decile using price changes produced by the comprehensive experiment.

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Appendix G
Calculating the Cumulative Effects of Tariffs

Overview

Tariffs accumulate as they are imposed at each border crossing during production in a global supply chain (GSC). Cumulative tariffs (CTs) are a way of adding up the tariffs on inputs, which cross borders in the various stages of early production, and eventually on the final product. Therefore, they are a measure of the total tariffs for the entire GSC. Chapter 3 provides an intuitive explanation of the approach and presents the results. This appendix describes the data and explains technical details of the calculations.[491] The approach largely follows work described in Rouzet and Miroudot (2013) and Miroudot, Rouzet, and Spinelli (2013).

Data Requirements and Availability

Making the calculations requires data on industry structure, which show products that cross borders and are used in GSCs, and on tariffs. The data on industry structure are from the Organisation for Economic Co-operation and Development (OECD) tables for inter-country, inter-industry input-output (ICIO). These tables show the origin of inputs that industries in different countries use to produce goods and services. For the calculations, the Commission used OECD's third revision of the ICIO tables, which include data on inter-country inputs and outputs for 33 goods and services sectors plus sectors of final demand.[492] The third revision tables provide annual data from 1995 to 2011 for 63 countries plus a region for the rest of the world.[493]

The tariff data are from the Trade Analysis Information System (TRAINS) maintained by the United Nations Committee on Trade and Development (UNCTAD) via the World Bank's Integrated Trade Solution (WITS) website. From the source data, the Commission created an importer-exporter-product dataset for each year in the third revision ICIO data.[494] The constructed dataset uses bilateral product-preferential (PRF) tariffs if available and most-favored-nation (MFN) tariffs if PRF tariffs are unavailable.

[491] The approach used largely follows Rouzet and Miroudot, "The Cumulative Impact of Trade Barriers along the Value Chain," 2013; and Miroudot, Rouzet, and Spinelli, *Trade Policy Implications of Global Value Chains*, 2013.
[492] The OECD released the third revision of its ICIO tables in April 2017. Rouzet and Miroudot, *The Cumulative Impact of Trade Barriers*, 2013, use the second revision tables for 2009, which have information for 36 industries and 57 economies, plus a "rest of the world" region.
[493] Although not used in these calculations, there are additional breakouts for China and Mexico.
[494] In a few cases when annual data were not available, data for the closest preceding year were used.

Methods

Rouzet and Miroudot (2013) calculate the CT paid on a bilateral country-sector basis between the output from country sector *i* used in production by country sector *j*:

$$\boldsymbol{CT_{i,j} = t_{i,j} + \sum_{n=0}^{\infty} \tau_i^n}$$

In this setup, $\boldsymbol{t_{i,j}}$ represents the direct tariff on imports from country sector *i* to country sector *j*; it is an element of the tariff matrix $\boldsymbol{T}$ and captures the direct tariff incurred at the last border crossing. However, country sector *i* producers may have already paid tariffs on their inputs, and the producers of those inputs may also have paid tariffs on their inputs, etc. Thus, we assume that up to *n* countries provide intermediate inputs for the supply chain. The second term captures this indirect effect, where $\boldsymbol{\tau_i^n}$ is the *i*-th element of the vector $\boldsymbol{e \times B \times A^n}$, where $\boldsymbol{e}$ is a 1 x *J* vector of ones; $\boldsymbol{B \equiv A.\times T.}$, the element-wise multiplication of $\boldsymbol{A}$ and $\boldsymbol{T}$; the requirements matrix from the ICIO table; and $\boldsymbol{T}$ is the tariff matrix. Both matrices have the dimensions *J* x *J*.

The requirements matrix tells how many cents of input are needed from each country-industry combination to produce one dollar's worth of output in each producing country-sector. For example, the table will tell us how many cents of manufacturing inputs from Germany are needed to produce one dollar's worth of agricultural output in Argentina. $\boldsymbol{A^n}$ is the requirements matrix raised to the power *n*. In the limit as *n* goes to infinity, the matrix $\boldsymbol{A^n}$ will numerically map the entire value chain for each country-industry. For example, it will tell us for each dollar of U.S. agricultural output, how many cents of German chemicals are required. This takes into account both the direct use of chemicals, such as fertilizers, in agriculture, and the indirect use of chemicals used to produce intermediate inputs, such as farming equipment, that are used in agriculture.

In matrix notation, the equation above can be re-written for country-sector pairs as follows:

$$\boldsymbol{CT = T^F + \left[\sum_{n=0}^{\infty} e * B * A^n\right]' * e}$$

where $\boldsymbol{T}^F$ is a matrix of final tariffs, and $\boldsymbol{e}$, $\boldsymbol{B}$ and $\boldsymbol{A}$ are as defined above.

This derivation follows Rouzet and Miroudot's approach for cumulative tariffs embodied in an import. Using the fact that the requirements matrix $\boldsymbol{A}$ is a convergent matrix, the equation for cumulative tariffs can be simplified as follows:

$$\boldsymbol{CT} = \boldsymbol{T}^{F} + [\boldsymbol{e} * \boldsymbol{B} * (\boldsymbol{I} - \boldsymbol{A})^{-1}]' * \boldsymbol{e}$$

In words, the cumulative tariff is equal to the tariff paid at the last border crossing, $\boldsymbol{T}^{F}$, and the sum of all tariffs paid on intermediate inputs. The first term represents the non-GSC direct tariff.

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Appendix H
Data for Figures

Table H.1: Data for figure 1.1

Year of report	Welfare gain	Average import tariff
	% of GDP	%
1993	0.424	3.4
1995	0.298	3.2
1999	0.197	2.3
2002	0.179	1.7
2004	0.146	1.7
2007	0.018	1.4
2009	0.019	1.3
2011	0.013	1.3
2013	0.007	1.3
2017	0.016	1.48

Source: USITC estimates.

Table H.2: Data for figure 2.1

Income decile	CPI change	Purchasing power change
	%	$
1	0.310	54.40
2	0.302	55.04
3	0.290	70.48
4	0.319	90.54
5	0.296	91.47
6	0.305	108.28
7	0.294	121.75
8	0.322	158.94
9	0.325	200.15
10	0.330	289.86

Source: USITC estimates.

Table H.3: Data for figure 2.2 (Architecture)

	STRI score
U.S. score	0.18
OECD average	0.22
All-country	0.25

Source: OECD Services Trade Restrictiveness Index, "Compare Your Country," n.d.

Table H.4: Data for figure 2.2 (Engineering, 2nd part of figure 2.2)

	STRI score
U.S. score	0.21
OECD average	0.24
All-country	0.22

Source: OECD Services Trade Restrictiveness Index, "Compare Your Country," n.d.

Table H.5: Data for figure 2.3 (Legal services)

	STRI score
U.S. score	0.19
OECD average	0.36
All-country	0.37

Source: OECD Services Trade Restrictiveness Index, "Compare Your Country," n.d.

Table H.6: Data for figure 2.4 (Telecommunications)

	STRI score
U.S. score	0.12
OECD average	0.21
All-country	0.24

Source: OECD Services Trade Restrictiveness Index, "Compare Your Country," n.d.

Table H.7: Data for figure 2.5 (Commercial banking)

	STRI score
U.S. score	0.21
OECD average	0.21
All-country	0.24

Source: OECD Services Trade Restrictiveness Index, "Compare Your Country," n.d.

Table H.8: Data for figure 2.6 (Insurance services)

	STRI score
U.S. score	0.29
OECD average	0.19
All-country	0.22

Source: OECD Services Trade Restrictiveness Index, "Compare Your Country," n.d.

Table H.9: Data for figure 2.7 (Distribution services)

	STRI score
U.S. score	0.16
OECD average	0.16
All-country	0.19

Source: OECD Services Trade Restrictiveness Index, "Compare Your Country," n.d.

Table H.10: Data for figure 2.8 (Air transport services)

	STRI score
U.S. score	0.54
OECD average	0.41
All-country	0.42

Source: OECD Services Trade Restrictiveness Index, "Compare Your Country," n.d.

Table H.11: Data for figure 2.9 (Maritime services)

	STRI score
U.S. score	0.35
OECD average	0.23
All-country	0.24

Source: OECD Services Trade Restrictiveness Index, "Compare Your Country," n.d.

Table H.12: Data for figure 3.2

	2012	2013	2014	2015	2016
				$ billions	
Brazil	6.2	6.8	5.7	3.6	2.9
Other	1.5	1.4	1.2	1.3	1.2

Source: IHS Markit, GTA Database (assessed June 28, 2017).

Table H. 13: Data for figure 3.3

	2012	2013	2014	2015	2016
				$ billions	
Argentina	3.7	5.5	3.0	2.9	4.2
Mexico	0.4	0.5	0.3	0.5	0.5
Other	0.6	0.6	0.6	0.8	1.3

Source: IHS Markit, GTA Database (assessed June 28, 2017).

Table H.14: Data for figure 3.4

Region	Cost to export	Time to export
	$	Hours
European Union	85	8.1
North America	171	2.0
South Asia	383	61.3
East Asia & Pacific	399	53.1
Middle East & North Africa	444	63.9
Latin America & Caribbean	510	64.1
Sub-Saharan Africa	580	103.6

Source: World Development Indicators (accessed June 30, 2017).

Table H.15: Data for figure 3.5

Year	World direct tariff	World indirect tariff	World Cumulative tariff
		%	
1995	3.65	0.59	4.24
1996	3.55	0.53	4.09
1997	3.38	0.53	3.92
1998	2.90	0.51	3.41
1999	2.57	0.52	3.09
2000	2.45	0.54	2.99
2001	2.55	0.56	3.11
2002	2.35	0.51	2.86
2003	2.38	0.51	2.89
2004	2.28	0.51	2.79
2005	2.15	0.49	2.64
2006	2.19	0.49	2.68
2007	2.12	0.47	2.59
2008	2.13	0.47	2.59
2009	2.27	0.43	2.71
2010	2.37	0.47	2.84
2011	2.40	0.49	2.89

Source: USITC estimates.

Table H.16: Data for figure 3.6

Year	U.S direct tariff	U.S. indirect tariff	U.S. Cumulative tariff
			%
1995	1.94	0.94	2.88
1996	1.84	0.89	2.73
1997	1.82	0.82	2.64
1998	1.76	0.77	2.53
1999	1.44	0.76	2.19
2000	1.40	0.75	2.16
2001	1.42	0.79	2.21
2002	1.42	0.70	2.13
2003	1.42	0.71	2.14
2004	1.36	0.70	2.06
2005	1.39	0.65	2.05
2006	1.41	0.64	2.05
2007	1.23	0.61	1.85
2008	1.47	0.58	2.04
2009	1.43	0.53	1.96
2010	1.49	0.54	2.04
2011	1.51	0.56	2.07

Source: USITC estimates.

Table H.17: Data for figure 3.7

Sector	Direct tariff	Indirect tariff
	%	
Average	1.052	0.411
Financial services	0	0.046
Real estate	0	0.075
Education	0	0.076
Utilities	0	0.093
Mining	0.018	0.077
Government	0	0.106
Wholesale/retail	0	0.158
Post/Telecom	0	0.177
IT services	0	0.188
R&D	0	0.212
Health	0	0.217
Renting equip	0	0.272
Paper prods	0.016	0.308
Other services	0.005	0.373
Transport	0	0.385
Hospitality	0	0.507
Construction	0	0.850
Other trans.	0.350	0.593
Basic metals	0.578	0.491
Computers	0.353	0.980
Other manu	0.752	0.681
Machinery	0.943	0.546
Wood prods	1.375	0.344
Chemicals	1.363	0.393
Motor veh.	1.059	0.866
Fabricated metals	1.489	0.482
Agriculture	2.008	0.321
Electical equip	1.622	0.774
Rubber/Plastics	2.175	0.690
Food	2.690	0.615
Non-metal minerals	3.375	0.308
Petroleum	4.847	0.420
Textiles & Apparel	9.693	0.933

Source: USITC estimates.

Table H.18: Data for figure 3.8

	Direct	Tier 1	Tier 2	Tier 3 and beyond
		%		
Computers	0.353	0.501	0.212	0.266
Machinery	0.943	0.252	0.121	0.173
Motor vehicles	1.059	0.464	0.180	0.222
Food	2.690	0.346	0.135	0.135

Source: USITC calculations

Table H.19: Data for figure 3.9

	Minimum	1st quartile	Median	3rd quartile	Maximum
			%		
Average	0.04	0.21	2.73	4.98	9.60
Switzerland	0.05	0.10	0.24	0.35	0.76
Norway	0.04	0.14	0.26	0.46	22.17
Taiwan	0.04	0.18	0.33	0.65	1.20
Singapore	0.04	0.20	0.38	0.81	1.03
Iceland	0.04	0.11	0.39	2.43	11.15
Hong Kong	0.04	0.22	0.41	0.65	1.58
Brunei	0.04	0.20	0.41	0.70	1.38
New Zealand	0.04	0.15	0.42	1.77	6.97
Morocco	0.05	0.16	0.42	0.54	0.83
Australia	0.04	0.16	0.52	2.91	7.57
Canada	0.03	0.12	0.52	1.12	12.81
EU	0.04	0.13	0.58	1.13	4.16
Mexico	0.04	0.17	0.74	2.13	9.66
Peru	0.05	0.17	0.75	2.84	12.04
Japan	0.03	0.16	0.77	1.39	9.55
Malaysia	0.03	0.27	0.77	5.12	17.69
USA	0.05	0.19	0.85	1.93	10.63
Israel	0.04	0.19	0.92	3.61	9.71
Turkey	0.05	0.19	0.93	4.09	30.93
Argentina	0.03	0.22	1.12	6.33	17.10
South Africa	0.04	0.15	1.24	6.69	29.94
Costa Rica	0.03	0.18	1.71	3.68	10.23
Philippines	0.04	0.30	1.77	5.49	20.32
Indonesia	0.04	0.24	2.10	4.92	17.06
South Korea	0.03	0.21	2.14	6.26	90.45
China	0.06	0.25	2.34	6.58	18.82
Vietnam	0.04	0.27	2.35	8.08	21.27
Brazil	0.03	0.19	2.84	9.29	24.90
Thailand	0.04	0.28	2.86	7.73	28.59

	Minimum	1st quartile	Median	3rd quartile	Maximum
Saudi Arabia	0.03	0.24	3.44	6.03	8.89
Chile	0.03	0.23	3.45	3.90	5.78
Tunisia	0.03	0.17	3.64	18.06	29.66
Colombia	0.03	0.25	3.90	6.76	16.48
Cambodia	0.05	0.25	4.30	11.08	22.42
Russia	0.03	0.18	4.32	10.44	19.77
India	0.04	0.25	4.52	8.65	55.46
ROW	0.04	0.18	5.51	9.68	13.09

Source: USITC calculations
Note: "Average" is the unweighted arithmetic mean of country cumulative tariffs.

Table H.20: Data for figure F.1 (ball and roller bearings)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0016	0.27
2	0.0015	0.28
3	0.0015	0.37
4	0.0015	0.43
5	0.0015	0.47
6	0.0015	0.54
7	0.0015	0.62
8	0.0015	0.74
9	0.0015	0.91
10	0.0014	1.26

Source: USITC estimates.

Table H.21: Data for figure F.2 (beef)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0003	0.06
2	0.0003	0.05
3	0.0003	0.07
4	0.0003	0.08
5	0.0003	0.08
6	0.0003	0.09
7	0.0003	0.11
8	0.0003	0.13
9	0.0003	0.16
10	0.0002	0.22

Source: USITC estimates.

Table H.22: Data for figure F.3 (butter)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0005	0.09
2	0.0005	0.09
3	0.0005	0.12
4	0.0005	0.14
5	0.0004	0.13
6	0.0004	0.14
7	0.0004	0.15
8	0.0004	0.19
9	0.0004	0.23
10	0.0003	0.27

Source: USITC estimates.

Table H.23: Data for figure F.4 (tuna)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0027	0.48
2	0.0027	0.50
3	0.0021	0.52
4	0.0023	0.64
5	0.0019	0.60
6	0.0019	0.69
7	0.0015	0.64
8	0.0015	0.76
9	0.0014	0.88
10	0.0012	1.09

Source: USITC estimates.

Table H.24: Data for figure F.5 (cellulosic organic fibers)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0005	0.09
2	0.0005	0.09
3	0.0005	0.11
4	0.0005	0.13
5	0.0005	0.14
6	0.0005	0.16
7	0.0004	0.18
8	0.0004	0.22
9	0.0004	0.27
10	0.0004	0.38

Source: USITC estimates.

Table H.25: Data for figure F.6 (ceramic tiles)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0011	0.19
2	0.0011	0.19
3	0.0011	0.26
4	0.0011	0.31
5	0.0011	0.34
6	0.0011	0.38
7	0.0012	0.48
8	0.0011	0.55
9	0.0011	0.68
10	0.0011	0.98

Source: USITC estimates.

Table H.26: Data for figure F.7 (cheese)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0021	0.38
2	0.0020	0.37
3	0.0020	0.48
4	0.0019	0.53
5	0.0019	0.58
6	0.0018	0.65
7	0.0019	0.77
8	0.0019	0.92
9	0.0018	1.10
10	0.0016	1.42

Source: USITC estimates.

Table H.27: Data for figure F.8 (China)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0018	0.31
2	0.0017	0.31
3	0.0017	0.42
4	0.0018	0.50
5	0.0018	0.56
6	0.0018	0.63
7	0.0020	0.81
8	0.0019	0.92
9	0.0018	1.12
10	0.0019	1.66

Source: USITC estimates.

Table H.28: Data for figure F.9 (cigarettes)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0016	0.29
2	0.0015	0.27
3	0.0013	0.31
4	0.0013	0.35
5	0.0012	0.37
6	0.0010	0.36
7	0.0009	0.38
8	0.0009	0.43
9	0.0007	0.42
10	0.0005	0.40

Source: USITC estimates.

Table H.29: Data for figure F.10 (jewelry)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0006	0.11
2	0.0005	0.10
3	0.0005	0.12
4	0.0005	0.14
5	0.0007	0.23
6	0.0006	0.22
7	0.0007	0.30
8	0.0006	0.30
9	0.0008	0.47
10	0.0010	0.86

Source: USITC estimates.

Table H.30: Data for figure F.11 (leather and footwear)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0742	13.05
2	0.0677	12.33
3	0.0680	16.54
4	0.0770	21.84
5	0.0762	23.52
6	0.0703	24.99
7	0.0689	28.54
8	0.0762	37.56
9	0.0786	48.42
10	0.0786	69.00

Source: USITC estimates.

Table H.31: Data for figure F.12 (pens)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0006	0.11
2	0.0006	0.10
3	0.0006	0.14
4	0.0006	0.16
5	0.0006	0.17
6	0.0006	0.20
7	0.0006	0.23
8	0.0006	0.31
9	0.0006	0.40
10	0.0006	0.54

Source: USITC estimates.

Table H.32: Data for figure F.13 (pesticides)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0009	0.16
2	0.0009	0.16
3	0.0009	0.21
4	0.0008	0.24
5	0.0008	0.25
6	0.0008	0.28
7	0.0008	0.33
8	0.0008	0.38
9	0.0008	0.48
10	0.0007	0.63

Source: USITC estimates.

Table H.33: Data for figure F.14 (glass)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0020	0.35
2	0.0019	0.35
3	0.0019	0.46
4	0.0019	0.55
5	0.0020	0.60
6	0.0020	0.70
7	0.0020	0.82
8	0.0020	0.97
9	0.0020	1.22
10	0.0020	1.73

Source: USITC estimates.

Table H.34: Data for figure F.15 (lighting fixtures)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0015	0.26
2	0.0014	0.26
3	0.0014	0.35
4	0.0014	0.41
5	0.0015	0.45
6	0.0014	0.51
7	0.0015	0.61
8	0.0015	0.72
9	0.0014	0.89
10	0.0015	1.28

Source: USITC estimates.

Table H.35: Data for figure F.16 (sugar)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0026	0.46
2	0.0024	0.44
3	0.0022	0.52
4	0.0021	0.60
5	0.0020	0.62
6	0.0020	0.70
7	0.0020	0.81
8	0.0019	0.94
9	0.0019	1.16
10	0.0017	1.46

Source: USITC estimates.

Table H.36: Data for figure F.17 (dyes)

Income decile	CPI change	Purchasing power change
	%	$
1	0.0004	0.06
2	0.0003	0.06
3	0.0003	0.08
4	0.0003	0.09
5	0.0003	0.10
6	0.0003	0.11
7	0.0003	0.13
8	0.0003	0.16
9	0.0003	0.19
10	0.0003	0.27

Source: USITC estimates.

Table H.37: Data for figure F.18 (textiles and apparel)

	CPI change	Purchasing power change
	%	$
1	0.2171	38.16
2	0.2169	39.52
3	0.2053	49.92
4	0.2257	63.99
5	0.2035	62.86
6	0.2184	77.61
7	0.2093	86.62
8	0.2304	113.64
9	0.2309	142.25
10	0.2366	207.79

Source: USITC estimates.

Table H.38: Data for figure F.19

Income decile	Naïve high tariff burden	Naïve low tariff burden	Comprehensive experiment tariff burden
	$	$	$
1	93.89	75.19	54.40
2	94.60	76.23	55.04
3	119.42	97.17	70.48
4	152.54	126.52	90.54
5	152.85	126.32	91.47
6	178.93	150.54	108.28
7	199.52	168.68	121.75
8	260.42	222.99	158.94
9	322.79	280.87	200.15
10	460.33	408.97	289.86

Source: USITC estimates.