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Assessment of the Impact of Panama Canal Transit Cost Changes on the US Economy

ACP AUTORIDAD DEL CANAL DE PANAMA

MERCER
Management Consulting

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Executive Summary

In 2004, the Autoridad del Canal de Panama (ACP) performed a detailed analysis to determine the impact of Canal transit cost increases on the Canal's customers. This research indicated that an increase in Canal transit costs would not have significant adverse effects on traffic, although the impact would vary by Canal customer segment. Given the mix of commodities that transit the Canal and the political and economic importance of the countries of origin, the ACP determined that it was important to explicitly assess and understand the impact of different pricing options on the economies of stakeholder countries.

This report provides a high-level overview of US trade in relation to the Panama Canal and a detailed analysis of the impact of potential new Canal pricing options on the export and import commodities transiting the Canal that are most important to the US economy, representing approximately 80 percent of total volume that trades through the Canal to and from the United States. For each commodity, the analysis examines the relevance of Canal-based traffic to overall US imports and exports and the impact of transit cost increases on overall landed costs and the US economy.

US Waterborne Trade

The United States is the world's largest trading nation. Total international US trade has been growing nearly twice as fast as GDP since 1990 and accounted for 18 percent of GDP in 2003. US imports have been increasing faster than exports over the past decade, and currently account for 63 percent of US international trade by value. Nevertheless, US merchandise exports continue to rise compared to the production of tradable goods.

Waterborne commerce accounts for approximately 60 percent of US international trade, or approximately US$807 billion in 2003; three-quarters of this trade is imports. Maritime imports have grown by 7.1 percent while exports have declined by 1.5 percent

annually since 1997. In terms of modal share, water transport accounts for 78 percent of US trade by weight, and 41 percent of trade by value.

The United States' top 25 maritime trade partners account for nearly 80 percent of trade value and tonnage. On the export side, the Asian countries as a trading bloc import more from the United States than any other region, with Europe (including the UK) as the second largest destination for maritime exports. Asia (particularly China) and Europe are also the major sources for US imports. In terms of growth, US trade has been gradually shifting away from traditional partners such as Europe and Japan, and toward industrializing economies such as China and Mexico.

Overall, the mix of commodities making up US imports/exports has shifted considerably in the past two decades, and will likely continue to shift due to changing consumer demand, the opening of more global markets, and the need for new energy sources. One area of strong growth has been manufactured goods, which accounted for 85 percent of the value of US merchandise trade in 2001. At the same time, trade in natural resources and raw minerals has declined in share.

US Trade Through the Panama Canal

The majority of US trade that passes through the Panama Canal travels between East Coast US and Asia, East Coast US and South America, and West Coast US and Europe. By far the largest recipients of US exports passing through the Panama Canal are the North Pacific Asian nations, primarily China, Japan, and South Korea. In 2003, this region received more than half of the weight of total US exports to the rest of the world that travel through the Canal.

Since 1999, the aggregate weight of US exports transported by sea, and the amount of tons passing through the Panama Canal specifically, have both declined at approximately 1 percent per year. The most prominent exports by weight are corn, soybeans, and containers, which together represent over half of US exports transiting the Canal. Containers, petroleum, soybeans, and scrap metal have grown in terms of share of US export tonnage transiting the Canal during 1999-2003, while lumber, corn, chemicals, wheat, and phosphates have lost share. On average during 1999-2003, 50 percent more US exports by weight than imports moved through the Panama Canal.

Methodology for Canal-Relevant Commodity Analysis

For the purposes of this study, the ACP analyzed US export commodities and import commodities, representing 80 percent of US trade volume through the Canal.

As mentioned previously, these commodities were analyzed with the objective of determining the potential impact of an increase in Canal transit costs on landed cost, and therefore the relevance of transit cost increases to US trade and the US economy.

The methodology for analysis of export commodities was threefold:

1. The relevance of Panama Canal tonnage transits for 1999-2003 to the overall trade in the commodity for the United States was determined.

2. If the commodity tonnage transits through the Canal were above a certain threshold (percent of country trade) then the commodity was analyzed further to determine the relevance of a potential increase in Canal transit cost on landed cost. The components of total landed cost include FOB, Canal transit cost (toll plus other marine services), other freight costs, and insurance.

3. A sensitivity analysis was then applied to determine a range of impacts on landed cost given different Canal transit cost increase scenarios.

For imports, the ACP undertook a more general analysis of the impact of Canal transit cost increases, focused on the final landed cost of each commodity and the impact of the aggregated value of Canal-relevant imports on total US imports and GDP.

Export Commodities Analysis

Overall, Panama Canal relevant US exports, including all containerized cargo, make up only 3.4 percent[1] of total US exports. As shown in Exhibit 1-1, the export commodities analyzed for this study represented approximately 13 percent of total US export value in 2003.

For nine of the twelve commodities, the portion of exports that transit the Canal represent less than one-quarter of each commodity's total export value. Only three commodities have more than a quarter of export value moving through the Canal – containerized wood pulp, corn, and soybeans.

Only two Canal-relevant commodities are significant in relation to total US exports: miscellaneous chemicals (3.4 percent of total US exports) and plastics (3.9 percent). However, a Canal toll increase of even 200 percent (the maximum analyzed in this study, with other marine services cost held constant) would cause total landed cost (CIF) to rise by only 0.3 percent for misc. chemicals and 0.4 percent for plastics. While both trades have high CIF values per ton, making them significant to the US economy overall, this also serves to reduces the impact of a Canal transit cost increase on final landed cost (CIF) – since generally the higher a commodity's total CIF, the lower the Canal transit cost will be as a percentage of CIF.

For 11 of the 12 analyzed commodities, the total Canal transit cost represents less than 2.0 percent of the commodity's CIF. Even with a 200 percent increase in the Panama

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[1] All containerized cargo includes containerized commodities that were not examined individually in this report. The value of containerized commodities was calculated using a weighted average of analyzed container commodities.

Canal toll for these 11 commodities, none of these commodities would experience an increase in total landed cost of more than 2.5 percent.

Petroleum coke is the one commodity for which a 200 percent increase in the Canal toll would have more of an impact, totaling 5.8 percent of CIF. However, the value of Canal-relevant petroleum coke represents only 0.02 percent of US exports.

Exhibit 1-1
Canal-Relevant US Exports Analyzed

Commodity	1. FOB Value of Canal Exports (US$B)	2. Canal Share of Total Exports	3. Total Export Value (US$B)	4. Commodity Exports Share of US Exports	5. Canal Transit Cost Share of CIF	6. 200% Toll Increase Impact on CIF
Corn	$1.89	37.8%	$5.02	0.7%	1.5%	2.4%
Soybeans	$3.31	41.7%	$7.94	1.1%	0.7%	1.2%
Miscellaneous chemicals	$5.16	20.9%	$24.62	3.4%	0.2%	0.3%
Miscellaneous fertilizers	$0.51	22.0%	$2.34	0.3%	1.4%	2.1%
Petroleum coke	$0.13	11.8%	$1.13	0.2%	3.7%	5.8%
Wheat	$0.41	10.4%	$3.96	0.5%	1.2%	1.9%
Miscellaneous lumber	$0.05	1.2%	$3.75	0.5%	0.9%	1.5%
Scrap metal	$0.75	16.0%	$4.73	0.7%	0.6%	1.0%
Container Cargo	$13.60					
Wood pulp	$0.39	28.4%	$1.37	0.2%	1.9%	2.9%
Salt, sulfur, earth, cement	$0.18	12.0%	$1.53	0.2%	1.2%	1.8%
Paper	$1.05	10.2%	$10.26	1.4%	0.5%	0.7%
Plastics	$2.91	10.4%	$27.92	3.9%	0.3%	0.4%

Source: ACP, US Waterborne Databank, UN COMTRADE, US Census Bureau.
Description of columns:
1 The merchandise value of the Canal-relevant portion of exports for each commodity
2 The percent of the total export value for each commodity that transits the Canal
3 The total value of all US exports of each commodity, regardless of transportation mode or route
4 The percent of total US exports value accounted for by each commodity
5 The percent of the final landed cost (CIF) of each commodity accounted for by the total Canal transit cost (toll, other marine services) of that commodity
6 The percent change in the CIF as a result of a 200 percent increase in the Panama Canal toll for ships carrying this commodity

Import Commodities Analysis

The import commodities analyzed in this study are shown in Exhibit 1-2. In 2003, US imports transiting the Panama Canal accounted for 6.4 percent of total goods imports (CIF value). Additionally, imports transiting the Panama Canal represented 0.8 percent of US GDP in 2003.

In 2003, the US current account deficit was US$ -530.7 billion, or 4.877 percent of GDP. The analysis determined that an increase in import prices, due to an increase in Canal tolls, would have a nearly imperceptible impact on the US deficit and national income: Even if tolls were increased by 200 percent for all US imports that transit the Canal, the cost of total goods imports would grow by only 0.028 percent, the current account deficit

would increase from 4.8770 to 4.8805 percent of GDP, and national income would drop by about 0.003 percent, with an negligible impact on inflation.

Exhibit 1-2
Canal-Relevant US Imports Analyzed

Commodity	Canal Share	Canal Transit Tons 2003 (millions)	Average CIF/Ton	CIF Value of Canal Transit Tons (US$B)
Iron and Steel	10.9%	5.74	$ 748	$ 4.23
Salt	7.7%	4.05	$ 21	$ 0.08
Crude Petroleum	5.5%	2.89	$ 208	$ 0.59
Petroleum Products	2.0%	1.03	$ 303	$ 0.31
Coke-Coal	4.2%	2.22	$ 109	$ 0.24
Petroleum Coke	0.6%	0.34	$ 64	$ 0.02
Gasoline	4.8%	2.54	$ 222	$ 0.55
Ores	4.7%	2.49	$ 48	$ 0.12
Chemicals Misc.	4.1%	2.17	$ 1,093	$ 2.33
Cement	3.9%	2.06	$ 48	$ 0.10
Autos and Trucks (Boxed and Unboxed)	3.3%	1.72	$10,618	$ 18.02
Container Cargo	26.3%	13.81	$ 4,177	$ 56.81
Other	21.9%			
Total CIF Value of Panama Canal Transit Tons (US$B)				**$ 83.40**

Source: ACP, Mercer analysis.

Conclusions

The analyses above demonstrate that given either the small proportion of a particular import/export commodity that transits the Canal, or the relatively small percentage of the landed cost represented by the Canal cost, the effect of a Panama Canal transit cost increase would not have a significant impact on the economy of the United States, nor on the principal industries that provide Canal-relevant export commodities.

Finally, the larger question facing the US economy with regard to the Canal is less whether the transit cost changes examined would have a significant impact, but rather whether the Canal will have sufficient capacity available to meet demand in the future, while providing an adequate level service. The implications for the critical supply chains that serve the US economy of a deterioration in service – due to increased waiting times or decreased reliability, for example – in the event that capacity is insufficient to meet demand, would be substantially more important than the analyzed Canal transit cost increases. Hence, the need to add capacity to the Canal – recognizing that the capital expense will have to be paid for through tolls – is the more critical issue facing the US economy, rather than the essentially negligible impact of the transit cost increases examined in this study.

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Introduction

2.1 Study Context

The Panama Canal is a critical and unique element of the global marine transportation industry. Its construction almost a century ago remains a well-known triumph of vision, engineering, and determination. Its efficient, safe handling of more than 13,000 transits per year has made the Canal an important element of the global transport network. Growing trade volumes, however, and the increasing reliance by shipping companies on vessels larger than can physically pass through the Canal's locks (post-Panamax vessels) have raised questions about what the Canal's future investments and pricing policies should be, including whether or when a third set of locks should be built.

In 2004, the Autoridad del Canal de Panama (ACP) performed a detailed analysis to determine the impact of toll price increases on the Canal's customers. This research indicated that an increase in Canal transit tolls would not have significant adverse effects on traffic, although the impact would vary by Canal customer segment. Given the mix of commodities that transit the Canal and the political and economic importance of the countries of origin, the ACP determined that it was important to explicitly assess and understand the impact of different pricing options on the economies of stakeholder countries.

This report provides a high-level overview of the United States' trade in relation to the Panama Canal and a detailed analysis of the impact of potential new Canal pricing options on the export and import commodities transiting the Canal that are most important to the US economy.

The overall objectives of this study were as follows:

- Generate a clear understanding of US maritime trade

- Review historical Canal transit data to determine principal imported and exported commodities from the United States

- Determine the relevance of this Canal-based traffic to US overall commodity imports and exports

- Develop an analysis of the impact of Canal transit cost increases on the overall landed costs of selected commodities

- Develop an analysis on the overall impact of the Canal cost increases on the US economy

- Appraise the ability of different industries within the US to continue to compete despite the toll difference

2.2 Approach to the Study

To address the commodities that are the most relevant to the US economy, this report focuses on the highest-volume and highest-value imported and exported commodities that transit the Canal. The report assesses US imports and exports at a commodity level, aiming for a detailed analysis of approximately 80 percent of total volume that trades through the Canal to and from the United States

The analysis examines, for each commodity, the relevance of Canal-based traffic to overall country commodity imports and exports; the impact of transit cost increases on overall landed costs; the expected ability to pass on cost increases to end customers; and the overall impact on the country's economy.

The analysis involved the following work steps:

- *Overview of US maritime trade:* Development of a high-level description of current US sea trade, including commodities and main partners. This overview allowed the ACP to understand the United States' principal and alternative trade routes, the overall impact of the Panama Canal on shipping, and the impact of key commodity trades on the US economy.

- *Commodity identification:* Identification of the principal commodities to be analyzed, based on commodity volume and value transiting the Panama Canal.

- *Commodity analysis:* Two-part work step: 1) High-level analysis involving estimation of commodity value, principal transportation cost components, and the percentage of the commodity that transits the Canal. This analysis allowed the ACP to decide which commodities transiting the Canal are significant to the US economy. 2) For the selected key commodities, a more detailed analysis was completed to determine the impact on shipping costs of a change in Canal toll charges.

- *Economic impact on the United States:* Determined the possible economic impact of potential toll increases for the United States, based on the previous analyses, and assessed whether toll increases would have a significant impact on the US economy and foreign trade.

The ACP commissioned Mercer Management Consulting, Inc. to undertake the analyses involved in this project. Mercer, which has one of the largest consultancies in the world dedicated to transportation, provided a seasoned team of professionals with extensive knowledge of worldwide trade and transportation, and of the Panama Canal's market and customer base specifically.

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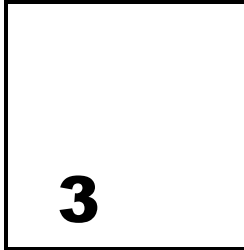
Overview of US Sea Trade

3.1 Imports and Exports

The United States has the largest economy in the world, with GDP growing by 3 percent annually, on average, since 1990, to approximately US$10.9 trillion in 2003. Additionally, it is the world's largest trading nation, both in terms of tonnage and merchandise value, with annual imports and exports totaling approximately US$2.0 trillion dollars in 2003.[2] The breakdown represents approximately 10 percent of world exports (US$724 billion) and 17 percent of world merchandise imports (US$1,259 billion).[3]

Despite a significant short-term decline following the terrorists attacks on September 11, 2001,[4] total international US trade has been growing nearly twice as fast as GDP since 1990, by 6.4 percent annually (Exhibit 3-1). That international trade is becoming increasingly important to the US economy can be seen in the growing share of GDP accounted for by import/export trade – which rose from 12 percent to 18 percent between 1990 and 2003 (Exhibit 3-2).[5]

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[2] America's Freight Transportation Gateways Report from the US DOT, US DOT Bureau of Transportation Statistics, WTO, Intracen.org.
[3] Ibid.
[4] Pre 9/11 US international merchandise trade grew at approximately 9 percent, nearly three times the rate of the economy. (America's Freight Transportation Gateways Report, USITC dataweb.usitc.gov)
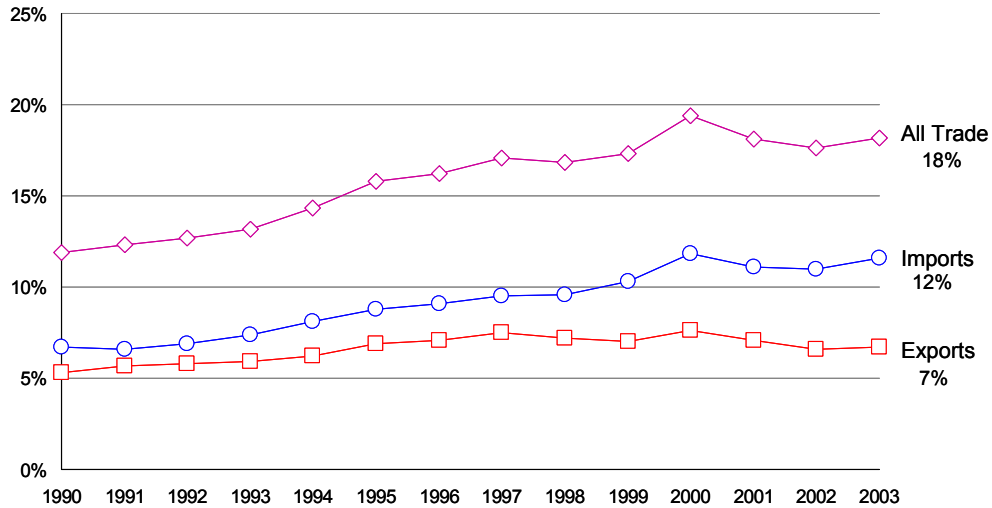[5] US DOT Bureau of Transportation Statistics, USITC dataweb.usitc.gov.

Exhibit 3-1
Value of Imports and Exports Relative to the US Economy
(US$ billions)
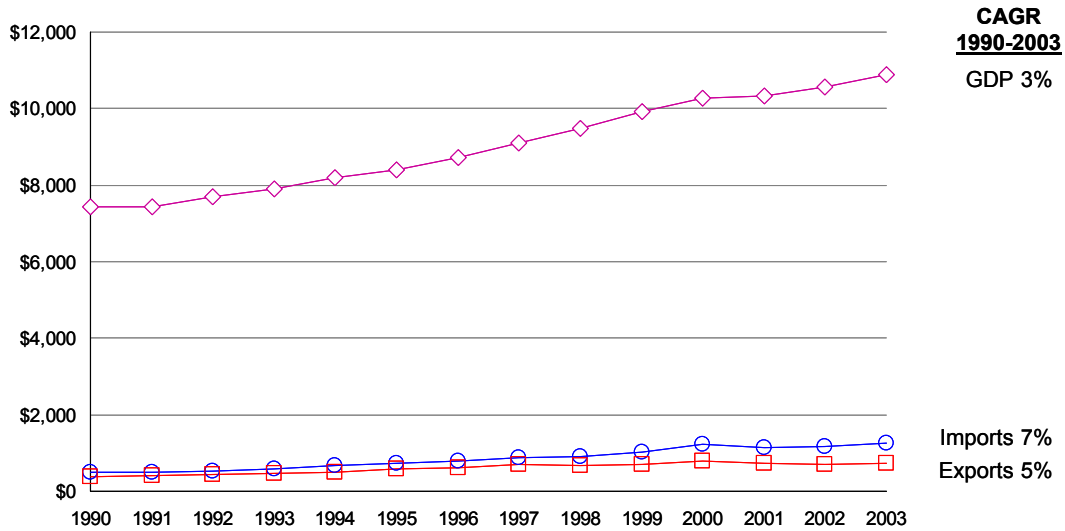
CAGR
1990-2003

GDP 3%

Imports 7%
Exports 5%

Source: Congressional Budget Office, World Bank; US DOT Bureau of Transportation Statistics, USITC Dataweb
(dataweb.usitc.gov).
Note: US imports and exports FOB value.

Exhibit 3-2
Ratio of Imports and Exports to US GDP
(percent of GDP)

All Trade
18%

Imports
12%

Exports
7%

Source: Congressional Budget Office, World Bank, US DOT Bureau of Transportation Statistics, USITC Dataweb
(dataweb.usitc.gov.), Mercer analysis.
Note: US imports and exports FOB value.

As evidenced in the preceding graphs, US imports have increased faster than exports over the past decade, and currently account for 63 percent of US international trade by value. There are two main drivers of this trend:

- The US economy is becoming more services-oriented overall, with less emphasis on goods production.

- Traditional domestic manufacturing jobs have been sourced to geographies with lower labor costs, which has increased the demand for foreign products and reduced domestic manufacturing.

However, despite this decline, the aggregate sum of US merchandise exports has risen compared to the production of tradable goods, demonstrating the importance of goods exports to continue supporting domestic production.

US Maritime Trade

Since 1990, the value of US overseas trade has more than doubled, rising by an average annual rate of 6 percent to US$1.36 trillion in 2003, or 68 percent of total US trade (Mexico and Canada account for the remaining 32 percent).

Waterborne commerce currently accounts for approximately 60 percent of this trade, rising from US$434 billion in 1990 to approximately US$807 billion in 2003 (annual growth of 5 percent).[6] Waterborne trade grew more slowly in tonnage terms, by 2.0 percent per year. Waterborne trade also has grown more slowly than its modal counterparts, but is still the preeminent shipping mode in terms of both value and weight (Exhibit 3-3). Additionally, post 9/11 maritime transportation suffered the least of all trade modes, with only a moderate decline of 3 percent in freight activity through 2002.

The discrepancy between US import and export activity is especially pronounced when maritime trade alone is considered: imports account for 75 percent of the US$807 billion in maritime trade value and 70 percent of the 1.2 billion short tons shipped.[7] Since 1997, maritime imports have grown by 7.1 percent while exports have declined by 1.5 percent (Exhibit 3-4).

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[6] America's Freight Transportation Gateways Report from the US DOT (pp. 7,11); US DOT Bureau of Transportation Statistics.
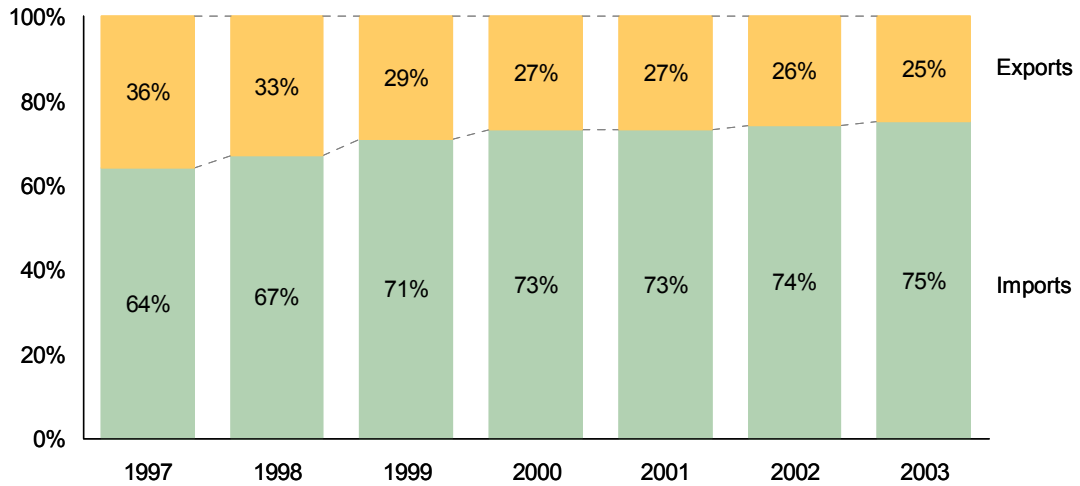[7] Ibid.

Exhibit 3-3
Value of US Merchandise Trade by Mode: 1990-2003
(US$ billions)
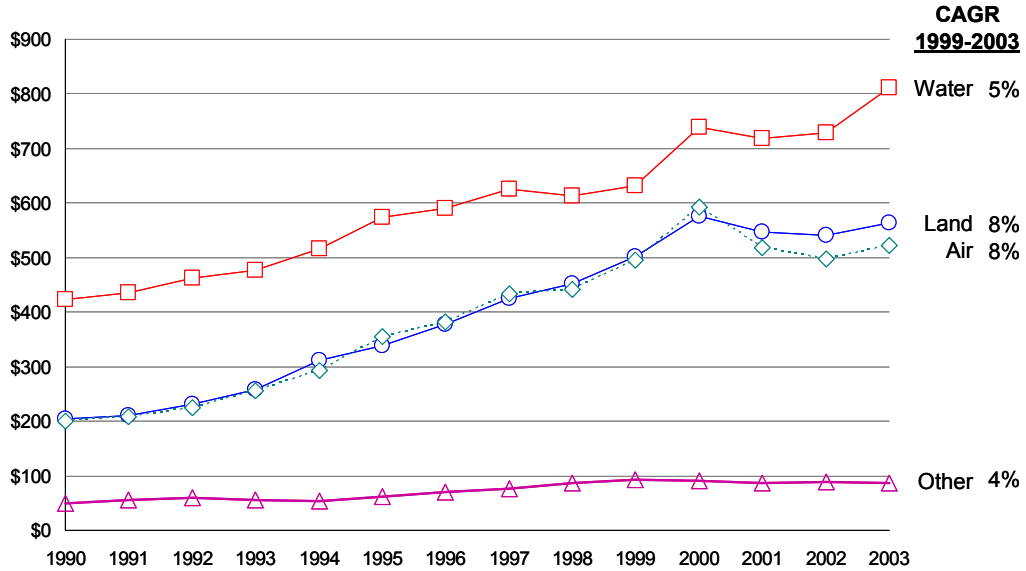
Source: US DOT Bureau of Transportation Statistics, US Dept. of Commerce, US Census Bureau Foreign Trade Division, America's Freight Transportation Gateways Report from the US DOT, Mercer analysis.

Exhibit 3-4
US Waterborne Trade: 1997-2003
(percent of waterborne trade revenue)

	1997	1998	1999	2000	2001	2002	2003	CAGR
Exports (US$ billions)	$221.6	$199.9	$181.2	$196.8	$196.3	$189.9	$202.5	-1.5%
Imports (US$ billions)	$401.3	$413.0	$448.9	$540.5	$523.1	$538.5	$604.6	7.1%

Source: US Maritime Administration, Waterborne Databank.

In terms of modal share, water transport accounts for 78 percent of US trade by weight, and 41 percent of trade value (Exhibit 3-5). This lower value-to-weight ratio is a result of the mix of commodities moved by water, which includes both higher-value containerized goods and lower-value bulk commodities such as salt and steel.

Exhibit 3-5
Modal Shares of US Trade by Weight & Value: 2003
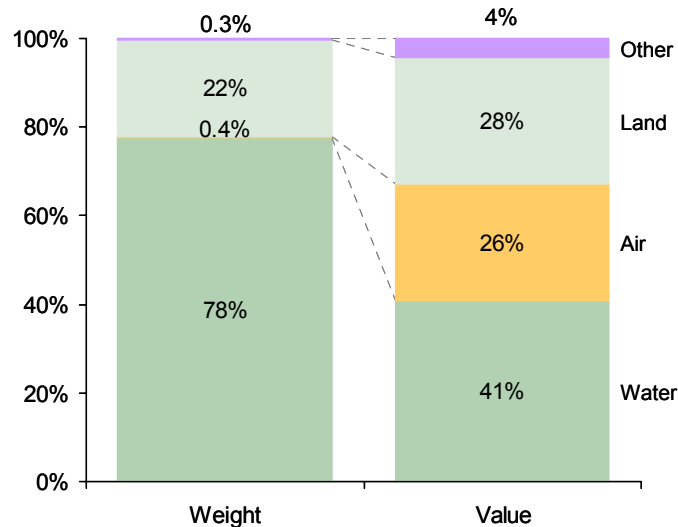
Source: America's Freight Transportation Gateways Report from the US DOT (pp. 5,7), US DOT Bureau of Transportation Statistics, USITC Dataweb (dataweb.usitc.gov), Mercer analysis.

3.2 Key Trade Partners

The United States' 400+ seaports, airports, and land border crossings facilitate international trade relationships with over 200 countries, of which approximately 30 countries represent 85 percent of total trade.[8] Domestically, the top 50 US transportation gateways handle 80 percent of total US trade.

Overall, Canada is the largest single US trade partner, accounting for US$397 billion in commerce in 2003. The European Union's 15 countries form the largest bloc trading with the United States, at US$402 billion.

Since 1970, the major US trading partners have shifted considerably. Traditionally, the strongest US trade partnerships were with Europe and Japan, but over the past three decades, trade with other Asian nations and Latin America has grown much faster. More recently, China and Mexico have rapidly increased their share of US trade (Exhibits 3-6 and 3-7). Mexico is the second largest single nation trading partner for the US in terms of overall value at US$237 billion, while China is the third largest, with US$192 billion in

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[8] World Trade Organization – http://www.wto.org, International Trade Statistics 2004.

trade.[9] The relative growth of trade with China is particularly remarkable, considering that in 1980 it was the United States' 24th largest trading partner, while Mexico was the fifth largest.

Exhibits 3-6 and 3-7 show key shifts among the top US trade partners. Between 1995 and 2003, China's share of US imports doubled, while Mexico's grew by 32 percent. Japan's share of US imports, however, fell by 43 percent. During this same period, the shares of US exports destined for China and Mexico grew by 95 percent and 71 percent respectively, while Japan's share fell by 35 percent.
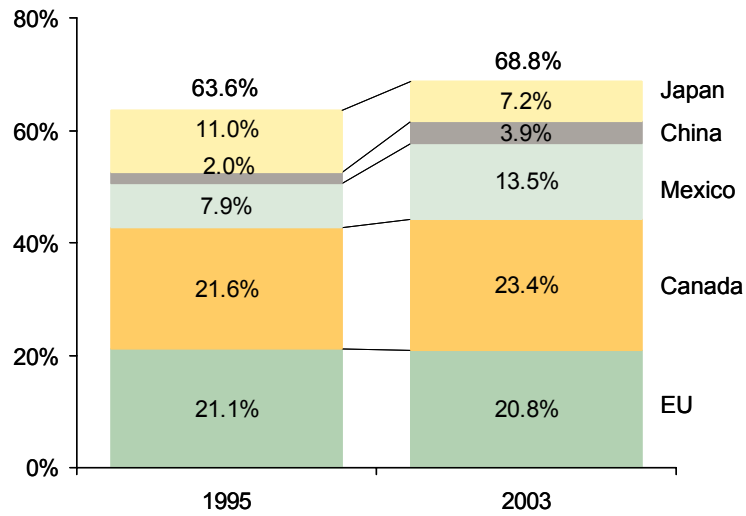
Exhibit 3-6
Top Five US Trade Partners: Share of Imports by Value
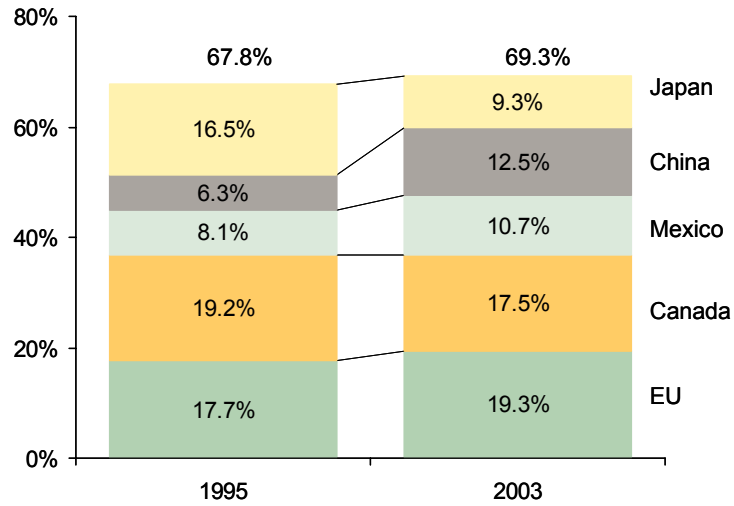
Source: WTO.

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[9] World Trade Organization.

Exhibit 3-7
*Top Five US Trade Partners: Share of Exports by Value*

Source: WTO.

US waterborne trade, accounting for just over 40 percent of total US trade, has shown a similar evolution in terms of trading partners. As shown in Exhibit 3-8, in value terms, US waterborne exports to China have grown by 13 percent annually since 1997 and now account for 8 percent of such exports; US waterborne exports to Mexico during the same period have grown by 11 percent per year and currently represent 3 percent of such exports. The largest share of US waterborne exports by value still move to Japan, but these have decreased by 5 percent per year over the period.

On the import side, waterborne imports from China grew by 15 percent per year, from 13 percent of US imports by value in 1997 to 20 percent in 2003. Three other countries experienced 10 percent annual gains in their exports to the United States during this period: South Korea (10 percent), Mexico (10 percent), and Saudi Arabia (12 percent).

Exhibit 3-8
Top 10 Destinations for US Waterborne Exports by Value

Waterborne Trade (In Billions)	$221.6	$202.5
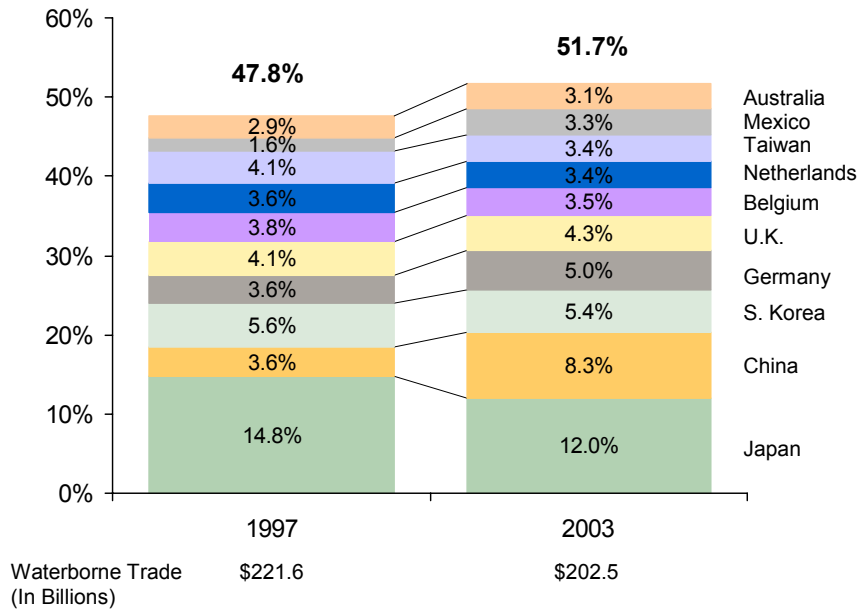
Source: US Maritime Administration Waterborne Databank.

Exhibit 3-9
Top 10 Origins of US Waterborne Imports by Value

Waterborne Trade (In Billions)	$401.3	$604.3
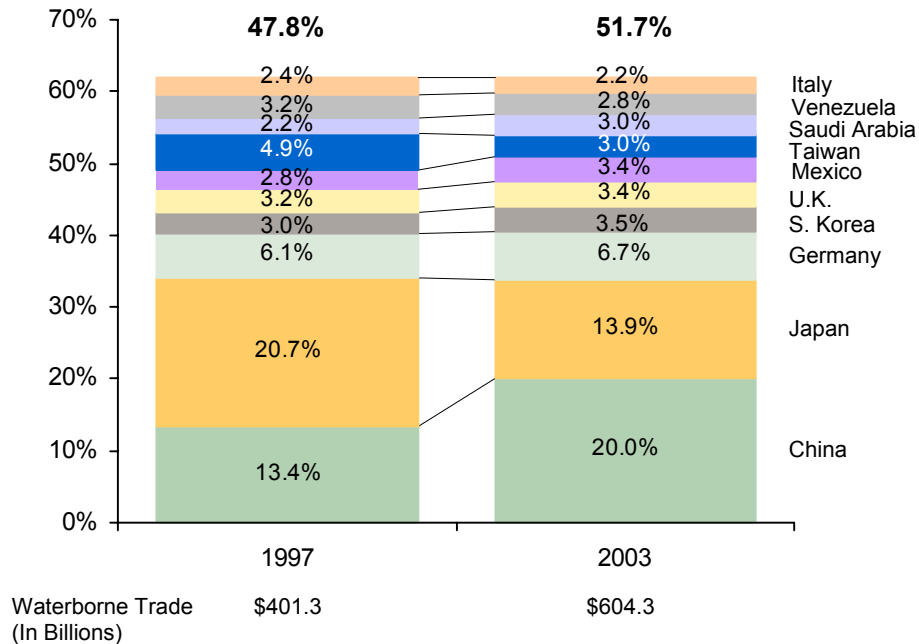
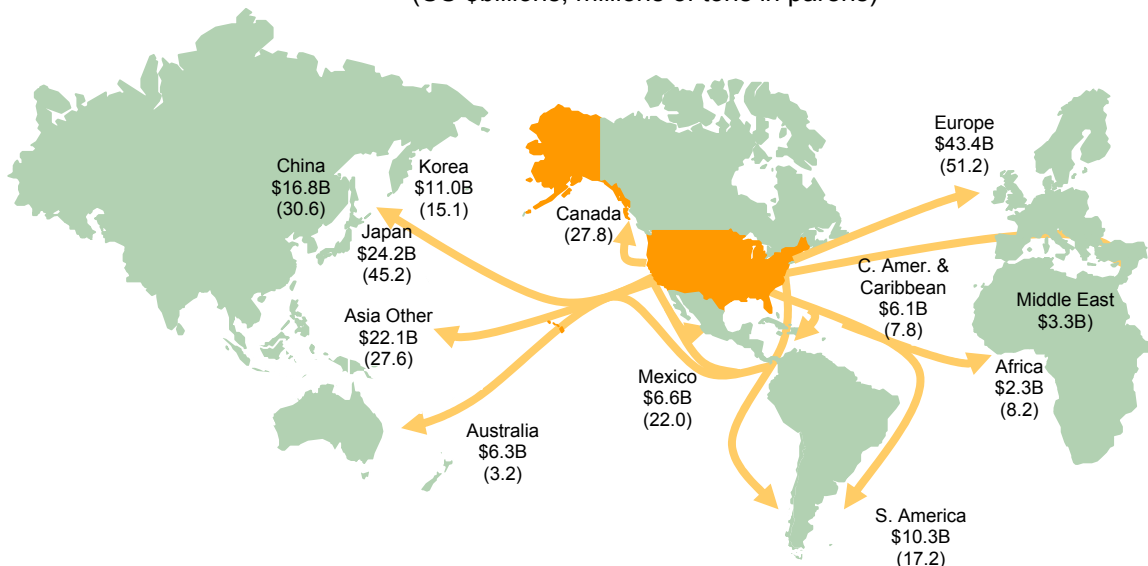Source: US Maritime Administration Waterborne Databank.

The United States' top 25 maritime trade partners account for 78 percent of total trade value and 79 percent of tonnage transported. They account for 75 percent of the value of

exports and 81 percent of the value of imports; in tonnage terms, they account for 79 percent of exports and 84 percent of imports.[10]

On the export side, the Asian countries as a trading bloc import more from the United States than any other region. In 2003, US exports to Asia totaled 119 million tons, with a value of US$63 billion. Europe (including the UK) is the second largest destination for maritime exports, at US$43 billion and 51 million tons transported.

In terms of value per ton exported, Europe has the highest ratio on average, of US$954 per ton. For Asia, the ratio for exports is US$609 per ton and for South America it is US$567 per ton. US exports to Mexico and China have lower export value to weight ratios: US$303 and US$550 per ton, respectively.[11] Exhibit 3-10 shows major US waterborne export destinations by value and weight shipped.

Exhibit 3-10
Major US Sea Trade Export Destinations: 2003
(US $billions, millions of tons in parens)

Source: US Maritime Administration Waterborne Databank (data from top 25 US import waterborne trade partners), WTO.

Routes are similar for the top 25 producers of US imports (Exhibit 3-11). In 2003, Asian countries exported 65 million tons of merchandise valued at US$284 billion to the United States, of which China represents 43 percent of the value and 60 percent of the weight. Europe exported 81 million tons by sea, valued at US$104 billion. South America exported primarily high-weight bulk commodities to the United States (171 million tons, value of US$35 billion).

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[10] US Maritime Administration, Waterborne Databank..
[11] Ibid; Mercer analysis.

The value to weight ratio of US imports are highest for goods coming from Asia, at US$3,629 per ton, compared to European imports at US$1,275 per ton and South American imports at US$202 per ton.

Exhibit 3-11
Major US Sea Trade Import Sources: 2003
(US $billions, millions of tons in parens)

Source: US Maritime Administration, Waterborne Databank (data from top 25 US import waterborne trade partners), WTO.
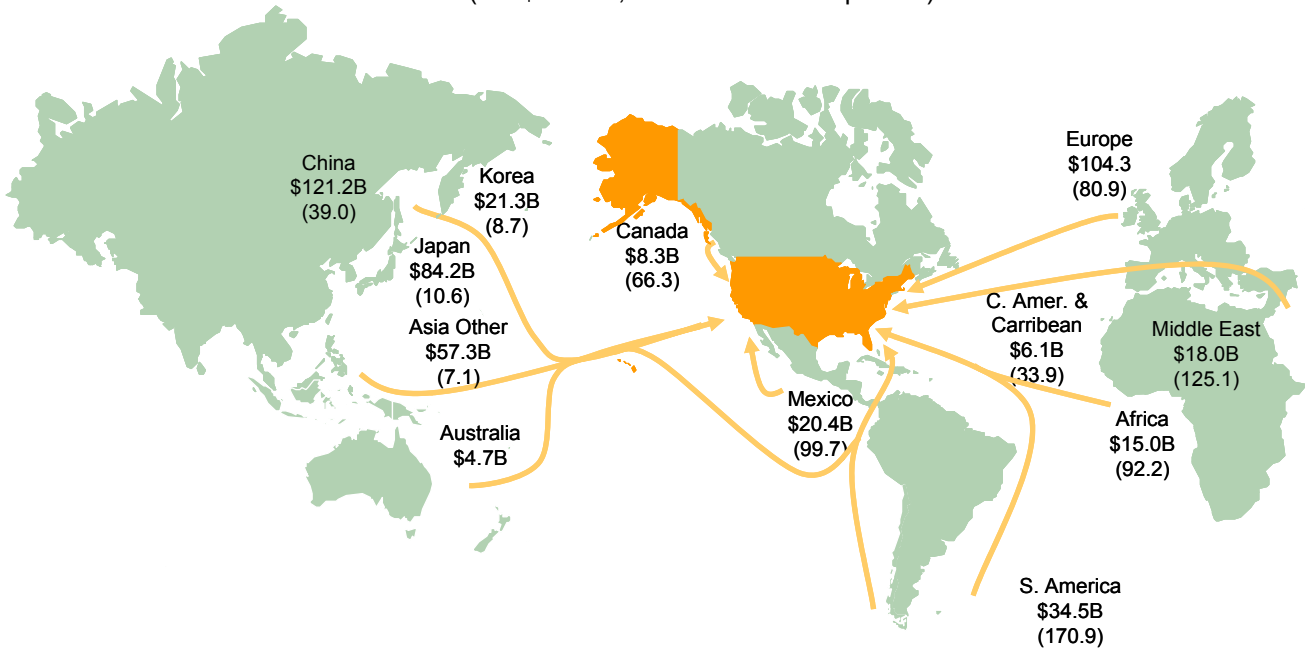
Region-Specific Sea Trade Partners

Europe

As Europe has reduced internal trade barriers and strengthened its unity through the formation of the European Union (EU), it has become a more formidable trading partner in terms of scale and bargaining power. In 2003, the US exported US$151 billion in merchandise to the EU, up 5 percent from the previous year, and imported US$252 billion in goods from it, up 8 percent from 2002.

The United States' strongest European trade partner in value terms is Germany, at 14. million tons and US$51 billion in total annual trade; this trade is growing at 8 percent per year. Additionally, in 2003, Germany had the highest European trade value to tonnage ratio of US$3,610, which is in part due to high-value automotive exports to the United States.

The economies of the US and EU are nearly the same size and highly interdependent, which increases the importance of this relationship, but also has led to bilateral tensions

as both jockey for increased leverage. Additionally, as both economies continue to compete in world markets, there may be increasingly retaliatory conflicts. Examples of this already can be seen in proposed (and existing) tariffs (e.g., 30 percent steel import tax), restrictions on US poultry and meat exports, and complaints of government subsidies corrupting competition (e.g., Airbus versus Boeing).

Recently, the high US trade deficit and instability due to the Iraq war, among other influences, have caused the value of the US dollar to decline significantly against the euro. It is possible that over the short term, weakness in the dollar may increase US exports to Europe, trimming deficit growth, while reducing European imports.

North America

Trade with Mexico and Canada has grown rapidly over the past decade, since the inception of the North American Free Trade Agreement (NAFTA). The value of US trade with its nearest neighbors has grown by 7.6 percent a year, from US$306 billion in 1993 to US$634 billion in 2003. [12] (Of this, however, only 5.9 percent is seaborne trade.) While wages in Canada are similar to those in the US, the lower labor costs and favorable proximity of Mexico has attracted a large share of US business and merchandise manufacturing. This has helped Mexico's economy grow over the past decade, but in recent years, new challenges have appeared as even lower-cost markets have grown (e.g., China), shifting investment away from Mexico.

As shown in Exhibit 3-12, these same lower-cost Asian markets that have been taking share from Mexico's manufacturing business are also exporting less expensive goods back to Mexico, thus impacting US exports to its southern neighbor.

The US imports more goods from Canada and Mexico than it exports to them. The most important US exports to Canada are chemical manufactures, machinery, and transport equipment, especially automotive products and office and telecommunications equipment. The most important imports to the US from Canada are mining products, especially fuels, and automotive products.

Key US exports to Mexico include agricultural products, office and telecom equipment, and automotive products. Higher value imports from Mexico include fuels, office and telecommunication equipment, electrical machinery, and automotive products. However, agricultural products, which have a lower value per ton, are also a significant import.

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[12] Office of the United States Trade Representative (ustr.gov).

Exhibit 3-12
US Suppliers Losing Market Share in Mexico
(percent share of Mexico trade)
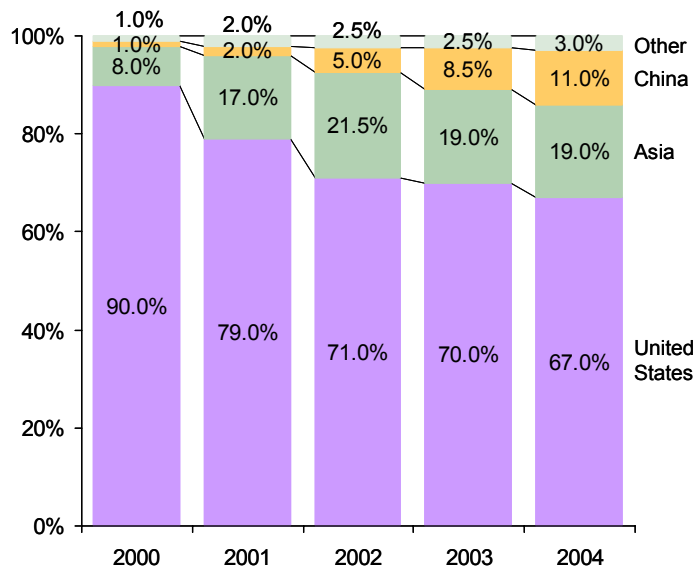
Source: Banco de Mexico.

Asia

The value of US trade with China has grown tremendously over the past decade. It is now the third largest exporter to the United States and fifth largest importer of US goods: US imports from China were US$163 billion and US exports to China were US$28 billion in 2003.

In addition, lower wages, less regulation, and strengthening economies have given South Korea, Taiwan, Singapore, and Malaysia a global advantage in manufacturing, greatly increasing these countries' trade with the United States. As a result, while in 1970 Japan was the only Asian nation/economy among the United States' top 10 trade partners,[13] today 6 of the top 10 are (Japan, China, South Korea, Taiwan, Hong Kong, and Singapore).

The United States' largest category of exports to Asia is machinery and transport equipment, especially office and telecom equipment, which accounts for half of this category. Additionally the US exports a large amount of agricultural products and chemicals to Asia. The United States' largest imports from Asia include automotive products, office and telecom equipment, clothing, and other manufactured consumer goods.[14]

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[13] The European Union is considered one trade partner by the WTO for this analysis.
[14] World Trade Organization.

Latin America

In December 1994, the heads of state of the 34 democracies in the Americas agreed to construct a Free Trade Area of the Americas (FTAA). While substantial progress has been made in the negotiations, the United States has also undertaken bilateral negotiations to expedite trade with critical partners. Currently, the United States has a successful bilateral free trade agreement (FTA) with Chile, and is pursing the Andean FTA with Bolivia, Colombia, Ecuador, Peru, and Venezuela.

However, in terms of trade value, these nations account for only a small portion of US trade. In 2003, of the top 30 US export recipients, only four (2.8 percent share of exports) were South American countries, and only three were among the top 30 US import sources (3.1 percent share of imports).

The United States' key exports to South America include office and telecom equipment, chemicals, and agricultural products, while its key imports from South America include agricultural products, fuels, office and telecom equipment, and automotive products.

3.3 Key Trade Commodities

Overall, the mix of commodities making up US imports/exports has shifted considerably in the past two decades, and will likely continue to shift due to changing consumer demand, the opening of more global markets, and the need for new energy sources. One area of strong growth has been manufactured goods, which increased from 62 percent of the value of US merchandise trade in 1980 to 85 percent in 2001. At the same time, trade in natural resources and raw minerals declined in share, despite strong domestic consumption. Between 1980 and 2001, agricultural goods' share of US trade value declined from 13 percent to 5 percent, and mineral fuels (oil and petroleum) declined from 19 percent to 7 percent.[15]

In tonnage terms, between 1990 and 2002, trade of manufactured goods and equipment experienced strong growth, with tonnage increasing by 5.7 percent and 5.9 percent per year, respectively. Increased merchandise trade has contributed to the increase in demand for container shipping and intermodal trade routes. International seaborne trade in coal declined by 5.1 percent per year during this same period, while tonnage of petroleum products and chemicals trade grew by 3.1 percent and 4.4 percent respectively. Additionally, tonnage of food and farm products and crude materials, which represent a major share of waterborne trade, remained relatively stable over the past decade, with little significant change in weight transported (Exhibit 3-13).

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[15] US DOT Bureau of Transportation Statistics: US International Trade and Freight Transportation Trends.

Exhibit 3-13
Total Waterborne US Commerce by Commodity Type
(millions of tons)
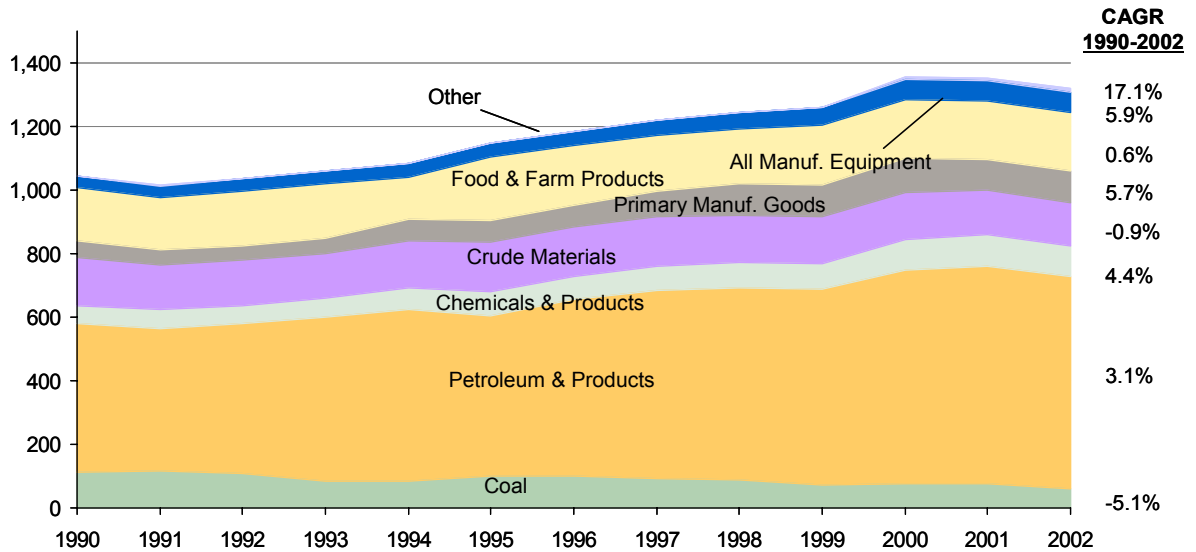
Source: US Waterborne Commerce - National Summaries, www.iwr.usace.army.mil/ndc/wcsc/wcsc.htm.

3.4 US Market Trends and Challenges

Key import/export trends that are expected to play a role in US trade going forward include a gradual decline in merchandise exports as the US continues to switch from a manufacturing to a service economy. As shown in Exhibit 3-14, US merchandise exports have been decreasing by about 1.0 percent a year, while China's have been growing by nearly 10 percent annually. Conversely, US demand for merchandise will continue to be increasingly met by the Asian region, with large volumes of containerized goods moving to the US West Coast, as well as through the Panama Canal to US East Coast ports.

Another issue impacting trade will be the US trade deficit, which has grown by 19 percent a year over the past two decades, from US$67 billion in 1991 to US$535 billion in 2003. This deficit, a result of increased spending, the recent economic recession, and an overall decline in US manufacturing and exports, is expected to continue to grow in the near-term.

Exhibit 3-14
US & China Merchandise Exports: 1990-2003
(percent of world merchandise exports)
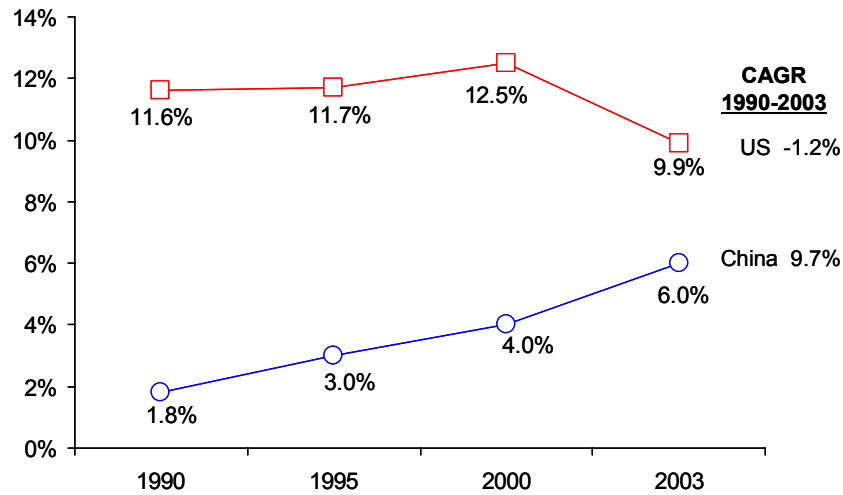
Source: WTO.

As globalization and US dependency on international trade increases it will be important, and increasingly challenging, to maintain sufficient port capacity. During the 2004 holiday season, for example, a record influx of goods from Asia jammed US West Coast ports, causing transport companies to have to adjust their routes or change their mode of shipping. An anticipated lack of capacity at ports such as Los Angeles/Long Beach in the near term may create opportunities for US East Coast ports to attract larger volumes of Asian goods through the Canal, provided that "landbridge" solutions are available to deliver goods to the interior in a timely fashion. Additionally, as ships exporting and importing goods from the US become larger and more technically sophisticated in order to increase their speed and carrying capacity while decreasing load times, they will need port and Canal technology and solutions to evolve as well.

Another challenge to the continued growth of US trade will be the ability to ensure transportation security. After September 11, 2001, the US government initiated plans for stricter security, including mandatory screening of all cargo traveling on planes and new regulations for maritime vessels. In some cases, security concerns have already affected sourcing (such as for natural gas). The degree to which security concerns impact future trade (routes, shipping costs) remains to be seen.

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The United States and the Panama Canal

4.1 Trade Routes Relevant to the Panama Canal

The United States conducts sea trade with all of the major world economies via numerous ports on its Pacific and Atlantic coasts. Although this geographic advantage means that a majority of its sea trade comes directly to coastal ports, the Canal can offer a less costly alternative to intermodal services for goods that need to cross from one US coast to another (all sea routes are generally less costly than combined land-sea routes). This is particularly true for cargoes with a low value to ton ratio, such as grain and petroleum.

As shown in Exhibits 4-1 and 4-2, the majority of US trade that passes through the Panama Canal travels between East Coast US and Asia and South America, and between West Coast US and Europe.

Exhibit 4-1
US Exports through Panama Canal: 2004
(millions of tons)
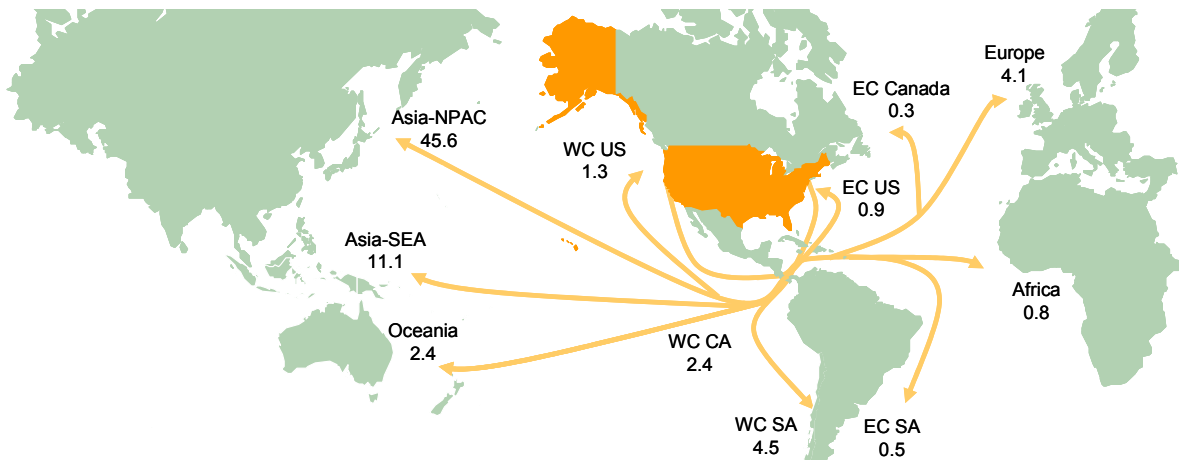
Source: ACP.

Exhibit 4-2
US Imports through Panama Canal: 2004
(millions of tons)

Source: ACP.

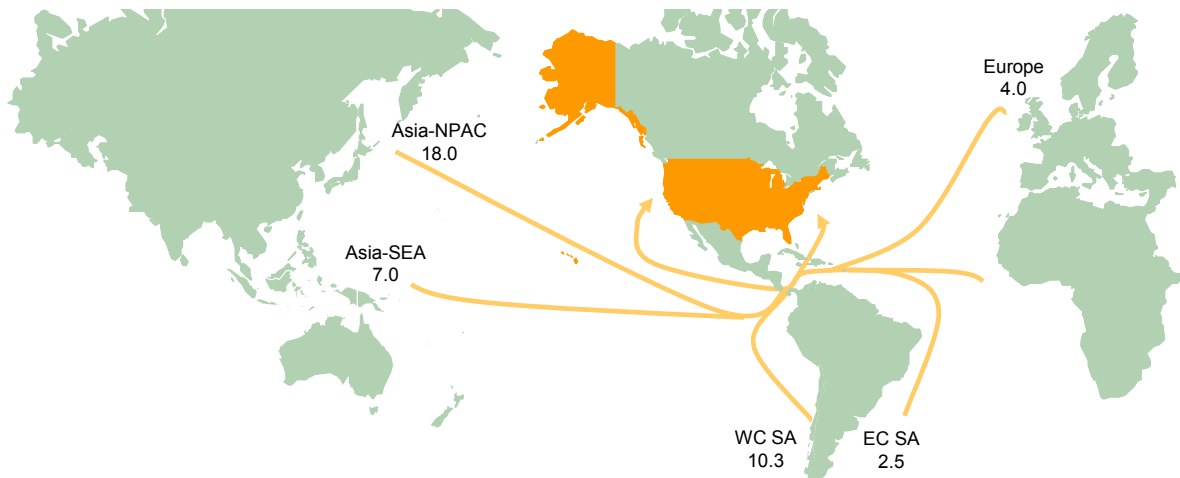## East Coast US and North Pacific Asia

By far the largest recipients of US exports passing through the Panama Canal are the North Pacific Asian nations, primarily China, Japan, and South Korea. In 2003, this region received 45.6 million tons of exports from the United States via the Panama Canal, which is more than half of the weight of total US exports to the rest of the world that travel through the Canal.

Principal exports from the US East Coast to this region include corn (28 percent of total US tonnage shipped to the region), soybeans (24 percent), and container cargo (16 percent). Key US exports to specific countries in the region are as follows:

- China: 17 millions tons were shipped from the East Coast US (ECUS) to China in 2003 via the Panama Canal. Soybeans shipped accounted for a 36 percent share of ECUS exports, followed by containerized cargo (21 percent), fertilizers (9 percent), and scrap metal (6 percent).

- Japan: 22 million tons were exported from ECUS via the Canal, of which corn accounted for 59 percent, soybeans for 15 percent, and container cargo for 6 percent.

- South Korea: received 7.3 million tons of goods from ECUS via the Canal. Container cargo represented a 28 percent share of ECUS exports, with 16 percent soybeans, 14 percent chemicals, 11 percent scrap metal, and 10 percent styrene.

The North Pacific Asian nations (primarily China, Japan, and South Korea) are also the largest suppliers of US imports that transit the Canal. In 2003, this region supplied 18

million tons of imports to the United States via the Panama Canal, which is approximately one-third of total Canal-relevant US imports.

Principal exports from NE Asia to ECUS include container cargo, which accounts for 41 percent of total US import tonnage from this region, natural coke-coal (11 percent), cement (8 percent), autos and trucks (8 percent), and miscellaneous ores (6 percent).

East Coast US and Southeast Asia

Exports to Southeast Asia from ECUS totaled 11 million tons in 2003. Of this, 43 percent was container cargo, 18 percent miscellaneous chemicals, 9 percent corn, and 8 percent soybeans.

Key trade partners for ECUS exports through the Canal include Taiwan and Hong Kong. Taiwan received 5 million tons in ECUS exports in 2003, comprised of 39 percent container cargo, 19 percent corn, 15 percent soybeans, and 14 percent chemical products. Hong Kong's 2.5 millions tons imported via this route are much less diverse, consisting of 88 percent container cargo and 11 percent miscellaneous refrigerated goods.

In 2003, SE Asia supplied 7 million tons of imports to the United States via the Panama Canal. The primary Canal relevant import partners for the US from this region include Taiwan, Hong Kong, the Philippines, Indonesia, and Malaysia.

Principal exports from SE Asia to ECUS include container cargo, which accounts for 74 percent of total US import tonnage from this region and miscellaneous refrigerated, rubber, and vegetable oil, each accounting for 3 percent.

East Coast US and West Coast South America

In 2003, the United States exported 4.5 million tons through the Panama Canal to the West Coast of South America (WCSA). Primary commodities shipped via this route were wheat (23 percent of total tons), container cargo (17 percent), fertilizers (8 percent), chemicals (5 percent), and paper, petroleum coke, and gasoline (4 percent each).

In 2003, the WCSA supplied 10 million tons of imports to the United States via the Panama Canal. The primary Canal relevant import partners for the US from this region include Peru, Ecuador, and Chile.

Principal exports from WCSA to ECUS include salt, which accounts for 40 percent of total US import tonnage from this region, crude petroleum (12 percent), and container cargo (7 percent).

West Coast US and Europe

The majority of transatlantic trade between the United States and Europe passes through ports on the US East Coast. Only a small amount of West Coast US trade passes through the Canal, approximately 4.1 million tons in 2003. Of this, 36 percent is petroleum coke, 29 percent container cargo, 10 percent soda and sodium compounds, and 7 percent borax.

In 2003, Europe supplied 4.0 million tons of imports to the West Coast United States (WCUS) via the Panama Canal. The primary Canal relevant import partners for the US from this region include Germany, Italy, the Netherlands, Spain, France, and Belgium.

Principal exports from Europe to the WCUS include containerized commodities, which account for 55 percent of total US import tonnage from this region, fertilizers (11 percent), autos and trucks (10 percent), and iron & steel (7 percent).

West Coast US and East Coast South America

Only 0.5 million tons of merchandise passed through the Canal from the WCUS (including Alaska) en route to the East Coast of South America (ECSA) in 2003. Of this, 43 percent was petroleum coke, 25 percent was soda and sodium compounds, and container cargo and potash accounted for 10.5 percent each.

In 2003, the ECSA supplied 2.5 million tons of imports to the WCUS via the Panama Canal. The primary Canal relevant import partners for the US from this region include Brazil, Colombia, and Venezuela.

Principal exports from the ECSA to the WCUS include iron and steel, which account for 31 percent of total US import tonnage from this region, crude petroleum (17 percent), residual fuel oil (17 percent), and container cargo (8 percent).

Trade Lane Trends

The following two graphs (Exhibits 4-3 and 4-4) show trends in Panama Canal-relevant trade lanes for US imports and exports. Exhibit 4-3 shows that while most routes have experienced minimal changes in transport share over the past 5 years, US exports through the Canal destined for Asian countries in the North Pacific have increased slightly, while exports to Southeast Asia and Europe have declined slightly. Changes in imports (Exhibit 4-4) show a similar trend, with an increase in Canal traffic share from the Asia to the US, and a decrease in share of goods originating in Europe.

Exhibit 4-3
US Exports through the Panama Canal by Destination: 1999-2003
(percent of total tons)
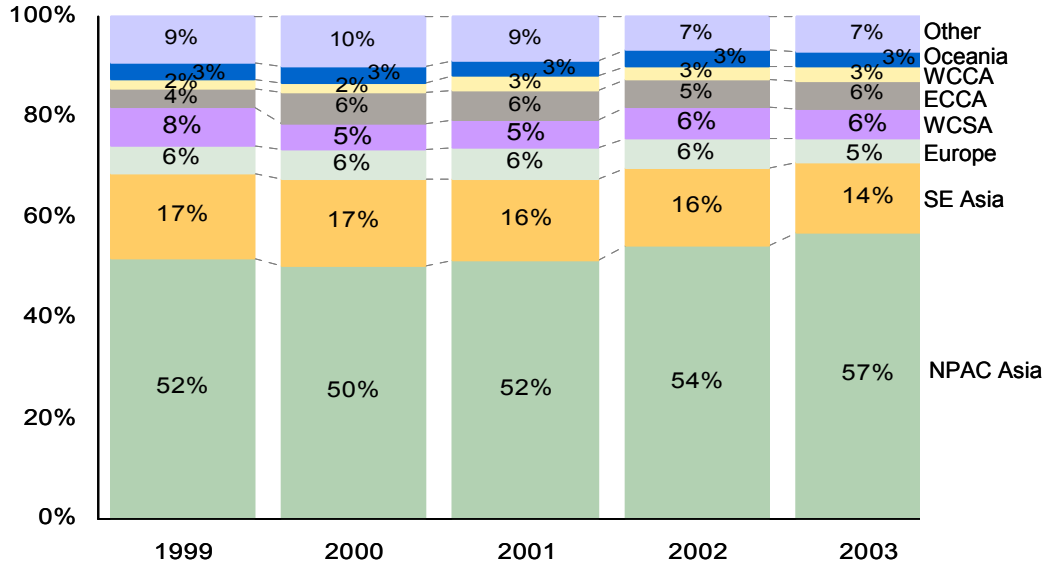
Source: ACP.

Exhibit 4-4
US Imports through the Panama Canal by Origin: 1999-2003
(percent of total tons)
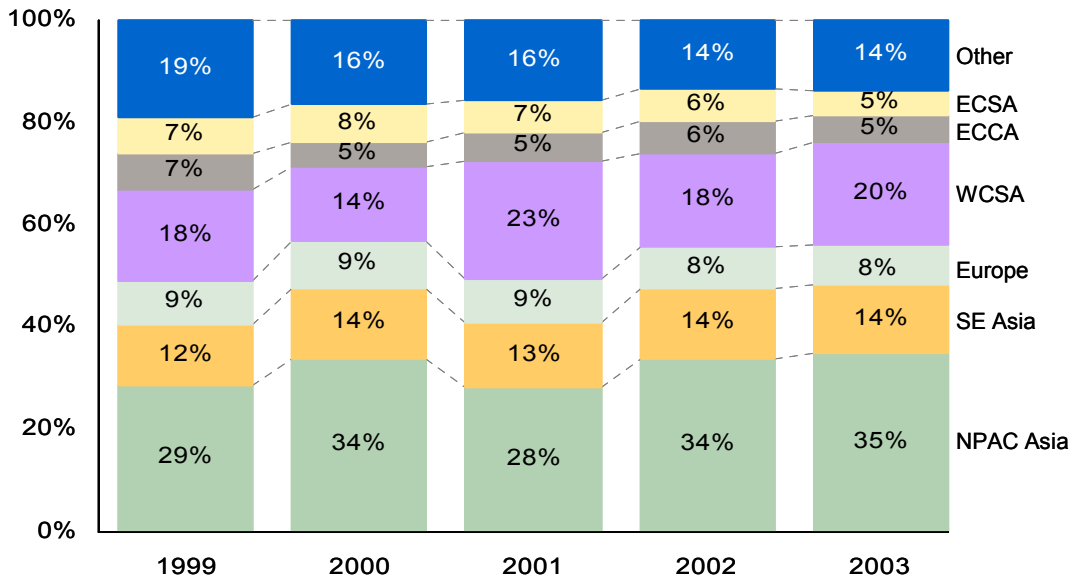
Source: ACP.

Container trade is very important to the Canal and is a major component of trade between the US and Asia. Changes in container trade are representative of global changes in the relative importance of specific shipping routes. Container trade between the US and both

Europe and West Coast South America is projected to double by 2025, while container trade between Northeast Asia and the US will likely more than triple over the same period (Exhibit 4-5).
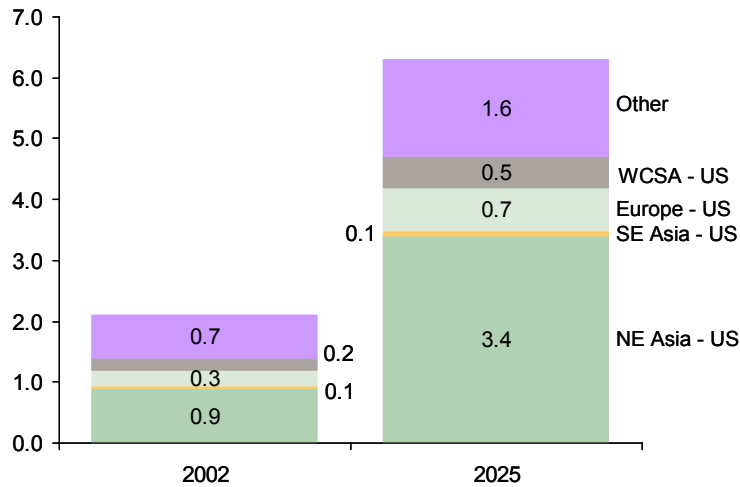
Exhibit 4-5
Forecast for US Container Trade through the Panama Canal – Major Routes
(thousands of transits)

Source: ACP.

4.2 US Imports/Exports Through the Canal

For the purposes of this report, when analyzing specific US trade commodities that transit the Panama Canal, we used the "80/20 rule," which means that we analyzed the most prevalent commodities making up approximately 80 percent of Panama Canal tonnage.

Since 1999, the aggregate weight of US exports transported by sea, and the amount of tons passing through the Panama Canal specifically, have both declined at approximately 1 percent per year. There also have been significant changes in the composition of US export commodities passing through the Canal.

The key export commodities are listed in Exhibit 4-6. The most prominent exports by weight are dry bulk goods (i.e., corn and soybeans), which together account for 36 percent of exports passing through the Canal in 2003. Additionally, containers account for 19 percent of total goods exported through the Canal; thus, these three commodities represent over one-half of US exports transiting the Canal.

The strongest annual growth in tons passing through the Canal between 1999 and 2003 occurred in scrap metal, which grew by 35 percent, followed by containers and petroleum, which grew by 12 percent and 6 percent, respectively. As a result of this growth in tonnage, the share of scrap metal relative to total US exports through the Canal grew from 1 percent to 4 percent, and containers grew from 15 percent to 25 percent.

The largest declines in US tonnage through the Canal were in lumber, which dropped by 56 percent per year during 1999-2003, and phosphates and chemicals, which dropped by 14 percent and 6 percent per year, respectively. The drastic drop in lumber exports through the Canal caused lumber's share of Canal-relevant exports to plummet from 7 percent in 1999 to 0.3 percent in 2003. Phosphate's share dropped from 4 percent to 2 percent over the time period.

Exhibit 4-7 indicates that while both total US exports and those passing through the Canal decreased from 1999-2002, before rebounding slightly, the share of total trade passing through the Canal has remained nearly constant.

Exhibit 4-6
Major US Export Commodities Transiting the Panama Canal: 1999-2003
(percent of total tons)

	CAGR 1999-2003
Other	-3%
Scrap Metal	35%
Phosphates	-14%
Lumber	-56%
Wheat	-4%
Petroleum	6%
Fertilizers	-5%
Chemicals	-6%
Soybeans	4%
Container	12%
Corn	-6%
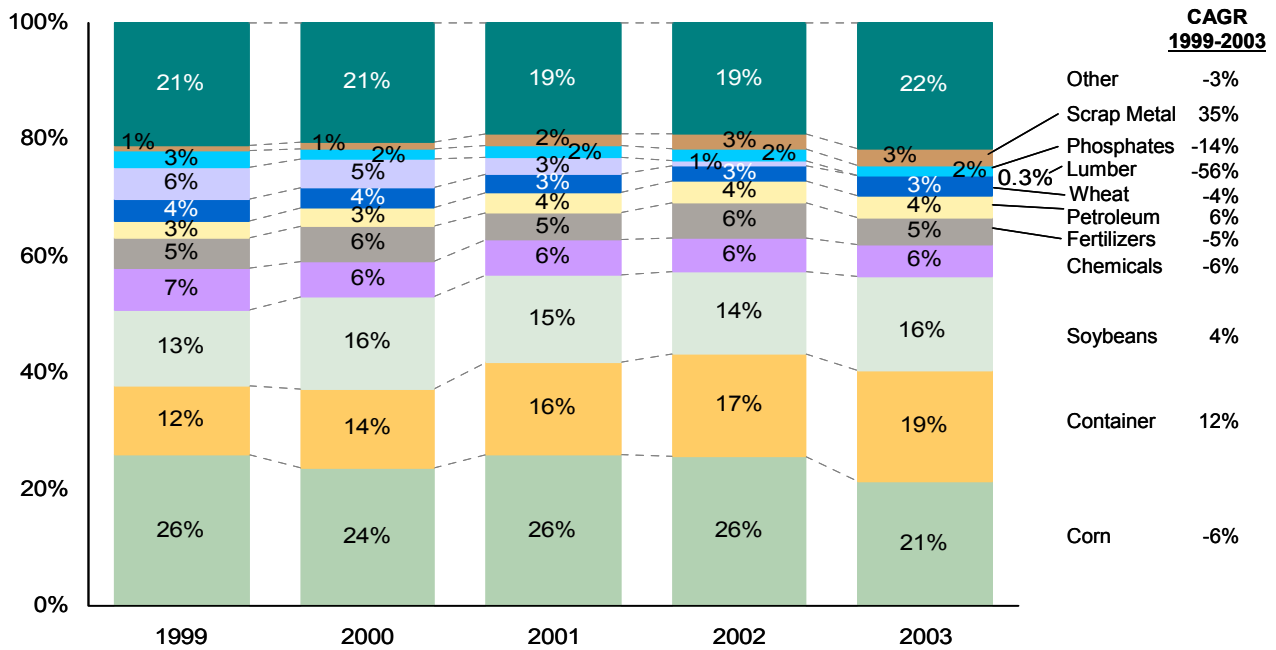
Source: ACP.

Exhibit 4-7
US Exports (Canal and Non-Canal): 1999-2003
(percent of total tons)

	1999	2000	2001	2002	2003
US Exports (million tons)	449	461	441	415	419
Panama Canal US Exports (million tons)	83	81	77	78	80
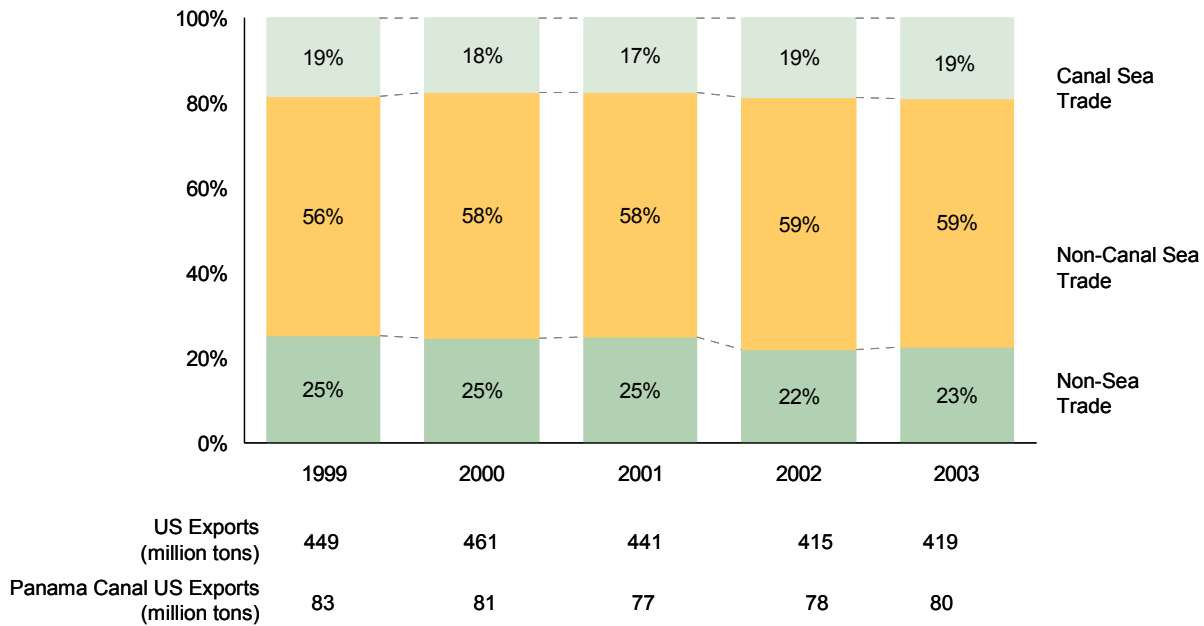
Source: ACP; US Maritime Administration Waterborne Databank, US DOT Bureau of Transportation Statistics, USITC Dataweb (dataweb.usitc.gov), America's Freight Transportation Gateways Report from the US DOT Bureau of Transportation Statistics, Mercer analysis.

Although the value of both total US imports and waterborne imports is much higher than that of US exports – waterborne or not – over the past five years on average 50 percent more US exports than imports have moved through the Panama Canal. This difference is due to the large amount of dry bulk goods (e.g., corn and soybeans) exported by the US through the Canal, which account for nearly 50 percent of total Canal-relevant US exports. Container cargo amounts to roughly 19 percent of total US exports moving through the Canal, and nearly 25 percent of imports (Exhibit 4-8).

Exhibit 4-8
Five Year Average US Trade through the Panama Canal
(millions of tons)
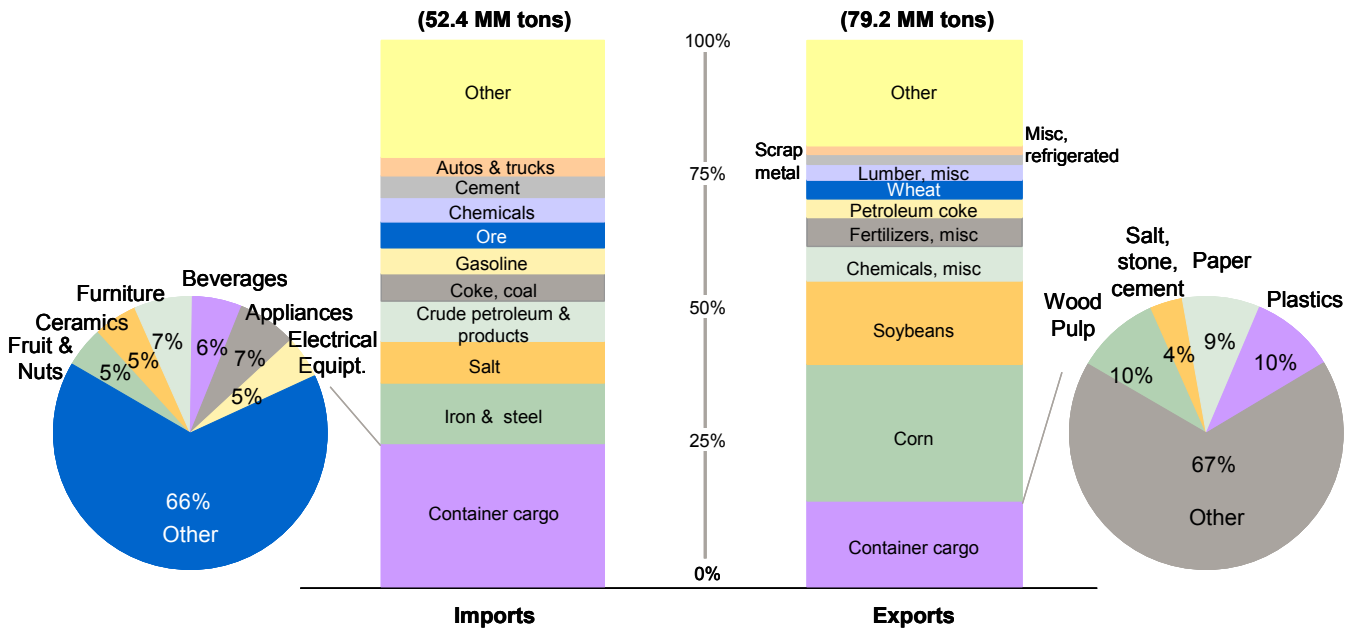
Source: ACP.

4.3 Canal-Relevant US Export Commodities

4.3.1 Corn

Corn is primarily used to feed livestock, but is also a major ingredient in food products for human consumption. It is used in many types of food and industrial products, including starches, sweeteners, corn oil, beverage and industrial alcohol, and fuel ethanol. In addition to foods, other everyday items – from toothpaste and cosmetics to adhesives and shoe polish – contain corn components.

Corn products are also being used in place of petroleum in many industrial applications. Polylactide (PLA), a biodegradable polymer made from corn, is being used successfully in the manufacturing of a wide variety of everyday items, such as clothing, packaging, carpeting, recreational equipment, and food utensils. Because these products are biodegradable and made from a renewable resource, they offer environmental benefits.

Corn is the United States' largest agricultural crop in terms of both volume and value. The states of Iowa, Illinois, Nebraska, and Minnesota account for more than 50 percent of US corn production.

In terms of weight produced, the United States grew 38 percent of the world's corn during fiscal year 2003, producing 229 million metric tons (9 billion bushels).[16]

The United States is not only the world's top corn producer, but also its top exporter. On average, about 20 percent of US corn is exported. During fiscal year 2003 (October-September), the United States exported 41 million metric tons (1.6 billion bushels), accounting for 53 percent of world corn exports by weight[17]. During the same period, other major corn exporters included China (15 million metric tons, or 590 million bushels) and Argentina (12 million metric tons, or 472 million bushels) (Exhibit 4-9).

In terms of value, the United States exported US$5 billion of corn, which accounted for 45 percent of the value of the world's total corn exports in 2003. The second and third largest exporters by value, China and France, accounted for 16 and 12 percent of the world's corn exports in 2003.

Between 1999 and 2003, on average the US exported 19 million tons of corn through the Panama Canal. During this period the US's top import partners for this commodity were Japan, which received 64 percent of Canal-relevant US corn exports, Taiwan with 11 percent, and South Korea with 6 percent of exports.

Exhibit 4-9
Top World Corn Exporters: 2003
(millions of tons)
Total Value: US$11.2 billion
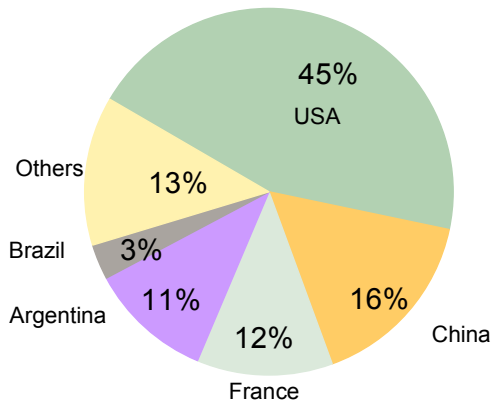
Source: UN COMTRADE.

4.3.2 Petroleum Coke

Petroleum coke, is a solid residue left by the cracking process in oil refining. Like natural coke, it is mainly used in the iron and steel industries and as an energy source to generate

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[16] US Grains Council - www.grains.org.
[17] Ibid.

electricity. Nevertheless, all types of industries use it: cement, chemicals, paper, and primary metals. Petroleum coke can be classified as either calcined petroleum coke (CPC) or non-calcined coke. CPC is the same as non-calcined coke, but has undergone additional refining and processing,[18]

World petroleum coke output has grown by 4 percent per year since 1991, and will likely rise from 83 million tons (including 59 million tons of marketable coke) in 2001, to 88 million by the end of 2005. This figure could be increased further, however, as 13.5 million tons-per-year of new or expanded capacity could come on-stream during this period.

Growth in CPC output in North America (3.3 percent annually) and Europe (1.4 percent annually) is below the world average, but this is balanced by significant expansion in Asia (about 8 percent per year).

In 2003, the United States was the largest exporter of both calcined and non-calcined petroleum coke, totaling US$1.1 billion or 63 percent of the world's petroleum coke exports (Exhibit 4-10).

Between 1999 and 2003, on average the US exported 3 million tons of petroleum coke through the Panama Canal. During this period the US's top import partners for this commodity were Belgium, which received 26 percent of Canal-relevant US petroleum coke exports, Japan and the Netherlands each with 11 percent, Canada with 8 percent, and Brazil with 6 percent.

Exhibit 4-10
Top World Petroleum Coke Exporters: 2003
(millions of tons)
Total value: US$1.8 billion
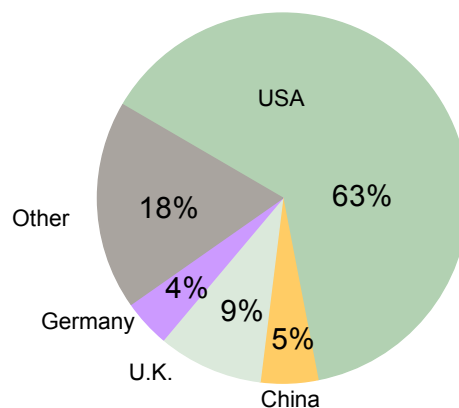
Source: UN COMTRADE.

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[18] www.portoflongview.com

World demand for petroleum coke is expected to rise mainly due to increasing oil production and consumption, decreasing quality of crude oil stocks, and higher demand for gasoline and other transportation feeds. The progressively stringent environmental regulations for these fuels will lead to a greater need for coking.

Globally, around 75 percent of petroleum coke output is burned as a fuel: in North America, around 90 percent of coke used in the energy sector is catalyst coke that is burned as a fuel in its host refinery. In Europe and the Pacific region, non-energy applications (including electrodes and cement manufacture) are proportionately more important. The manufacture of carbon and graphite electrodes is the largest non-fuel end-use for petroleum coke, which is the main ingredient in carbon anodes for primary aluminum smelting and in graphite electrodes for steel production via the electric arc furnace (EAF) process.[19] The main importers of non-calcined coke are Japan, Spain, and Italy, while the main importers of calcined coke are the Netherlands, Australia, and Canada.[20]

4.3.3 Wood Pulp

Pulp is a generic term for a wide range of technically distinct products resulting from complex manufacturing processes that involve the chemical and/or mechanical treatment of various types of plant material. Wood currently provides the basis for approximately 90 percent of global pulp production. The primary use for wood pulp is in paper and paperboard products.

In 2003, North American pulp mills produced 18 million tons of paper grade wood pulp. The United States was the largest pulp producer in the world, with output of 52 million tons in 2003. Canada ranked second, with a total of 26 million tons produced, 1.7 percent more than in 2002.[21]

Canada was the world's largest supplier of total pulp in 2003 accounting for 24 percent of global exports. In value terms it generated US$4.9 billion or 24 percent of world wood pulp exports in 2003. The United States was the world's second largest supplier of wood pulp with US$4.2 billion worth of exports in 2003, accounting for 20 percent of the world's exports (Exhibit 4-11).[22]

In 2003 the United States exported 9.5 million tons of containerized wood pulp.[23] The US's top seaborne import partners for this containerized commodity were China, which imported 4.7 million tons or 49 percent of total US exports, South Korea with 10 percent

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[19] Roskill, http://www.roskill.com/reports/petroleum.
[20] UN COMTRADE.
[21] Pulp and paper products council, www.pppc.org.
[22] UN COMTRADE.
[23] Total seaborne containerized export information was used because containerized wood pulp exports are not broken out specifically for the Panama Canal. Analysis in section 5 is based on containerized wood pulp.

of US exports, Thailand with 4.3 percent, Japan with 4.0 percent, and Taiwan with 3.9 percent.[24]

Exhibit 4-11
Top World Total Wood Pulp Exporters: 2003
(millions of tons)
Total value: US$20.8 billion
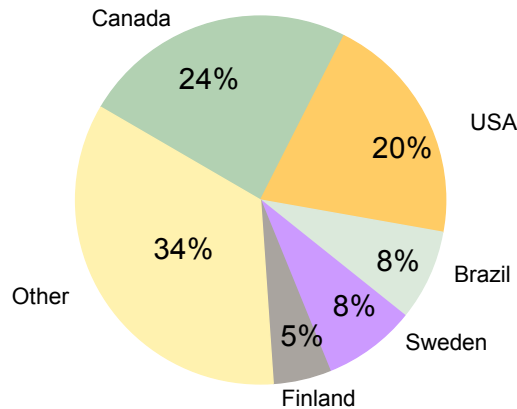
Source: UN COMTRADE.

4.3.4 Soybeans

Like corn, soybeans make up a significant portion of the world's food supply. Soybeans are converted into a large variety of food and food-related products such as oil, crackers, vegetarian burgers, non-dairy cheese and milk, bread/flour, etc. Additionally, soybeans can be used to generate biodiesel fuel used for transportation and other energy needs. Processed soybeans are the largest source of protein feed and vegetable oil in the world.

The United States is the world's leading soybean producer. Farm value of US soybean production in 2003/2004 was US$18 billion, trailing only corn in value terms among US-produced crops. Soybeans equal about 90 percent of US total oilseed production, while other oilseeds–such as cottonseed, sunflower seed, and peanuts–account for the remainder.[25]

As with corn, the United States is the world's largest exporter of soybeans, with over US$7.9 billion shipped in 2003. That year, soybean and soybean product exports accounted for 53 percent of the world's total soybean exports (Exhibit 4-12). The largest importers of US soybeans transported by all modes are China, which imported US$2.8

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[24] US Maritime Administration: Waterborne Databank.
[25] United States Department of Agriculture, Economic Research Service:
http://www.ers.usda.gov/briefing/soybeansoilcrops.

billion or 35 percent of US soybean exports , Mexico with 13 percent, and Japan with 12 percent.[26]

Exhibit 4-12
Top World Soybean Exporters: 2003
(millions of tons)
Total Value: US$14.9 billion
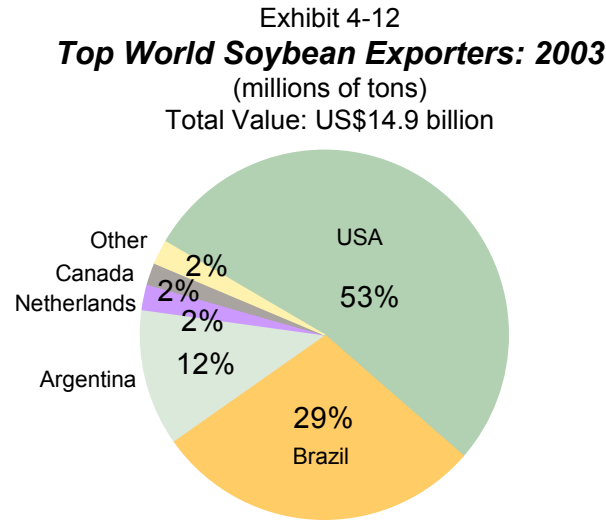
Source: UN COMTRADE.

US soybean acreage expanded throughout the 1990s as farm program changes increased planting flexibility and encouraged more farmers to incorporate the crop into their rotations. However, planted soybean area has declined slightly since its 2000 peak of 74.3 million acres. Corn yields have generally outperformed soybean yields for the last several years, leading producers to favor corn.

Between 1999 and 2003, on average the US exported 12 million tons of soybeans through the Panama Canal. During this period the US's top import partners for this commodity were China, which received 33 percent of Canal-relevant US soybeans exports, Japan with 29 percent, South Korea with 11 percent, Taiwan with 10 percent, and the Philippines with 5.3 percent.

4.3.5 Fertilizers

Fertilizers are key components of agricultural production, enhancing the ability of existing land and soil resources to increase food production. The more common fertilizers including nitrogen, phosphorus, potassium, calcium, sulfur, and magnesium.

The United States is the world's largest exporter of fertilizer products by value, amounting to US$1.1 billion in 2003, or 15 percent of world exports (Exhibit 4-13).

Between 1999 and 2003, on average the US exported 4.1 million tons of fertilizers through the Panama Canal. During this period the US's top import partners for this commodity were China, which received 54 percent of Canal-relevant US fertilizers

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[26] UN COMTRADE.

exports, Australia with 15 percent, Japan with 9.4 percent, Mexico with 3.0 percent, and Chile with 2.5 percent.

Exhibit 4-13
Top World Miscellaneous Fertilizer Exporters: 2003
(millions of tons)
Total Value: US$16.6 billion
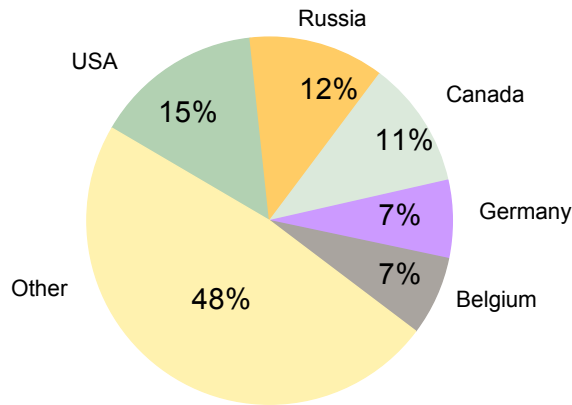
Source: UN COMTRADE.

4.3.6 Other Canal-Relevant Export Commodities

In addition to the commodities listed above, there are a number of additional Canal-relevant commodities that the United States exports, which move in smaller trades.

Wheat

Like corn and soybeans, wheat is a staple grain that is processed to make many end-consumer foodstuffs. In the crop year 2003, the US produced 63.8 million metric tons of wheat. Nearly half – 31 million metric tons – was exported Clearly, the US wheat industry continues to depend on export sales.[27]

In 2003, the United States exported US$4.0 billion worth of wheat. This total represented over one-quarter of the world's wheat exports (which totaled US$15.5 billion in 2003). However, despite the United States' strong share of this market, it faces a number of global competitors. In 2003, France exported 15 percent of the world's wheat supply, followed by Canada (13 percent), Australia (10 percent), and Argentina (6 percent).

Between 1999 and 2003, on average the US exported 2.6 million tons of wheat through the Panama Canal. During this period the US's top import partners for this commodity

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[27] US Wheat Associates.

were Peru, which received 20.4 percent of Canal-relevant US wheat exports, Egypt with 17 percent, Colombia with 8.3 percent, El Salvador with 7.9 percent, and Chile with 6.8 percent.

Miscellaneous Lumber

The United States is a top exporter of lumber products. The miscellaneous lumber category includes wood chips, fuel wood, sawdust, wood charcoal, logs & poles, rough wood, wood wool, pallets, drums & crates, manufactured wood products, and other articles of wood. The United States exported US$3.7 billion of miscellaneous lumber in 2003, accounting for roughly 13 percent of world exports. [28]

Between 1999 and 2003, the value of total US wood product exports (lumber is included in this figure) decreased by 17 percent. The primary factors contributing to the decline included increased world production of wood products and therefore increased competition, a strong US dollar early in this period, and slow economic growth in many of the United States' major markets.[29]

The top three markets for US wood exports are Canada, Japan, and Mexico. However, China, currently the fourth-largest market, is experiencing rapid growth in demand, while exports to Japan fall and exports to Mexico stay flat.

Between 1999 and 2003, on average the US exported 2.3 million tons of lumber through the Panama Canal. During this period the US's top import partners for this commodity were Japan, which received 86.7 percent of Canal-relevant US lumber exports, and South Korea with 8.3 percent of US lumber exports.

Miscellaneous Chemicals

The ACP defines miscellaneous chemicals to include more than 350 different natural and manufactured chemicals categories. In 2003, the United States supplied US$24.6 billion or approximately 15 percent of the world's exports of these commodities.

Between 1999 and 2003, on average the US exported 4.8 million tons of chemicals through the Panama Canal. During this period the US's top import partners for this commodity were South Korea, which received 21.2 percent of Canal-relevant US chemicals exports, Taiwan with 17 percent, Japan with 13 percent, and China with 9.0 percent.

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[28] This figure is calculated using UN COMTRADE, using the ACP miscellaneous number codes at the 4 and 6 digit level. A similar approach was taken with miscellaneous chemicals.
[29] United States Department of Agriculture.

Scrap Metal

Scrap metal is used for industrial purposes to manufacture many different products. The metals in the category include waste and scrap of most common metal types (e.g., steel, copper, iron) and ash or compounds of precious metals. In 2003, the United States exported US$4.7 billion worth of scrap metal, which accounted for approximately 19 percent of worldwide exports.

Between 1999 and 2003, on average the US exported 1.5 million tons of scrap metal through the Panama Canal. During this period the US's top import partners for this commodity were South Korea, which received 44 percent of Canal-relevant US scrap metal exports, China with 37 percent, Mexico with 12.7 percent, and Taiwan with 4.6 percent.

Miscellaneous Refrigerated Products

This category includes a variety of fresh and processed fruits, vegetables, flowers, plants, dairy products, and juices. Most of the products in this category are shipped ready for end-consumer use. This category of products has a high freight cost, and generally a high value per ton. In 2003, the United States exported US$2.0 billion of this commodity.

Between 1999 and 2003, on average the US exported 1.2 million tons of refrigerated products through the Panama Canal. During this period the US's top import partners for this commodity were Hong Kong, which received 27 percent of Canal-relevant US refrigerated products exports, Japan with 26 percent, South Korea with 8.3 percent, and Taiwan with 6.5 percent.

Paper

This commodity includes intermediate paper goods (products that have been partially developed and processed for consumer use) and consumer ready products. In 2003, the United States was the third largest exporter of paper products, valued at US$11 billion. This represented 9 percent of the world's total paper exports.

The world's largest exporter of paper products in 2003 was Germany with US$16 billion in exports, representing 14 percent of world paper exports. Germany was followed by Canada with 10 percent, Finland with 8 percent, and Sweden with 7 percent. The world's largest importers of paper in 2003 were the United States, which accounted for 14 percent of US$113 billion in world paper imports, Germany (10 percent), France (7 percent), the UK (7 percent), and Belgium (4 percent).[30]

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[30] UN COMTRADE.

Plastics

The United States produces a large assortment of plastics, manufactured in both primary and end-user states. In 2003, the United States was the second largest exporter of plastics & plastic products, exporting US$29 billion worth. This represented 13 percent of the world's plastics exports by value.

The US plastics industry experienced a slight slowdown in growth in the latter half of the 1990s, with the annual growth rate in shipments slipping from 4.9 percent during 1990-1995 to 2.2 percent during 1995-2000. This was followed by a significant downturn starting in 2000, with shipment dropping by an average of -5.4 percent during 2000-2002.[31]

Salt, Sulfur, Earth & Stone, Cement

This category encompasses products that are intended for general industrial applications and that are in either a completely raw state or that have been washed, crushed, ground, powdered, levigated, sifted, screened, concentrated by flotation, magnetic separation or other mechanical or physical processes (except crystallization), but not products that have been roasted, calcined, obtained by mixing or subjected to additional processing.

In 2003, the United States was the world's largest exporter of this commodity group, shipping 9 percent of world exports, or US$1.5 billion worth. The next largest exporters were Germany and China, each with US$1.4 billion in exports.

4.4 Canal-Relevant US Import Commodities

4.4.1 Iron and Steel

Steel is derived from metallic iron, which first must be extracted from iron ore. The main uses of iron and steel include automotive vehicles and parts, construction, and cans and containers. Iron and steel comprise about 95 percent of all the tonnage of metal produced annually in the world.

Although world exports of iron and steel declined between 2000 and 2001 by 2.2 percent, more recently they have been growing significantly, by 14 percent per year from 2001 to 2003.[32]

In 2003, by value, the United States imported US$11 billion worth of iron and steel products, accounting for 11 percent of world imports of this commodity.

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[31] Plastics Data Source (www.plasticsdatasource.org).
[32] UN COMTRADE.

Between 1999 and 2003, on average 5.7 million tons of non-containerized iron and steel exports destined for the United States passed through the Panama Canal. During this period, the top suppliers of this commodity to the US were Japan, which supplied 24 percent of Canal-relevant US iron and steel imports, Mexico (17 percent), Brazil (14 percent), South Korea (13 percent), and China (7.5 percent).

4.4.2 Salt

Salt as a commodity is produced in over 100 countries. It is primarily used for chemical production, road de-icing, and in direct consumption. Salt consumption is tied to overall economic activity, with higher usage levels in northern regions because of salt's use as a de-icer. Trade is highly fragmented; the United States, which is the main destination for salt transiting the Canal, exports salt to 69 countries and imports it from 40.[33]

The US imports 18 times the amount of salt it exports by volume, due to the fact that it is a low-value commodity that can be supplied by many lower-cost regions. Salt's high sensitivity to cost favors production in countries with low wage structures and ocean transportation over truck and rail.

In 2003, the United States imported 13 million tons of salt from 46 countries, 58 percent more than it imported during 2002.[34] In terms of value, the US imported US$0.29 billion of salt in 2003, accounting for 21 percent of world imports.

Between 1999 and 2003, on average, 4.1 million tons of salt destined for the United States passed through the Panama Canal. During this period, the top suppliers of this commodity to the US were Chile, which supplied 66 percent of Canal-relevant US salt imports, Mexico (21 percent), and Peru (13 percent).

4.4.3 Petroleum Products

Petroleum products are used for lubrication purposes, in the manufacturing of various products including plastics, and as fuel. Petroleum products imported by the United States include petroleum crude (79 percent), gasoline (11 percent), and other petroleum oils and derivates (10 percent).

In 2003, the United States imported US$129 billion worth of petroleum products, accounting for approximately 22 percent of world imports.

Between 1999 and 2003, on average, 2.5 million tons of gasoline, 2.9 million tons of crude petroleum, and 1.0 million tons of other petroleum oils and derivates destined for the United States passed through the Panama Canal. Top suppliers of these commodities

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[33] U.S. Geological Survey Minerals Yearbook, 2002.
[34] US Census Bureau

to the US include Ecuador (28 percent of Canal-relevant US petroleum products imports), the Netherlands West Indies (8.4 percent), and Peru (7.9 percent).

4.4.4 Petroleum and Natural Coke

Coke is divided into two major categories: petroleum coke and natural coke. Natural coke is coal, and petroleum coke is a solid residue left by the cracking process in oil refining. Both products are mainly used in the in the iron and steel industries and as an energy source to generate electricity.

In recent years, world natural coke imports have experienced accelerating growth: Between 2000 and 2003, total world exports of coke-coal grew on average by 15 percent per year, but from 20002 to 2003, exports grew by 45 percent. For petroleum coke, world imports rose by 10 percent per year between 2000 and 2003, and by 18 percent between 2003 and 2003.

In 2003, the United States imported US$0.28 billion worth of natural coke-coal, accounting for approximately 7.0 percent of world imports, and US$0.12 billion in 2003, accounting for 4.8 percent of world imports. .

Between 1999 and 2003, on average, 2.2 million tons of natural coke-coal and 0.3 million tons of petroleum coke destined for the United States passed through the Panama Canal. During this period, top suppliers of natural coke to the US were Japan, which supplied 57. percent of Canal-relevant US natural coke imports and China, which supplied 42 percent. The top suppliers of petroleum coke to the US via the Canal were Japan, which supplied 51 percent, and China, which supplied 40.6 percent.

5

Canal-Relevant Commodities Analysis

5.1 Methodology for Export Commodities Analysis

This section provides the results of an analysis of the US Canal-relevant commodities discussion in section 4. These commodities were analyzed with the objective of determining the potential impact of an increase in the Canal toll on landed cost, and therefore the relevance of a toll increase to US trade and the US economy.

The methodology for analysis was threefold:

1. The relevance of Panama Canal tonnage transits for 1999-2003 to the overall trade in the commodity for the United States was determined. Where possible, commodities were matched to the ACP's description of each category and HS 6-digits.

2. If the commodity tonnage transits through the Canal were above a certain threshold (percent of country trade) then the commodity was analyzed further to determine the relevance of a potential increase in Canal toll on landed cost. (For US exports, freight and insurance charges were determined by calculating these charges for US imports of the same commodity that travel via Canal-relevant routes.)

3. A sensitivity analysis was then applied to determine a range of impact on landed cost given different toll increase scenarios.

This methodology may have been slightly modified depending on the particular commodity analyzed (and if so, that information is noted below).

In most cases, the first step involved two analyses to determine the significance of a particular commodity's Panama Canal transits with respect to US trade:

- Total value of the exports of a specific commodity compared to total US exports

- ▪ Total value of the specific commodity transiting the Canal compared to the value of the United States' total exports of that commodity

ACP transit data was used to determine Panama Canal transits for each commodity. If the commodity tonnage transits through the Canal were above a certain threshold (percent of country trade or exports through the Canal), the next step involved first determining what percentage of total landed cost is represented by the Panama Canal toll. For the purposes of this analysis, landed cost was unbundled as shown in Exhibit 5-1.

Exhibit 5-1
Components of Landed Cost

Freight

| FOB | Canal toll | Other Freight Cost | Insurance |
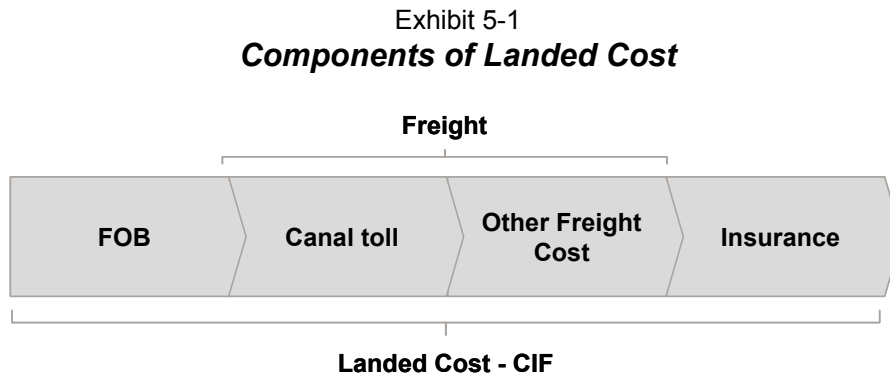
Landed Cost - CIF

To determine total landed cost (CIF) for each exported commodity, the FOB, tonnage, and freight and insurance charges were obtained from the US Census Bureau Foreign Trade Division. All costs are average values of all sea trade exports. The average Canal toll per ton for each commodity was calculated using ACP data from ships laden with that commodity.

A total CIF per ton was then calculated, and compared to the Canal cost (toll plus other maritime services) per ton for that commodity to determine the percentage share accounted for by the Canal cost out of the total landed cost, i.e.:

Canal Cost/(FOB+Freight+Insurance+Toll+OMS) = Canal Cost as % of CIF

In the final step, a sensitivity analysis was applied to determine the potential increase in CIF for potential toll increase scenarios, including toll increases of 50, 100, 150, and 200 percent.
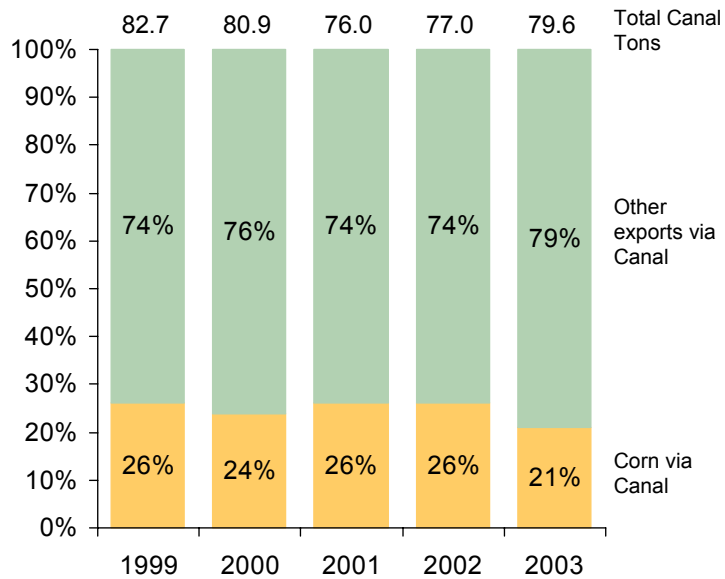
5.2 Corn Analysis

5.2.1 Overview

The analysis for corn covered corn for seed and not for seed, and for groats and meal. Of the corn exports from the United States, 98 percent is corn that is not for seed. Overall, US$4.2 billion, or 84 percent of total US corn exports by value are moved by sea.

In 2003, the United States exported 16.9 million tons of corn through the Panama Canal. This represented 21 percent of total US Canal exports (Exhibit 5-2).

Exhibit 5-2
Corn Share of Total US Canal Exports: 2003
(million tons)

	1999	2000	2001	2002	2003	
Total Canal Tons	82.7	80.9	76.0	77.0	79.6	
Other exports via Canal	74%	76%	74%	74%	79%	
Corn via Canal	26%	24%	26%	26%	21%	

Source: ACP.

As described above, two analyses were carried out to determine the significance of Panama Canal corn transits with respect to the United States' trade: total value of corn exports was compared to total US exports, and to the total value of corn transiting the Canal.

These analyses determined that the value of total US corn exports in 2003 was US$5.0 billion, which represented 0.7 percent of total US exports (Exhibit 5-3). Of this, 37.8 percent transited the Panama Canal.

Exhibit 5-3
Panama Canal Transit Share of Total Corn Exports
(US$ billions)
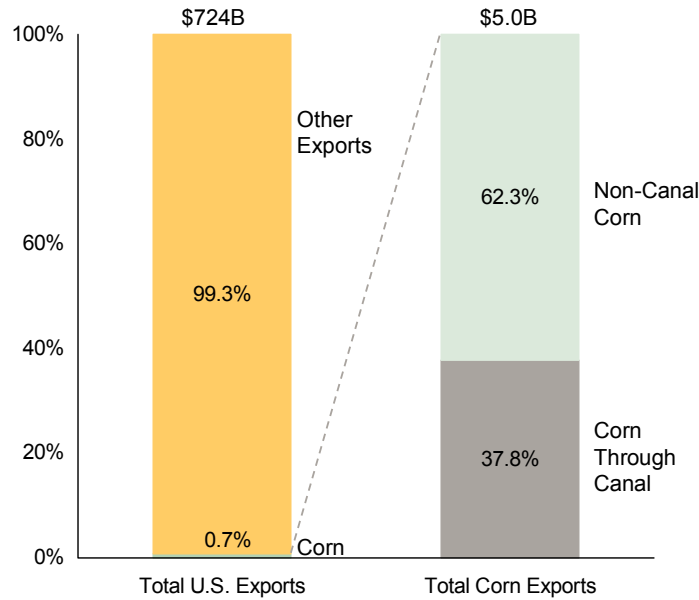
Source: World Trade Organization, US Census Bureau of Statistics, US Waterborne Databank, ACP.

5.2.2 Panama Canal Cost Share of Landed Cost

Exhibit 5-4 shows the cost components of the calculated CIF for US corn exports. Using the methodology described in section 5.1, the analysis found that the total Canal transit cost represents 1.53 percent of the total landed cost for US export corn.

Exhibit 5-4
Total Canal Cost Share of US Exported Corn CIF (Landed Cost)
(2003 values, US$/ton)

	FOB	Charges (Freight & Insurance)	Canal Cost (Toll + OMS)	Total CIF	Canal Cost as % of CIF
Corn	$111.99	$17.62	$2.01	$131.63	1.53%

Source: US Census Bureau of Statistics, US Waterborne Databank, ACP.

Based on this analysis, it can be expected that an increase in the toll for ships transporting corn through the Canal would have a moderate impact on the commodity's total landed cost.

A sensitivity analysis further showed that corn exports would be moderately affected by Panama Canal toll changes:

- Corn is a low-value bulk commodity, at US$112 per ton FOB in 2003. Therefore, a large increase in the Canal toll, which represents 1.21 percent of the landed cost, would cause a significant price change per ton (Exhibit 5-5).

- However, the United States is a dominant corn trading nation, with few alternative sources or product substitutes, and thus an increase in Canal toll would not affect the competitive landscape (i.e., no new producers our sources would emerge).

Exhibit 5-5
Corn Sensitivity Analysis: CIF Increase vs. Toll Increase

Toll Increase	50%	100%	150%	200%
CIF Increase	0.60%	1.21%	1.81%	2.41%

Source: Mercer analysis.

5.2.3 Analysis of Commodity Relevance

The US is the dominant producer of exported corn, and corn represents only 0.7 percent of US exports. Therefore, the impact of a Canal toll increase would not have a significant effect on the United States' trade and economy nor on the industry's role in the US economy.

5.3 Petroleum Coke Analysis

5.3.1 Overview

This analysis includes data for calcined and non-calcined petroleum coke. Overall, US$1.0 billion, or 91 percent of total US petroleum coke export value was transported via ships in 2003.

The United States exported 3.0 million tons of petroleum coke through the Panama Canal, representing 3.8 percent of total US Canal exports (Exhibit 5-6).

The value of total US coke exports in 2003 was US$1.1 billion, which represented 0.2 percent of total US exports (Exhibit 5-7). Of this, 11.8 percent transited the Panama Canal.

Exhibit 5-6
Petroleum Coke Share of Total US Canal Exports: 2003
(million tons)
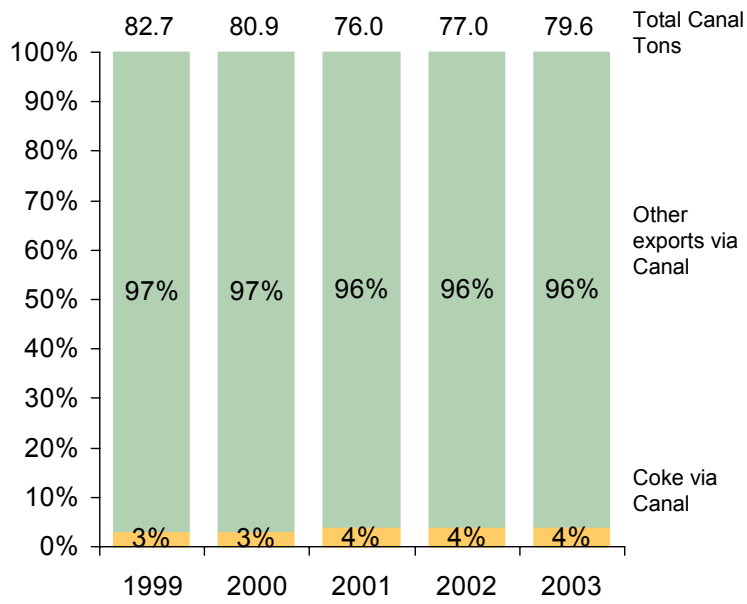
Source: ACP.

Exhibit 5-7
Panama Canal Transit Share of Total Petroleum Coke Exports
(US$ billions)
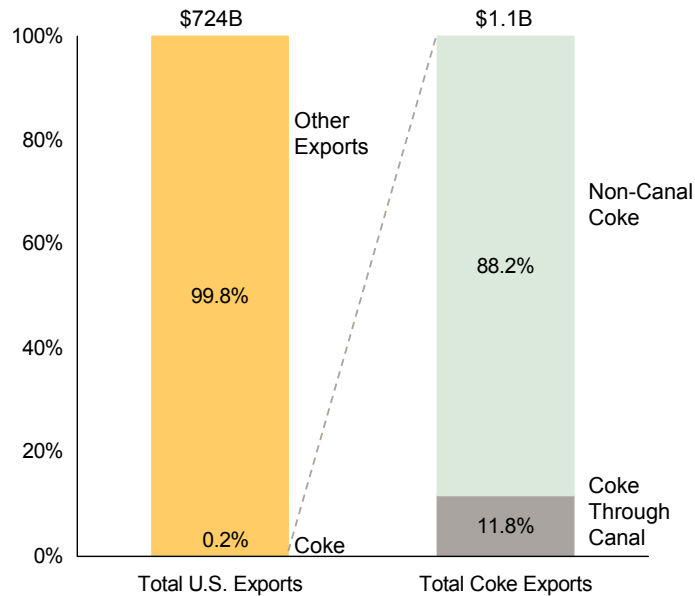
Source: World Trade Organization, US Census Bureau of Statistics, US Waterborne Databank, ACP.

5.3.2 Panama Canal Cost Share of Landed Cost

Exhibit 5-8 shows the cost components of the calculated CIF for petcoke. The comparison of CIF to total Canal cost determined that the Canal cost represents 3.7 percent of the CIF per ton for petroleum coke.

Exhibit 5-8
Total Canal Cost Share of US Exported Petroleum Coke CIF (Landed Cost)
(2003 values in US$/ton)

	FOB	Charges (Freight & Insurance)	Canal Cost (Toll + OMS)	Total CIF	Canal Cost as % of CIF
Petcoke	$44.18	$13.14	$2.20	$59.51	3.70%

Source: US Census Bureau of Statistics, US Waterborne Databank, ACP.

Based on this analysis, it can be expected that a significant increase in the toll for ships transporting petroleum coke would have a moderate effect on the commodity's total landed cost.

A sensitivity analysis further showed that petroleum coke exports would be moderately affected by changes to Panama Canal tolls:

- Petroleum coke is a very low-value bulk commodity, at US$44 per ton in 2003. Therefore, a large increase in the Canal toll, which represents 2.89 percent of the landed cost, would cause a large percentage price change per ton (Exhibit 5-9).

- However, the United States is a dominant petroleum coke exporter, with seven times the total export value of its nearest competitor in 2003, and only 11.8 percent of its petcoke exports transit the Canal. It is therefore unlikely that an increase in the Canal toll would affect the competitive landscape (i.e., no new competitive producers our sources would emerge).

Exhibit 5-9
Petroleum Coke Sensitivity Analysis CIF Increase vs. Toll Increase

Toll Increase	50%	100%	150%	200%
CIF Increase	1.44%	2.89%	4.33%	5.78%

Source: Mercer analysis.

5.3.3 Analysis of Commodity Relevance

As a result of this analysis, it was determined that petroleum coke plays a minor role in the US economy and that only a small portion of this commodity is relevant to the Canal.

Therefore, the impact of a Canal toll increase would not have a significant effect on the United States' trade and economy nor on the industry's role in the US economy.

5.4 Soybeans Analysis

5.4.1 Overview

Data was analyzed for soybeans, whole and broken. Overall, US$7.3 billion, or 92 percent of total soybean value is exported via seaborne transport.

In 2003, the United States exported 12.8 million tons of soybeans through the Panama Canal. This represents 16 percent of total US Canal exports by weight (Exhibit 5-13).

The value of total US soybean exports in 2003 was US$7.9 billion, which represented 1.1 percent of total US exports (Exhibit 5-14). A high 41.7 percent of soybean exports were shipped through the Panama Canal.

Exhibit 5-13
Soybeans Share of Total US Canal Exports: 2003
(million tons)
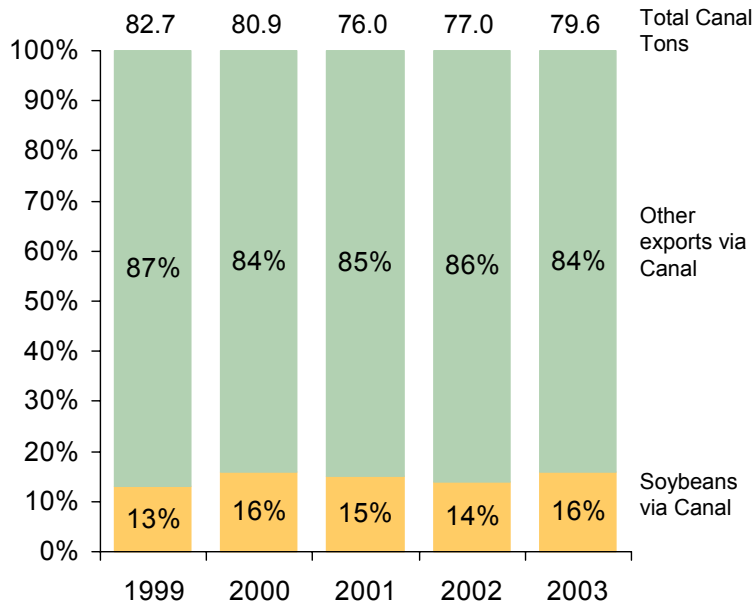
Source: ACP.

Exhibit 5-14
Panama Canal Transit Share of Total Soybeans Exports
(US$ billions)

Source: World Trade Organization, US Census Bureau of Statistics, US Waterborne Databank, ACP.
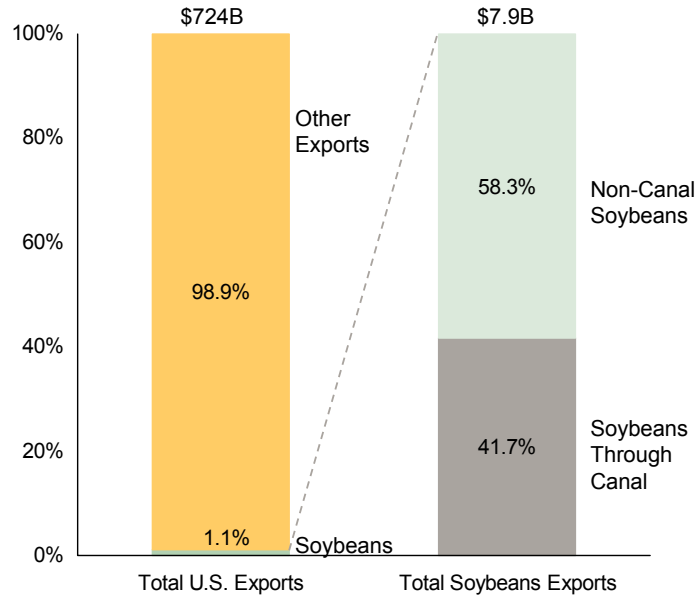
5.4.2 Panama Canal Cost Share of Landed Cost

Exhibit 5-15 shows the cost components of the calculated CIF for soybeans. The comparison of CIF to the total Canal cost determined that Canal cost represents only 0.73 percent of the CIF for soybeans.

Exhibit 5-15
Total Canal Cost Share of US Exported Soybeans CIF (Landed Cost)
(2003 values in US$/ton)

	FOB	Charges (Freight & Insurance)	Canal Cost (Toll + OMS)	Total CIF	Canal Cost as % of CIF
Soybeans	$258.30	$17.59	$2.04	$277.90	0.73%

Source: US Census Bureau of Statistics, US Waterborne Databank, ACP.

From this analysis, it can be expected that a significant increase in the toll for ships transporting soybeans would not have a significant impact on the commodity's total landed cost.

A sensitivity analysis further showed that soybean exports would not likely be affected by Panama Canal toll changes:

- The value per ton of soybeans (US$258) is over twice as high as the value of corn, but the Canal toll and transport charges per ton are equivalent for each commodity. Therefore, an increase in the Canal toll, which represents only 0.59 percent of landed cost, would not cause a significant price change in total landed cost per ton for soybeans (Exhibit 5-16).

- Additionally, while the United States is the world's largest exporter of soybeans, this commodity represents only 1.1 percent of US exports, and of this only 41 percent of the commodity transits the Canal.

- With few alternative sources or product substitutes, an increase in the Canal toll would not affect the competitive landscape (i.e., no new producers our sources would emerge).

Exhibit 5-16
Soybeans Sensitivity Analysis CIF Increase vs. Toll Increase

Toll Increase	50%	100%	150%	200%
CIF Increase	0.30%	0.59%	0.89%	1.19%

Source: Mercer analysis.

5.4.3 Analysis of Commodity Relevance

As a result of this analysis, it was determined that soybeans' moderately high value per ton lessens the impact of a toll increase on the US economy to the point where any change in tolls would not be significant. Additionally, soybeans make up a very small portion of the US export economy. Therefore, the impact of a Canal toll increase would not have a significant effect on the United States' trade and economy nor on the industry's role in the US economy.

5.5 Containerized Wood Pulp Analysis

5.5.1 Overview

Data analyzed for containerized wood pulp includes paper and paperboard waste. Overall, US$1.0 billion, or 70 percent of containerized wood pulp value was exported via seaborne transport in 2003.

In 2003, the United States exported 1.5 million tons of wood pulp through the Panama Canal, representing 1.8 percent of total US Canal exports.

The value of total US containerized wood pulp exports supplied in 2003 was US$1.4 billion, which represents 0.19 percent of total US exports (Exhibit 5-10). Approximately 28 percent of wood pulp exports transited the Panama Canal.

Exhibit 5-10
Panama Canal Transit Share of Total Containerized Wood Pulp Exports
(US$ billions)
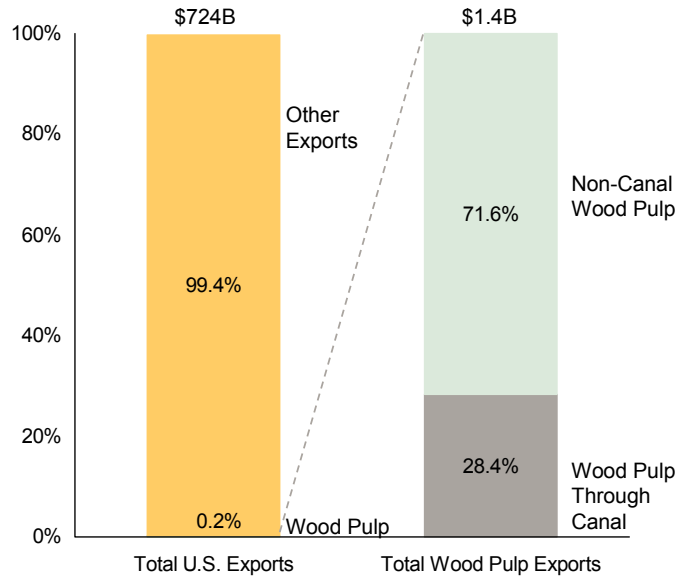
Source: World Trade Organization, US Census Bureau of Statistics, US Waterborne Databank, ACP.

5.5.2 Panama Canal Cost Share of Landed Cost

Exhibit 5-11 shows the cost components of the calculated CIF for wood pulp. The comparison of total landed cost to the total Canal cost determined that Canal cost represents 1.94 percent of the CIF for wood pulp.

Exhibit 5-11
Total Canal Cost Share of US Exported Wood Pulp CIF (Landed Cost)
(2003 values in US$/TEU)

	FOB	Charges (Freight & Insurance)	Canal Cost (Toll + OMS)	Total CIF	Canal Cost as % of CIF
Wood Pulp	$1,774	$318.53	$41.33	$2,133.48	1.94%

Source: US Census Bureau of Statistics, US Waterborne Databank, ACP.

From this analysis, it can be expected that a significant increase in the toll for ships transporting wood pulp would have a slightly moderate effect on the commodity's total landed cost.

A sensitivity analysis further showed that wood pulp exports would be moderately affected by Panama Canal toll changes:

- At a value of US$1,774 per TEU, wood pulp has a moderately high value similar to soybeans (when converted to tons), but an even higher transport cost of US$318.53 per TEU. However, its Canal transit cost per TEU is approximately three times greater than that of soybeans (when converted to transit cost per ton), magnifying the effect on landed cost of any percentage based toll increase. Therefore, a large increase in the Canal toll would cause a moderately significant price change per TEU (Exhibit 5-12).

- The United States' only peer competitor for exports in this industry is Canada, which essentially faces the same export route decisions as producers in the United States. Therefore, any change in the Canal toll for this commodity would affect both countries to a very similar degree.

Exhibit 5-12
Wood Pulp Sensitivity Analysis CIF Increase vs. Toll Increase

Toll Increase	50%	100%	150%	200%
CIF Increase	0.70%	1.50%	2.20%	3.00%

Source: Mercer analysis.

5.5.3 Analysis of Commodity Relevance

As a result of this analysis, it is evident that wood pulp plays a very small role in the US economy and that only a small portion of this commodity is relevant to the Canal. Therefore, the impact of a Canal toll increase would not have a significant effect on the United States' trade and economy nor on the industry's role in the US economy.
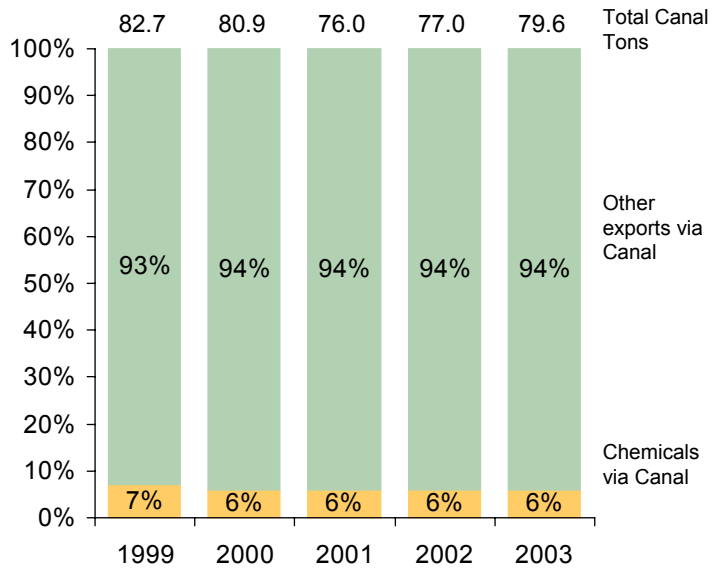
5.6 Miscellaneous Chemicals Analysis

5.6.1 Overview

The miscellaneous chemicals category includes 350 different natural and manufactured chemicals, including ethyl alcohol, chlorine, iodine, fluorine, bromine, silicon, calcium, arsenic, selenium, mercury, and other ores, sulfites, nitrates, acids, sulfates, leads, & oxides. Overall, only US$13.3 billion, or 54 percent of total US miscellaneous chemicals' value is exported via seaborne transport.

In 2003, the United States exported 4.4 million tons of these chemicals through the Panama Canal. This represents 5.6 percent of total US Canal exports (Exhibit 5-17).

The value of total US miscellaneous chemicals exports supplied in 2003 was US$24.6 billion, which represents 3.4 percent of total US exports (Exhibit 5-18). A moderately high 20.9 percent of these exports transited the Panama Canal.

Exhibit 5-17
Miscellaneous Chemicals Share of Total US Canal Exports: 2003
(million tons)

Source: ACP.

Exhibit 5-18
Panama Canal Transit Share of Total Miscellaneous Chemicals Exports
(US$ billions)
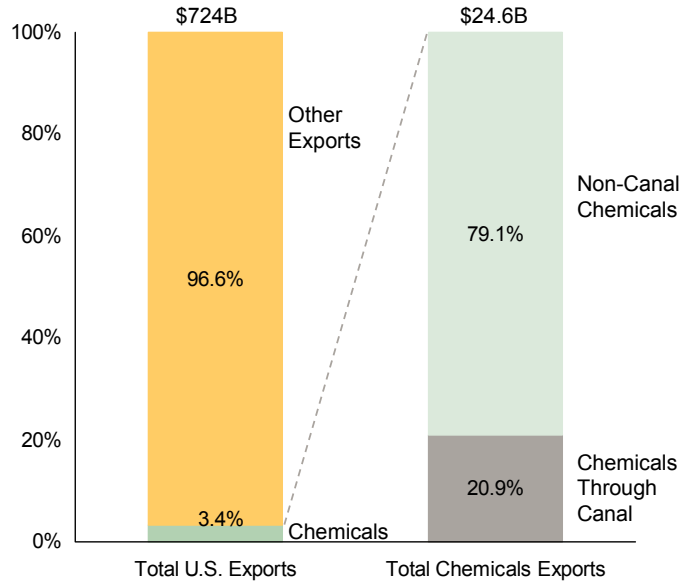
Source: World Trade Organization, US Census Bureau of Statistics, US Waterborne Databank, ACP.

5.6.2 Panama Canal Cost Share of Landed Cost

Exhibit 5-19 shows the cost components of the calculated CIF for misc. chemicals. The comparison of CIF to the total Canal cost determined that Canal cost represents only 0.22 percent of the CIF cost for misc. chemicals.

Exhibit 5-19
Total Canal Cost Share of US Exported Misc. Chemicals CIF (Landed Cost)
(2003 values in US$/ton)

	FOB	**Charges (Freight & Insurance)**	**Canal Cost (Toll + OMS)**	**Total CIF**	**Canal Cost as % of CIF**
Misc. Chemicals	$1,161.86	$58.85	$2.66	$1,223.37	0.22%

Source: US Census Bureau of Statistics, US Waterborne Databank, ACP.

Based on this analysis, it can be expected that any increase in the toll for ships transporting miscellaneous chemicals would not have a significant impact on the commodity's total landed cost.

A sensitivity analysis further showed that miscellaneous chemicals exports would not be affected by Panama Canal toll changes. Miscellaneous chemicals is comprised of high-value commodities, at US$1,162 per ton in 2003. Therefore, a Canal toll price increase of even 200 percent would cause a very minor price change per ton (Exhibit 5-20).

Exhibit 5-20
Miscellaneous Chemicals Sensitivity Analysis CIF Increase vs. Toll Increase

Toll Increase	50%	100%	150%	200%
CIF Increase	0.08%	0.16%	0.24%	0.32%

Source: Mercer analysis.

5.6.3 Analysis of Commodity Relevance

As a result of this analysis, it was determined that miscellaneous chemicals do not make up a significant portion of the US economy. The high value per ton makes the final impact of any toll change insignificant on the industry, and ultimately on the United States' trade and economy.

5.7 Miscellaneous Fertilizers Analysis

5.7.1 Overview

For the misc. fertilizer commodity analysis, data was analyzed for fertilizers in general, not for any specific sub-category. Overall, US$2.0 billion, or 84 percent of total US misc. fertilizers value is exported via seaborne transport.

In 2003, the United States exported 3.5 million tons of miscellaneous fertilizers through the Panama Canal. This represents 4.5 percent of total US Canal exports (Exhibit 5-21).
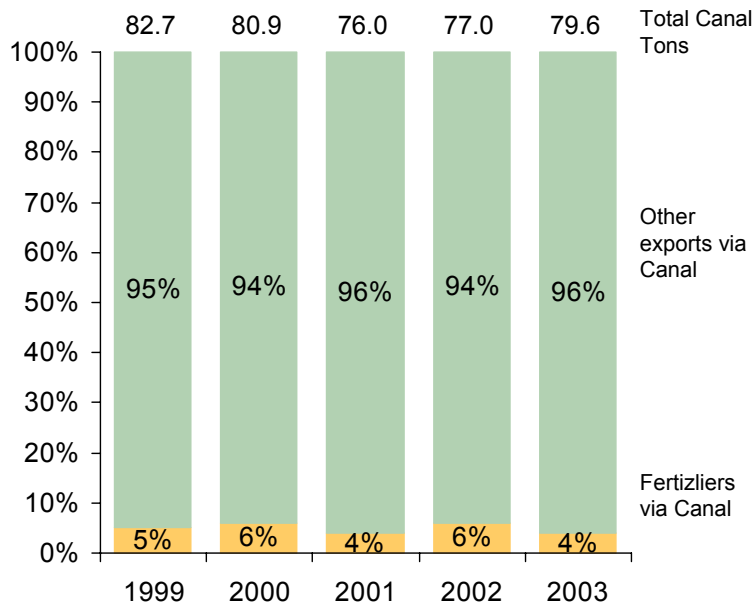
The value of total US miscellaneous fertilizers exports supplied in 2003 was US$2.3 billion, which represents 0.3 percent of total US exports (Exhibit 5-22). Of these misc. fertilizer exports, 22 percent transited the Panama Canal.

Exhibit 5-21
Miscellaneous Fertilizers Share of Total US Canal Exports: 2003
(million tons)

Source: ACP.

Exhibit 5-22
Panama Canal Transit Share of Total Miscellaneous Fertilizers Exports
(US$ billions)
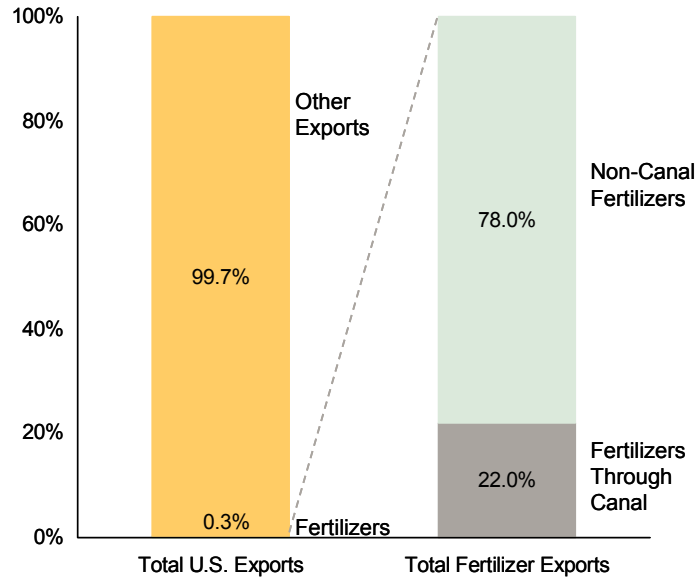
Source: World Trade Organization, US Census Bureau of Statistics, US Waterborne Databank, ACP.

5.7.2 Panama Canal Cost Share of Landed Cost

Exhibit 5-23 shows the cost components of the calculated CIF for misc. fertilizers. The comparison of CIF to the total Canal cost determined that Canal cost represents 1.37 percent of the CIF for this commodity.

Exhibit 5-23
Total Canal Cost Share of Exported Misc. Fertilizers CIF (Landed Cost)
(2003 values in US$/ton)

	FOB	Charges (Freight & Insurance)	Canal Cost (Toll + OMS)	Total CIF	Canal Cost as % of CIF
Misc. Fertilizers	$145.00	$17.32	$2.26	$164.58	1.37%

Source: US Census Bureau of Statistics, US Waterborne Databank, ACP.

From this analysis, it can be expected that a significant increase in the toll for ships transporting miscellaneous fertilizers would have a slightly moderate effect on the commodity's total landed cost.

A sensitivity analysis further showed that the landed cost of miscellaneous fertilizer exports would by slightly affected by Panama Canal toll changes. The miscellaneous fertilizers group is a moderately low-value bulk commodity, at US$145 per ton in 2003.

Therefore, a large increase in the Canal toll, which represents 1.07 percent of the landed cost, would cause a slight price change per ton (Exhibit 5-24).

Exhibit 5-24
Miscellaneous Fertilizers Sensitivity Analysis CIF Increase vs. Toll Increase

Toll Increase	50%	100%	150%	200%
CIF Increase	0.54%	1.07%	1.60%	2. 14%

Source: Mercer analysis.

5.7.3 Analysis of Commodity Relevance

This analysis determined that fertilizers make up an insignificant portion of the US economy and would only be slightly affected by a significant toll increase. The impact of a Canal toll increase would not have a significant effect on the United States' trade and economy nor on the industry's role in the US economy.

5.8 Wheat Analysis

5.8.1 Overview

For the analysis of wheat, data was analyzed for wheat and groats and meal of wheat. Overall, US$3.8 billion, or 96 percent of total US wheat export value is exported via seaborne transport.

In 2003, the United States exported 2.6 million tons of wheat through the Panama Canal. This represents 3.3 percent of total US Canal exports (Exhibit 5-25).

The value of total US wheat exports supplied in 2003 was US$4.0 billion, which represents 0.6 percent of total US exports (Exhibit 5-26). Approximately 10 percent of wheat exports transit the Panama Canal.

Exhibit 5-25
Wheat Share of Total US Canal Exports: 2003
(million tons)
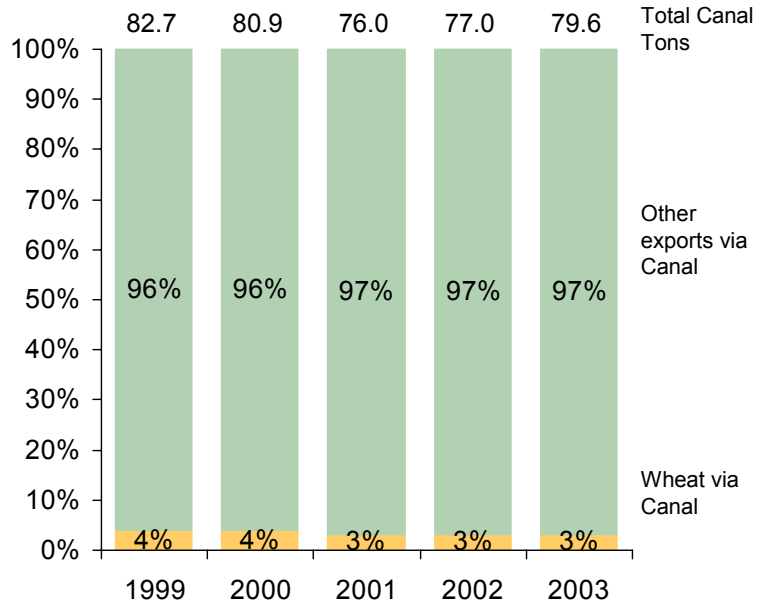
Source: ACP.

Exhibit 5-26
Panama Canal Transit Share of Total Wheat Exports
(US$ billions)
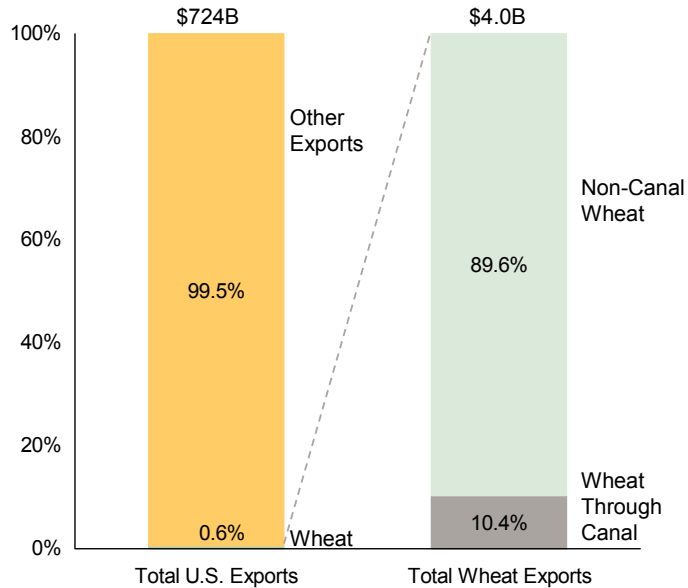
Source: World Trade Organization, US Census Bureau of Statistics, US Waterborne Databank, ACP.

5.8.2 Panama Canal Cost Share of Landed Cost

Exhibit 5-27 shows the cost components of the calculated CIF. The comparison of CIF to the total Canal cost determined that Canal cost represents 1.23 percent of the CIF for this commodity.

Exhibit 5-27
Total Canal Cost Share of US Exported Wheat CIF (Landed Cost)
(2003 values in US$/ton)

	FOB	Charges (Freight & Insurance)	Canal Cost (Toll + OMS)	Total CIF	Canal Cost as % of CIF
Wheat	$155.41	$17.47	$2.16	$175.04	1.23%

Source: US Census Bureau of Statistics, US Waterborne Databank, ACP.

From this analysis, it can be expected that a significant increase in the toll for ships transporting wheat would have only a slightly moderate effect on the commodity's total landed cost.

A sensitivity analysis further showed that wheat exports would be slightly affected by Panama Canal toll changes:

▪ Wheat is a fairly low-value bulk commodity, at US$155 per ton in 2003. Therefore, a large increase in the Canal toll, which represents less than 1 percent of the landed cost, would cause a small price change per ton (Exhibit 5-28).

▪ Additionally, the United States is the dominant wheat exporting nation, and with few alternative competitive sources or product substitutes, an increase in Canal toll would not effect the competitive landscape (i.e., no new producers our sources would emerge).

Exhibit 5-28
Wheat Sensitivity Analysis CIF Increase vs. Toll Increase

Toll Increase	50%	100%	150%	200%
CIF Increase	0.48%	0.96%	1.44%	1.92%

Source: Mercer analysis.

5.8.3 Analysis of Commodity Relevance

As a result of this analysis, it was determined that wheat makes up an insignificant portion of the US economy and would only be slightly affected by an increase in Canal tolls. Therefore, the impact of a Canal toll increase would not have a significant effect on the United States' trade and economy nor on the industry's role in the US economy.

5.9 Miscellaneous Lumber Analysis

5.9.1 Overview

The miscellaneous lumber category includes wood chips, fuel wood, sawdust, wood charcoal, logs & poles, rough wood, wood wool, pallets, drums & crates, manufactured wood products, and other articles of wood. Overall, US$2.2 billion, or 59 percent of total US miscellaneous lumber export value was exported by sea.

In 2003, the United States exported 0.2 million tons of miscellaneous lumber through the Panama Canal. This represents only 0.2 percent of total US Canal exports (Exhibit 5-29).

The value of total US miscellaneous lumber exports supplied in 2003 was US$3.7 billion, which represents 0.5 percent of total US exports (Exhibit 5-30). Of these lumber exports, 1.2 percent transited the Panama Canal.

Exhibit 5-29
Miscellaneous Lumber Share of Total US Canal Exports: 2003
(million tons)
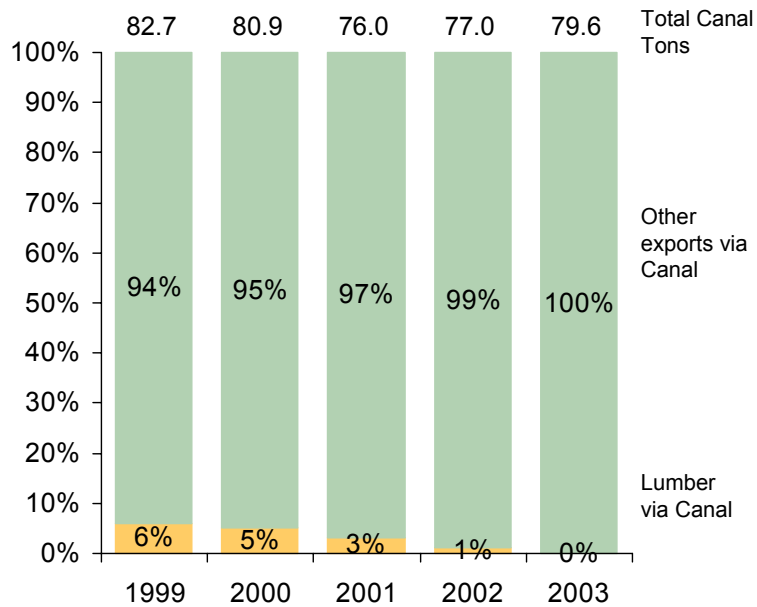
Source: ACP

Exhibit 5-30
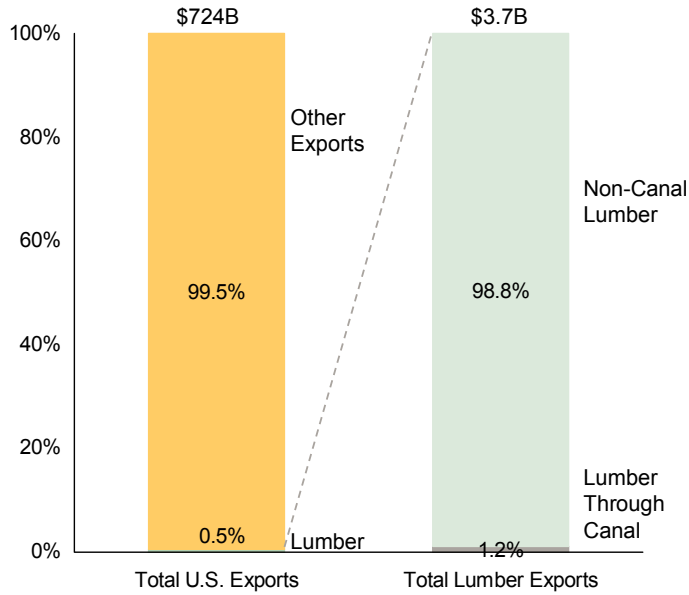## Panama Canal Transit Share of Total Miscellaneous Lumber Exports
(US$ billions)

Source: World Trade Organization, US Census Bureau of Statistics, US Waterborne Databank, ACP.

5.9.2 Panama Canal Cost Share of Landed Cost

Exhibit 5-31 shows the cost components of the calculated CIF for misc. lumber. The comparison of CIF to the total Canal cost determined that Canal cost represents 0.90 percent of the CIF for this commodity.

Exhibit 5-31
Total Canal Cost Share of US Exported Misc. Lumber CIF (Landed Cost)
(2003 values in US$/ton)

	FOB	Charges (Freight & Insurance)	Canal Cost (Toll + OMS)	Total CIF	Canal Cost as % of CIF
Misc. Lumber	$278.88	$67.76	$3.13	$349.77	0.90%

Source: US Census Bureau of Statistics, US Waterborne Databank, ACP.

From this analysis, it can be expected that a significant increase in the toll for ships transporting miscellaneous lumber would have only a slight effect on the commodity's total landed cost.

A sensitivity analysis further showed that miscellaneous lumber exports would be moderately affected by Panama Canal toll changes:

- Miscellaneous lumber is a relatively high-value bulk commodity, at US$279 per ton in 2003. Therefore, a large increase in the Canal toll, which represents only 0.73 percent of the landed cost, would cause a very small price change per ton (Exhibit 5-32).

- This slight change makes it unlikely that an increase in Canal toll would affect the competitive landscape (i.e., no new significant producers or sources would emerge).

Exhibit 5-32
Miscellaneous Lumber Sensitivity Analysis CIF Increase vs. Toll Increase

Toll Increase	50%	100%	150%	200%
CIF Increase	0.37%	0.73%	1.09%	1.45%

Source: Mercer analysis.

5.9.3 Analysis of Commodity Relevance

As a result of this analysis, it was determined that miscellaneous lumber represents only 0.5 percent of the US export economy, and that of this only 1.2 percent of the value transits the Panama Canal. Therefore, the impact of a Canal toll increase would not have a significant effect on the United States' trade and economy nor on the industry's role in the US economy.

5.10 Scrap Metal Analysis

5.10.1 Overview

Scrap metal includes miscellaneous waste and scrap metals. Overall, US$3.4 billion, or 72 percent of total US scrap metal export value is exported via sea.

In 2003 the United States exported 2.3 million tons of scrap metal through the Panama Canal. This represents 2.8 percent of total US Canal exports (Exhibit 5-33).

The value of total US scrap metal exports supplied in 2003 was US$4.7 billion, which represents 0.7 percent of total US exports (Exhibit 5-34). Of these scrap metal exports, 16.0 percent transited the Panama Canal.

Exhibit 5-33
Scrap Metal Share of Total US Canal Exports: 2003
(million tons)
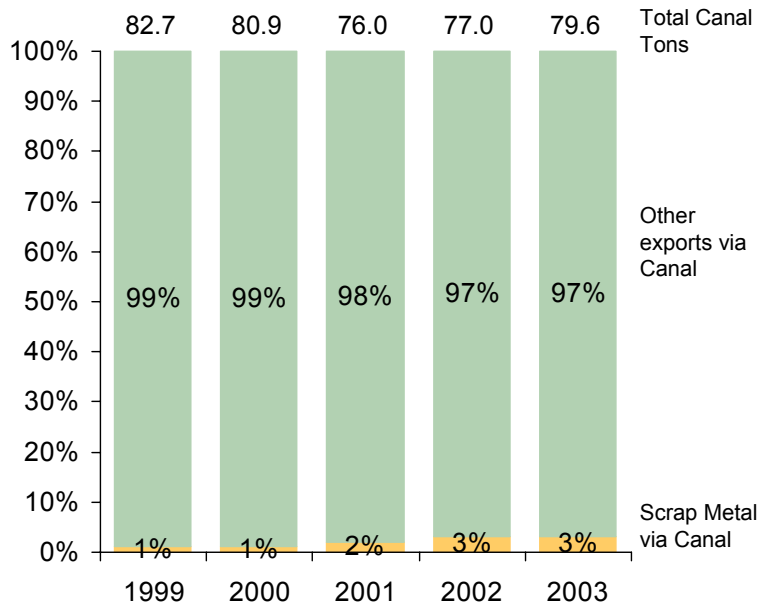
Source: ACP.

Exhibit 5-34
Panama Canal Transit Share of Total Scrap Metal Exports
(US$ billions)
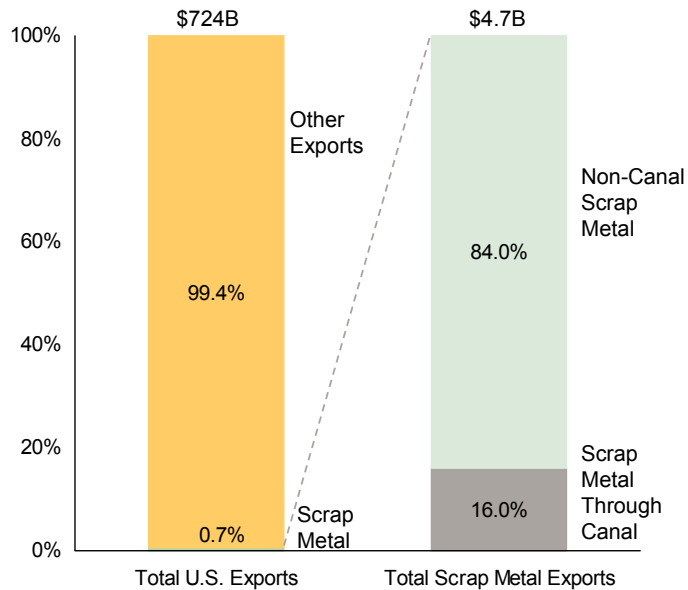
Source: World Trade Organization, US Census Bureau of Statistics, US Waterborne Databank, ACP.

5.10.2 Panama Canal Cost Share of Landed Cost

Exhibit 5-35 shows the cost components of the calculated CIF. The comparison of CIF to the total Canal cost determined that Canal cost represents only 0.64 percent of the CIF for scrap metal.

Exhibit 5-35
Total Canal Cost Share of US Exported Scrap Metal CIF (Landed Cost)
(2003 values in US$/ton)

	FOB	Charges (Freight & Insurance)	Canal Cost (Toll + OMS)	Total CIF	Canal Cost as % of CIF
Scrap Metal	$333.27	$14.66	$2.24	$350.17	0.64%

Source: US Census Bureau of Statistics, US Waterborne Databank, ACP.

From this analysis, it can be expected that a significant increase in the toll for ships transporting scrap metal would have a very minimal effect on the commodity's total landed cost.

A sensitivity analysis further showed that scrap metal exports would be minimally affected by Panama Canal toll changes:

▪ Scrap metal is a relatively high-value bulk commodity, at US$333 per ton in 2003. Therefore, even a large increase in the Canal toll, which represents only 0.49 percent of the landed cost, would not cause a significant price change per ton (Exhibit 5-36).

▪ While scrap metal is exported by numerous countries, the United States is the largest exporter of this commodity category. This and the minimal impact of a Canal toll change on US exports of this product make it unlikely that a Canal toll increase would affect the competitive landscape (i.e., no new significant producers or sources would emerge).

Exhibit 5-36
Scrap Metal Sensitivity Analysis CIF Increase vs. Toll Increase

Toll Increase	50%	100%	150%	200%
CIF Increase	0.25%	0.49%	0.74%	0.98%

Source: Mercer analysis.

5.10.3 Analysis of Commodity Relevance

The analysis determined that due to scrap metal's high value per ton and its minor role n the US export economy, the impact of a Canal toll increase would not have a significant effect on the United States' trade and economy nor on the industry's role in the US economy.

5.11 Containerized Salt, Sulfur, Earth, and Cement Analysis

5.11.1 Overview

Data analyzed for this commodity category included salt, sulfur, earth and stone, lime, and cement plaster. Overall, US$0.5 billion, or 34 percent of US containerized salt, sulfur, and earth value was exported via seaborne transport in 2003.

In 2003, the United States exported 0.6 million tons of salt, sulfur, and earth through the Panama Canal, representing 0.8 percent of total US Canal exports.

The value of total US containerized salt, sulfur, and earth exports supplied in 2003 was US$1.5 billion, which represents 0.21 percent of total US exports (Exhibit 5-37). Approximately 12 percent of salt, sulfur, and earth exports transited the Panama Canal in 2003.

Exhibit 5-37
Panama Canal Transit Share of Total Containerized Salt/Sulfur/Earth Exports
(US$ billions)
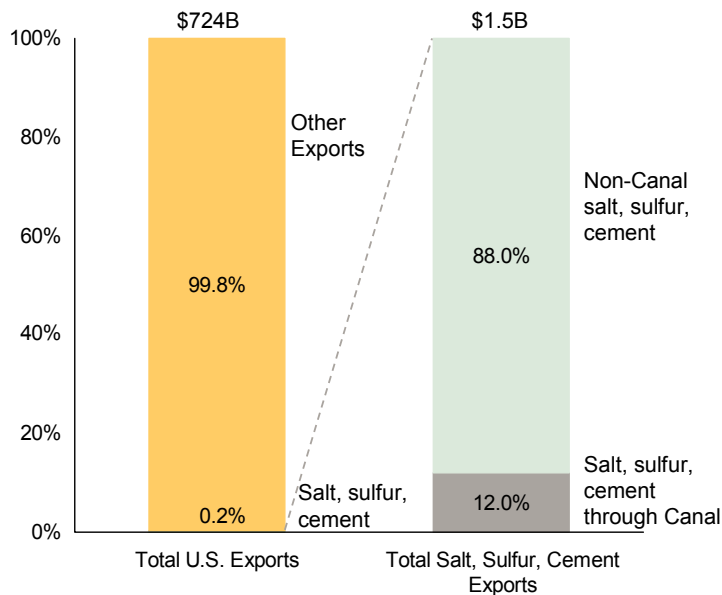
Source: World Trade Organization, US Census Bureau of Statistics, US Waterborne Databank, ACP.

5.11.2 Panama Canal Cost Share of Landed Cost

Exhibit 5-38 shows the cost components of the calculated CIF for salt, sulfur, and earth. The comparison of total landed cost to the total Canal cost determined that Canal cost represents 1.19 percent of the CIF for salt, sulfur, and earth.

Exhibit 5-38
Total Canal Cost Share of US Exported Salt/Sulfur/Earth CIF (Landed Cost)
(2003 values in US$/TEU)

	FOB	Charges (Freight & Insurance)	Canal Cost (Toll + OMS)	Total CIF	Canal Cost as % of CIF
Salt, sulfur, earth, cement	$2,897.11	$529.58	$41.33	$3,468.02	1.19%

Source: US Census Bureau of Statistics, US Waterborne Databank, ACP.

From this analysis, it can be expected that a significant increase in the Canal toll for ships transporting salt, sulfur, and earth would not have a significant effect on the commodity's total landed cost.

A sensitivity analysis further showed that salt, sulfur, and earth exports would be only slightly affected by Panama Canal toll changes, given this commodity group's moderately high transportation value and low total Canal transit cost per TEU. Therefore, a large increase in the Canal toll would not cause a significant price change per ton (Exhibit 5-39).

Exhibit 5-39
Salt, Sulfur, and Earth Sensitivity Analysis CIF Increase vs. Toll Increase

Toll Increase	50%	100%	150%	200%
CIF Increase	0.45%	0.90%	1.35%	1.80%

Source: Mercer analysis.

5.11.3 Analysis of Commodity Relevance

As a result of this analysis, it is evident that salt, sulfur, and earth plays a very small role in the US economy and that only a small portion of this commodity is relevant to the Canal. Therefore, the impact of a Canal toll increase would not have a significant effect on the United States' trade and economy nor on the industry's role in the US economy.

5.12 Containerized Paper Analysis

5.12.1 Overview

Data analyzed for containerized paper includes paper and paperboard. Overall, US$3.0 billion, or 30 percent of containerized paper value was exported via seaborne transport in 2003.

In 2003, the United States exported 1.3 million tons of paper through the Panama Canal, representing 1.7 percent of total US Canal exports.

The value of total US containerized paper exports supplied in 2003 was US$10.3 billion, which represents 1.4 percent of total US exports (Exhibit 5-40). Approximately 10 percent of paper exports transited the Panama Canal.

Exhibit 5-40
Panama Canal Transit share of Total Containerized Paper Exports
(US$ billions)
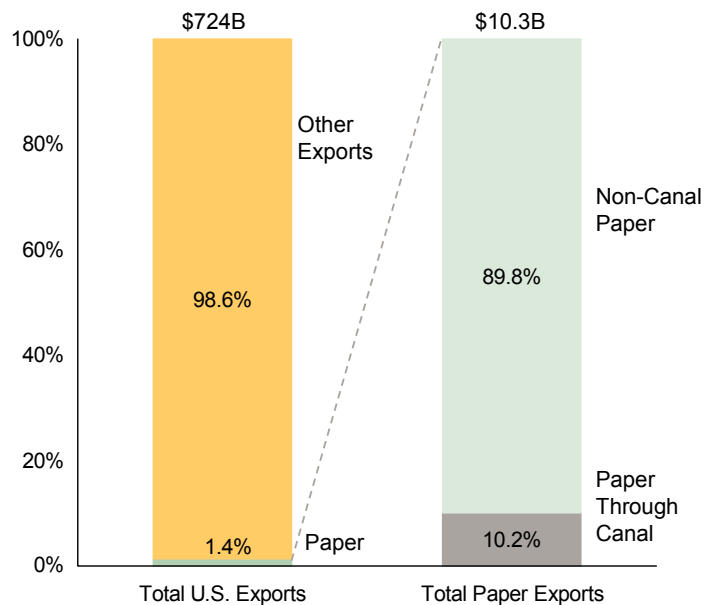
Source: World Trade Organization, US Census Bureau of Statistics, US Waterborne Databank, ACP.

5.12.2 Panama Canal Cost Share of Landed Cost

Exhibit 5-41 shows the cost components of the calculated CIF for paper. The comparison of total landed cost to the total Canal cost determined that the Canal cost represents 0.49 percent of the CIF for paper.

Exhibit 5-41
Total Canal Cost Share of US Exported Paper CIF (Landed Cost)
(2003 values in US$/TEU)

	FOB	**Charges (Freight & Insurance)**	**Canal Cost (Toll + OMS)**	**Total CIF**	**Canal Cost as % of CIF**
Paper	$7,218.76	$1,143.59	$4.52	$8,403.68	0.49%

Source: US Census Bureau of Statistics, US Waterborne Databank, ACP.

From this analysis, it can be expected that a significant increase in the Canal toll for ships transporting paper would not have a significant effect on the commodity's total landed cost.

A sensitivity analysis further showed that paper exports would be only slightly affected by Panama Canal transit cost changes. Paper has a moderately high transportation value and cost per TEU, and a relatively Canal transit cost per TEU. Therefore, a large increase in the Canal toll would not cause a significant price change per TEU (Exhibit 5-42).

Exhibit 5-42
Paper Sensitivity Analysis CIF Increase vs. Toll Increase

Toll Increase	50%	100%	150%	200%
CIF Increase	0.19%	0.37%	0.55%	0.73%

Source: Mercer analysis.

5.12.3 Analysis of Commodity Relevance

As a result of this analysis, it is evident that paper plays a small role in the US economy and that only a small portion of this commodity is relevant to the Canal. Additionally, its moderately high value per ton would reduce the impact of a Canal toll increase on the final landed cost. Therefore, the impact of a Canal toll increase would not have a significant effect on the United States' trade and economy nor on the industry's role in the US economy.

5.13 Containerized Plastics Analysis

5.13.1   Overview

Overall, US$8.3 billion, or 30 percent of US containerized plastics value was exported via seaborne transport in 2003.

In 2003, the United States exported 1.6 million tons of plastics through the Panama Canal, representing 2.0 percent of total US Canal exports.

The value of total US containerized plastics exports supplied in 2003 was US$27.9 billion, which represents 3.86 percent of total US exports (Exhibit 5-43). Approximately 10 percent of plastics exports transited the Panama Canal.

Exhibit 5-43
Panama Canal Transit Share of Total Containerized Plastics Exports
(US$ billions)
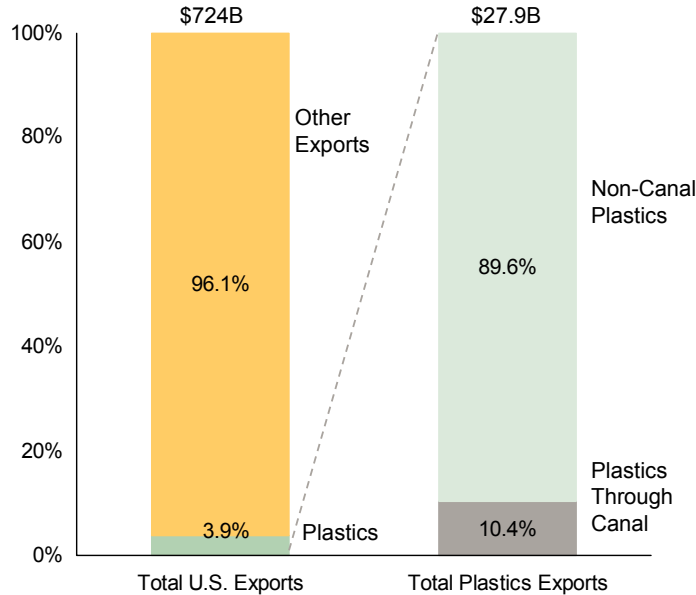
Source: World Trade Organization, US Census Bureau of Statistics, US Waterborne Databank, ACP.

5.13.2 Panama Canal Cost Share of Landed Cost

Exhibit 5-44 shows the cost components of the calculated CIF for plastics. The comparison of total landed cost to the total Canal cost determined that Canal cost represents 0.27 percent of the CIF for plastics.

Exhibit 5-44
Total Canal Cost Share of US Exported Plastics CIF (Landed Cost)
(2003 values in US$/TEU)

	FOB	Charges (Freight & Insurance)	Canal Cost (Toll + OMS)	Total CIF	Canal Cost as % of CIF
Plastics	$13,755.91	$1,325.73	$41.33	$15,122.97	0.27%

Source: US Census Bureau of Statistics, US Waterborne Databank, ACP.

From this analysis, it can be expected that a significant increase in the toll for ships transporting plastics would not have a significant effect on the commodity's total landed cost.

A sensitivity analysis further showed that plastics exports would only be very slightly affected by Panama Canal toll changes. Plastics has a high transportation value and cost per TEU, and a relatively low total Canal cost per TEU. Therefore, a large increase in the Canal toll would not cause a significant price change (Exhibit 5-45).

Exhibit 5-45
Plastics Sensitivity Analysis CIF Increase vs. Toll Increase

Toll Increase	50%	100%	150%	200%
CIF Increase	0.10%	0.20%	0.30%	0.40%

Source: Mercer analysis.

5.13.3 Analysis of Commodity Relevance

As a result of this analysis, it is evident that while plastics play a relatively significant role in the US economy, only a small portion of this commodity is relevant to the Canal. Additionally, its high value per ton reduces the percent impact of any Canal toll increase on its total landed cost. Therefore, the impact of a Canal toll increase would not have a significant effect on the United States' trade and economy nor on the industry's role in the US economy.

5.14 Analysis of Total Relevant US Imports

To ensure a thorough analysis of the effects of an increase in Panama Canal tolls, US commodity imports were analyzed in addition to exports. For the purposes of this analysis, only the most significant commodities, representing approximately 80 percent of US import tons passing through the Panama Canal, were analyzed.

Exhibit 5-46 shows Canal-relevant commodities imported into the United States[35]. The largest imports for the United States that transit the Canal include iron & steel, salt, metal ores, and energy-related commodities. Nearly one-quarter of US imports are containerized cargo, but there is no one containerized commodity that has a relatively large share of this traffic flow.

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[35] Containerized imports were broken down using US Maritime Administration Waterborne Databank of US Imports for 2003.

Exhibit 5-46
Average Canal Relevant US Imports: 1999-2003
(percentage of tons)

(52.4 MM tons)

Other	
Autos & trucks	
Cement	
Chemicals	
Ore	
Gasoline	
Coke, coal	
Crude petroleum & products	
Salt	
Iron & steel	
Container cargo	

Containerized Cargo Breakdown

5% Edible Fruit and Nuts, Citrus

5% Ceramics Products

7% Furniture

6% Beverages, Spirits, & Vinegar

7% Machinery & Mechanical Appliances

5% Electrical Machinery & Equipment

66% Other
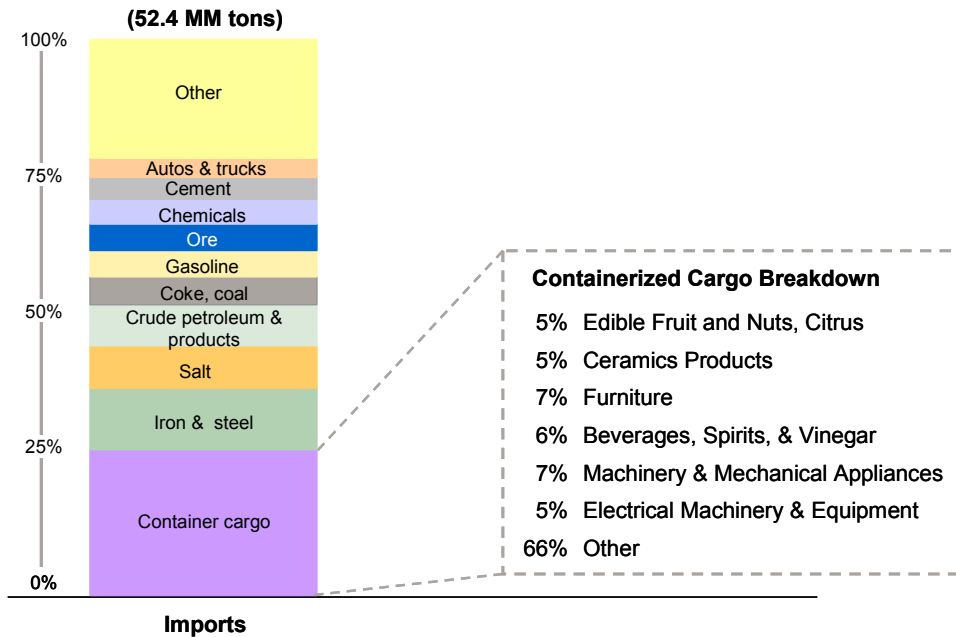
Imports

An increase in Canal tolls will increase the final landed price for imported commodities. There are various methods by which the impact of such increases on the US economy can be evaluated:

▪ One approach would be to examine the effect of the Panama Canal toll increases on the final consumer price for all of the relevant commodities imported. This method would evaluate the impact of a Canal toll increase relative to import tariffs, inland transportation costs, distribution and retailer mark-ups, and final state and federal taxes, and would take into account the total impact on the US CPI (Consumer Price Index) and consequently on inflation.

▪ A more technical approach would be to evaluate the impact of a Canal toll increase on US inflation and GDP by performing an analysis to capture the relationship between major US macroeconomic variables.

▪ A third option would be to focus on the final landed cost of each commodity. An increase in the cost of imports from a Canal toll increase will reduce the current account (exports minus imports), which is part of national income, and as a result reduce the output (GDP) of the US economy, assuming that everything else is constant. Therefore, a Panama Canal toll increase would be equivalent to a transfer of income from the United States to Panama through a shift in the terms of trade.

After considering the above approaches within the context of the scope and goals of the present study, the ACP decided to pursue the third option, a general analysis of the impact of toll increases on the final landed cost of significant import commodities. The magnitude of the direct effect (e.g., inflation) of a given toll increase depends mainly on:

- The share of US national income represented by the imports that are passing through the Panama Canal

- The US economy's degree of dependence on these imports

- The ability of end-users to reduce their consumption and/or substitute alternative products or sources

Exhibit 5-47 shows the relative importance of world imports to the US economy: From 1999 to 2003, while US GDP grew by 3 percent per year, merchandise imports grew more than twice as fast.
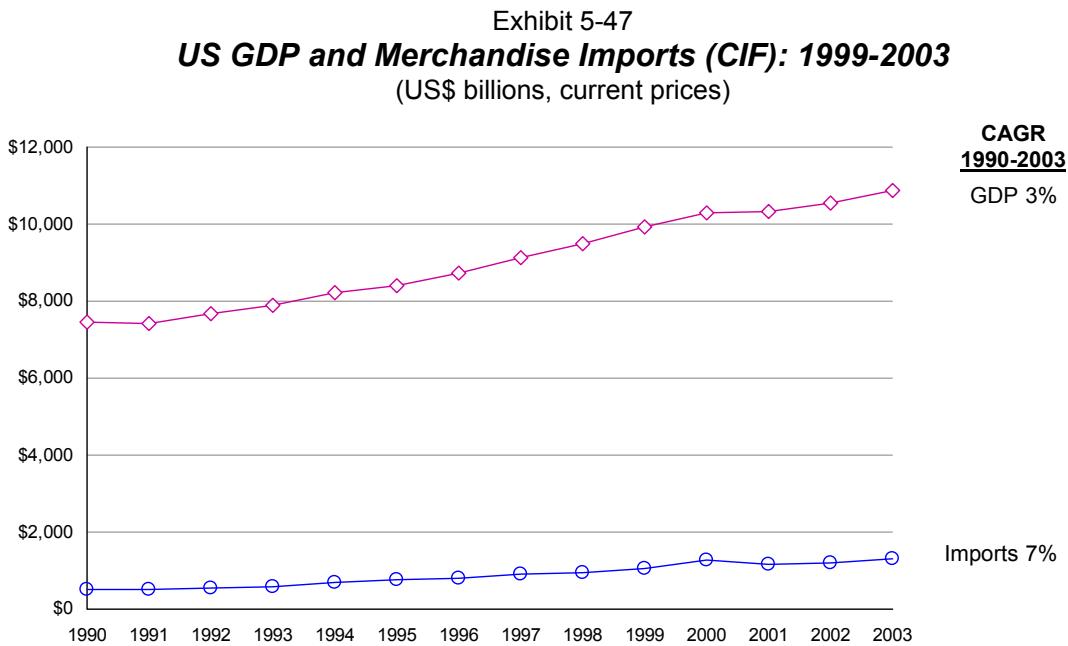
Exhibit 5-47
US GDP and Merchandise Imports (CIF): 1999-2003
(US$ billions, current prices)

Source: Congressional Budget Office, World Bank, US DOT Bureau of Transportation Statistics, USITC Dataweb (dataweb.usitc.gov).

As mentioned above, approximately 80 percent of US Canal-relevant imports were analyzed in order to determine their share in CIF value of total imports and of GDP. Exhibit 5-48 illustrates the relevant values used for this analysis.

In 2003, US imports transiting the Panama Canal accounted for 6.4 percent of total goods imports (CIF value). Additionally, imports transiting the Panama Canal represented only 0.8 percent of US GDP in 2003. Thus, the Canal (and associated toll increases) are

relevant for only a small portion of US imports, which represent an even smaller contribution to US GDP (Exhibit 5-49).

Exhibit 5-48
### *Canal-Relevant US Imports Analyzed*

| Commodity	Canal Share	Canal Transit Tons 2003	Average CIF/Ton	CIF Value of Canal Transit Tons
Iron and Steel	10.9%	5,741,792.40	$ 748	$ 4,225,069,598
Salt	7.7%	4,051,379.80	$ 21	$ 84,148,894
Crude Petroleum	5.5%	2,891,095	$ 208	$ 590,654,075
Petroleum Products	2.0%	1,028,275	$ 303	$ 306,319,599
Coke-Coal	4.2%	2,224,939	$ 109	$ 239,023,789
Petroleum Coke	0.6%	337,536	$ 64	$ 21,375,738
Gasoline	4.8%	2,540,620	$ 222	$ 554,418,608
Ores	4.7%	2,493,808	$ 48	$ 118,508,516
Chemicals Misc.	4.1%	2,169,268	$ 1,093	$ 2,333,131,051
Cement	3.9%	2,059,747	$ 48	$ 96,787,379
Autos and Trucks (Boxed and Unboxed)	3.3%	1,724,009	$10,618	$18,016,731,523
Container Cargo	26.3%	13,818,208	$ 4,177	$56,811,985,268
Other	21.9%			
Total CIF Value of Panama Canal Transit Tons				**$83,398,154,037**

Source: ACP, Mercer analysis.

Exhibit 5-49
Canal Relevant Imports Relative to US Goods Imports and GDP
(US$ trillion, current prices)
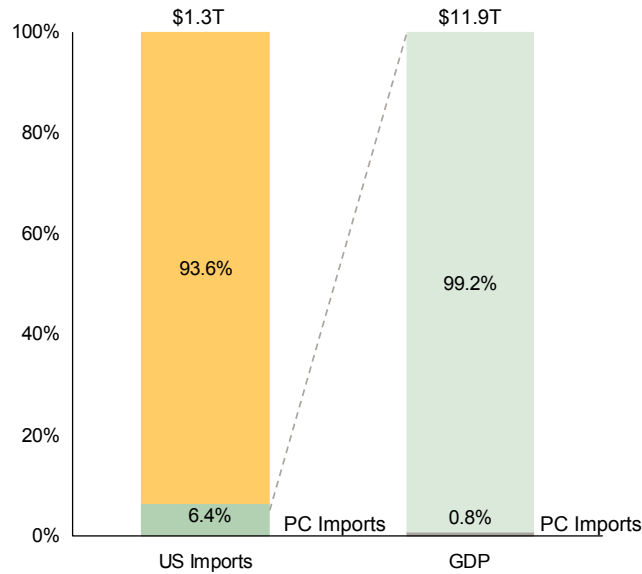
Source: ACP, US Waterborne Databank, World Bank, WTO.

In 2003, the US current account deficit was US$530.7 billion, representing 4.877 percent of GDP. An increase in import prices, due to an increase in Canal tolls, would increase the deficit and reduce national income. Our analysis, however, determined that the impact would be nearly imperceptible – even if tolls were increased by 200 percent for all US imports that transit the Canal, the cost of total goods imports would grow by 0.028 percent, the current account would increase to 4.8805 percent of GDP, and national income would drop by about 0.003 percent.

With a drop in national income of only 0.003 percent, the impact on inflation would also likely be imperceptible. To put this in perspective, in the case of past oil price shocks, a decrease of 0.4 percent of GDP was needed to generate an 0.5 percent increase in inflation in OECD countries.

<div style="border: 2px solid black; width: 180px; height: 230px; display: flex; align-items: flex-end; padding: 20px;">

6

</div>
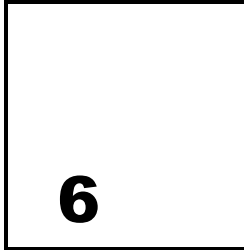
Assessment of Impact of Panama Canal Transit Cost Changes

The analysis in section 5 determined that an increase in the Panama Canal tolls would not have a significant effect on the final landed cost of Canal-relevant US import and export commodities. In this section, we summarize the impacts of Panama Canal transit cost changes on the US economy as a whole.

6.1 Impact of Transit Cost Changes for Exports

Twelve major US export commodities (representing approximately 80 percent of US export tonnage that transits the Panama Canal) were determined to be significantly Canal-relevant and analyzed in detail in this study. The following factors were analyzed for each of these commodities to determine the impact of an increase in the Canal toll on related industries and the US economy as a whole:

- The portion of the exported commodity that transits the Canal

- The relative importance of the commodity to total US exports

- The Canal transit cost impact on the final landed cost of the commodity (CIF)

### 6.1.1 Exported Commodities that Transit the Canal

Overall, Panama Canal relevant exports, including all containerized cargo, make up only 3.4 percent of total US exports.[36]

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[36] All containerized cargo includes containerized commodities that were not examined individually in this report. The value of containerized commodities was calculated using a weighted average of analyzed container commodities.

As shown in Exhibit 6-1, the analyzed export commodities represented approximately 13 percent of total US export value in 2003; approximately 24 percent of this value transited the Panama Canal.

For nine of the twelve commodities, the portion of exports that transit the Canal represents less than one-quarter of each commodity's total export value. Only three commodities have more than a quarter of their export value moving through the Canal: containerized wood pulp (28 percent of exports by value), corn (38 percent), and soybeans (42 percent).

Exhibit 6-1
Panama Canal Transit Share of Analyzed Exports
(US$ billions)
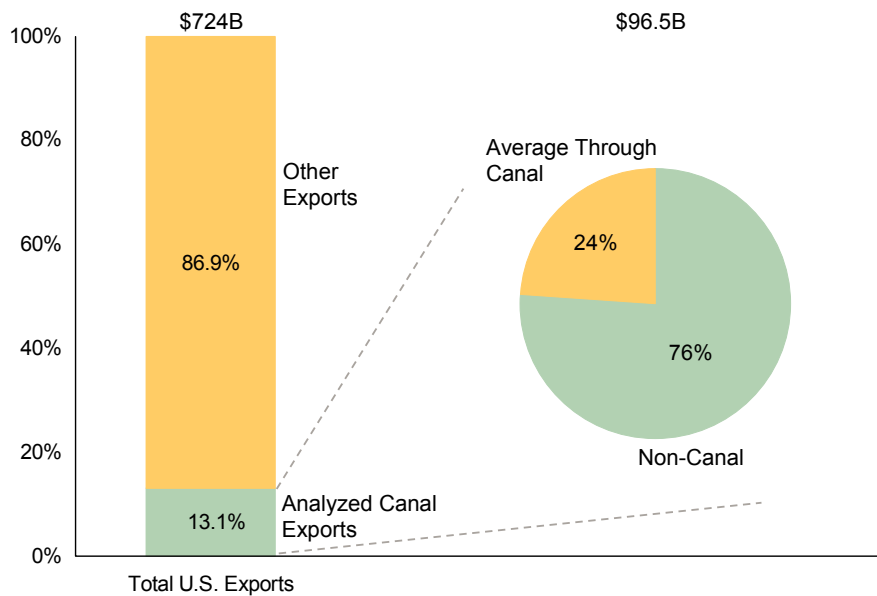
Source: ACP, US Waterborne Databank, WTO, US Census Bureau.

6.1.2 Commodity Importance Relative to US Exports

For the three commodities where a significant portion of total exports move through the Canal, none represent a significant portion of total US exports: Corn accounts for 0.69 percent of total US exports, soybeans account for 1.10 percent, and wood pulp accounts for 0.19 percent.

Of the 12 Canal-relevant commodities analyzed, only four accounted for more than 1 percent of US exports. Total exports of two Canal-relevant commodities are significant in relation to total US exports: miscellaneous chemicals (3.4 percent of total US exports) and plastics (3.9 percent). However, a Canal toll increase of 200 percent would cause total landed cost (CIF) to rise by only 0.3 percent for misc. chemicals and 0.4 percent for

plastics. While both trades have high CIF values per ton, making them significant to the US economy overall, this also serves to reduces the impact of a Canal toll increase on final landed cost (CIF) – since generally the higher a commodity's total CIF, the lower the Canal transit cost (toll plus other marine services) will be as a percentage of CIF.

6.1.3 Canal Transit Cost Impact on Final Landed Cost

Finally, for each export discussed in this report, Canal transit cost was analyzed to determine its importance to the final landed cost (CIF) of the commodity. The analysis determined that the total Canal transit cost for 11 of the 12 analyzed commodities represented less than 2.0 percent of the commodity's CIF. Therefore, even with a 200 percent increase in the Panama Canal toll (the highest increase calculated in the study) for these 11 commodities, none of these commodities' would experience an increase in total landed cost of more than 2.5 percent.

Exhibit 6-2
Summary of Canal Relevant Exports Analysis by Commodity
(US$ billions)

Commodity	1. FOB Value of Canal Exports	2. Canal Share of Total Exports	3. Total Export Value	4. Commodity Exports Share of US Exports	5. Canal Transit Cost Share of CIF	6. 200% Toll Increase Impact on CIF
Corn	$1.89	37.8%	$5.02	0.7%	1.5%	2.4%
Soybeans	$3.31	41.7%	$7.94	1.1%	0.7%	1.2%
Miscellaneous chemicals	$5.16	20.9%	$24.62	3.4%	0.2%	0.3%
Miscellaneous fertilizers	$0.51	22.0%	$2.34	0.3%	1.4%	2.1%
Petroleum coke	$0.13	11.8%	$1.13	0.2%	3.7%	5.8%
Wheat	$0.41	10.4%	$3.96	0.5%	1.2%	1.9%
Miscellaneous lumber	$0.05	1.2%	$3.75	0.5%	0.9%	1.5%
Scrap metal	$0.75	16.0%	$4.73	0.7%	0.6%	1.0%
Container Cargo	$13.60					
Wood pulp	$0.39	28.4%	$1.37	0.2%	1.9%	2.9%
Salt, sulfur, earth, cement	$0.18	12.0%	$1.53	0.2%	1.2%	1.8%
Paper	$1.05	10.2%	$10.26	1.4%	0.5%	0.7%
Plastics	$2.91	10.4%	$27.92	3.9%	0.3%	0.4%

Source: ACP, US Waterborne Databank, UN COMTRADE, US Census Bureau.

Description of columns:

1   The merchandise value of the Canal-relevant portion of exports for each commodity

2   The percent of the total export value for each commodity that transits the Canal

3   The total value of all US exports of each commodity, regardless of transportation mode or route

4   The percent of total US exports value accounted for by each commodity

5   The percent of the final landed cost (CIF) of each commodity accounted for by the total Canal transit cost (toll, other marine services) of that commodity

6   The percent change in the CIF as a result of a 200 percent increase in the Panama Canal toll for ships carrying this commodity

Petroleum coke is the one commodity for which a 200 percent increase in the Canal toll would have more of an impact, totaling 5.8 percent of CIF. However, petroleum coke has a very low value per ton, does not make up a significant portion of US exports in value, and therefore, an increase in Canal transit costs for this commodity would not significantly impact the US economy. In fact, exports of this economy in 2003 accounted for just 0.16 percent of the value of total US exports. Additionally, only 12 percent of these exports transited the Panama Canal in 2003, which means that the value of Canal-relevant petroleum coke represents only 0.02 percent of US exports.

6.2 Impact of Transit Cost Changes for Imports

The total value of the Canal-relevant import commodities analyzed in this report account for 57 percent of the United States' total imports of US$1.3 trillion, but only 6 percent of the value of these analyzed commodities transited the Canal (Exhibit 6-3).

An analysis of US Canal-relevant import commodities determined that the effect of a Canal toll increase on the total cost of US imports and on GDP would be negligible. If the toll were to increase by 200 percent, the cost of total US imports would increase by only 0.028 percent, with a minimal impact on GDP of -0.003 percent.

Exhibit 6-3
Panama Canal Transit share of Analyzed Imports
(US$ billions)
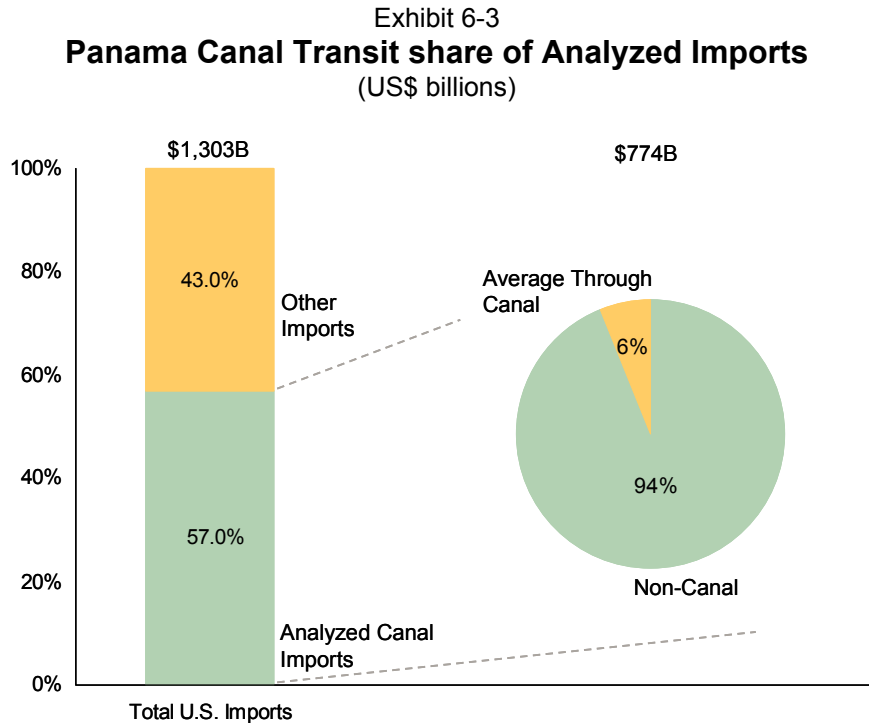
Source: ACP, US Waterborne Databank, WTO, US Census Bureau

Considering the very small increase in import cost represented by an increase in Canal transit costs, and the fact that the Canal toll is only one of many costs involved in

bringing a commodity from origin to destination and impacting a commodity's final cost to the end consumer, the Canal transit cost increase would not be a significant contributor to inflation.

6.3 Conclusions

The effect of a Panama Canal toll increase would not have a significant impact on the economy of the United States, or on the principal industries that provide Canal-relevant export commodities.

For imports, the Canal toll represents a small portion of the final landed cost (CIF) and the most significant Canal-relevant imports that were analyzed in the report only account for 3 percent of total US imports. Additionally, even a large Canal-toll increase would have virtually no effect on the cost of total US imports or on GDP. For exports, seventy-five percent of the analyzed Canal-relevant commodities transit less than 25 percent of their value through the Canal, and of those commodities for which a significant portion does transit the Canal, none accounted for more than 1 percent of total US exports.

Finally, the larger question facing the US economy with regard to the Canal is less whether the transit cost changes examined would have a significant impact, but rather whether the Canal will have sufficient capacity available to meet demand in the future, while providing an adequate level service. The implications for the critical supply chains that serve the US economy of a deterioration in service – because of increased waiting times or decreased reliability, for example – in the event that capacity is insufficient to meet demand, would be substantially more important than the cost increases that have been examined. Hence, the need to add capacity to the Canal – recognizing that the capital expense will have to be paid for through tolls – is the more critical issue facing the US economy, rather than the essentially negligible impact of the transit cost increases examined in this study.

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